# Determining the Impact of Financial Characteristics on Firm Profitability: An Empirical Analysis on Borsa Istanbul Energy Firms

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*Abstract:* - In this study, the effect of financial ratios of liquidity, financial structure, productivity and profitability of the energy sector firms on the return on assets was examined. For this purpose, quarterly financial data (2008:Q1-2015:Q4) of the 10 Energy firms whose shares are quoted on BIST (Borsa İstanbul) have been used. For the empirical analysis of the data set, Panel Data Analysis was implemented. In the analysis, The Asset Turnover Ratio and Liquidity Ratio were found to be statistically significant and positive. Financial Leverage Ratio, Tangible Fixed Asset/Assets, and Long-Term Debt/Assets ratios were found to have a negative impact on the Return on Assets. However, in empirical analysis, it was determined that there was no significant relationship between Return on Asset with Equity Turnover Ratio and Net Working Capital Turnover ratios.

*Key-Words:* -Energy Sector, Panel Data Analysis, Profitability, Borsa İstanbul

## 1 Introduction

Energy consumption is important in terms of the economic development of countries. One of the most vital inputs of manufacturing industry is energy. The importance of energy as a manufacturing input in the world has not been taken into consideration until the breakout of oil crisis in the 1970s. However, after the oil crisis since the 1970s, energy has been included in the production function as a production factor [1]. Energy plays an important role in influencing the economic progress and in determining the foreign policy of the countries. Since there is a positive relationship between energy and economic progress, the main reason for the warm and cold wars in the world lies in their efforts to have energy sources and to keep them under control. In this context, it can be said that the use of energy sources and the increase in energy demand are closely related to economic growth. Energy sources are composed of two parts: non-renewable and renewable energy sources. Hydraulic, geothermal energy, wind energy, energy derived from tides and waves in the sea, solar energy, wood, animal, and plant waste are the main

renewable energy sources. Non-renewable energy sources are nuclear energy, oil, coal and natural gas. At the same time, coal, oil, and natural gas are the primary sources of energy and the production (electricity, petroleum products) is secondary energy sources. Though Turkey, is an energy dependent country in terms of renewable energy sources, it has been proposed to meet a significant portion of the energy demand using renewable energy sources. Turkey's growing trend in energy demand is a prominent indicator of its economic development [2].

The risky limits of fossil fuel reserves are progressively raising the importance of energy in sustainable development. Global energy consumption is expected to increase by 28 percent till 2040. Most of this increase will stem from developing countries excluding OECD (The Organization for Economic Co-operation and Development). High economic growth rates of developing countries increase their energy consumption. The energy consumption of countries outside the OECD, particularly in China and India, outstrips the total energy consumption of OECD

countries, and this gap will increase in the following years. Increasing energy demand and changing balances in the market affect the supply and demand seriously. For energy importers and energy-dependent countries, getting rid of energy dependence is of great importance in order to ensure economic independence. In addition, the geopolitically uncertain environment, the approach to the limits of sustainability in the use of fossil fuels, and the climate change, which has begun to give dramatic signals, compels countries to re-create their energy cycles in the earliest time. When producing solutions for climate change, it is necessary to focus not only on increasing alternative energy sources, but also on reducing energy consumption and developing solutions for energy efficiency [3]. Energy demand will increase gradually in parallel with economic growth. Energy sector is expected to support economic growth as much as a country is able to produce the energy it needs. In this context, there are various research studies which examined the relation between economic growth and energy consumption. In one of these studies, the data set covering the period 1989-2010 has been analyzed. In this empirical analysis; it was determined that there is a causality relationship between electricity consumption per capita and the growth rate in the industrial sector [4].

In Turkey, according to 2016 statistics, among the top 100 firms that paid the highest corporate tax, 11 were energy firms. The total amount of tax accrued to 11 energy firms is TL (Turkish Lira) 2.6 billion. The first three tax-payers are public institutions and the remaining 8 are private sector firms. These results show the importance of energy sector companies for the economy of the country [3].

Our paper is organized as follows. In the second part, the studies examining the financial factors that have impact on firm profitability are summarized. In the third part, we explained research data, model and methodology. In the fourth part, an empirical analysis is carried out by using the data. Finally the interpretations and assessments are made in the conclusion part.

## 2 Literature Review

Some of the empirical studies that examine financial characteristics affecting the profitability of the firms are summarized below.

Külter and Demirgüneş [5] examined the financial ratios of the retail firms listed in ISE (Istanbul Stock Exchange) that have impact on return on assets by pooled regression method during the 1997-2006 period. In the study while return on assets is adopted as dependent variable, firm's assets, the ratio of the company's sales to the sector total, the market share, the ratio of net working capital to assets, the receivable turnover rate, inventory turnover rate and leverage ratio are assigned as independent variables. The empirical evidence shows that return on assets decreases depending on increase in the firm size (assets) and the financial leverage. At the same time, return on assets increases as the working capital investments (NCI) and market share increases.

Albayrak and Akbulut [6], by using the 2004-2006 data from 55 companies listed in the ISE industry and service sectors performed stepwise regression analysis to determine the financial variables that have impact on profitability. In the study, 18 financial variables and profitability indicators related to liquidity, asset utilization efficiency, capital structure, market value and size of the firm have been used. In the analysis, it is determined that variables such as leverage ratio, current asset / short term debt, net working capital / net sales ratio, asset turnover rate, size and stock turnover ratio are effective on return on assets, return on equity, profit per share and profit margin variables.

