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WHAT ARE THE INTERNAL DETERMINANTS OF RETURN ON ASSETS AND EQUITY OF THE ENERGY SECTOR IN TURKEY?

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Abstract

The rapid transformations and developments experienced today have increased the importance of energy resources and sustainable energy. In this context, the success and profitability of the activities of companies engaged in energy production and distribution is an important topic. This study, which was carried out in such an environment, was aimed to determine the financial indicators that statistically significantly affect the return on assets (ROA) and equity (ROE) of companies that produce and distribute oil, gas and electricity in Turkey. In the context of the energy sector, ROA and ROE increase competitiveness and provide companies with an advantage in terms of financial success and sustainability of operations. Considering the increasing importance of energy, it is important to determine the internal factors that have an impact on the profitability of energy companies. The research was carried out on a sample of 16 companies operating in the Turkish energy sector and traded on Borsa Istanbul. A panel linear regression model was used to identify the strongest predictors of ROA and ROE. The study used fifteen ratios that are believed to impact ROA and ROE significantly. According to the results obtained, ROE is influenced by CSR (at the significance level of 10%), QR, LR, RTO, ITR, and TA, and ROA is influenced by RTO, CSR, LR, QR (10%), and PB.

JEL classification: G12, G39, C23
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Introduction

If managers use the resources of the enterprise efficiently and effectively, they will ensure that the activities and economic life of the enterprise can be continued in a healthy way (Naser & Mokhtar, 2004). Financial performance of companies is an issue that attracts attention and is carefully monitored by management and other stakeholders. Financial performance helps management learn about the use of finance and the flow of funds inside and outside the organization. In this way, it is ensured that the right decisions are taken (Almajali et al., 2012). Especially in today's conditions, companies need to be successful in a global sense for the continuity of their businesses.

Regardless of establishment, companies aim to engage in income-generating activities while incurring expenses at the beginning. There have been many studies on the difference between incomes and expenses, that is, profit generated because of economic activities. In addition to the profit target, management aims to reduce expenditures and maximize revenues to ensure effectiveness and efficiency in activities. In financial accounting, operating cash flows represent positive cash flows from the main activities of a business or cash flows from the day-to-day operations of the business. Operating cash flow indicates when the company will need external financing or whether it is generating enough cash flow to continue its current operations without the need for external financing (Sabău-Popa et al., 2021).

The energy sector is a strategic area of vital importance in countries' development policies. The increase in energy prices with the increase in world energy demand and the tendency of energy resources to run out around the world make the sector even more critical (İskenderoğlu et al., 2015). Today, energy has become a vital part of the modern industry and services sector. Energy is essential in various sectors such as manufacturing, healthcare, education, agriculture and other service sectors. As a necessity of life, energy significantly affects economic growth and contributes significantly to increasing social welfare (Xu et al., 2022). Access to energy, the cost of energy and its environmental effects have caused renewable energy to come to the fore and suit is supported nationally and internationally. These supports are essential for providing energy efficiency and developing and disseminating technology (Aydoğdu, 2021). The energy sector has been the most critical pillar of a country's economy from past to present. The energy sector is a vital sector for countries that allow people and businesses to lead their daily lives and meet electricity, oil, gas, thermal energy, and other day-to-day needs. Therefore, stable energy sector development is essential for a country's social and economic stability (Fu & Shen, 2021).

In this context, energy, with its important role in economic growth, is an indispensable element of development programs. Energy policies are integral to sustainable development plans, especially in developing countries. Population growth, industrialization and urbanization in the world, and increasing trade opportunities due to globalization are increasing the demand for natural resources and energy (İskenderoğlu et al., 2015).

Oil prices decreased due to the increase in oil supply realized by Russia and Saudi Arabia competing with each other at the beginning of 2020 (Karadağ, 2021). With the subsequent COVID-19 pandemic, oil prices decreased further (Duran & Acar, 2020, p. 60). Another reason for the decrease in oil prices during the pandemic period was the uncertainty about when businesses will resume their activities (Gümüş & Hacıevliyagil, 2020, p. 81). While the decrease in oil prices is a disadvantage for oil-exporting countries, it is an advantage for oil-importing countries such as Turkey (Ertekin, 2020, p. 408; Karadağ, 2021).

