FINANCIAL RISKS IN TURKISH BANKING INDUSTRY: A PANEL DATA ANALAYSIS ON ISTANBUL STOCK EXCHANGE

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ABSTRACT

Global price movements have been affecting markets dramatically in recent years. The changes in exchange rates, interest rates, and liquidity directly affect market value of firms. These risks are called financial risks and typically affect financial institutions. Many methods are developed to compute these risks. This study has a panel data analysis on 7 banks listed on Istanbul Stock Exchange. The motivation of this study is to investigate the relationship between financial risks (interest rate risk, exchange rate risk and liquidity risk) and market value of these banks. Many tests are available in the research such as VIF, AR Roots, Lag Length Selection Criteria, Cross Section Dependence Test, Delta Test, Unit Root Tests, Model Selection Tests, Heteroscedasticity and Autocorrelation Tests. Based on the tests, two way fixed effects model is developed. The results reveal that financial risks explain 29% of all price movements of commercial banks. The model is statistically significant. There is a positive relationship between liquidity and market value and negative relationships between interest rate risk and market value, and exchange rate risk and market value. The results are also consistent with the literature. The research is unique for the Turkish Banking industry and therefore is important academically as well as for risk management practice. Results show that banks operating in Turkey don't properly manage financial risks. Macroeconomic dynamics and maturity mismatch problems in Turkey require great attention on financial risks. It is recommended that banks should operate with more risk management instruments such as financial derivatives and corporate risk management.

Contribution/Originality: This study is one of the very few studies which have investigated the relationship between financial risks and market value of Turkish commercial banks. Most studies on financial risks have analyzed non-financial firms. And the studies on financial risks of financial firms primarily focus on profitability.

1. INTRODUCTION

Financial risk can be defined as the loss potential which may affect a company negatively to reach its goals and possibly results in a profit less than expected (Koroglu, 2019). This risk will lead to an increase in liabilities or a decrease in assets of a company. In the event of fluctuation of prices in the market, especially commercial banks are very fragile. Many techniques have been developed to measure this risk (Kocak, 2012).

Price fluctuations in the markets have increased in the recent years. The fluctuations in exchange rates, interest rates, stocks and commodities directly affect firms. Because of these factors, firms are exposed to financial risks which are difficult to be managed (Yucel, Mandacı, & Kurt, 2007).

Companies work in the field of risk management to still obtain profits while protecting themselves from financial risks. Financial risks may lead to low financial leverage, negative changes in exchange rates, overdependence to a supplier, loss of primary customer, and loss of external investors (Chapman, 2006).

Due to increased communication and information technologies, firms and individuals interact more closely. The advances in Internet led to developments in domestic trade. On the other hand, economic and political operations between countries and continents have increased. A negative situation in one part of the World may lead to several consequences in other parts of the World. These financial shocks stem from economic and non-economic reasons (Yanartaş, 2010).

Examples of economic factors that is related to financial risk are inflation, interest rate, exchange rate, and market volatility. Non-economic financial risks may occur because of political and social events. The increase in financial instruments and information technologies has led to an increase in the number of financial risks that can occur. Firms develop new financial instruments to attract global capital, however increased leverage also come with greater financial risks (Uzak, 2019).

The motivation of this study is to investigate the relationship between market value and financial risks of commercial banks. For this purpose, a panel data analysis of commercial banks listed on Istanbul Stock Exchange is done. The rest of this study is organized as follows. In the next chapter, several previous works in this field are given. In the main focus of the study section, the motivation and information on data set is available. The methodology section has information on the computation of variables and panel data regression. The results of the analysis and a brief discussion are available in solutions and recommendations part. Final remarks are available in the conclusion section of this study.

2. BACKGROUND

Most works on the literature of financial risks focus on non-financial firms. Most of the studies that focus on commercial banks have analysis on profitability.

