Marmara Üniversitesi
İ.İ.B.F. Dergisi
YIL 2010, CİLT XXVIII, SAYI I, S. 445-462

FACTORS THAT DISCRIMINATE BETWEEN DOMESTIC AND FOREIGN BANKS OPERATING IN TURKEY

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Abstract

The Banking Restructuring Program has resulted in significant changes in the Turkish banking sector after 2001: together with the improvement in risk management systems and more effective public supervision, measures were taken to strengthen the capital structure of domestic commercial banks. As a result, domestic banks operate with a healthier financial structure today, as evidenced by their strong position during the recent global financial crisis.

This study aims at determining if there are any operational differences between domestic and foreign commercial banks operating in Turkey today. In this respect, their main financial ratios, as well as their personnel and branch network related ratios are compared. These ratios demonstrate their strategy while operating in the Turkish banking system. To find out if the differences between the means of these ratios are statistically significant for the two groups (domestic – foreign), both the discriminant analysis and the logistic regression analysis are used.

Keywords: *discriminant analysis, logistic regression analysis, Turkish banking sector, financial ratios, operational ratios*

TÜRKİYE'DEKİ YERLİ BANKALARI YABANCI BANKALARDAN AYIRAN FAKTÖRLER

Özet

Bankacılık sektöründeki yeniden yapılandırma programı, 2001'den sonra sektörde önemli değişikliklere neden olmuştur: Bankacılık Düzenleme ve Denetleme Kurumu (BDDK) ile denetim arttırılırken, risk yönetimi sistemleri geliştirilmiş ve bankaların sermaye yeterliliğini arttıracak ciddi önlemler alınmıştır. Sonuç olarak,

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son global finansal krizdeki güçlü konumlarından da görüldüğü gibi, yerli bankalar günümüzde çok daha güçlü bir finansal yapıya sahiptir.

Bu çalışmanın amacı, Türkiye'deki yerli ve yabancı mevduat bankaları arasında operasyonel farklar olup olmadığını belirlemek, eğer varsa bu farklara neden olan faktörleri ortaya çıkarmaktır. Bu nedenle, bankaların finansal rasyoları ile beraber şube ve personel yapılarına ilişkin rasyoları da incelenmiştir. Bu oranların yerli ve yabancı bankalar için hesaplanan ortalamaları arasındaki farkın istatistiksel olarak anlamlı olup olmadığını test etmek için diskriminant analizi ve lojistik regresyon analizi kullanılmıştır.

Anahtar Kelimeler: *diskriminant analizi, lojistik regresyon analizi, Türk bankacılık sektörü, finansal oranlar, operasyonel oranlar*

1. Introduction

As compared to many other countries, the negative effects of the global financial crisis in 2008-2009 on the Tukish banking sector were limited. The reasons behind this are a high capital adequacy ratio, a high asset quality, low currency and liqidity risks thanks to successful risk management and effective public supervision, and the good management of the interest, counterparty and maturity risks.[1]

This healthy financial structure in the Turkish banking system is mainly the result of the Banking Restructuring Program introduced in Turkey after 2001. Together with the program, measures were taken to keep the risks that banks can carry under control. The Program mainly aimed at improving the financial structure of the domestic banks, and Banking Regulatory and Supervisory Authority (BRSA) is responsible from the supervision of domestic, as well as the foreign banks operating in Turkey since then.

There are various studies that analyze and compare the performance of the foreign and domestic banks: Chantapong[2], Kosmidau[3] and Jeon and Miller[4] analyzed domestic and foreign banks in Thailand, UK and Korea, respectively. Their base for comparison was the differences in the profitability of the two groups. In terms of comparing domestic and foreign banks operating in Turkey, Ünsal and Duman[5] used principal component analysis to evaluate the performance of foreign, state-owned and privately owned domestic banks in Turkey in 2002-2004. Their

[1] **The Banks Association of Turkey**, "The Financial System and Banking Sector in Turkey", October 2009, pg:4.