Andres [7] examined the relationship between founder family property and firm performance of 275 firms, whose shares are quoted on the Frankfurt Stock Exchange in Germany in the period 1998-2004 by performing panel data analysis. In accordance with this purpose, 3 models were created: In the models, return on assets (EBIT-earnings before interest, taxes, and EBITDA-earnings before interest taxes, depreciation and amortization) and Tobin's Q are adopted as dependent variables. In these models: family firm, founding CEO (chief executive officer), family descendant CEO, professional CEO, audit committee, and status of one the employees to be a member of the board are determined as control of the variables. Likewise natural logarithm of assets, industrial firms and time (year) are adopted as control variables. The natural logarithm of the firm age, the ratio of the amount of the dividend to the carrying amount of equity, capital structure and volatility of the stock price are taken as independent variables. In the analysis, it has been determined that for the firms where majority of the shares are controlled by the family are profitable and perform well. In addition, it is identified that the firms perform well in which the founder family is on the executive or supervisory board.

Asimakopoulos et al. [8] analyzed the determinants of profitability by performing panel data analysis for the 1995-2003 period from selected companies whose shares are quoted on the Athens Stock Exchange. In empirical analysis, size, sales growth and investment have positive impacts on firm profitability, while the leverage and current assets have negative ones. In addition, participation in the EU (European Union) and the adoption of the Euro were found to be negatively correlated with firm profitability.

Coşkun and Kök [9] examined the stocks of the 74 companies which are quoted on the BIST by implementing the System-GMM (Generalized Moment Method) estimation method for the period of 1991-2005. In the study, it is aimed to determine the effect of working capital policies on profitability. For this purpose, for the analysis of working capital policies, the sector adjusted cash conversion period, receivable collection period, debt payment period, stock turnover period and return on assets have been used. It was determined that there was a negative relationship between cash conversion period, receivable turnover period, inventory turnover period and return on assets, whereas there was a positive relationship between debt payment period and return on assets.

Gülhan and Uzunlar [10] analyzed bank-specific variables for the determinants of profitability using macro-economic variables and sector variables by panel data analysis. In the study, it was determined that bank-specific variables such as capital adequacy, operating expenses, liquidity position, bank size, securities portfolio and non-performing loans had a significant impact on return on assets. On the other hand, inflation, economic growth rate, market share, concentration in the sector and economic crises have been found to have significant impacts on return on assets.

In order to determine the effect of bank-specific variables and macroeconomic variables on bank profitability by Gul et al. [11], the periodic data of 15 Pakistani banks for the period 2005-2009 were analyzed by the pooled least squares method. In the study, return on assets and return on equity variables were used. In the empirical analysis, it is determined that bank specific variables and macro-economic variables have a strong impact on return on assets and return on equity.

Karadeniz and İskenderoğlu [12] analyzed the variables affecting the return on assets of the tourism companies listed in the ISE during between 2002-2009. In this context, quarterly data of 8 tourism companies were analyzed by integrated regression method. For the analysis, return on assets

as a dependent variable, leverage ratio, firm size, market share of the firm in the sector, ratio of net working capital to assets, receivable turnover rate, stock turnover rate and asset turnover rate were used as independent variables. As a result of the empirical analysis, when the leverage ratio had negative impact on the return on assets, firm size, market share, net working capital turnover rate and asset turnover rate were found to have a positive effect.

Saleem and Rehman [13] examined the impact of liquidity ratios on the profitability of 26 oil and gas firms listed in the Karachi Stock Exchange between 2004-2009 period. In the study, the return on assets, return on equity and return on investment as dependent variables are included in 3 models as current ratio, liquidity ratio, and cash ratio. Panel data analysis method was used for models. According to the empirical results, it was determined that cash ratio had a significant effect only on return on assets, but its effect on return on equity and return on investment was insignificant. On the other hand, it was determined that the current ratio, cash ratio, and liquidity ratio did not significantly affect the return on equity. In addition, current ratio, cash ratio and liquidity ratio have been found to affect investment profitability to a great extent.

The factors influencing the financial performance of 18 SMEs (Small and Medium Enterprises) listed in the ISE were examined by using panel data method for the period 2006-2010 by Şahin [14]. As a financial performance indicator, return on assets, return on equity, net profit margin and firm value ratio were used as dependent variables. Current ratio, asset turnover rate, inventory turnover rate, receivable turnover rate and fixed asset turnover rate, equity turnover rate, fixed assets to assets ratio, firm size as logarithm of firm value, stock price to profit per share ratio, net profit to shares ratio, leverage ratio, logarithm of assets, logarithm of sales, market value / book value ratio, liabilities to equity ratio, long-term debt to total debt ratios were used. The analysis results display the positive relationship between the return on equity and the leverage ratio (0.252), significant relationship between return on assets and asset size (0.271), and between return on equity and asset size (0.408). During crisis periods, the high-risk level arising from a deeper indebtedness has a negative impact on the raise of firm value.

Aygün [15] aims to determine the effect of the 107 companies in the manufacturing industry listed in the ISE. In the study, as a firm performance indicator, return on assets is adopted as dependent

variable while average collection period of receivables, stock retention period and short-term debt payment period were used as independent variables. In the study, it was determined that there was a negative relationship between return on assets and average collection period, stock holding period and short-term debt payment period, however, there was a positive relationship between return on assets and cash conversion period.