Unal and Altin (2010) analyzed the relationship between firm value and net foreign exchange position in the Turkish Automotive Industry. Reis, Kilic, and Bugan (2016) showed that GDP, leverage ratio, loans/deposits ratio, and market capitalization affect probability. The study is a panel data analysis. The research period is between 2009 and 2013.Saldanli and Aydin (2016) analyzed 23 commercial banks. The research period is between 2004 and 2014. They found that shareholders' equity / total assets, liquid assets / current liabilities, non-interest income / total assets, and interest income/ interest expense ratios all affect profitability of banks.

Kok, Ekinci, and Ay (2017) studied the effect of financial risks with an ARDL model. The research period is 1993-2015. They found a relationship between financial risks and non-financial firms. Senol and Karaca (2017) studied the effect of financial risks on non-financial firms. The analysis includes 35 firms. The research period is 2008-2015. They found that there are statistically significant relationships between exchange rate risk and liquidity risk and Tobin's Q and leverage and credit risk and market value. Topaloglu (2018) used 3 different models to test the relationship between financial risk and market value of non-financial firms. Accordingly, there are statistically significant relationships between capital and liquidity risk and Tobin's Q, credit risk and market value, and exchange rate risk and credit risk and price / earnings ratio.

Senol, Oncül, and Buyer (2019) found that liquidity risk affect profitability positively, whereas credit and capital risks negatively affect profitability of commercial banks. The study consists of 19 commercial banks.

3. MAIN FOCUS OF THE STUDY

In this study, the relationship between market value of commercial banks and financial risks in these banks are analyzed. Financial risks are studied in three broad categories which are liquidity risk, exchange rate risk, and interest rate risk.

The research period is between 2010 and 2019. The reason of starting the research with the year 2010 is extremely high volatility in banking industry in the years 2008 and 2009 due to global financial crisis. The data used in this research is obtained from annual reports of the banks, Banking Regulation and Supervisory Agency, and Finnet database.

The commercial banks analyzed in this study is given in Table 1. Albaraka Turk is excluded from the study because it doesn't accept deposits. TSKB (industrial development bank of Turkey) is not included because it doesn't have regular financial operations. ICBC Turkey and Q&B Finansbank are also not studied due to the the high volatility of these stocks related with Mergers & Aquisitions activities.

Table-1. Banks analyzed in the research.

No.	Bank	Ticker
1	Akbank	AKBNK
2	Türkiye Garanti Bankası	GARAN
3	Türkiye Halk Bankası	HALKB
4	Türkiye İş Bankası	ISCTR
5	Şekerbank	SKBNK
6	Vakıfbank	VAKBN
7	Yapı ve Kredi Bankası	YKBNK

These banks are listed in Istanbul Stock Exchange. They have to make disclosures on financial risks such as exchange rate risk, interest rate risk and liquidity risk in their quarterly financial reports. The data on financial risks are obtained from these audited financial reports.

The motivation of the study is to see whether there is a relationship between financial risks and market value of the commercial banks operating in Turkey. If there is such a relationship, a further analysis is what kind of financial risks affect the market price. This is important for academic purposes and for the banks in order to effectively manage these risks.

4. METHODOLOGY

The formulas to obtain variables used in the study to represent independent variables of financial risk; exchange rate risk, interest rate risk and liquidity risk and the dependent variable of market value are given in Table 2. These values are computed for each of the bank analyzed in this study.

Table-2. Formulas to obtain variables.

	Variable	Abbreviation	Formula
Independent Variables	Exchange Rate Risk	EXC	Net Foreign Exchange Position / Shareholders' Equity
	Interest Rate Risk	INT	(Interest Rate Risk $_t$ − Interest Rate Risk $_{t-1}$) / Interest Rate Risk $_{t-1}$
	Liquidity Position	LIQ	Cash and Liquid Assets / Total Assets
Dependent Variable	Market Value	MBV	Market Value / Book Value

Commercial banks disclose net foreign exchange position in financial statements. This is used in exchange rate calculations of this study. To account for the size effect, net foreign exchange position is divided to shareholders' equity. Interest rate risk consists of the maturity mismatch in the balance sheet which is related with asset liability management and revaluation of off balance sheet positions. In the study, interest rate risk disclosed in the annual reports of the banks is used. For a meaningful calculation, the change in interest rate risk is used instead of the level of interest rate risk.