Extraordinary achievements and developments were experienced in the energy field and sector in the world through the beginning of 2020, and 2021. Covid19 has challenged the nemesis that can be called “The Nightmare of the Century” (Gollakota & Shu, 2022). As in many other sectors, the energy sector was also significantly affected by the pandemic in late 2019. Despite its intense nature, the energy sector is highly vulnerable and sensitive to natural disasters such as the Covid-19 pandemic. The strict quarantine or temporary closure procedures implemented during the epidemic transformed the way of working and lifestyle, disrupted the energy balance and market, and caused price fluctuations (Gollakota & Shu, 2022). According to the 2022 edition of Tracking SDG 7: The Energy Progress report, the COVID-19 pandemic has been a critical factor in slowing progress towards universal energy access. Globally, 733 million people still do not have access to electricity, and 2.4 billion people still cook using fuels that are harmful to their health and the environment. At the current rate of progress, 670 million people will be without electricity by 2030 – 10 million more than projected in 2021 (Tracking SDG7, 2022).

After the pandemic, the Ukraine war broke out. The effects of the COVID-19 crisis on energy have been exacerbated by Russia's invasion of Ukraine, which has led to uncertainty in global oil and gas markets and increased energy prices. The war in Ukraine caused

a sharp increase in energy prices and significant market fluctuations. In the context of fears of energy supply disruptions and increasingly stringent sanctions against the Russian energy sector, prices have fluctuated significantly, as markets sought to assess the potential consequences on the global energy supply (Adolfsen et al., 2022). Increasing uncertainty in global oil and gas markets has put tremendous pressure on net importers to reduce risk (Tracking SDG7, 2022).

Companies operating in the energy sector are trying to finance many fixed assets that cause high fixed costs and maintain their cash flows in such an environment. The financing of these assets, which are used in daily activities, carries significant risks as it causes high operating leverage. The energy industry is characterized by significant investments in fixed assets and carries high fixed costs. Due to the pandemic, governments have tightly controlled production. Factories were closed in some severely affected areas, resulting in declines in operating income. In the energy sector, since there are "high energy consumption" and "high cost fixed assets", the return must be able to cover the high fixed costs. Therefore, the performance of energy industry companies is more likely to fluctuate with changes in the external environment. Under the double pressure of falling revenue and rising costs, corporate operational uncertainty dramatically increases. Corporate growth of companies is possible with the equity allocated to long-term investments (Micheli et al., 2021).

High return on equity allows companies to increase their profitability and enable company investors to earn more (Bunea et al., 2019). ROE is the net income and average equity percentage. It is the percentage obtained by dividing the company's after-tax profit by net assets. This indicator reflects the income level of equity and measures the company's efficiency in using its capital. The higher this percentage value, the higher the return on investment. This ratio reflects equity's ability to generate net income. Return on equity is also a significant financial indicator used to measure the efficiency of shareholders' use of capital (Li et al., 2021).

Gitman (1998) indicated that the generally accepted goal of financial management became “maximizing the wealth of the firm’s owners,” and the focus shifted from ROA to ROE. The main objective of a company is to generate profits and maximize equity. ROE is more prominent than ROA, as it measures how effectively corporate executives create wealth for shareholders. However, in studies such as Padake and Soni (2015), Herciu et al. (2011), it has been stated that using a single indicator as a measure of profitability does not give reliable results and it is possible to obtain results that are more meaningful by using more than one profitability ratio.

However, the main determinants of companies' profitability remain a topic of current research. Firm profitability refers to the earnings from the allocation of available capital. Profitability in companies is an important determinant of their ability to compete, maintain their economic life, increase their assets and capital, and increase their value. Profitability is important for companies to create innovation, technological change and development and sustainable employment. All stakeholders of the business (competitors, managers, investors, shareholders, creditors, business partners, etc.) interpret company performance and future expectations according to profitability indicators (Wieczorek-Kosmala et al., 2021).

The increase in energy demand has been affected by globalization and population; however, supply bottlenecks due to unexpected crises frequently experienced in recent years cause significant fluctuations in prices, profitability, and competition intensity in the energy sector. Financial soundness is essential in enterprises in the energy sector, which have high fixed capital investments and are in the risky sector group (Arsu, 2021). The measurement of financial performance, which includes financial soundness, can be carried out with ratio analysis, which is one of the financial analysis methods (Terzioğlu, 2022).