Meder-Çakır and Küçükkaplan [16] aims to determine the effect of the current ratio, liquidity ratio, cash ratio, stock turnover rate, receivable turnover rate, asset turnover rate and leverage ratio on return on assets, return on equity and market value.2000-2009 period data of 122 production companies listed in ISE were used for the research. For analysis, liquidity ratios, receivables turnover and stock turnover were adopted as independent variables, asset turnover rate and leverage ratio were assigned as control variables. Accordingly, return on assets, return on equity and market value / book value ratios were used as dependent variables. As a result, current ratio and leverage ratio were found to be negatively related to return on assets. Besides, liquidity ratio, stock turnover rate and asset turnover rate variables have a positive and significant impact on return on assets.

Doğan [17]examined the effect of the capital structure of insurance companies listed in the ISE on their return on assets during between 2005-2011.In the model when return on assets is determined as dependent variable, logarithm of assets, earned prime rate of total sum of outstanding and outstanding claims, leverage ratio, ratio of current assets to short term liabilities, and age of firms are adopted as independent variables. Multiple regression and correlation methods were performed to obtain empirical evidence. According to the results of empirical analysis, when the insurance premium rate, leverage ratio and liquid assets of insurance companies increased, return on assets was adversely affected. However, in case of increase in asset size, return on assets increases. On the other hand, a negative and statistically significant outcome was found between the age and return on assets of insurance companies.

Apergis and Sorros [18] investigated the relationship between R&D (Research and Development) expenditures and profitability of energy companies in the USA (United State of America). The data set belongs to 183 energy companies (39 fossil energy and 144 renewable energy companies) for the period 1990-2011. In the study, the return on assets is adopted as dependent variable and R&D expenditures and free cash flows

are determined as independent variables. In empirical findings, R&D expenditures in renewable energy firms have been found to have a strong impact on return on assets.

Korkmaz and Karaca [19] aims to examine the relationship between financial indicators and profitability variables whether financial indicators have explanatory power on the profitability level or not. In the analysis, the financial data of 78 firms listed in the BIST-Manufacturing Industry Index for the period 2000-2011 was used. In order to measure the relationship between variables, 3 different panel regression models were formed. For the models while earnings per share, return on equity and return on assets are determined as dependent variable, net sales / assets ratio, product cost / inventories ratio, net sales / trade receivables ratio, current ratio, fixed asset / total assets ratio, tangible fixed asset / long-term liabilities ratio, net sales / current assets ratio and leverage ratio were used as independent variables. In the empirical analysis, it was determined that the profits per share dramatically decreases as the leverage ratio of the firms increases. It was determined that the increase in the debt levels of firms, the increase in fixed assets/assets and the current ratio causes a decrease in return on equity.

Tailab [20] aimed to analyze the impact of capital structure on financial performance. In this context, return on assets and return on equity are determined as dependent variables for financial performance. On the other hand, the ratio of short-term debt to assets, ratio of long-term debt to assets, leverage ratio, ratio of total liabilities to equity, logarithm of sales and logarithm of assets were used as independent variables. The financial data set belongs to 30 American energy companies for the period of 2005-2013 is examined by using multiple regression method. In the study, 10% of the return on equity and 34% of the return on assets were explained by independent variables. On the other hand, total liabilities have a significant negative effect on return on equity and return on assets, and the logarithm of total sales has a negative effect on return on equity. In addition, short-term debt has a positive effect on the return on equity.

Gozbasi and Aslan [21] aimed to analyze the profit persistence in the energy sector. In the study, the financial data of 13 Turkish Energy Firms covering the 1997-2011 period is used to perform panel data analysis. The empirical evidence shows that market saturation is low; price competition is weak, the volume of retail deals in the market is low and profit persistence is high.

In the analysis carried out by İslamoğlu and Çelik [22], it is aimed to determine the factors affecting the financial performance of firms in the paper and paper products industry listed in the BIST. Panel regression analysis was performed for the 2011:Q1-2014:Q3 period data of the firms. When return on assets and return on equity are adopted as the dependent variables, the ratio of sales to assets, net profit margin, ratio of equity to assets, liquidity ratio, market share, foreign trade deficit and commercial loan interest rate were used as independent variables. In empirical analysis, net profit margin, the ratio of equity to assets, and liquidity ratios on return on assets and return on equity were found to be statistically significant. Consequently, the effect of the variables on the return on equity was stronger compared to the return on assets.

Akben and Selcuk [23] aimed to determine the factors affecting the competitiveness of the company in a developing market. In this context, return on assets, gross profit margin and Tobin's Q are found to be the measure of financial performance of a firm in a competitive environment. In the study, return on assets, gross profit margin and Tobin's Q ratio are adopted as dependent variables while leverage ratio, current ratio, natural logarithm of assets, export, R&D expenditures and growth variables in sales were determined as independent variables. The financial data set of 359 firms listed in BIST for the period of 2005-2014 was analyzed by the panel data analysis method. According to empirical analysis, there was a positive relationship between return on assets, firm size, export, current ratio and growth in sales. It was determined that there was a negative correlation between leverage ratio and R&D expenditures.

Doğan and Topal [24] aim to identify the financial factors that determine the profitability of the manufacturing industry firms whose shares are quoted on the BIST. In the research, financial data of 136 firms listed in BIST manufacturing industry for the period of 2005-2012 were used. In the study, when return on assets and return on equity were taken as independent variables, logarithm of assets, leverage ratio, current ratio and firm's age are chosen as independent variables. As a result of the empirical analysis, there was no statistically significant relationship between current ratio, firm's age and return on equity.