[2] S. Chantapong, Comparative Study of Domestic and Foreign Bank Performance in Thailand: The Regression Analysis, **www.statistics.gov.uk/events/caed/abstracts/downloads/chantapong.pdf**, 14/03/2010

[3] K. Kosmidau, et al., Foreign versus Domestic Banks' Performance in the UK: A Multicriteria Approach, **www.springerlink.com/index/AD5VG18VRQVJJA60.pdf,**

[4] Yongil Jeon and Stephen M. Miller, Performance of Domestic and Foreign Banks: The Case of Korea and the Asian Financial Crisis, 14/03/2010, **www.informaworld.com/smpp/content~content=a714575713~jumptype=rss,**

[5] Aydın Ünsal - Duman Sibel, "Türkiye'deki Bankaların Performanslarının Temel Bileşenler Yaklaşımı ile Analizi", **VII.th National Econometry and Statistics Symposium**, May 2005.

findings pointed out that state-owned banks performed generally better than others except for lower capital adequacy. Tufan, Vasilescu, Cristea and Hamarat[6] analyzed the performance of domestic and foreign banks in Turkey by categorizing them as success-failure. They used both the principal component analysis and logistic regression analysis, and came up with the conclusion that foreign banks are not more successful than domestic banks.

Ünsal and Güler[7] used the financial ratios of the 21 banks that failed during the 1997-2003 period to discriminate between success and failure banks. They used discriminant and logistic regression analysis in the study, and aimed at using the findings of this analysis as a signal for banks that may possibly fail in the future. Demirhan[8] analyzed the change in the sector shares of domestic and foreign banks during the 1990-2007 period, using a panel data model with a qualitative dependent variable. The aim of the study was to find the factors that determined the changes in the sector shares, and results showed that liquidity, capital adequacy and profitability should be followed closely.

The purpose of this study is to determine the differences between foreign and domestic banks operating in Turkey. The dependent variable in the study is categorical (domestic vs foreign), and 2009 personel and branch network related ratios, as well as the financial ratios of commercal banks operating in Turkey are used as discriminatory independent variables.

2. The Statistical Methods Used in the Analysis

Discriminant analysis is the main statistical tool that can be used to determine the factors that discriminate between two or more groups. It does, however, have various assumptions, the violation of which may lead to misleading results. In this respect, logistic regression analysis has gained popularity, as it has in general less stringent requirements: it does not require normally distributed variables and does not assume homoscedasticity. Logistic regression is useful to model the event probability of a binary variable[9]. Hence, logistic regression analysis can also be used to determine factors that disciminate between two groups.

2. a. Discriminant Analysis

In addition to determining the variables that discriminate between two or more groups, discriminant analysis also calculates the relative importance of the variables that discriminate between the groups. It detemines the distance between

[6] Ekrem Tufan et al.,, "Evaluation of Domestic and Foreign Banks by Using Financial Ratios", **11th International Finance and Banking Symposium**, 2007, pg:814-829.

[7] Aydın Ünsal – Hüseyin Güler, "Türk Bankaclık Sektörünün Lojistik Regresyon ve Diskriminant Analizi ile İncelenmesi", **VII.th National Econometry and Statistics Symposium**, May 2005.

[8] Ayşe Demirhan, "The Analysis of the Sector Share Change of the Banks by Panel Data Model with Qualitative Dependent Variable",**Yönetim Dergisi**, October 2009, pg:78-97.

[9] Alan Agresti, **An Introduction to Categorical Data Analysis**, John Wiley and Sons Inc., New York, 2007, pg:99.

the groups, if there actually is a statistically significant discrimination between the groups. If there are two categories to be discriminated, the analyis is called the two-group discriminant analysis and if there are more than two categories the analysis is called a multiple (or canonical) discriminant analysis.

While regression analysis is used when both the dependent and the independents variables are continous, discriminant analysis is appropriate when the dependent variable is categorical and the independent variables are continuous[10] .

The disciminant analysis produces the discriminant function, which is a linear combination of two or more independent variables:

$$Z= a + w_1X_1 + w_2X_2 + w_3X_3 + \ . \ . \ . \ . \ . + w_nX_n$$

where Z is the value of the categorical variable and is made up of two or more pedefined groups, a is the constant and w_1, w_2, . . .w_n are the discriminant weights (coefficients). The discriminant function analysis calculates the weights (coefficients) that maximize the between-groups variance, given the within groups variance. Then each weight is multiplied by the related independent variable X, and then they are added up. The result is one single discriminant value (Z) for each case in the analysis. The average of the weights of all cases within one group is called the centroid, and dicriminant analysis is used to test the null hypothesis that these group means (centroids) are equal[11].