Turkey’s electricity and energy sector is one of the most important industrial sectors, as in other countries. This is because the activities of almost all other sectors are dependent on the activities and supply of companies in the energy sector. According to the “Energy Sectoral Overview 2022” report prepared in cooperation with KPMG Turkey and Energy IQ, while there was a 9% annual growth in total electricity consumption in Turkey in 2021, the annual electricity consumption in residences was approximately 3,000 kWh. It is stated that more than 99% of the natural gas demand is met through imports, and the country from which the most natural gas is imported is Russia. Turkey's crude oil stock is sufficient to meet net imports for 100 days. Among the public offerings in 2021, the energy sector stands out, with 12 public offerings totaling more than TRY 8.1 billion.

According to the report, Turkey's electricity production in 2021 reached 329 TWh with an increase of 9%. While the share of wind and solar power plants in electricity production increased to 13% in total, the annual electricity production of hydroelectric power

plants decreased by 29% due to low water levels. This decrease in the share of hydroelectric power plants in electricity generation was compensated by the increased production in natural gas power plants. While the solar-based installed power reached 7.9 GW at the end of the year, 64% of the total renewable generation of 117 TWh came from the power plants operating under the Renewable Energy Resources Support Mechanism. The monthly share of renewable energy sources in electricity generation reached 50% in April 2021 for the first time.

Turkey's electricity industry has been robustly growing for over a decade with more than 5% CAGR. Turkey is the sixth-largest electricity market in Europe with 85.2 gw installed power and the fourth-largest gas consumer in Europe with 53.4 bcm consumption (Energy Sector Report, 2020).

Turkey has been the country with the fastest increase in energy demand among the Organization for Economic Cooperation and Development (OECD) countries in the past 20 years. In this period, Turkey ranks second in the world after China in the electricity and natural gas demand increase. In a region adjacent to approximately 60% of the world's proven oil and natural gas reserves, Turkey has become one of the largest natural gas and electricity markets in its region. On the other hand, Turkey is approximately 74% foreign dependent to meet its energy demand. Turkey's energy strategy is multifaceted, and dependence on foreign energy increases international relations' importance in this field (mfa.gov.tr, 25.06.2022).

It is very important for companies that go public, as the high level of performance of companies, regardless of which sector they operate in, will bring an increase in the welfare level of the company's shareholders. Also, before investing their capital in companies' securities, investors look at the financial performance of the company. If the company is considered good and provides future benefits, many potential investors will invest in the company. Conversely, if a company's financial performance is not good, potential investors will want to either not invest their capital in the company or defer investment (Muhani et al. 2022).

Based on the issues mentioned above, within the scope of this study, the effect of specific ratios on equity and return on assets was examined based on the financial statement data of 16 energy sector companies operating on Borsa Istanbul in Turkey. The study covers the period between the first quarter of 2010 and the fourth quarter of 2019. Panel regression analysis was performed in the study. This study aims to determine which financial ratios affect Turkey's energy sector's profitability and to what extent. It is thought that the findings will have important policy implications for investors, companies and economic policy makers.

Literatue review

There is a substantial and extensive literature on the use of financial ratios and their relationship to profitability. It is seen that there are not enough studies on the profitability of the financial ratios of companies operating in the energy sector and especially on their relationship with ROE. It is seen that this relationship is examined more frequently in companies operating outside the energy sector. The lack of sufficient studies on the financial ratios that can affect ROA and ROE in the energy sector has been the source of motivation for this study. In this part of the study, a summary of previous studies on the subject in the literature is presented.

Considering the studies on the energy sector in Turkey, it is noteworthy that performance research is generally conducted in the context of multi-criteria decision-making methods (Metin et al., 2017; Çiftçi & Yıldırım, 2020; Arsu, 2021; Özdemir & Parmaksız, 2022). In other studies, it is seen that past and present situations are analyzed in the context of financial ratios (İskenderoğlu et al., 2015; Paça & Karabulut, 2019; Dikmen, 2021).