As liquidity variable liquidity position is used. Due to unique balance sheet structure of the banks, liquidity position is a meaningful indicator of liquidity risk. The banks with higher liquidity position are exposed to less liquidity risk.

Panel data analysis is used study. The model allows to test the relationship between liquidity risk and market value, interest rate risk and market value and exchange rate risk and market value. The panel data regression model is given below. In the formula i stands for each commercial bank used in the study t stands for the time period, β is coefficient of independent variable, and Ɛ is the error term.

$$MBV_{it} = \alpha_{it} + \beta_{2it}\, EXC_{it} + \beta_{3}it\, INTit + \beta_{4it}\, LIQ_{it} + \varepsilon_{it} + \lambda_t$$

5. SOLUTIONS AND RECOMMENDATIONS

First the data is tested for multicollinearity. The method used for this is VIF. The results are presented in Table 3. The maximum VIF value is 1.016518 which is less than five. Therefore, there is no multicollinearity problem for the variables used in this research.

Table-3. Results for VIF.

	Coefficient	Variance Coefficient	Non Central VIF	Central VID
MBV	LIQ	4.878232	28.339460	1.016518
	EXC	0.000174	1.014890	1.012592
	INT	0.000180	1.133516	1.005991
	C	0.078783	28.132030	NA

To test the validity of the model, AR Roots are analyzed. The results are given in Figure 1. Accordingly, all of the roots are inside the unit circle. This shows the model is appropriate for the analysis.

Figure-1. AR Roots.
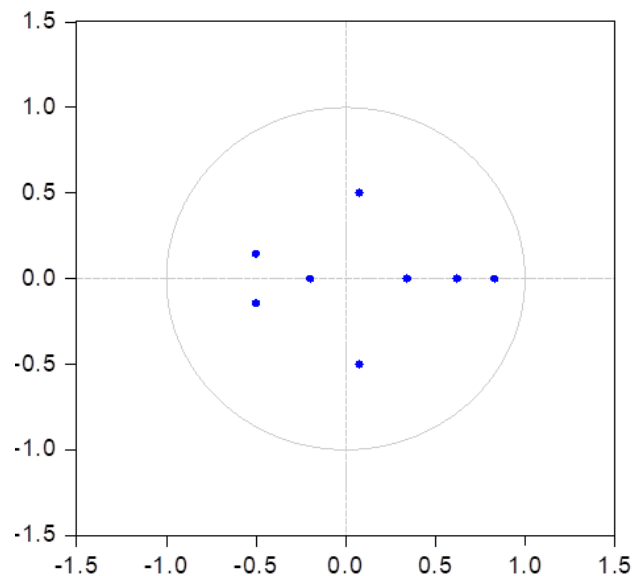
Appropriate lag length has to be determined in panel data analysis. Lag length selection criteria are used for this purpose. The results are given in Table 4. Accordingly, 2 lengths are suggested by all (AIC, SC, HQ, LR and FPE) criteria.

82

Table-4. Lag length selection criteria.

Lag	LR	FPE	AIC	SC	HQ
0	NA	0.017842	7.3253	7.479734	7.383892
1	73.18276	0.006516	6.315117	7.087288	6.608078
2	51.75661*	0.003481*	5.674263*	7.064171*	6.201592*
3	21.54703	0.003808	5.728795	7.736441	6.490493

Cross section dependence is also analyzed in this study. Since time period (10) is more than number of banks (7) Peseran CD is applied. The results are given in Table 5. Accordingly, for the variables MBV and INT there is no cross section dependence as the probability is greater than 0.05, whereas for the variables EXC and LIC there is cross section dependence.

Table-5. Cross section dependence test.

Variable	Test Statistics	Probability Value
MBV	–0.983	0.163
EXC	–1.899	0.029
INT	–0.805	0.211
LIQ	–1.672	0.047

In panel data analysis, series are assumed to be homogenous. This assumption is tested with Pearson and Yagamata Delta Test. The results are shown in Table 6. As for all of the variables probability values are larger than critical value, slope coefficients are homogenous.

