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Analysis of the relationship between financial performance indicators and earnings per share using panel data method

Finansal performans göstergeleri ile hisse başına kâr arasındaki ilişkinin panel veri yöntemiyle analizi

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Abstract

This study aims to examine the effects of financial ratios on earnings per share (EPS). Using panel data analysis, variables such as firm value, asset turnover, short-term debt to total debt ratio, and liquidity ratio were considered as determinants of EPS. The study utilised quarterly financial data from a total of 14 companies operating in the energy and automotive sectors listed on the BIST between the first quarter of 2018 and the fourth quarter of 2024. A fixed effects model was applied, and model selection was validated using the Hausman test. The model estimation was performed using the Driscoll-Kraay robust standard error estimator. According to the findings, firm value and asset turnover ratio have a positive effect on EPS at the 1% significance level. On the other hand, the effect of the liquidity ratio on EPS was determined to be negative and significant at the 5% level. The ratio of short-term debt to total debt has no statistically significant effect on EPS. These findings indicate that companies need to use their assets efficiently and maintain their liquidity levels at optimal levels to increase their earnings per share.

Keywords: Earnings per share, financial ratios, panel data.

Özet

Bu çalışma, finansal oranların hisse başına kâr (EPS) üzerindeki etkilerini incelemeyi amaçlamaktadır. EPS'nin belirleyicileri olarak firma değeri, aktif devir hızı, kısa vadeli borçların toplam borçlara oranı ve likidite oranı gibi değişkenler dikkate alınarak panel veri analizi yöntemiyle analiz gerçekleştirilmiştir. Araştırmada 2018 yılı 1. çeyreği ile 2024 yılı 4. çeyreği arasındaki BİST'E işlem gören enerji ve otomotiv sektörlerinde faaliyet gösteren toplam 14 firmaların dönemsel finansal veriler kullanılmış ve sabit etkiler modeli uygulanarak Hausman testi ile model tercihi doğrulanmıştır. Model tahmini Driscoll-Kraay dirençli standart hatalar tahmincisi ile yapılmıştır. Elde edilen bulgulara göre, firma değeri ve aktif devir hızı oranı EPS üzerinde %1 anlamlılık düzeyinde pozitif bir etki göstermektedir. Öte yandan, likidite oranının EPS üzerindeki etkisi ise %5 düzeyinde negatif ve anlamlı olarak belirlenmiştir. Kısa vadeli borçların toplam borçlara oranı değişkenin EPS üzerinde istatistiksel olarak anlamlı bir etkisi bulunmamıştır. Bu bulgular, işletmelerin hisse başına kârlarını artırabilmek için varlıklarını etkin bir şekilde kullanmaları ve likidite düzeylerini optimal seviyede tutmaları gerektiğini göstermektedir.

Keywords: Hisse başına kâr, finansal oranlar, panel veri.

1. Introduction

Financial performance indicators play an important role in determining the sustainability of companies and the value they provide to investors. One of these indicators, the earnings per share ratio (EPS), shows the portion of a company's profit per share in a certain period and is of critical importance, especially in investors' decision-making processes. Earnings

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per share (EPS) is an important financial performance indicator that measures the periodic profitability of enterprises through net profit per share. This ratio, which is frequently used by investors in the evaluation process of companies and stock valuation models, also reflects the firm's profitability structure, resource utilisation efficiency and financial management skills. While a high EPS ratio indicates that the company provides more earnings to its shareholders, low levels may negatively affect investor confidence. Therefore, analysing the factors affecting the EPS ratio provides important guidance for companies' long-term strategic decisions. In the existing literature, EPS, which is usually treated as an independent variable, is analysed through its effects on outcomes such as share prices and dividend policies.

EPS is not only a measure of profitability, but is also considered a direct reflection of the company's capital structure, resource efficiency and financial management policies [1]. In recent years, although empirical studies on the effects of financial ratios on Earnings Per Share (EPS) have increased, the context-specific determinants of this relationship are still a matter of debate. For example, it is argued that operating efficiency indicators such as asset turnover positively affect EPS by making asset utilization more efficient [2]. Similarly, studies have shown that there is a positive relationship between the size of the firm and the EPS obtained. It has been determined that large-scale firms have more predictable and sustainable profitability levels [3].