The results of the discriminant analysis will be more reliable when the sample size is greater than 30 for each independent variable in the analysis. Moreover, there should be at least two observations for each group. Here again, it will be better if the number of observations within each group exceeds 30. Moreover, the number of observations within each group should not be highly different from another, otherwise groups with larger number of observations will have a higher probability of classification. The number of independent variables, on the other hand, can at most be two less than the sample size. But the reliability of the results will decrease as the difference between the sample size and the number of independent variables decreses[12].

In addition to assuming the relationship is linear in the parameters, the discriminant function analysis is based on three main assumptions and the validity of these assumptions should be checked before starting the analysis[13]:

1) The data for the variables should represent a multivariate normal distribution: This assumption can be checked graphically through

[10] S.I.Press and S.Wilson, "Choosing Between Logistic Regression and Discriminant Analysis, **Journal of American Statisticians Association**, 73, pg: 700.

[11] W.R. Dillon and M. Goldstein, **Multivariate Analysis: Methods and Applications**, John Wiley and Sons Inc., New York, 1984, pg:157.

[12] K. Fukanga and R.R. Hayes, "Effects of the Sample Size in Classifier Design", **IEEE Transactions on Pattern Analysis and Machine Intelligence**, PAM-II, pg:873-885.

[13] R.H. Rifferburgh and C.W. Clunies-Ross, **Linear Discriminant Analysis**, Pasific Science Association, XVI, pg:251-256.

histograms and plots, but a more precise way will be to use descriptives (skewness and kurtosis) and statistical tests like Kolmogrov Smirnov test.

2) The variance – covariance matrix of variables should be homogenous accross groups: Therefore it is a good idea to look at scatterplots as well as within group variances and correlation matrix. Here again, a test of significance will give a more precise result, and Box M test is the one most frequently used fort his purpose.

3) The independent variables used in the analysis should not be correlated with each other, and also one variable should not be a linear combination of the other variables: if this assumption does not hold, the problem of multicollinearity will arise, decreasing the reliability of the coefficients (or the discriminant weights) of the independent variables. Tolerance values can be used to have a better idea of the existance of multicollinearity in the analysis.

While the problem of multicollinearity can be handled by dropping one or more variables, it is not so easy to find a solution to the violation other two assumptions. Lachenbruch[14] has shown that while efficiency and sensitivity decreases slightly, there will not be a major problem unless the assumption of normality is significantly violated. If the variance–covariance matrix of variables is not homogenous, on the other hand, the discrimination functions will be misleading.

2. b. Logistic Regression Analysis

Logistic regression is a form of regression which is used when there is a dichotomous dependent variable, and can be used to discriminate between two groups. Since the dependent variable is dichotomous and can take only two values (0 – 1), linear regression faces a problem in dealing with a dependent variable (Y) with ceiling and floor: the same change in an independent variable X has a different effect on Y depending on how close the curve corresponding to any X value comes to the maximum (1) or minimum (0) Y value. Therefore, a transformation of the dependent variable is necessary to allow for the decreasing effects of X on Y as the predicted Y value approaches the floor or the ceiling. The probability ($л_i$) of experiencing an event (one group) to the probability of the other event is called the odds or the odds ratio[15] :

$$Odds = л_i/(1-л_i)$$

Logistic regression equation predicts the log odds (also called the logit) of the dependent variable (Y)[16] :

$$z = Logit(Y) = a + b_1X_1 + b_2X_2 + ... + b_kX_k$$

[14] P.A. Lachenbruch, "Note on Initial Misclassification Effects on the Quadratic Discriminant Function", **Technometrics**, 21, pg:129-132.

[15] Alan Agresti, **An Introduction to Categorical Data Analysis**, John Wiley and Sons Inc., New York, 2007, pg:28-29.

[16] Scott Menard, **Applied Logistic Regression Analysis**, Sage Publications, Inc., CA, 2002, pg:13.

where z is the logit, or the log odds of the dependent variable, a is the constant, b_1, b_2, . . b_k are the logistic regression coefficients -also called parameter estimates-, and X_1, X_2, . . .X_k are the independent variables of the logistic regression equation.

Logistic regression estimates the odds of a certain event occurring: in this respect, logistic regression calculates changes in the log odds of the dependent variable, not changes in the dependent variable itself as ordinary least squares (OLS) regression does. Moreover, unlike OLS regression, logistic regression does not assume linearity of relationship between the independent variables and the dependent, but requires that observations should be independent and that the independent variables should be linearly related to the logit of the dependent.