Considering the studies carried out outside Turkey, Fairfield and Yohn (2001) investigated the predictive power by dividing the firm's profitability by asset turnover and profit margins. The results showed that acting in this way can provide information about the level of future profitability. They thought that the changes that affect the components of the profitability are the changes that affect the future profitability and bring information on this issue, and therefore companies should focus on asset transfer. Adner and Helfat (2003) found that the effects at the firm level have the greatest impact on profitability in their study of 30 companies operating in the energy industry. Sueyoshi (2005) carried out the financial ratio analysis of the American electricity generation sector and tried to determine the most important ratios that determine the financial success or failure of the companies in this sector with the discriminant analysis. As a result of the study, it has been determined that leverage and return on equity are two very important ratios in terms of financial performance of energy companies. Saleem and Rehman (2011) examined the relationship between the liquidity and profitability of oil and gas companies in Pakistan. As a result of the study, they determined that it has a significant effect on the liquidity ratio (ROA), but has

no effect on ROE and return on investment (ROI). The authors also found that ROE is not significantly affected by the current ratio, cash ratio, and liquidity ratio, whereas ROI is heavily affected by the current ratio, quick ratio, and liquid ratio. Taani (2011) tried to identify the financial ratios that affect earnings per share. In his study, he performed a regression analysis and determined that the earnings per share of companies are affected by ROE and financial leverage ratios. Akhtar et al. (2012) examined the relationship between financial leverage and financial performance in the Pakistani energy sector. As a result of the study, it was determined that the profitability of energy companies, which is one of the indicators of financial performance, increased with higher levels of borrowing. In the study performed by Wu (2014), the prospective relationship between PE and ROE was analyzed. According to the results of the study, it was determined that PE ratio has a U-shaped relationship with ROE. This result shows that companies with a higher PE ratio generate lower ROE prospectively in the following years. A.T. Noghondari and A.T. Noghondari (2017) concluded that financial leverage has a significant positive effect on the company's performance. Kharatyan, Lopes and Nunes (2017) revealed in their research on companies traded in the NASDAQ 100 index that asset turnover and financial leverage affect ROE. Afolabi et al. (2019) found similar results in his study in Nigeria. Barbuta-Misu et al. (2019) concluded that leverage affects the performance of the company in European companies during the financial crisis. Neves et al. (2019) reached similar results in the energy sector in his study in Portugal. El-Deeb et al. (2021) shows that there is a significant effect between leverage and firm value. Alarussi and Alhaderi (2018) examine the factors affecting profitability in companies listed on the stock exchange in Malaysia, the data of 120 companies traded in the stock exchange covering the period 2012-2014 were used. The results showed that the main ratios that positively and strongly affect profitability are asset turnover, total sales and working capital. While leverage and debt-equity ratios affect profitability negatively, profitability is not affected by the current ratio. Bunea et al. (2019) stated that the most important ratios affecting return on equity (ROE) in energy companies in Romania are price/earnings, financial leverage, asset turnover and price/book ratios. Among them, the ratios that most affect ROE are price/earnings and asset turnover. Samo and Murad (2019) investigated the effect of financial leverage and liquidity on profitability. According to the results of the application they carried out on the sample between 2006 and 2016 in the textile industry in Pakistan, profitability is positively related to liquidity and negatively to leverage. Westerman et al. (2020) examined energy companies in Western Europe for the period 2009-2015 and found that firm size was positively associated with return on assets (ROA). Neves et al. (2021) stated that company performance varies according to the way stakeholders evaluate the company, for example, managers want to secure EBITDA margins by focusing on cash flows and leverage, along with current assets. On the other hand, the author emphasizes that the shareholders focus on the sustainability of the companies' profitability and the preservation of the company's market image. For other stakeholders, including the global community, investments in debt and tangible assets reduce profitability, while investments in intangibles help create value and performance for energy companies. T. N. L. Nguyen and V.C. Nguyen (2020) tried to determine the determinants of financial performance of companies traded on the Vietnam Stock Exchange were investigated in the period of 2014 -2017. The results show that firm size has a positive effect on both ROA and ROS, but has an adverse effect on ROE. Financial leverage has a rather negative effect on ROE and ROS, but a positive effect on ROA. Liquidity has a positive effect on both ROA and ROE, but has a negative effect on ROS. In the study conducted by Paul and Rahman (2021), the relationship between net profit after tax and total assets, total equity, total turnover, current assets and short-term liabilities was examined. According to the results of the study on companies traded on the Dhaka Stock Exchange between 2010 and 2019, they found that total assets and total turnover ratio have a significant positive relationship with net profit after tax. There is a significant negative relationship between current assets and net profit after tax. In the fuel and energy sector, net profit after tax and total assets were found to have a significant negative relationship. Trang et al. (2022) examined the determinants of profitability in companies traded on the Vietnam stock exchange between 2007 and 2020. According to their results, there is a negative relationship between cost ratio, debt/equity ratio, and firm profitability with the COVID-19 pandemic. They found that while the ratio of firm size and equity to total assets had positive effects on ROA, there was a negative relationship between equity, total assets and ROE.

