

## The Effect of Financial Ratios and Macroeconomic Factors on Firm Value: An Empirical Analysis in Borsa Istanbul

Rifat KARAKUS<sup>1</sup>  
İbrahim BOZKURT<sup>2</sup>

### Abstract

The aim of this study is to determine the effect of financial ratios and macroeconomic factors on firm value. For this purpose, data of 58 companies listed on BIST-100 index between 2006 and 2015 is used and panel data analysis is performed. According to analysis results, there is a negative relationship between debt ratio and stock returns. On the other hand, return on assets and net working capital turnover affects stock returns positively. In addition the effect of macroeconomic factors on stock return is significant. While inflation negatively affects stock returns, unemployment, gross domestic product, net inflows of portfolio equity and exchange rates positively affect stock returns.

**Keywords:** Financial Ratios, Firm Value, Macroeconomic Factors, Panel Data Analysis

### 1. Introduction

The basic financial aim of the companies is to increase the firm value. Missing aspects of profit maximization purpose are removed for this purpose and an objective performance measure is formed. The aim of investors also is to increase their assets in the form of dividends and capital gains. For this reason, the firm value is important both for the company and for the investors.

Increasing attention on firm value which is the main focus of the firms and investors makes its determinants important. The effect of accounting information on firm value is considered as an important determinant to be explained. Financial ratios providing summary information about the financial status and activities of the company are useful accounting information. For this reason, it is probable that they are effective in explaining firm value. In this study, the effect of financial ratios on firm value is analyzed. Firstly related studies in literature are reviewed and then the related information and results of the analysis were presented. In addition to the financial ratios, the effect of macroeconomic factors on firm value is also examined.

### 2. Literature Review

The relationship between financial ratios and stock returns has been investigated in different studies. There are studies on Turkey market as well as studies on markets outside Turkey.

Martini and Khairurizka (2009) determine the effects of accounting information such as profitability, liquidity, leverage, market ratio, size and cash flow on stock return. Cumulative abnormal return and market adjusted return are used as stock return variables. By using multiple linear regression, data of 39 listed companies in manufacturing industries that actively trading between 2003 and 2006 in Indonesia Stock Market is analyzed. According to analysis results, net profit margin, return on equity, total asset turnover and price to book value affects cumulative abnormal return and market adjusted return positively. Also the positive influence of total assets (size) on abnormal return is determined.

Birgili and Düzer (2010) investigate the effects of financial ratios on firm value by using data of 58 companies indexed in IMKB-100 between 2001 and 2006. By using panel data analysis, the effect of liquidity ratios, financial structure ratios, market ratios, activity ratios and profitability ratios is determined. According to the

<sup>1</sup> Asst. Prof., Çankırı Karatekin University, FEAS, Banking and Finance, rifatkarakus@karatekin.edu.tr

<sup>2</sup> Assoc. Prof., Çankırı Karatekin University, FEAS, Banking and Finance, ibozkurt@karatekin.edu.tr

results all ratios in liquidity, financial structure and market ratios groups have statistically significant impact on firm value. On the other hand, only some of the activity and profitability ratios influence firm value significantly. The results reveals that current ratio, cash ratio, equity to total assets, debt to equity, long term debt to total debt, asset turnover, current asset turnover, gross profit margin, return on equity, price earnings ratio, market to book value and earnings per share affect firm value positively. However, acid test ratio, total debt to total assets, short term debt to total debt, inventory turnover, account receivable turnover, equity turnover, operating profitability, net profit margin and return on assets have a negative influence on firm value.

Aydemir et al. (2012) determines the relationship between firm value and financial ratios by using panel data analysis. Data of 73 manufacturing companies listed in IMKB between 1990 and 2009 is selected as sample. The results of the study show that profitability and liquidity ratios have a positive effect on stock return. It also reveals that the leverage ratio has a positive effect in determining the stock return, but it is lower than the profitability and liquidity ratios. On the other hand, it is seen that the activity rates do not affect the stock return.