In logistic regression, maximum likelihood techniques are used to maximize the value of the log-likelihood function, which indicates how likely it is to obtain the observed values of Y, given the values of the independent variables X_1, X_2, . . .X_k and the parameters a, b_1, b_2, . . b_k. The solution for the logistic regression model is found by an iterative process, until it converges -meaning the change in the likelihood function from one step to another becomes negligible[17].

One way to interpret the size of the log-likelihood involves comparing the value of the model to the initial or baseline which includes only a constant in the model, assuming all regression coefficients equal to zero. The difference between the baseline log likelihood and the model log likelihood, when multiplied by -2 gives a chi-square value with degrees of freedom equal to the number of independent variables. This chi square value is used to test the overall model significance[18].

In logistic regression, a measure which is conceptually similar to the coffficient of determination of the OLS model is derived by calculating the improvement due to the independent variables, relative to the baseline model:

$$R^2 = [(-2\ln L_0) - (-2\ln L_1)] / (-2\ln L_0)$$

where L_1 is the model log likelihood. However, the measure does not represent the explained variance, as the likelihood functions do not deal with variance as defined by the sum of squared deviations. This and similar measures are therefore called pseudo R^2.

The predictive success of the logistic regression can be assessed by looking at the classification table, showing correct and incorrect classifications of the dichotomous dependent variable. Here, predicted group membership is compared with the observed group membership. Using predicted probabilities for each case, logistic regression predict the expected group membership. Based on a typical cut of value of 0,5, those cases with predicted probabilities above 0,5 are predicted to score

[17] David Ruppert, et al., **Semiparametric Regression,** Cambridge University Press, 2003.

[18] Fred C. Pampel, **Logistic Regression –A Premier**, Sage Publications, Inc., CA, 2000, pg:46.

1 on the dependent vaiable and those with predicted probabilities below 0,5 are predicted to score 0 [19].

3. Turkish Banking Sector

The banking sector has always been the most important part of the Turkish financial system. A major restructuring in the sector (the Banking Restructuring Program) took place following the financial and economic crisis in Turkey in 2001, which resulted in a strong improvement in the financial structure of Turkish banks. The initial efforts of the restructuring program were directed towards making extensive amendments to the Banking Law. The Banking Regulation and Supervisory Authority (BRSA) was established as a regulatory authority, and within the scope of the program:

- Banks that were facing financial problems were taken over by the Savings Deposit Insurance Fund (SDIF),
- Considerable public resources were transferred to strengthen the capital structure of the state-owned banks, and operational restructuring accelerated through mergers between each other,
- Mismanagement, and the negative effects of the 2001 financial and economic crisis had resulted in a significant rise in non-performing loans of the private sector. Hence, capital support was extended and better audit systems were introduced to improve private banks' asset quality,
- Legislative measures were taken so as to bring Turkish banks' financial structure in line with international standards and regulations, and the infrasructural requirements of the new Basel Capital Accord (Basel II) were incorporated.

Hence, Banking Restructuring Program resulted in stronger financial structure for banks, and improvement in risk management systems and more effective public supervision in the sector[20].

Since then, there was a steady growth in the Turkish banking sector: total assets of the sector increased 260%, from 212,7bn TL at year end 2002 to 765,2bn TL as of the end of September 2009. Hence, despite the fact that non-bank financial institutions have grown in number and size in the recent years, the banking system today still has the major share in the Turkish financial sector: as of the end of 2008, the ratio of total assets to GDP was 78% for the banking sector, as compared to the 2.6% for the insurance sector and the 2.5% for the mutual investment funds[21].

As of the end of September 2009, there were 32 commercial banks and 13 investment and development banks operating the Turkish banking sector, all of which are a member of the Banks Association of Turkey. The commercial banks have the highest share:

[19] Fred C. Pampel, **Logistic Regression –A Premier**, Sage Publications, Inc., CA, 2000, pg:13.

[20] **The Banks Association of Turkey**, "The Financial System and Banking Sector in Turkey", October 2009, pg7.

[21] **The Banks Association of Turkey**, "Bankalarımız – 2008",

Table 1: Total Assets and Equity of Banks in Turkey

	Total Assets		Total Equity	
	Billion TL	Share in Total	Billion TL	Share in Total
Commercial Banks	739,4	96,6%	89,2	88,1%
Investment and Development Banks	25,8	3,4%	12,0	11,9%
Total Banking Sector	765,2	100,0%	101,2	100,0%

Source: **The Banks Association of Turkey**

4.1. Data Used in the Analysis

Out of the 32 domestic and foreign commercial banks operating in Turkey, 31 of them were included in the analysis, and only one of them (Birleşik Fon Bankası) was excluded because it currently is under the control of the Deposit Insurance Fund and is a significant outlier within most of the independent variables discussed below.