Methodology & findings

In the study, companies operating in the production, supply and distribution of energy resources such as oil, gas, renewable energy and electricity, which were operating in Turkey and traded on Borsa Istanbul for the period 2010:Q1 - 2019:Q4, were taken into account. A total of 640 observation calculations were

made. This study used a balanced panel data method to analyze relations between dependent and independent variables. According to the information on the Public Disclosure Platform of Turkey, it has been determined that 16 companies are operating continuously in the Electricity, Gas, Petroleum and Renewable Energy sectors on Borsa Istanbul during the research period. The data comes from the companies' financial statements and Financial Information News Network (finnet.com.tr) data collection and distribution platform. Previous studies in the literature were used to determine the study's variables. In this context Table 1 shows the variables included in the study. 15 financial indicators, including 2 dependent variables and 13 independent variables, were used. These indicators consist of liquidity ratios, activity ratios, profitability ratios, debt ratios and firm size.

Table 1: Variables

Variables	Financial Indicator	Notation	Calculation
Dependent	Return on Assets	ROA	Net Profit / Total Assets
	Return on Equity	ROE	Net Profit / Equity
Independent	Assets Turnover Ratio	ATR	Net Sales / Total Assets
	Leverage Ratio	LR	Total Debt / Equity
	Current Ratio	CR	Current Assets / Current Liabilities
	Quick Ratio	QR	(Cash + Accounts Receivables + Marketable Securities) / Current Liabilities
	Price to Book	PB	Market Price per Share/ Balance Sheet Price per Share
	Price to Earnings	PE	Market Price per Share/ Earnings per Share
	Receivable turnover in days	RTD	365 / Receivable turnover ratio
	Inventory Turnover Ratio	ITR	Cost of Goods Sold/ Average Inventory
	Interest Coverage Ratio	ICR	EBM / Interest Expense
	Cost Of Sales Ratio	CSR	Cost of Sales/Net Sales
	Receivable turnover Ratio	RTO	Net Credit Sales / Average Accounts Receivable
	EBM Margin	EBM	EBM / Net Sales
	Firm Size	TA	Total Assets

Source: Own work.

Descriptive statistics

Table 2 shows the descriptive statistics. The mean of ROE of the 16 companies is approximately -1.48%. The relatively low level of return on equity in specific periods within the analysis period of Ak Energy (2018-2019; mean ROE is -207.476%) and Zorlu Energy (2011-2013; mean ROE is -204.399%) had a significant impact on this result. This result also shows that companies operating in the energy sector in Turkey have very low ROE. During the analysis period, it was seen that the company with the highest ROE was TÜPRAŞ, and the company with the lowest ROE was Ak Enerji. When the results are analyzed in terms of ROA, the company with the highest mean ROA is AYGAZ. In contrast, the company with the lowest ROA is AK Enerji.

Excluding Ak Enerji and Zorlu Enerji, ROE is the highest in the fourth quarter of 2017 (17.31%) and the lowest in the third quarter of 2011 (-2.02%). On a period basis, ROA was the highest in the first quarter of 2010 (6.62%) and the lowest in the third quarter of 2018 (-2.35%).

Descriptive statistics about independent variables from descriptive statistics are also included. When the descriptive statistics are evaluated in general, it is seen that the data set of the study does not fit the normal distribution (Skewness, Kurtosis, and Jarque-Bera). This situation is frequently observed in financial data. At the same time, the CR average is relatively high (3.53). The CR's of Aksu Energy, Eurasia Petroleum, İpek Natural Energy, Park Elektrik and Madencilik and Turcas Petrol companies rose to very high levels from time to time were effective in the high mean of this rate. The CR average of this company is 8.72. The maximum value in CR is 158.