The reason for choosing these two sectors is that they require high investment and are of strategic importance to the Turkish economy in terms of production and exports. In addition, energy and automotive companies make it possible to observe more clearly the effects of financial ratios such as liquidity, indebtedness and asset efficiency on EPS. This study makes an important contribution to the literature by treating EPS as the dependent variable and jointly evaluating the effects of micro-level financial ratios such as firm value, asset turnover, debt maturity structure, and liquidity ratio on EPS. In the existing literature, many studies use EPS as an independent variable to examine its effects on outcomes such as stock prices, dividend policies, or market value (e.g., Korkmaz and Karaca [4]; Rahmawati and Hadian [5]). Therefore, this research aims to fill the gaps in the literature and provide practitioners with guiding evidence through a comprehensive variable selection and structure focused on EPS.

2. Literature

The effects of financial ratios on firm performance are an important area of research that has been emphasized for a long time in the business literature. In this context, the earnings per share ratio (EPS) stands out as one of the basic indicators that measure the periodic profitability of businesses from an investor's perspective. Determining the relationships between EPS and financial ratios is of strategic importance both academically and practically. In the studies conducted on this subject in the literature, the determinants of EPS have been examined using different sectors, methods and variable combinations, and various findings have been obtained. Some basic studies analyzing the relationship between EPS and financial ratios will be given below.

In Türkoğlu and Bekçi's study, 54 manufacturing sector enterprises that were continuously traded on Borsa Istanbul between 2010 and 2020, prepared consolidated financial statements and had regular access to data were examined. Within the scope of the research; In addition to variables such as active profitability, return on equity and profit per share, market-based financial performance indicators such as Tobin's Q ratio, stock market price and market value/book value ratio were also used. Since the aim of the study is to determine the effect of conservative accounting on the financial performance of enterprises, panel data analysis method was applied. The results show that conservative accounting has both positive and negative effects on the financial performance of enterprises, although there are changes in different models [6].

The purpose of Rahmawati and Hadian [5] study is to analyze how the debt-equity ratio, earnings per share, price-earnings ratio and stock prices are determined in consumer goods industry companies listed on the Indonesia Stock Exchange during the period 2016-2018. The results obtained reveal that the debt-equity ratio, earnings per share and price-earnings ratio have a significant effect on stock prices. The research findings also show that the degree to which these elements affect stock prices is 98.7%. The scope of Say [7] study covers food companies operating on Borsa Istanbul between 2009-2019. The dependent variable of the study is annual average stock returns. However, the independent variables include a total of six financial ratios, namely cash ratio, inventory turnover, asset turnover, fixed asset turnover, short-term debt/total debt ratio and return on equity. Multiple regression analysis and correlation methods were used in the empirical analysis. As a result of the findings, it was concluded that factors such as cash ratio, inventory turnover, asset turnover and fixed asset turnover affect the stock returns of companies.

In Fathinah and Setiawan study, the consumer goods industry population of seven companies working with quarterly data between 2015 and 2019 and meeting the purposive sampling criteria was examined [8]. In this context, a total of 140 data observations were obtained. The independent variables in the study are PBV, EPS, DER, SIZE, NPM and ROA; the dependent variable is defined as firm value. The results obtained show that only PBV has no statistically significant effect on the stock price. Changes in the independent variables can explain 64.02% of the change in the stock price. In addition, PER, as a moderator variable, has the capacity to strengthen the EPS variable in order to affect the stock price. The variable with the most significant effect on the stock price among the independent variables is EPS [8].

The study of Septiani et al. [9] aims to examine the effects of stock prices, return on assets (ROA) and firm size on dividend payout ratio (DPR). Five-year panel data from 2014 to 2018 of 17 financial sector companies listed on the Indonesia Stock Exchange (IDX) were used within the scope of the study. The analyses conducted with three different regression methods (pooled OLS, fixed effects and random effects) revealed that stock prices have a positive effect on DPR. However, both ROA and firm size were found to have negative effects on DPR [9].