Karaca and Savsar (2012) examine the influence of financial ratios on firm value. The data of 36 firms in the sectors of Food-Drink-Tobacco and Basic Metal Industry indexed in IMKB 100 between 2002 and 2009 is analyzed by panel data analysis. Analysis results show that account receivables turnover has a positive impact on firm value. However the effect of inventory turnover and return on equity on firm value is significant and negative. The relationship between other financial ratios and firm value is not statistically significant.

Kurtaran et al. (2015) examines whether there is a relationship between the ratios used in financial analysis and firm value. The study covers 45 companies that are consistently in the BIST-100 index between 2008 and 2012, and whose data can be accessed regularly. Current ratio, acid test ratio, inventory turnover, receivables turnover, equity turnover, operating margin, net profit margin, return on assets, equity profitability, the ratio of the debt-to-equity and interest coverage ratio is determined as independent variables. Multiple regression analysis results reveal that there is a significant and positive relationship between acid-test ratio, return on assets and firm value and a significant and negative relationship between current ratio and firm value. The relationship between other ratios used in financial analysis and firm value is not explained statistically.

Vedd and Yassinski (2015) explore the relationship between financial ratios, firm sizes, operating cash flows and the stock price. Data of 717 companies listed in the biggest stock exchange markets in Latin American (the Bolsa Mexicana de Valores in Mexico, Bolsa de Valores de Colombia in Colombia, Rio de Janeiro Stock Exchange in Brazil and the Santiago Stock Exchange in Chile) between 2004 and 2013 is analyzed by regression analysis. Analysis results reveal that assets turnover ratio and firm size have a significant effect on stock prices in companies from Brazil, Chile, and Mexico, and debt ratio has an important effect on stock prices in Colombian companies.

Sevim (2016) investigates the relationship between stock returns and financial ratios for 32 manufacturing firms indexed in BIST 100. By using their data between 2001 and 2014, panel data analysis is applied. According to analysis results, there is a statistically significant and negative effect of inventory turnover, accounts receivable turnover and tangible assets turnover on stock returns. On the other hand, short debt to total debt ratio influences stock returns positively. The effects of other liquidity, profitability, activity and leverage ratios on stock returns are not statistically significant.

### 3. Data and Methodology

#### 3.1. Data Set

To determine the effect of financial ratios on firm value, data of 58 companies listed on BIST-100 index is used. The yearly data between 2006 and 2015 is selected as sample. Banking sector companies and sport sector companies are excluded from data set because of different financial tables' structure and different financial terms respectively. Also companies with missing data for this period are excluded from the data set.

Dependent variable of the study is the natural logarithm of stock value (RTN). 27 financial ratios and 8 macroeconomic factors are selected as the independent variables of the study. The independent variables and acronym are shown in Table 1.

Table 1. Independent Variables

ACRONYM	VARIABLE	ACRONYM	VARIABLE
CR	Current Ratio	NPM	Net Profit Margin
QR	Quick Ratio	ROA	Return on Assets
CSR	Cash Ratio	ROE	Return on Equity
DTA	Debt to Total Assets	LnTA	The Natural Logarithm of Total Assets
ETA	Equity to Total Assets	LnSR	The Natural Logarithm of Sales Revenue
SLTA	Short-term Liabilities to Total Assets	DOL	Degree of Operating Leverage
ETD	Equity to Total Debt	DFL	Degree of Financial Leverage
FAE	Fixed Assets to Equity	DCL	Degree of Combined Leverage
FALE	Fixed Assets to Long-term Debt Plus Equity	DPR	Dividend Payout Ratio
IT	Inventory Turnover	UNE	Unemployment, total (% of total labor force)
ART	Accounts Receivable Turnover	TTR	Total tax rate (% of commercial profits)
WCT	Working Capital Turnover	lnGDP	The Natural Logarithm of GDP per capita
NWCT	Net Working Capital Turnover	DIR	Deposit interest rate (%)
FAT	Fixed Asset Turnover	lnCPI	The Natural Logarithm of Consumer price index
ET	Equity Turnover	FDI	Foreign direct investment, net inflows (% of GDP)
TAT	Total Asset Turnover	PE	Portfolio equity, net inflows (% of GDP)
GM	Gross Margin	lnEXR	The Natural Logarithm of Official exchange rate (as US\$)
OP	Operating Profitability		