Esmeray and Esmeray [25] examined the firm profitability of Turkish Energy Firms for the period 2005:Q1-2015:Q3. The panel data analysis method was applied for the data set. In the model, when net profit is assigned as dependent variable, net assets, net sales, capital and total liabilities are used as independent variables. According to empirical analysis, total debt, equity and net sales have a positive effect on net profit.

Fareed et al. [26] examined the variables affecting the profitability of firms in the electricity and energy sector in Pakistan. For this purpose, the data of the 16 firms for the period of 2001-2012 were analyzed by the panel data analysis method. In the study, econometric model was formed by using independent variables as return on assets dependent variable, firm size, firm's age, sales growth, retained earnings, leverage ratio, efficiency and electric crisis. In the results of empirical analysis, it was determined that firm size, sales growth and electricity crisis had positive effects on return on assets, but firm's age, leverage ratio and productivity variable had negative effects on return on assets. In the study, it was observed that although the energy sector's production in the electricity crisis was very low, the profitability of the larger and younger firms with high growing rate and low productivity and profitability were higher. It has been determined that firm productivity and firm size are strong determinants of return on assets.

Keskin and Gökalp [27] examined the effect of working capital on firm profitability through panel data analysis. In the study, 2009-2013 period data of 17 firms in the food and beverage sector of BIST were analyzed by performing panel data analysis method. Return on assets as a performance measure is adopted as dependent variable in the model. When cash conversion period, receivable collection period, stock turnover period, debt payment period are assigned as independent variables current ratio, firm size and leverage ratio are chosen as control variables. In the empirical analysis, the negative relationship between the return on assets and cash conversion period was found to be insignificant, a negative and significant relationship between the receivable collection period and return on assets was observed.

Kocaman et al. [28] aimed to determine the relationship between indicators of firms and profitability variables. In the study, 15 firms of ICI (Istanbul Chamber of Industry) listed in BIST 100, which are also among Top-100 firms based on the performance period 1997-2013 were selected. In this study, when the ratio of EBIT to liabilities, economic profitability were taken as dependent variable, return on assets, return on equity, net profit margin, receivable turnover rate, leverage ratio, ratio of fixed assets to total assets, current ratio, ratio of net working capital to net sales and net working capital turnover rate were determined as

independent variables. According to the empirical results, it was determined that there was a significant relationship between economic profitability and net profit margin, receivable turnover rate, leverage ratio and ratio of fixed assets to total assets.

Demirci [29], examined financial data set of 12 sub-sectors of the manufacturing industry for the period 1996-2015. He performed panel data analysis for the estimation. While return on assets is adopted as dependent variable in the study, current ratio, leverage ratio, ratio of tangible fixed assets to total assets, receivable turnover rate, asset size are taken as an independent variables in the econometric model. Empirical analysis results show that leverage ratio and tangible fixed assets to total assets have negative impact on return on assets while, receivable turnover rate and real asset size have positive.

Işık [30] aimed to analyze the effect of firm-specific variables of 153 real sector firms listed in BIST on the return on assets of them. When return on assets was taken as dependent variable, natural logarithm of assets, growth in sales, current ratio, ratio of fixed assets to assets were selected as independent variables. According to the results of empirical analysis, it was determined that the firm size was strong positive impact on return on equity in both sample and sub-samples, and that larger firm size led to higher return on assets. A positive and significant relationship was found between the high level of liquidity and high return on assets in large firms. Although the relationship between the high rate of tangible fixed assets and the return on assets is important in large firms, this relationship has been identified as insignificant in young firms. The effect of stock return volatility on return on assets was found to be negative and significant for small and young firms. It is also revealed that the age of the firm has a positive effect on the level of return on assets.

## 3 Data and Methodology
### 3.1 Research Data and Model
In order to determine the financial characteristics that affect the profitability of the energy sector firms, the models and variables for the 2008:Q1-2015:Q4 period data of the firms listed in BIST are presented below.

Table1. Firm Names and Codes

|   | Firm Names | Codes |
|---|---|---|
| 1 | AKENERJİ ELEKTRİK ÜRETİM A.Ş. | AKENR |
| 2 | AKSA ENERJİ ÜRETİM A.Ş. | AKSEN |
| 3 | AKSU ENERJİ VE TİCARET A.Ş. | AKSUE |
| 4 | AYEN ENERJİ A.Ş. | AYEN |
| 5 | AYGAZ A.Ş. | AYGAZ |
| 6 | İPEK DOGAL ENERJİ KAYNAKLARI ARAŞTIRMA VE ÜRETİM A.Ş. | İPEKE |
| 7 | PETKİM PETROKİMYA HOLDİNG A.Ş. | PETKM |
| 8 | TÜPRAŞ-TÜRKİYE PETROL RAFİNERİLERİ A.Ş. | TUPRS |
| 9 | TURCAS PETROL A.Ş. | TRCAS |
| 10 | ZORLU ENERJİ ELEKTRİK ÜRETİM A.Ş. | ZOREN |

The companies subject to our analysis are tabulated above. The financial information of the firms for the data set is provided from the public disclosure platform www.kap.gov.tr and www.borsaistanbul.com

When setting up our research model, we have taken net working capital turnover as independent variable in line with the research studies implemented by [19], [12], [6], [24], [14], [31], [5], [27], [26],[30], [29], [32], [33],[34], and [35].In the data set, net working capital turnover rate was calculated according to CBRT's calculation method. Thus, for the study when return on assets is adopted as dependent variable asset turnover rate, financial leverage ratio, fixed asset / total assets ratio, long-term liability / liabilities ratio, equity turnover rate, net profit margin, net working capital turnover rate were determined as independent variables. The variables in the study are expressed as financial characteristics. The research model and financial characteristics are shown below.