Table 2: Descriptive Statistics

	ROA	ROE	ATR	CSR	CR	EBM
Mean	2.362922	-1.485234	1.471641	1.842077	3.532297	-158.14650
Median	1.780000	4.100000	0.450000	1.925674	1.250000	9.35000
Maximum	101.690000	213.950000	142.590000	2.540651	158.020000	816.50000
Minimum	-34.440000	-519.710000	0.000000	0.000000	0.000000	-65649.83000
Std. Dev.	10.618160	48.488890	10.405230	0.304086	11.106040	2672.94000
Skewness	3.513460	-4.987454	12.554660	-4.472825	11.068210	-23.18852
Kurtosis	34.641300	45.936030	160.279100	26.579560	142.856700	565.34880
Jarque-Bera	28014.650000	51813.370000	676458.400000	16960.540000	534664.300000	8490321.00000
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
Observations	640.000000	640.000000	640.000000	640.000000	640.000000	640.00000
	ICR	**QR**	**LR**	**PB**	**PE**	**ACP**
Mean	13.780520	3.130203	1.590449	0.88962	47.54884	1.647943
Median	0.450000	0.840000	1.739061	1.22500	7.21500	1.645732
Maximum	928.490000	158.020000	2.016423	11.71000	15151.32000	5.819765
Minimum	-8.500000	0.000000	-0.199575	-220.97000	0.00000	-1.074821
Std. Dev.	65.194060	11.079280	0.364689	9.92852	612.30000	0.584451
Skewness	8.251231	11.228620	-1.464672	-18.99848	23.65251	1.177388
Kurtosis	87.354230	145.785000	5.542917	403.18060	580.88270	16.649630
Jarque-Bera	197012.500000	557116.700000	401.266100	4309021.00000	8964966.00000	5116.199000
Probability	0.000000	0.000000	0.000000	0.00000	0.00000	0.000000
Observations	640.000000	640.000000	640.000000	640.00000	640.00000	640.000000
	RTO	**ITR**	**TA**			
Mean	0.876791	0.796740	8.983591			
Median	0.878140	0.729589	9.065682			
Maximum	4.654762	3.274404	10.750360			
Minimum	-2.987426	-2.180245	6.458295			
Std. Dev.	0.566087	0.750957	0.808790			
Skewness	-0.586378	0.551187	-0.301069			
Kurtosis	14.667420	3.570798	2.564681			
Jarque-Bera	3666.772000	41.094330	14.721910			
Probability	0.000000	0.000000	0.000636			
Observations	640.000000	640.000000	640.000000			

Source: Own work.

Within the scope of the study, two different models were tested in which ROE and ROA variables were dependent variables. The two model to be tested in this context are as follows:

$$ROE_t = \alpha + \beta_1 ATR_t + \beta_2 CSR_t + \beta_3 EBM_t + \beta_4 ICR_t + \beta_5 QR_t + \beta_6 LR_t + \beta_7 PB_t + \beta_8 PE_t + \beta_9 RTD_t + \beta_5 RTO_t + \beta_5 ITR_t + \beta_5 TA_t + e \quad (1)$$

$$ROA_t = \alpha + \beta_1 ATR_t + \beta_2 CSR_t + \beta_3 EBM_t + \beta_4 ICR_t + \beta_5 QR_t + \beta_6 LR_t + \beta_7 PB_t + \beta_8 PE_t + \beta_9 RTD_t + \beta_5 RTO_t + \beta_5 ITR_t + \beta_5 TA_t + e \quad (2)$$

To avoid false regressions some diagnostic tests (stationary, cross-sectional dependence, heterogeneity heteroscedasticity, multi-collinearity, autocorrelation) of data must be carried out before regression estimation. Table 3 provides the bivariate associations between variables. Table 3 shows the relationship between the independent variables and the dependent variable. Looking at the table, a strong (r = 0.80 and > 0.80) relationship can be mentioned only between CR and QR. It is seen that there is a positive and significant strong relationship at the level of 0.999 between QR and CR. There is a moderate positive and significant relationship between ROE and ROA. It is seen that there is a positive and significant relationship at the

level of -0,725 between RTO and RTD. Before moving on to panel regression analysis, it is important to consider an econometric problem multicollinearity. The Pearson correlation coefficient obtained as a result of the correlation analysis helps control the independent variables' linearity. As a result of the correlation analysis performed for this purpose, it was observed that the maximum correlation between dependent and independent variables, except CR and QR, was 0.759. Here, the absolute value of the Pearson correlation coefficient is less than 0.8, indicating that the probability of linearity existing is very low (Shrestha, 2020). Correlation analysis results show that there is no multicollinearity problem in this study.