In this study of Korkmaz and Karaca [4], 16 companies included in the ISE 30 Index were examined using a panel regression model between 1998 and 2010. In order to evaluate company performance, data such as the year-end closing price of the stock and the stock return rate were used. In the study, the relationships between the year-end closing price of the stock and the stock return rate, cash dividend distribution ratio, return on assets, price/earnings ratio, earnings per share, net profit growth, market value/book value ratio, market value and return on equity were also discussed. Two different models were developed in the study. As a result of Model 1, it was found that the closing price of the stock increased with changes in the dividend payout ratio (DPR) and earnings per share (EPS), but the change in return on assets (ROA) decreased; however, the market value/book value (M_B) and market value increase (MVI) did not affect the closing price of the stock (CLS). In Model 2, it was observed that the stock return ratio (RSR) increased with the increase in market value (MVI) and earnings per share (EPS), but did not affect the return on assets (ROA) [4].

The study of Gör and Tekin [10] examines the data obtained from the financial statements and stock prices of companies that were continuously included in the Borsa Istanbul 100 Index between 2009 and 2017. Based on these data, panel data analysis, regression analysis and Granger causality test methods were used. As a result of the analyzes, it was determined that accounting profit affected stock prices. In particular, it is understood that the return on assets, which represents accounting profit the most, has a positive effect on stock prices. In addition, net profit margin emerged as another variable that positively affected stock prices [10].

Allozi and Obeidat's study examined the relationships between stock returns and financial ratios using data from 65 firms listed on the JSE between 2001 and 2011. The leverage and profitability ratios of the firms were considered as independent variables in the study. The results obtained by Allozi and Obeidat reveal that the return on equity ratio can affect stock returns [11].

Arkan [12] examined data from 15 firms operating in three different sectors listed on the Kuwait Stock Exchange between 2005 and 2014. The study analyzed the financial ratios that are thought to have an impact on the stock returns of these companies. The results obtained revealed that the relationship between the financial performance of firms and stock returns varies according to the sector they operate in [12].

3. Purposal and method of research

The data set analysed in this study consists of the periodic financial data of a total of 14 companies operating in the energy and automotive sectors traded on the Istanbul Stock Exchange from the first quarter of 2018 to the fourth quarter of 2024. The main objective of this study is to examine the relationship between the financial structures of companies and earnings per share (EPS). EPS is an important indicator of financial performance and is considered a reflection of the return provided by the company to investors, serving as a crucial reference point in decision-making processes. In this context, the effects of selected financial indicators such as firm value, asset turnover rate, short-term debt/total debt ratio, and liquidity ratio on EPS were examined using panel data analysis. The data used in the study were obtained from the financial statements of companies through the Public Disclosure Platform (KAP) from the first quarter of 2018 to the fourth quarter of 2024. This study aims to contribute to the identification of key factors affecting profitability for company managers and investors by examining the effects of financial ratios on EPS at the micro level and their statistical significance. Additionally, the findings aim to guide companies' financial decision-making processes and provide original empirical evidence to the literature.

In order to determine the unit effect in the research model, Hausman (1978) test was applied and an effective fixed effects model was created [13], [14]. The assumption tests suggested for the fixed effects estimator were performed. In addition, Wald test was used to evaluate the heteroscedasticity assumption of the fixed effects model [15]. During the examination of autocorrelation, Baltagi-Wu's [16] Local Best Invariance (LBI) test and Bhargava, Franzini and Narendranathan's [17] Modified Durbin Watson test were applied. Pesaran test was used to determine the inter-unit correlation in the model [18]. The results showed that there were heteroscedasticity, autocorrelation and inter-unit correlation problems in the model [18]. Therefore, the model estimates were made with the Driscoll-Kraay robust standard errors estimator [19]. The variables used in the study are presented in detail in Table 1.