Table 2. Research Characteristics and Formulas

| Codes | Characteristics | Formula |
|---|---|---|
| ROA | Return on Assets | Net Profit / Assets |
| ATR | Asset Turnover Ratio | Net Sales / Assets |
| FLR | Financial Leverage Ratio | Total Debts / Assets |
| TFAAR | Tengible Fixed Asset/Total Assets Ratio | Tengible Fixed Asset/Assets Ratio |
| LTDLR | Long Term Debts / Liabilities Ratio | Long Term Debts / Liabilities Ratio |
| ETR | Equity Turnover Ratio | Net Sales / Equity |
| NPM | Net Profit Margin | Net Profit / Net Sales |
| NWCTR | Net Working Capital Turnover Ratio | Net Sales / Net Working Capital |
| LR | Liquidity Ratio | (Current Assets -Inventory) / Short-Term Debts |

**Research model;**

$$ROA = \beta_0 + \beta_1 ATR_{it} + \beta_2 FLR_{it} + \beta_3 TFAAR_{it}$$
$$+ \beta_4 LTDLR_{it} + \beta_5 ETR_{it} + \beta_6 NPM_{it}$$
$$+ \beta_7 NWCTR_{it} + \beta_8 LR_{it} + \varepsilon_i$$

### 3.2 Research Characteristics

The research studies examining the financial characteristics of firm profitability by industrial distribution are as follows. Industrial and service sector [6] ,production-manufacturing [9],[16], [15],[24],[28],[19],[29], Banking Sector [10],[11], Insurance Sector [17], SMEs [14], various real sector companies [30], tourism sector [12], retail sector [5], energy sector [21],[18],[26], [25], [13], [20], export companies [23], family partnership [7], food and beverage sector [27], paper and paper products [22]. In this study, the most frequently used financial characteristics, which have impact on return on assets of the firms, are used in the research model.

### 3.2.1 Return on Assets

This ratio, which is calculated by dividing the profit after tax to the total of assets, shows to what extent a firm uses its assets profitability. When comparing the firms having different capital structures, the ratio of net profit to total of assets before the interest and tax rate is to be more meaningful and consistent. However, in the studies on performance or profitability determinants, return on assets is used frequently as a dependent variable. The return on assets is calculated by the "net profit / assets" formula [35], [32]. This characteristic was used by [19], [12], [6], [14], [5], and [17] to measure performance and profitability.

### 3.2.2 Asset Turnover Ratio

The ratio is obtained by dividing net sales by the total of assets indicates that the company's assets have been transferred over a period of one year in order to realize the sales amount. This ratio reveals that the company's assets are used effectively and efficiently in revenue generation. Generally between 2 and 4 is a positive indicator for the company. This ratio reflects the relative importance of fixed assets within the asset structure of a firm. Asset turnover is calculated by the formula "net sales / assets" [35], [32]. The sectors with low asset turnover rates are generally risky sectors [33]. This characteristic was used by [29], [12], and [6].

### 3.2.3 Financial Leverage Ratio

This ratio shows the extent to which the firm's assets are financed by debts. This ratio is also called borrowing rate. A high rate indicates that the entity's financial risk is high. If the leverage ratio increases and the return on equity decreases, financial leverage works negatively. The leverage ratio should be less than 1 or 0.50. As developing countries to fluctuate around 0.60, this ratio is considered adequate in Turkey. Financial leverage ratio can be calculated as, "Total debts / assets" [35], [32], [36]. Those who grant loan to the company prefer this rate to be low but shareholders prefer it to be high [33]. This characteristic was used by [19], [29], [12], [6], [14], and [5].

### 3.2.4 Tangible Fixed Asset to Assets Ratio

This ratio shows the rate to what extent assets of a firm is composed of fixed assets. Fixed asset ratio may vary depending on the company's structure and operations. While in manufacturing firms the ratio is expected to be high, in trade and service companies it may be low. If this ratio is high, the firm's ability to adapt to changing market conditions will be weak. In general, the ratio of fixed assets to assets is between 0.40 and 0.60. Fixed asset to assets ratio is calculated as "Fixed asset / assets" [35]. In some of the studies this characteristic is used in the models [29], [19], and [14].

### 3.2.5 Long Term Debts Liabilities Ratio

This ratio shows the share of long-term debts in liabilities. The possibility of borrowing long-term debt from financial markets is limited in Turkey. Therefore, the ratio of long-term debt in liabilities is between 1/6 and 1/8. The fact that this ratio is above the specified limits may mean that the long-term liabilities of the company have a high proportional importance. The ratio of long-term debt to liabilities is calculated as "Long-term debt / Liabilities" [35].