Table-6. Delta test results.

MBV				EXC			
$\tilde{\Delta}$	0.877	$\tilde{\Delta}_{adj}$	1.049	$\tilde{\Delta}$	-1.446	$\tilde{\Delta}_{adj}$	-1.728
Prob	0.190	Prob	0.147	Olasılık	0.926	Prob	0.958
INT				**LIQ**			
$\tilde{\Delta}$	-1.543	$\tilde{\Delta}_{adj}$	-1.844	$\tilde{\Delta}$	0.777	$\tilde{\Delta}_{adj}$	0.929
Prob	0.939	Prob	0.967	Olasılık	0.218	Prob	0.176

The variables used in the panel data analysis has to be stationary. Based on the results of cross section and homogeneity tests, Levin, Lin and Chu (LLC) test is used for MBV and INT while Bai and Ng PANIC test is used for EXC and LIQ. The results for LLC test is given in Table 7. According to LLC Test, the variables MBV and INT are stationary in level. The results of PANIC test are available in Table 8. Accordingly, the variables EXC and LIQ are not stationary in level but stationary in first difference.

Table-7. LLC panel unit root test results.

Variable	Statistics	Probability		Variable	Statistics	Probability
MBV	–2.42688	0.0076***	Constant+ Trend	MBV	–10.9845	0.0000***
INT	–7.04066	0.0000***		INT	–6.62184	0.0000***

Table-8. PANIC panel unit root test results.

	Constant		Constant +Trend	
Level	Statistics	Probabilty	Statistics	Probabilty
EXC				
$Z_{\hat{e}}^c$	–0.6888	0.7545	0.1877	0.4256
$P_{\hat{e}}^c$	10.3550	0.7358	14.9930	0.3786
LIQ				
$Z_{\hat{e}}^c$	–0.8612	0.8054	–0.9543	0.8300
$P_{\hat{e}}^c$	9.4431	0.8017	8.9503	0.8342
First Difference				
EXC				
$Z_{\hat{e}}^c$	1.8899	0.0294**	2.4545	0.0071***
$P_{\hat{e}}^c$	24.0003	0.0458**	26.9882	0.0193**
LIQ				
$Z_{\hat{e}}^c$	3.4017	0.0003***	5.3716	0.0000***
$P_{\hat{e}}^c$	32.0003	0.0040***	42.4236	0.0001***

Table-9. Model selection results.

Test	Statistics	p-value	Hypothesis
F-group_fixed	14.64063	0.000000	H_0:Cross section Effect
F-time_ fixed	19.84238	0.000000	H_0: Time Effect
F-two way_ fixed	17.88136	0.000000	H_0:No Effect
LM-group_random	12.52044	0.000403	H_0: Cross section Effect
LM-time_ random	35.68262	2.32E-09	H_0: Time Effect
LM- two way_ random	48.20306	3.41E-11	H_0: No Effect
Honda-group_ random	3.538424	0.000201	H_0: Cross section Effect
Honda-time_ random	5.973493	1.16E-09	H_0: Time Effect
Honda-twoway_ random	6.725941	8.72E-12	H_0: No Effect

In the analysis, an evaluation is made to choose between fixed effect and random effect models. The tests used for this purpose are F test, Breuch-Pagan LM test and Honda test. The results are shown in Table 9. According to F test results, group and time two way fixed effects model is suggested. However LM and Honda Tests suggest two

way random effects model. Considering data set of the study, two way random effects model is chosen for the analysis.

Finally, error term is tested for heteroscedasticity and autocorrelation. Heteroscedasticity is tested with Breusch-Pagan-Godfrey LM Test. Autocorrelation is tested with Baltagi and Li, Born and Bretuing and Durbin-Watson tests. The results are presented in Table 10. According to the results, there are both heteroscedasticity and autocorrelation problems in the model.

Table-10. Heteroscedasticity and autocorrelation tests results.