The financial ratios identified as independent variables in this study represent the key financial elements that affect the profitability of companies and the return to investors. Firm value reflects the overall size and market capitalisation of the company, measuring its capacity to benefit from economies of scale and its impact on earnings per share (EPS). Asset turnover plays an important role in assessing the contribution of operational efficiency on EPS, as it shows how efficiently the company utilises its assets. While the liquidity ratio expresses the capacity to meet short-term liabilities, excessively high levels of this ratio may lead to idle resources and negatively affect profitability. The ratio of short-term debt to total

debt provides information on the maturity of the debt structure and aims to evaluate the possible effects of financial risk on EPS.

Table 1. Variables used in the study.

Variable Name	Display	Formula	Definition
Earnings Per Share	EPS	Net Profit / Number of Shares	Shows the amount of profit per share of the company. It is an indicator of investor returns
Firm Value	lnFV	Debts + Equity – Cash Assets	A logarithmic variable showing the size of the company.
Asset Turnover Ratio	ATR	Net Sales / Total Assets	Shows how effectively the company uses its assets. It is related to asset efficiency.
Current Ratio	CR	Current Assets / Short-Term Liabilities	Shows the ability to pay short-term debts.
Short-Term Debt / Total Debt	STDR	Short-Term Liabilities / Total Debt	Shows the maturity of the debt structure.

4. Findings

The theoretical basis of the panel data model used in this study is based on previous studies that investigated the relationship between EPS and financial indicators. In particular, studies conducted by Korkmaz and Karaca [4], Rahmawati and Hadian [5], and Fathinah and Setiawan [8] examined the factors affecting EPS and used EPS as a dependent variable. Korkmaz and Karaca [4] included EPS as an important explanatory variable in their models while evaluating the effects of ratios such as firm value, return on equity, and liquidity on stock prices. In Rahmawati and Hadian [5] study, EPS was considered a variable that directly affects stock prices. Fathinah and Setiawan [8] also investigated the effects of EPS on firm value. In this study, since the basic variable structures of the specified models were retained, EPS was selected as the dependent variable, and the independent variables were determined as firm value (lnFV), asset turnover ratio (ATR), liquidity ratio (CR), and short-term debt to total debt ratio (STDR). The author adapted this model design to the energy and automotive sectors, aiming to test the effects of financial performance on EPS in a more specific sectoral context. The research model is as in Equation 1.

$$EPS_{i,t} = \alpha_{i,t} + \beta_1 lnFV_{i,t} + \beta_2 ATR + \beta_3 CR_{i,t} + \beta_4 STDR_{i,t} + \varepsilon_{i,t} \quad (1)$$

The variables and symbols in the panel data model are explained below. '$EPS_{i,t}$' represents the earnings per share of enterprise i for period t. This variable is the dependent variable of the study and measures the level of return offered by the company to investors. The expression 'ln' in the equation indicates that the natural logarithm of the relevant variable is taken; this transformation is used to normalise the distribution, especially for variables with large numerical differences. The symbol 'α' stands for the constant term in the model, while '$\varepsilon_{i,t}$' represents the error term and reflects the effects that are not included in the model or cannot be measured. The coefficients 'β_i' are included in the model to estimate the effect of each independent variable on EPS. Thanks to this structure, the impact and significance of the selected financial ratios on EPS are econometrically evaluated. Descriptive statistics of the variables used in the study are given in Table 2.

Table 2. Descriptive statistics of the variables used in the panel data model.

Variables	Number of Observations	Average	Standard Deviation	Min. Value	Max. Value
EPS	392	9.23	24.32	0	220.81
lnFV	365	22.44	1.83	17.07	26.53
CR	392	1.51	2.70	0.10	29.94
ATR	392	1.19	1.10	0.03	7.57
STDR	392	49.54	24.18	0.59	95.82

EPS (Earnings Per Share) variable is distributed between 0 and 220.81 with a mean of 9.23 and a standard deviation of 24.32. lnFV (Firm Value) variable is distributed between 17.07 and 26.53 with a mean of 22.44 and a standard deviation of 1.83. CR (Current Ratio) variable is distributed between 0.10 and 29.94 with a mean of 1.51 and a standard deviation of 2.70. ATR (Asset Turnover) variable is distributed between 0.003 and 7.57 with a mean of 1.19 and a standard deviation of 1.10. The STDR (Short-Term Debt / Total Debt) variable is distributed between the values of 0.59 and 95.82, around the mean of 49.54 and with a standard deviation value of 24.18.