Table 3: Multicollinerati̇y Research Results

	ROE	ROA	ATR	CSR	CR	EBM	ICR	QR	LR	PB	PE
ROE	1.000	0.542	0.013	-0.119	0.056	0.002	0.067	0.050	-0.210	0.106	0.006
ROA	0.542	1.000	-0.010	-0.260	0.080	0.025	0.133	0.075	-0.287	0.039	-0.010
ATR	0.013	-0.010	1.000	0.058	0.755	0.009	-0.015	0.759	-0.285	0.020	-0.004
CSR	-0.119	-0.260	0.058	1.000	-0.040	-0.006	0.009	-0.039	0.221	-0.017	0.003
CR	0.056	0.080	0.755	-0.040	1.000	-0.021	0.020	0.999	-0.552	0.024	-0.009
EBM	0.002	0.025	0.009	-0.006	-0.021	1.000	0.015	-0.022	0.026	0.001	0.004
ICR	0.067	0.133	-0.015	0.009	0.020	0.015	1.000	0.014	-0.176	0.012	-0.004
QR	0.050	0.075	0.759	-0.039	0.999	-0.022	0.014	1.000	-0.542	0.023	-0.008
LR	-0.210	-0.287	-0.285	0.221	-0.552	0.026	-0.176	-0.542	1.000	-0.037	0.009
PB	0.106	0.039	0.020	-0.017	0.024	0.001	0.012	0.023	-0.037	1.000	0.003
PE	0.006	-0.010	-0.004	0.003	-0.009	0.004	-0.004	-0.008	0.009	0.003	1.000
RTD	0.064	0.196	-0.315	0.088	-0.251	-0.084	-0.037	-0.251	0.043	0.002	0.047
RTO	-0.070	-0.179	0.166	0.263	0.140	0.022	0.069	0.137	-0.062	0.060	-0.065
STR	-0.236	-0.134	-0.072	0.347	-0.143	0.081	0.031	-0.139	0.122	-0.076	0.017
TA	0.016	0.122	-0.221	0.097	-0.297	0.018	-0.026	-0.295	0.394	-0.034	-0.020

	RTD	RTO	ITR	TA
ROE	0.064	-0.070	-0.236	0.016
ROA	0.196	-0.179	-0.134	0.122
ATR	-0.315	0.166	-0.072	-0.221
CSR	0.088	0.263	0.347	0.097
CR	-0.251	0.140	-0.143	-0.297
EBM	-0.084	0.022	0.081	0.018
ICR	-0.037	0.069	0.031	-0.026
QR	-0.251	0.137	-0.139	-0.295
LR	0.043	-0.062	0.122	0.394
PB	0.002	0.060	-0.076	-0.034
PE	0.047	-0.065	0.017	-0.020
RTD	1.000	-0.725	-0.064	-0.204
RTO	-0.725	1.000	0.126	0.215
STR	-0.064	0.126	1.000	0.333
TA	-0.204	0.215	0.333	1.000

Source: Own work.

Another frequently used method to detect the multicollinearity between the variables is the Variance inflation factor (VIF) (Toğa et al., 2021). VIF is used to measure how much the variance of the estimated regression coefficient swells if there is a correlation between independent variables. If VIF ≥ 5 to 10, there will be multicollinearity among the predictors in the regression model, and VIF > 10 indicates that the regression coefficients are poorly estimated with multicollinearity (Belsly, 1991; Myers, 1990; Kim, 2008). According to Table 4, only the VIF values of liquidity and current ratios are quite high. For this reason, the current ratio, which is the ratio with the highest VIF value, was excluded from the analysis. According to the results, there is no multicollinearity between the variables in the model used in this study.