Heteroscedasticity		
Breusch-Pagan-Godfrey LMh_fixed	36.49401	0.000000
H_0: No Heteroscedasticity H_1: Heteroscedasticity		
Autocorrelation		
Baltagi and Li (1991) **LMp-stat**	13.44682	0.000245
H_0: No Autocorrelation H_1: Autocorrelation		
Born and Breitung (2016) **LMp*-stat**	22.13317	0.000003
H_0: No Autocorrelation H_1: Autocorrelation		
Durbin-Watson Bhargava, Franzini and Narendranathan	0.683223	
H_0: No Autocorrelation H_1: Autocorrelation		

Table-11. Model Results.

Dependent Variable	Method			Data
MBV	Least Square Method White Period standard errors & covariance (d.f. corrected)			2010-2019
Independent Variable	Coefficient	Std Error	t-Stat	Prob
LIQ	5.790447	2.852820	2.029727	0.0474**
EXC	-0.003159	0.000459	-6.883929	0.0000***
INT	-0.014317	0.001712	-8.360204	0.0000***
C	0.864289	0.011510	75.08737	0.0000***
	Period Fixed (Dummy Variables)			
	R-squared	0.391486	Mean dependent var	0.866512
	Adjusted R-squared	0.288153	S.D. dependent var	0.358401
	S.E. of regression	0.302386	Akaike info criterion	0.590395
	Sum squared resid	4.846187	Schwarz criterion	0.930575
	Log likelihood	-8.597435	Hannan-Quinn criter.	0.724189
	F-statistic	3.788603		
	Prob(F-statistic)	0.000967***		

As a result, two way fixed effects model is used to analyze the relationship between financial risks and market value of commercial banks. White panel corrected standard errors is used to cope with autocorrelation and heteroscedasticity problems. The results are shown in Table 11. The model is significant with 1% level of significance. R2 value of %28,81 means that financial risks (exchange rate risk, interest rate risk and liquidity risk)

affect around %29 of market price movement. Therefore, there are statistically significant relationships between exchange rate risk, interest rate risk and liquidity risk and market value.

6. CONCLUSION

Volatility in global markets and the pandemic increases the importance of banks. Countries' stability and growth require strong commercial banks. In recent years, asset size and profitability of Turkish Banks have increased. Meanwhile, the stock prices of commercial banks haven't increased that much on Istanbul Stock Exchange.

The most important barriers of stock price increase are the financial risks. In this study, 7 commercial banks on Istanbul Stock Exchange are analyzed. Financial risks available in this study are interest rate risk, exchange rate risk and liquidity risk. The motivation of the study is to test the relationship between financial risks and market value. According to the results of the research, there is a statistically significant and positive relationship between liquidity position and firm value. A unit increase in liquidity position results in 5.79 units increase in firm value. Liquidity position is computed by dividing liquid assets to total assets. This result highlights the importance of holding liquid assets in commercial banks. Liquidity risk in general is related to the inability of paying back the current liabilities. For banks, this requires an additional maturity mismatch analysis. However, strong liquidity positions contribute to the market value of commercial banks.

There is also statistically significant but negative relationship between firm value and exchange rate risk. A unit increase in exchange rate risk results in 0.003 unit decrease in firm value. Excessive use of speculative foreign exchange positions in bank treasuries may lead to decreases in their market value. Therefore the results of this study are also consistent with financial risk literature.

On the other hand, there is a statistically significant and negative relationship between interest rate risk and firm value. Foreign exchange and interest rate is closely connected in finance theory, so this explains similar patterns that occur as a result of this study. The primary operations of banks; loans and deposits are interest related. Therefore interest rate is an important risk for commercial banks. In addition, central bank of Turkey, often changes the market interest rates in order to control the volatility in exchange rates. This results in losses for banks in wrong position.

As a result, economic situation in Turkey combined with maturity mismatch contain threats for banks operating in Turkey. Since banks work under intense financial risks, these risks have to be measured, categorized and managed properly. This research shows that Banks don't adequately manage financial risks. Increase in the use of hedging instruments such as derivatives, and corporate risk management would make the banks more resistant.

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