Table 3. Variance Inflation Factor (VIF) value.

Variable	VIF	1/VIF
STDR	1.80	0.555764
lnFV	1.73	0.577110
ATR	1.56	0.642155
CR	1.04	0.958080
Mean VIF	1.53	

Variance Inflation Factor (VIF) values were analysed to determine whether there is a multicollinearity problem among the variables in the model. As a result of this examination, it was determined (VIF < 10) that there is no multicollinearity problem among the variables [20].

Table 4. Tests used to decide between forecasters.

Breusch-Pagan [13] Test		
Unit Impact	$X^2(01)=91.00$ ***	Prob=0.0000
Time Impact	X^2 (01)=0.00	Prob=1.0000
Hausman (1978) Test	X^2 (04)=15.79**	Prob=0.0033

Breusch and Pagan LM test was conducted to determine the presence of unit and time effects. According to the results obtained, there are unit effects in the model ($\chi^2(01) = 91.\ 00$ *, $p = 0.\ 000$). However, tests for time effects show that there is no time effect in the model ($\chi^2(01) = 0.\ 00$, $p = 1.\ 000$). Following the detection of unit effect, Hausman test was performed and it was decided to construct a fixed effects model ($X^2(04) =15.79$, $p = 1.\ 0000$).

Table 5. Deviations from the assumption distorting the effectiveness.

Heteroskedasite		
Wald test	$X^2(14)=9150.54$***	Prob = 0.0000
Autocorrelation		
Durbin-Watson Test	0. 72421825	
Baltagi-Wu LBI Test	0.89951509	
Correlation Between Units		
Pesaran's Test	14.967***	Prob=0.0000

According to the results of Walt Test to test the changing variance assumption of the fixed effects model, there is a changing variance problem in the model ($X^2(14)=9150.54$*** p= 0.000). According to Durbin-Watson and Baltagaji-Wu Autocorrelation test, autocorrelation problem is observed in the model (0.72421825<2, 0.89951509<2). According to the results of Pesaran test proposed to test the inter-unit correlation, there is an inter-unit correlation in the model (14.967*** Prob=0.0000). Variable variance and autocorrelation problems were detected in the model. In this case, the fixed effects estimator for the model was estimated and interpreted with Driscoll-Kraay robust standard errors estimator.

Table 6. Estimation results based on fixed effects with Driscoll-Kraay standard errors.

Independent Variables	Coefficient	Drisc/Kraay Std Err.	Significance Level
lnFV	5.56	0.67	0000***
CR	-0.49	0.19	0.027**
ATR	13.77	3.09	0.001***
STDR	0.04	3.09	0.554
Fixed Term	-134.24	0.07	0.000***
F Test	F (4, 13) = 58.81*** Prob=0.000		
R^2=0.39			
Observations = 390			
Dependent Variable: EPS			

F Test: Tests the significance of the model.

R^2: Shows the explanatory power of the model.

* : 1 %, ** : 5 %, *** : 10 % significance levels.

According to the results of the analysis, there is a positive relationship between firm value (lnFV) and earnings per share (EPS) at 1% significance level. This finding indicates that the market or balance sheet-based size of the company has an increasing effect on the profitability provided to investors. Furthermore, there is a negative relationship between liquidity ratio (CR) and earnings per share (EPS) at 5% significance level. This situation reveals that liquidity ratio, which expresses the ability of companies to fulfil their short-term liabilities, decreases the profitability reflected to investors. Asset turnover ratio (ATR) is positively correlated with earnings per share (EPS) at 1% significance level. This finding indicates that how efficiently the company utilises its assets plays a determinant role in the profitability provided to investors. In the panel data analysis, no statistically significant relationship was found between the ratio of short-term debt to total debt (STDR) and earnings per share (EPS). The fact that the effect of this variable on EPS is not significant even at the 10% significance level reveals that the maturity structure of debt does not have a direct determining effect on the profitability reflected to investors.