Based on the end-September 2009 (last available) financial statements of these 31 banks, five main performance ratios (capital adequacy, balance sheet structure, liquidity, asset quality and profitability) were calculated for each bank. One or two ratios were selected from each one of these groups, in trying to decrease the possibility of multicollinearity among variables and to keep a better balance between the number of variables and the sample size. Hence, the financial performance ratios used were:

1) Liquidity : Liquid Assets / Short Term Liabilities
2) Asset Quality : Net Nonperforming Loans / Total Loans
3) Capital Adequacy : Equity / Risk Weighted Assets
4) Profitability : Return on Equity
   Net Interest Income / Total Assets
   Non-Interest Income / Total Assets
5) Balance Sheet Structure: Foreign Currency Assets / Foreign Currency Liabilities
   Net Balance Sheet + off-Balance Sheet Position / Equity
   Loans / Total Assets

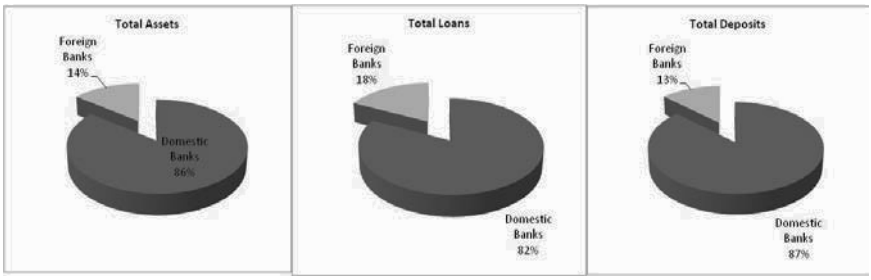
In addition to these financial performance ratios, ratios related to banks' operations were also used in the analysis:

1) Number of personnel per branch
2) The ratio of female personnel to total,
3) Education level of branch personnnel: the ratio of those that are university graduates (or a higher level of education) to total employees

4.2 Statistical Analysis of the Data

Out of the 31 commercial banks currently operating in Turkey, 17 are foreign and 14 are domestic. The number of domestic commercial banks has decreased following the Banking Restructuring Program, through takeovers, mergers and acquisitions. Despite they are less in number, domestic commercial banks have a clear dominance in the Turkish banking sector, with total assets, deposits, loans and equity significantly higher than foreign commercial banks.

Graph 1: Foreign and Domestic Commercial Banks' Share in Sector Assets, Loans and Deposits



Source: **The Banks Association of Turkey**

When some basic descriptive statisitics of the ratios were calculated, the skewnes and kurtosis statistics were quite high for a lot of variables, and therefore the assumption of normality is tested:

Table 2: Tests of the Assumption of Normality

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Equity / Risk Weighted Assets	,315	31	,000	,565	31	,000
Net Balance Sheet + off-Balance Sheet position / Total Equity	,138	31	,137	,934	31	,057
Foreign Currency Assets / Foreign Currency Liabilities	,151	31	,068	,862	31	,001
Total Loans / Total Assets	,150	31	,075	,919	31	,022
Net Nonperforming Loans / Total Loans	,163	31	,036	,867	31	,001
Liquid Assets / Short Term Liabilities	,292	31	,000	,481	31	,000
Return on Equity	,153	31	,061	,836	31	,000
Net Interest Income / Total Assets	,104	31	,200*	,955	31	,212
NonInterest Income / Total Assets	,295	31	,000	,706	31	,000
Female Personel / Total Personnel	,146	31	,089	,910	31	,013
Higher Education Personnel / Total Personnel	,111	31	,200*	,970	31	,509
Number of Personnel per Branch	,369	31	,000	,637	31	,000

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

As can be seen from Table 3, the deviation from normality is highly significant for most of the independent variables used in the study. The two tests in general provide similar results, but on those that they disagree, Shapiro-Wilks test is preffered as it is a stronger test. In this respect, the distribution of all of the independent variables used in the study, except for three ratios:

1) Net Balance Sheet + off-Balance Sheet Position / Total Equity,
2) Net Interest Income / Total Assets,
3) Higher Education Personnel / Total Personnel

are significantly different from normal distribution.