Stationary of the series is important for correct R square and t statistics. For preventing spurious relations between the variables, unit root tests are applied and nonstationary series are included the model with first or second differences which provides stationary series. In this study, Im, Pesaran and Shin and ADF panel unit root tests are used to test the stationarity of series. Tests results are shown in Table 2. According to test results, variables with unit root at level are added to models with their stationary first difference.

Table 2. Unit Root Test Results

VARIA BLES	LEVEL		1st DIFFERENCE		VARIA BLES	LEVEL		1st DIFFERENCE	
	Im, Pesaran and Shin	ADF	Im, Pesaran and Shin	ADF		Im, Pesaran and Shin	ADF	Im, Pesaran and Shin	ADF
RTN	0.0000	0.0000	-	-	OP	0.0000	0.0000	-	-
CR	0.0088	0.0012	-	-	NPM	0.0000	0.0000	-	-
QR	0.0912	0.0653	-	-	ROA	0.0000	0.0000	-	-
CSR	0.0739	0.0428	-	-	ROE	0.0000	0.0000	-	-
DTA	0.2896	0.0274	0.0000	0.0000	LnTA	0.9964	0.9769	0.0000	0.0000
ETA	0.0173	0.0003	-	-	LnSR	1.0000	1.0000	0.0000	0.0000
SLTA	0.1620	0.0413	0.0000	0.0000	DOL	0.0000	0.0000	-	-
ETD	0.0000	0.0000	-	-	DFL	0.0000	0.0000	-	-
FAE	0.0000	0.0001	-	-	DCL	0.0000	0.0000	-	-
FALE	0.0007	0.0000	-	-	DPR	0.2283	0.0459	0.0000	0.0000
IT	0.0000	0.0000	-	-	UNE	0.0000	0.0000	-	-
ART	0.0000	0.0000	-	-	TTR	0.0000	0.0001	-	-
WCT	0.0370	0.0345	-	-	lnGDP	0.4001	0.5485	0.0000	0.0000
NWCT	0.0000	0.0000	-	-	DIR	0.0000	0.0004	-	-
FAT	0.0003	0.0000	-	-	lnCPI	1.0000	1.0000	0.0000	0.0230
ET	0.0000	0.0278	-	-	FDI	0.0000	0.0276	-	-
TAT	0.1064	0.0189	0.0000	0.0000	PE	0.0000	0.0000	-	-
GM	0.0003	0.0001	-	-	lnEXR	0.1211	1.0000	0.0000	0.0000

To select best suitable model which reveals the effects of financial ratios on firm value, stepwise backward elimination is used and only three financial ratios is selected from 27 according to their significance. The following model is established by these three financial ratios:

$$RTN_{i,t} = \beta_1 + \beta_2 DTA_{i,t} + \beta_3 NWCT_{i,t} + \beta_4 ROA_{i,t}$$

In addition to model 1, one, two and three period lagged RTN which are selected according to Schwarz information criterion are also added as independent variables and Model 2 is formed.

$$RTN_{i,t} = \beta_1 + \beta_2 DTA_{i,t} + \beta_3 NWCT_{i,t} + \beta_4 ROA_{i,t} + \beta_5 RTN_{i,t-1} + \beta_6 RTN_{i,t-2} + \beta_7 RTN_{i,t-3}$$

In addition to model 2, by adding 8 macroeconomic variables as independent variable, Model 3 is formed.