5. Conclusions

Earnings per share (EPS) is considered to be an extremely important financial indicator for investors, measuring a company's profitability level with net profit per share. This ratio provides a critical reference point for investors when evaluating company performance and valuing stocks. In addition, earnings per share (EPS) also provides important information about a company's resource utilisation efficiency and financial management skills. In this context, this study analyses the effects of key ratios representing the financial structure of firms on EPS using panel data analysis method.

During the research, variables such as firm value, asset turnover, current ratio and the ratio of short-term debt to total debt are used to analyse which factors affect EPS and to what extent.

The data obtained is based on an analysis of companies operating in the energy and automotive sectors. The selection of these sectors allows the results of the study to be placed within a specific industrial framework, enabling the impact of financial ratios on HBK to be assessed in line with the dynamics of these sectors. The high capital requirements, long-term investments, and production-oriented activities of the energy and automotive sectors have provided an important motivation for understanding the effects of financial performance indicators on HBK. The results of the study reveal that there is a positive relationship between firm value and earnings per share (EPS). This indicates that the market or balance sheet-based size of the company has a positive effect on the profitability provided to investors. In other words, it is possible to say that larger-sized firms have higher levels of earnings per share due to their higher operational sustainability, more efficient access to resources and their ability to benefit from economies. On the other hand, there is an inverse relationship between liquidity ratio and earnings per share (EPS). This indicates that the ability of companies to meet their short-term liabilities may reduce the profitability reflected to investors. It is thought that high liquidity levels may be related to the fact that idle resources are not utilised in investment and production processes. In other words, high liquidity levels may reduce operational efficiency as a result of inefficient utilisation of resources and thus negatively affect earnings per share. This finding emphasises that high liquidity does not always contribute positively to financial performance and the strategic importance of liquidity management. Moreover, a positive relationship is found between asset turnover ratio and earnings per share (EPS). This finding suggests that the extent to which companies utilise their assets effectively is a determinant of the profitability provided to investors. A high asset turnover rate implies that the company increases its sales and contributes to net profit by utilising its assets more efficiently. This increased efficiency leads to an increase in earnings per share. Therefore, efficiency in asset management stands out as a critical factor that directly affects not only operational success but also investor returns.

The findings of the study reveal that some financial indicators play an important role in increasing the earnings per share (EPS). In particular, the positive and statistically significant effects of firm value and asset turnover ratio on EPS suggest that enterprises should adopt growth and efficiency-oriented strategies. Effective management of assets, increase in sales and strengthening operational performance directly increase the return to investors. On the other hand, the negative impact of the liquidity ratio on EPS indicates that excess liquidity may reduce profitability. This indicates that firms should optimise their resources and avoid excessive cash positions. As a result, firms can increase their potential to create value for investors through strategic decisions that consider both operational efficiency and financial balance.

In this study, we focus only on key indicators such as key financial ratios and balance sheet size to assess their impact on EPS. In future research, it is possible to deepen the analyses by including factors such as corporate governance structure, industry effects, macroeconomic variables (e.g. inflation, interest rates, exchange rates) and internal management strategies in the model. In addition, it would be useful to perform multidimensional analyses by creating comparative models with financial performance indicators other than EPS (ROA, ROE, Tobin's Q, etc.). Expanding the panel data set to cover longer periods may provide a more robust analysis of time-dependent effects.

6. Author contribution statement

The author conducted all research, analysis, and writing for this manuscript.

7. Ethics committee approval and conflict of interest statement

Ethics committee approval is not needed for this study. This article also has no financial conflict of interest with any institution, organisation or person.

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