### 3.2.6 Equity Turnover Ratio

This is an indicator of how efficiently equity is used. A high rate of equity turnover may mean that the equity is managed efficiently or not. The low rate may be due to the fact that the equity is higher than the volume of business or the equity is managed efficiently. In case of low equity turnover ratio, return on equity will be expected to be low, because there is a correlation between the rate of return on equity and sales profitability. Equity turnover rate is calculated as "Net sales / equity" [35], [32],[33]. This characteristic was used by [14].

### 3.2.7 Net Profit Margin

This ratio gives information about the net efficiency of the firm activities and called the rate of sales profitability. It shows the results of various policies and decisions applied by the firm. The company's net profit margin should be compared with the previous period results and the sector average profitability rates. Net profit margin ratio is calculated as "Net profit / net sales" [35], [32], [36]. Net profit margin is a ratio that enables net profit to be generated and the effectiveness of net sales and expenditures [33]. It was used by [14].

### 3.2.8 Net Working Capital Turnover Ratio

This ratio shows the effective utilization of net working capital. In general, high net working capital turnover rate is considered to be positive. Net working capital turnover ratio may be due to the effective use of net working capital or the lack of net working capital. The average of net working capital turnover in developed countries is around 10. Net working capital turnover ratio is calculated as "Net sales / net working capital" [35], [36].

### 3.2.9 Liquidity Ratio

Although the conversion of some of the assets to cash is in a very short period of time, the exchange of inventories among the current assets varies depending on the nature of the inventories and the economic conditions.

It is a more sensitive measure than the current ratio, since the inventories are excluded when calculating the ratio which is relatively illiquid. This ratio shows the company's ability to pay its short-term debts. It is calculated as "(current assets - inventories)/short term liabilities" [35], [36]. The ratio complements the current ratio and makes it more meaningful [33].

### 3.3 Econometric Method

In this study, due to the lack of financial data for some of the companies in the analysis, unbalanced panel data was used in the regression estimation. In econometric analysis is implemented by using Stata 13 and E-views 9. Initially, descriptive statistics and correlation values of the series were calculated.

Before setting up Panel Regression Model, the series should be examined whether they are stationary and if not, the necessary conversion should be done. However, in the Panel Data Analysis, the type of unit root test to be applied depends on whether there is a cross-sectional dependency between the series. Hence, the cross-sectional dependency was examined by Pesaran CD Test [37] and it was concluded that there is a cross-sectional dependence between the series. Therefore, in order to test whether the series have unit roots, through the second generation unit root tests which considers the cross-sectional dependence on the series, Cross-Sectional Im, Pesaran, Shin (CIPS) [38] Unit Root Test was performed. After ensuring stationarity of series to avoid spurious regression problem, it is necessary to decide for the appropriate model in estimation. For this purpose, in order to come to a decision on the appropriate model (the panel pooled least squares or random effects models), Breusch and Pagan [39] test was applied to the series and the random effects method was accepted as the appropriate model for the estimation. In order to verify the hypothesis that the error term components of the random effects model were not related to the independent variables in the model, Hausman [40] test was applied to the series and it was concluded that to use Fixed Effects Model rather than the Random Effects Model is appropriate in the estimation.

Autocorrelation, heteroscedasticity and multi-collinearity problems, which causes the inconsistency and inefficiency of the model were examined by applying the appropriate statistical tests. In order to solve these problems, standard errors were corrected without changing the parameter estimates. For this purpose, White cross-section standard errors and covariance coefficient corrections were implemented.

## 4 Empirical Analysis

Descriptive statistics of the panel data set for the determination of the financial characteristics that affect the profitability of BIST energy companies are presented in the table below.

Table 3. Descriptive statistics

|  | ROA | ATR | LR | FLR | TFAAR | LTDLR | NWCTR | ETR | NPM |
|---|---|---|---|---|---|---|---|---|---|
| Mean | 0.022325 | 0.452069 | 3.573774 | 0.482749 | 0.718782 | 0.260732 | -29.36693 | 1.124397 | -0.131425 |
| Median | 0.021450 | 0.210822 | 1.005970 | 0.462217 | 0.767772 | 0.192499 | 0.421188 | 0.609040 | 0.046834 |
| Maximum | 0.181114 | 3.526353 | 49.61335 | 1.053076 | 0.962560 | 0.821222 | 258.5472 | 9.736892 | 9.598193 |
| Minimum | -0.155774 | 0.000483 | 0.211331 | 0.013034 | 0.313018 | 0.005354 | -6210.445 | -5.159617 | -47.80248 |
| Std. Dev. | 0.051551 | 0.570931 | 6.585304 | 0.279562 | 0.172129 | 0.212222 | 388.1248 | 1.769914 | 4.326584 |
| Skewness | -0.208930 | 2.011697 | 3.839155 | 0.089401 | -0.716718 | 0.655887 | -14.29983 | 2.165681 | -8.732887 |
| Kurtosis | 4.082185 | 7.539094 | 21.06962 | 1.776750 | 2.287239 | 2.239240 | 220.7410 | 11.29429 | 87.38537 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Jarque-Bera | 16.76557 | 458.3555 | 4802.282 | 19.04019 | 31.92782 | 29.70195 | 600854.1 | 1090.801 | 92514.89 |
| Probability | 0.000229 | 0.000000 | 0.000000 | 0.000073 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| Sum | 6.675111 | 135.1686 | 1068.558 | 144.3421 | 214.9158 | 80.82700 | -8780.713 | 336.1947 | -39.29602 |
| SumSq. Dev. | 0.791943 | 97.13685 | 12923.13 | 23.29023 | 8.829274 | 13.91675 | 44890981 | 933.5133 | 5578.359 |
| Observations | 299 | 299 | 299 | 299 | 299 | 299 | 299 | 299 | 299 |