One of the main assumptions of the discriminant analysis is that the variance-covariance matrix of independent variables should be homogenous accross groups. The validity of this assumption is also analyzed using a Box M test, and the null hypothesis that variance-covariance matrix of independent variables accross groups is homogenous is accepted based on the test statistic and its low significance level:

Table 3: BOX M test

Test Results

Box's M		1,043
F	Approx.	1,008
	df1	1
	df2	2451,766
	Sig.	,315

Tests null hypothesis of equal population covariance matrices.

The correlation matrix of the independent variables is also analyzed, which showed a significant correlation between many variables in the study, and revealed possible multicollinearity problems. The "Equity / Risk Weighted Assets" ratio was the variable which had a significant correlation with the largest number of independent variables.

5. Methods Used in the Analysis

The two statistical data discrimination tools -discriminant analysis and logistic regression analysis- that were discussed theoretically above, were both used to determine any operational factors that discriminate between the domestic and foreign commercial banks operating in Turkey. The statistical analysis of the data in section 4.2 shows that the normality assumption of the discriminant analysis is violated. Slight deviations from this assumption are tolearable, but the deviations in our data are quite significant, and therefore, discriminant analysis results are compared with those of logistic regression analysis. The violation of the assumption of noncollinearity of independent variables is a concern for both the discriminant and logistic regression analysis, and was inevitably handled by dropping some variables. SPSS statistical software program was used for the calculations of both analyses. Moreover, stepwise method is used in applying both the discriminant and the logistic regression analysis, to see the most important variables and their contribution to the model step by step.

5.1. Discriminant Analysis Results

Only one independent variable, the ratio of foreign currency assets to foreign curency liabilities, was selected when the stepwise method was used. Once this variable has entered the equation, the other variables' F values and tolerance level were not sufficient to enter the equation:

Table 4: Independent Variables Selected Using the Stepwise Method

Variables Entered/Removed[a,b,c,d]

Step	Entered	Wilks' Lambda							
						Exact F			
		Statistic	df1	df2	df3	Statistic	df1	df2	Sig.
1	Foreign Currency Assets / Foreign Currency Liabilities	,850	1	1	29,000	5,105	1	29,000	,032

At each step, the variable that minimizes the overall Wilks' Lambda is entered.

a. Maximum number of steps is 24.

b. Minimum partial F to enter is 3.84.

c. Maximum partial F to remove is 2.71.

d. F level, tolerance, or VIN insufficient for further computation.

Table 5: The Coefficients of the Discriminant Function Equation

Classification Function Coefficients

	Domestic vs Foreign	
	Foreign	Domestic
Foreign Currency Assets / Foreign Currency Liabilities	,035	,055
(Constant)	-1,715	-3,213

Fisher's linear discriminant functions

Wilks' Lambda, and the chi-square test of significance tests are used to test the null hypothesis that the means of the functions are equal across groups. Hence, a smaller level of significance indicates that the discriminant function does a better job in discriminating the groups than chance.

Table 6: The Significance of the Discriminant Model

Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	,850	4,621	1	,032

5.2. Logistic Regression Analysis Results

Logistic regression analysis starts with (beginning block) by including only the coefficient in the equation, which is called step 0. All independent variables are listed together with their siginificance level, which will constitute the basis for deciding which one will enter the equation first.

In the first step, the "Foreign Currency Assts / Foreign Currency Liabilities" variable which has the highest significance (0,031) is included in the equation. As mentioned above in section 2.b, logistic regression uses log-likelihood and the chi-square statistics for significance testing, and therefore the "Liquid Assets / Short Term Liabilities" variable that improves likelihood ratio entered the equation at the second step:

Table 7: Independent Variables Selected Using the Stepwise Method

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Foreign Currency Assets / Foreign Currency Liabilities	,027	,01	3,71	1	,05	1,03
	Constant	-2,14	1,9	3,87	1	,05	,12
Step 2[b]	Foreign Currency Assets / Foreign Currency Liabilities	,049	,02	5,49	1	,02	1,05
	Liquid Assets / Short Term Liabilities	-,012	,01	3,74	1	,05	,988
	Constant	-2,97	1,4	4,79	1	,03	,051

a. Variable(s) entered on step 1: Ratio3.

b. Variable(s) entered on step 2: Ratio6.