$$RTN_{i,t} = \beta_1 + \beta_2 DTA_{i,t} + \beta_3 NWCT_{i,t} + \beta_4 ROA_{i,t} + \beta_5 RTN_{i,t-1} + \beta_6 RTN_{i,t-2} + \beta_7 RTN_{i,t-3} + \beta_8 UNE_{i,t} + \beta_9 TTR_{i,t} + \beta_{10} \ln GDP_{i,t} + \beta_{11} DIR_{i,t} + \beta_{12} \ln CPI_{i,t} + \beta_{13} FDI_{i,t} + \beta_{14} PE_{i,t} + \beta_{15} \ln EXP_{i,t}$$

### 3.2. Panel Model Selection

In this study, panel data analysis which enables to analyze time series and cross section together is used. To select suitable panel model, F Test, Breusch-Pagan LM Test and Hausman Test is performed and results are shown in Table 3. According to analysis results, random effect model for Model 1, fixed effect model for Model 2 and pooled OLS model for Model 3 is selected.

Table 3. Panel Model Selection Results

MODELS	TESTS	Statistics	Probability	ESTIMATION MODEL
MODEL 1	F Test	0.348482	1.0000	Random Effects
	Breusch-Pagan LM Test	12.61129	0.0000	
	Hausman Test	3.113263	0.3745	
MODEL 2	F Test	1.588558	0.0070	Fixed Effects
	Breusch-Pagan LM Test	21.07255	0.0000	
	Hausman Test	71.252709	0.0000	
MODEL 3	F Test	0.701425	0.9506	Pooled OLS
	Breusch-Pagan LM Test	2.169632	0.1408	
	Hausman Test	-	-	

### 3.3. Heteroscedasticity and Autocorrelation Tests

Two important assumptions of linear regression are homoscedasticity (constant variance) of the errors and statistical independence of the errors (no correlation between consecutive errors). For model 1, heteroscedasticity is tested by Levene, Brown and Forsythe test and result reveals that there is no heteroscedasticity problem. For this model, autocorrelation is tested by LM and Adjusted LM tests and according to results, autocorrelation problem occurs in the model. For model 2, heteroscedasticity is tested by Modified Wald test and result reveals that heteroscedasticity problem occurs in the model. For this model, autocorrelation is tested by Baltagi-Wu LBI and according to results, there is no autocorrelation problem. For model 3, heteroscedasticity is tested by White test and result reveals that there is no heteroscedasticity problem. For this model, autocorrelation is tested by Wooldridge test and according to results, autocorrelation problem occurs in the model. Analysis results are shown in Table 4.

Table 4. Heteroscedasticity and Autocorrelation Tests Results

MODELS	Heteroscedasticity Test	Serial Correlation Tests
MODEL 1	W0 = 0.63905872 df(57, 464) Pr > F = 0.98094069 W50 = 0.51188466 df(57, 464) Pr > F = 0.99880979 W10 = 0.63905872 df(57, 464) Pr > F = 0.98094069	LM(rho=0)=25.46 Pr>chi2(1) = 0.0000 ALM(rho=0)=14.35 Pr>chi2(1)=0.0002
MODEL 2	chi2 (58) = 2072.33 Prob>chi2 = 0.0000	Baltagi-Wu LBI = 2.0506943
MODEL 3	chi2=56.33 p= 0.8632	F( 1, 57) = 45.572 Prob > F = 0.0000

### 4. Estimation Results and Discussion

To eliminate the autocorrelation problem, Model 1 and Model 3 are analyzed by with robust standard errors generated by Arellano (1987), Froot (1989) and Rogers (1993). Also Model 2 is analyzed with Huber (1967), Eicker (1967) and White (1980) heteroscedasticity-consistent standard errors to eliminate only heteroscedasticity problem. Analysis results are shown in Table 5.

For Model 1, F test probability shows that the model is statistically significant. According to Adjusted R2, independent variables have an explanatory power on dependent variable about 8.90 percent. The model reveals that ROA and NCWT have a statistically significant and positive effect on stock return. Increasing return on assets and net working capital turnover result increase in stock return. On the other hand, DTA affects stock return negatively. Increasing in debt to total assets results decrease in stock return.