According to Table 3, the average return on assets of firms listed in BIST Energy Sector was realized as 2.23%, it is determined that the best performance in profitability is 18.11% and the worst is -15.58%. The correlation values for the financial characteristics of the research model are shown in the table below. In table 4, there is a negative relationship between dependent variable

Table 4. Correlation Results

| | ROA | ATR | LR | FLR | TFAAR | LTDLR | NWCTR | ETR | NPM |
|---|---|---|---|---|---|---|---|---|---|
| ROA | 1.000 | | | | | | | | |
| ATR | 0.322 | 1.000 | | | | | | | |
| LR | 0.235 | -0.267 | 1.000 | | | | | | |
| FLO | -0.237 | -0.116 | -0.031 | 1.000 | | | | | |
| TFAAR | -0.203 | -0.533 | 0.197 | 0.054 | 1.000 | | | | |
| LTDLR | -0.157 | 0.008 | -0.010 | 0.394 | 0.054 | 1.000 | | | |
| NWCTR | -0.058 | -0.206 | 0.033 | 0.012 | 0.018 | -0.025 | 1.000 | | |
| ETR | 0.210 | 0.785 | -0.249 | -0.122 | -0.436 | -0.050 | -0.152 | 1.000 | |
| NPM | 0.223 | 0.033 | 0.112 | -0.019 | 0.017 | 0.004 | -0.003 | 0.025 | 1.000 |

ROA and independent variables FLR, TFAAR, LTDLR and NWCTR but there is a positive relationship between ROA and ATR, ETR, NPM and LR. According to Table 4, while the independent variable with the highest positive correlation with ROA was ATR, FLR was found to have the highest negative correlation with ROA.

When performing Panel Data Analysis, first of all we should examine whether there is a cross-sectional dependence between variables. Pesaran CD [37]test was applied to verify the cross-sectional dependence. Pesaran CD Test results are given in Table 5 below.

Table 5. Cross-sectional dependence test

| Test | Statistics | d.f. | Prob. |
|---|---|---|---|
| Pesaran CD | 3.79723 | | 0.0001 |

According to the results of Pesaran CD test, the probability value of 1% significance level shows cross-sectional dependence between the variables. For this reason, in order to test the stationarity of the variables, through second generation unit root tests which considers the cross-sectional dependence, Cross-Sectional Im, Pesaran, Shin [38] Unit Root Test was applied to the series. Unit root test results are presented below.

Table 6. Unit Root Test Results

| Variables (Constant+Trend) | Im, Pesaran and Shin (CIPS) | |
|---|---|---|
| | Statistic | Prob.** |
| ROA | -632.821 | 0.0000 |
| ATR | -107.101 | 0.0000 |
| $\Delta$FLR | -910.978 | 0.0000 |
| TFAAR | -175.012 | 0.0400 |
| $\Delta$LTDLR | -830.964 | 0.0000 |
| ETR | -836.877 | 0.0000 |
| NPM | -198.098 | 0.0238 |
| NWCTR | -716.836 | 0.0000 |
| LR | -180.608 | 0.0355 |

According to the unit root test results, since FLR and LTDLR series were not stationary at the level, after taking the first differences of the series, they became stationary. Then, it is necessary to decide which model is more appropriate in panel estimation. For this purpose, Breusch and Pagan [39]test was applied to the series in order to decide (the panel pooled least squares or random effects models) the appropriate model. The hypothesis testing and test results of the Breusch and Pagan Test are given below.

Table7. Breusch-Pagan LM Test Results

| Test | Statistics | d.f. | Prob. |
|---|---|---|---|
| Breusch-Pagan LM | 181.4933 | 45 | 0.0000 |

$H_0$: *Pooled Least Squares Model is Appropriate.*
$H_1$: *Random Effects Model Is Appropriate.*

In Table 7, Breusch and Pagan test statistics reveals that $H_1$ hypothesis at 1% significance level is accepted. Accordingly, it is concluded that the random effects model will be preferred to the pooled least squares method. After that, the Hausman [40] test was applied to the series to verify the hypothesis

that the error term components of the random effects model were not related to the independent variables in the model. Thus, it was decided whether to apply the Random Effects Model or the Fixed Effects Model in the model estimation. The hypothesis testing and test results of the Hausman Test are given below.

Table 8. Hausman Test Results

| Test Statistics | Chi$^2$Stat. | Chi d.f. | Prob. |
|---|---|---|---|
| Cross-Sectional Random Effects | 23.947 | 8 | 0.0023 |

$H_0$: *Random Effects Model is appropriate*
$H_1$: *Fixed Effects Model is appropriate*

According to Hausman test results, $H_0$ hypothesis is rejected at 1% significance level and it is concluded that Fixed Effects Model will be preferred to the random effects model.

After deciding to use the Fixed Effects Specification in the model estimation, the existence of auto-correlation, heteroscedasticity and multi-collinearity problem was examined.

Table 9. Auto-correlation Test Results

| Bhargava et al. Durbin-Watson = 0.92107726 |
|---|
| Baltagi-Wu LBI = 0.9902772 |

Auto-correlation test results in Table 9 indicate the existence of auto-correlation problem in the model. Indeed, both Bhargava et al. [41]Durbin-Watson and Baltagi-Wu LBI [42]statistics values were obtained as 0.92 and 0.99, respectively. In order to claim that there is no auto-correlation in the model, the Durbin Watson value is expected to be approximately 2.