The Wald statistic is calculated by dividing the coefficient by its standard error and then taking the square of it. The importance of the variable increases as the Wald statistic decreases, as can be seen from the significance level. Among the two variables in the equation, "Foreign Currency Assets / Foreign Currency Liabilities" ratio is clearly more important.

Among the pseudo R^2 statistics, Nagelkerke R^2 is easier to use, mainly because it adjusts for the Cox-Snell R^2, so that the ratio covers the full range from 0 to 1. These pseudo R^2 values are useful especially comparing models, and here they show an improvement in model fit at the second step, with the addition of the "Liquid Assets / Short term Liabilities" variable into the equation.

Table 8: Improvement in the Likelihood Ratio of the Logistic Regression Method

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	37,098[a]	,165	,221
2	32,861[a]	,272	,363

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

The Hosmer and Lemeshow test is the most reliable goodness of logistic regression model fit in SPSS, and the test indicates a poor fit if the significance value is low. Here, the test significance is quite high, at 0,62 level, indicating the model fits the data well.

Table 9: Test of Goodness of Fit for the Logistic Regression Model

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	13,224	8	,104
2	6,243	8	,620

5.3 Comparison of the Models

In terms of determining the factors that discriminate between domestic and foreign commercial banks in Turkey, the results of both the discriminant and the logistic regression equation were quite similar: both showed that the "Foreign Currency Assets / Foreign Currency Liabilities" ratio is the most important variable. While it was the single most important variable in the discriminant analysis, the logistic regresssion analysis pointed out a second variable, the "Liquid Assets / Short Term Liabilities" ratio as an important variable (though having a much less significance than the "Foreign Currency Assets / Foreign Currency Liabilities" ratio).

To compare the practical results of the discriminant and the logistic regression analyses, the classification table is used. Table 10 shows the classification table of the discriminant analysis, and Table 11 shows the classification table of the logistic regression analysis. On the classification table, cells on the diagonal are correct, and the cells off the diagonal are incorrect predictions.

Table 10 : Discriminant Function Analysis Classification Table:

Classification Results[a]

			Predicted Group Membership		
		Domestic vs Foreign	Foreign	Domestic	Total
Original	Count	Foreign	12	5	17
		Domestic	5	9	14
	%	Foreign	70,6	29,4	100,0
		Domestic	35,7	64,3	100,0

a. 67,7% of original grouped cases correctly classified.

Table 11 : Logistic Regression Analysis Classification Table:

Classification Table[a]

			Predicted		
			Domestic vs Foreign		
	Observed		Foreign	Domestic	Percentage Correct
Step 1	Domestic vs Foreign	Foreign	13	4	76,5
		Domestic	5	9	64,3
	Overall Percentage				71,0
Step 2	Domestic vs Foreign	Foreign	13	4	76,5
		Domestic	4	10	71,4
	Overall Percentage				74,2

a. The cut value is ,500

Discriminant analysis:

1) Correctly classified 12 commercial banks as foreign (out of the 17 total) : a correct percentage of 70.6%,
2) Correctly classified 9 commercial banks as domestic (out of the 14 total) : a correct percentage of 64,3%,
3) Overall, correctly classified 21 banks (out of the 31 total) : a correct percentage of 67,7%,

Logistic regresiont analysis:

1) Correctly classified 13 commercial banks as foreign (out of the 17 total) : a correct percentage of 76.5%,
2) Correctly classified 10 commercial banks as domestic (out of the 14 total) : a correct percentage of 71,4%,
3) Overall, correctly classified 23 banks (out of the 31 total) : a correct percentage of 74,2%.

6. Conclusion

In this research, we compared domestic and foreign banks in Turkey based on their financial ratios that are related to the asset quality, liquidity, profitability, capital adequacy, and balance sheet structure of their financial statements. We also analyzed operational ratios, such as the number of personnel per branch, the ratio of female personnel to total and the ratio of higher educated personnel to total. Based on our analysis of the Turkish banking system, there do not remain significant operational differences between domestic and foreign commercial banks today.

Both of the methods we used for analysis –the discriminant function analysis and the logistic regression analysis- have given almost the same result: among these various ratios, only "Foreign Currency Assets / Foreign Currency Liabilities" ratio is a statistically significant discriminating factor among domestic and foreign banks. The ratio is higher for domestic commercial banks: this can be due to the fact that foreign banks –relying on their foreign shareholder-, may be more inclined to carry a short foreign currency position to benefit from the real appreciation of the Turkish Lira in the past few years.

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