For Model 2, F test probability reveals that model is statistically significant at 1% level like as Model 1. In addition, adding lagged stock returns as independent variable increase the explanatory power of the model at 34.84 percent. When the independent variables is examined, although the effects of DTA and ROA on stock return is same with Model 1, the effect of NWCT is not statistically significant in this model. In addition, one, two and three term lagged stock return have a negative influence on stock return. This means that stock return will decrease if their previous terms returns is high.

Model 3 has the highest explanatory power. Changes in independent variables explain 54.2 % of the changes in dependent variable. According to model, positive effect of NWCT and ROA on stock return is statistically significant. Also one and three term lagged stock term create a negative effect on current stock return. However two terms lagged stock return is not statistically significant and its effect cannot be explained. Unlike other models, Model 3 also examines the impact of macroeconomic variables on stock return. According to model results, only lnCPI has a negative effect on stock return. Increasing inflation results to decrease in stock returns. On the other hand, UNE, lnGDP, PE and lnEXR affects stock return positively. The effect of TTR, DIR and FDI on stock return is not statistically significant.

Table 5. Panel Data Analysis Results

Independent Variables	MODEL 1		MODEL 2		MODEL 3	
	Coefficient	T statistic (probability)	Coefficient	T statistic (probability)	Coefficient	T statistic (probability)
DTA	-1.105694	-3.71 (0.000)	-0.5186364	-2.74 (0.008)	-0.0910396	-0.69 (0.496)
NWCT	8.35e-06	18.14 (0.000)	0.0000251	1.41 (0.165)	0.0000397	3.50 (0.001)
ROA	1.10212	3.84 (0.000)	2.118342	4.74 (0.000)	1.954784	7.10 (0.000)
RTN(-1)	-	-	-0.4376376	-15.16 (0.000)	-0.1380886	-2.91 (0.005)
RTN(-2)	-	-	-0.2681946	-9.74 (0.000)	-0.0413752	-1.26 (0.214)
RTN(-3)	-	-	-0.1032151	-3.76 (0.001)	-0.0951708	-2.91 (0.005)
UNE	-	-	-	-	0.1516155	2.26 (0.013)
TTR	-	-	-	-	0.7576244	0.69 (0.492)
lnGDP	-	-	-	-	2.095572	3.00 (0.004)
DIR	-	-	-	-	0.2744199	0.40 (0.688)
lnCPI	-	-	-	-	-17.57313	-8.93 (0.000)
FDI	-	-	-	-	0.2219814	1.27 (0.209)
PE	-	-	-	-	0.5790981	7.88 (0.000)
lnEXR	-	-	-	-	1.348945	6.23 (0.000)
Constant	.0239523	1.35 (0.178)	.1545808	7.44 (0.000)	-9.594507	-0.82 (0.418)
F Test (Probability)	94.99 (0.0000)		50.81 (0.000)		30.45 (0.000)	
Adjusted R <sup>2</sup>	0.0890		0.3484		0.542	
Observations	522		406		406	

## 5. Conclusion

The firm is very important for the investors as well as the managers. For this reason, it is important for the parties to know the factors affecting the firm value in terms of decision making processes. In this study, the financial ratios affecting the firm value are investigated. The effect of the 27 financial ratios on the change in the firm value, in other words, on the stock returns has been examined. With stepwise backward elimination, it has been determined that only 3 of the 27 financial ratios have an effect on the stock returns. In addition, the effect of past stock returns on current stock returns has been investigated. In addition, 8 macroeconomic factors have been used to determine whether stock returns are affected by macroeconomic factors.

According to the results of the analysis, it is seen that the return on assets and the net working capital turnover positively affect the stock return. In other words, the increase in the return on assets and the net working capital turnover creates an increase in stock returns. On the other hand, there is a negative relationship between the debts to total assets and the stock returns. As the borrowing rate increased, the stock returns decreased. When macroeconomic factors are examined, there is a negative relationship between consumer price index and stock returns. During periods when inflation is on the rise, stock returns have declined. On the other hand, unemployment, gross domestic product, net inflows of portfolio equity and exchange rates positively affect stock returns. The increases in these variables provide the rise of stock returns.

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