Table 10. Heteroscedasticity Test Results

| Test Statistics | Chi$^2$StatisticsProb. | |
|---|---|---|
| Breusch-Pagan / Cook-Weisberg | 5.50 | 0.0190 |

In Table 10, test results verify heteroscedasticity problem in the model as the prob. value is less than 0,05. The existence of multi-collinearity problem among independent variables was tested by calculating the Variance Inflation Factor (VIF) values.

Table 11. Variance Inflation Factor Results

| Variable VIF | | 1/VIF |
|---|---|---|
| ATR | 3.12 | 0.320214 |
| ETR | 2.65 | 0.377863 |
| TFAAR | 1.43 | 0.699294 |
| ΔFLR | 1.21 | 0.825554 |
| ΔLTDLR | 1.20 | 0.831752 |
| LR | 1.11 | 0.902351 |
| NWCTR | 1.06 | 0.944859 |
| NPM | 1.02 | 0.981843 |
| Mean VIF | | 1.60 |

VIF results in Table 11 show that there is not a multi-collinearity problem in the model. In other words, the VIF statistic values for all the independent variables are smaller than 5, indicating that the multi-collinearity is insignificant.

Table 12 shows the variables affecting the return on assets of firms listed in BIST Energy Sector with the Fixed Effects Model. According to the results of Panel Fixed Effects Model, it is observed that there is a significant positive relationship between return on assets of firms listed in BIST Energy Sector and ATR, NPM and LR. A one-unit increase in ATR, NPM and LR increases return on assets by 0.0248, 0.0026 and 0.0015 units, respectively. Again, the results of the analysis show that there is a significant negative relation between return on assets of firms and FLR, TFAAR and LTDLR. A one-unit increase in the FLR leads to a decrease in the Return on Assets by 0.238 units. Likewise, one unit increase in the TFAAR and LTDLR ratios decreases return on assets of the companies by 0.1055 and 0.0895 respectively. It is revealed that there is no significant relationship between return on assets of companies and ETR and NWCTR.

Tablo 12. Panel Fixed Effects Model Results

Dependent Variable: ROA
Years: 2008Q2 2015Q4
Period Number: 31
Observation Number: 299

| Variable | Coefficient | Std. Dev. | t-Statictics | Prob. |
|---|---|---|---|---|
| ATR | 0.0248 | 0.0096 | 2.566 | 0.01 |
| LR | 0.0015 | 0.0008 | 1.947 | 0.05 |
| ΔFLR | -0.2380 | 0.0794 | -2.995 | 0.00 |
| TFAAR | -0.1055 | 0.0380 | -2.777 | 0.00 |
| ΔLTDLR | -0.0895 | 0.0456 | -1.962 | 0.05 |
| NWCTR | 1.72E-06 | 1.88E-06 | 0.919 | 0.36 |
| ETR | 0.0003 | 0.0026 | 0.098 | 0.92 |
| NPM | 0.0026 | 0.0006 | 4.451 | 0.00 |
| C | 0.0833 | 0.0292 | 2.851 | 0.00 |
| Adjusted R$^2$ | 0.3738 | | | |
| Prob. | 0.00000 | | | |

These results shows that independent variables (ratios) of the model explain approximately 37% of the change in return on assets.

# 5 Conclusion

In the study, the financial characteristics (liquidity, financial structure, productivity and profitability)

which have a significant effect on the return on assets of the BIST Energy sector companies were examined. In this context, for the period 2008:Q1-2015:Q4 quarterly financial data of 10 Energy firms whose shares are quoted on BIST were used.

In the regression analysis conducted through using the Panel Fixed Effects Model, the improvement in liquidity levels of the BIST energy sector firms, the increase in the assets turnover rate and the increase in sales profitability have a statistically significant effect on the increase of the return on assets, while the increase in the financial leverage (debt) ratio affects return on assets statistically significant but negatively.

As a matter of fact, when the debt structure of BIST energy firms is analyzed, it is observed that both in the short and long-term debt composition, there is substantial amount of foreign currency liabilities. It is considered that the borrowings in foreign currencies are exposed to interest rate risk as well as exchange rate risk. For this reason the energy sector firms have to bear a significant amount of financial cost. This findings were also obtained by the following studies Külter and Demirgüneş [5], Karadeniz and İskenderoğlu [12], Kocaman et al. [28], Doğan [17], Korkmaz and Karaca [19], Tailab [20], Akben-Selcuk [23], Doğan and Topal [24], Fareed et al.[26], Keskin and Gökalp [27], Demirci [29], Işık [30]. "Assets turnover rate has impact on the return on assets" hypothesis is also verified by Albayrak and Akbulut [6], Karadeniz and İskenderoğlu [12], and Meder-Çakır and Küçükkaplan [16]. However, "There is no effect of net working capital turnover ratio on return on assets" is rejected by Karadeniz and İskenderoğlu [12] contrary to our findings. In the study, the liquidity ratio has a positive impact on the return on assets. It was supported by the findings of Karadeniz and İskenderoğlu [12] and İslamoğlu and Çelik [22]. As the energy firms have foreign exchange risk due to the level of fx borrowing, for further studies the impact of foreign currency change on return on assets of energy companies can be examined.

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