Table 4: VIF Values

Variable	VIF
ATR	2.7493
CSR	1.8143
CR	1145.5000
EBM	1.0320
ICR	1.0757
QR	1141.9
LR	2.2955
PB	1.0195
PE	1.0057
RTD	3.3782
RTO	3.1117
ITR	1.3812
TA	1.7312
ROA	1.4537

Source: Own work.

Cross-sectional dependence leads to inconsistent, upward, biased, inefficient and invalid estimates (Pesaran, 2006). Heteroskedasticity leads to consistent but inefficient least squares parameter estimates and inconsistent covariance matrix estimates (Lee, 1992). Because companies in the panel are likely to be subject to heterogeneity, the use of econometric methods that do not consider heterogeneity across the panel may result in estimation errors. The fact that the variables in the panel regression model are meaningful due to the first estimation is not sufficient to reach a conclusion in the case of autocorrelation in the model. Durbin-Watson (DW) statistics were used to test the presence of autocorrelation in the data. The DW is a test statistic used to determine the presence of autocorrelation at lag 1 in regression analysis residuals (estimation errors). According to the diagnostics test results in Table 5, there are heteroskedasticity and the cross-section dependency in the panel. Also homogeneity tests show heterogeneity in the panel.

Panel data should be analyzed with the F and Hausman tests to determine the model type to build before the model estimation. With the help of the F test, the Pooled Model - Fixed Effects Model is compared first. Since the statistic value in the table is not significant at the 5% level, the H0 hypothesis that states the pooled model is appropriate was not rejected. The comparison of the Breusch-Pagan Test, the pooled model, and the random-effects model was made in the second stage. According to Table 5, the H0 hypothesis that states the model is suitable for the pooled regression was not rejected because the statistic value is insignificant at the 5% level. As a result of the F and Breusch-Pagan tests, it was seen that the Pooled Model was the most suitable.

Table 5: Diagnostics Tests for Model I

Cross-Section Dependence	Breusch-Pagan LM	356.0038***
	Pesaran scaled LM	15.2339***
Homogeneity Tests	Slope heterogeneity	Δ 9.8050***
		Δadj 12.3550***
	Swamy S	χ2 2994.4500***
Heteroskedasticity LR	Cross-Section	1100.7130***
	Period	466.8160***
Model Selection	F Test	0.0110
	Breusch-Pagan	81.3695

*** Indicates significance at the 1% level and ** %5. The cross-sectional dependence test null hypothesis is that no cross-sectional dependence and the slope homogeneity test null hypothesis is that slope coefficients are homogenous. The Swamy S homogeneity test null hypothesis is that parameters are homogeneous.

Source: Own work.

Panel data needs unit root testing before regression estimation to check if the data is stationary. The regression estimation result may not be reliable if it is not stationary. The first generation unit root test has some flaws in its results, as it does not consider the cross section's problems. Therefore, the cross-sectionally augmented Im, Pesaran and Shin (CIPS) unit root test is adopted in this study to eliminate the flaws of the first generation unit root test. The null hypothesis is that the panel data has a unit root and is not fixed, while the alternative hypothesis is that the data is stationary and does not contain a unit root (Huang & Guo, 2022). The CIPS unit root test (Table 6) shows no stationarity in the level of all variables except ATR, EBM, ICR, PE ve RTO. Therefore, other variables were included in the model by taking their first difference.

Table 6: Second Generation Unit Root Test (CIPS) Results

Variables	Level		First Difference		Order of Integration
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	
ROA	-2.566**	-2.780**	-	-	I(0)
ROE	-2.325***	-2.545	-2.325***	-4.159***	I(1)
PB	-2.319***	-2.509	-2.319***	-4.695***	I(1)
ATR	-1.574	-2.209	-3.701***	-3.744***	I(1)
LR	-2.510***	-2.620	-2.510***	-4.722***	I(1)
PE	-3.492***	-3.505***	-	-	I(0)
CR	-2.268**	-2.612	-2.268**	-5.345***	I(1)
TA	-1.825	-2.641*	-4.407***	-4.421***	I(1)
ITR	1.543	-1.963	-3.230***	-3.362***	I(1)
RTO	-2.830***	-3.337***	-	-	I(0)
RTD	-2.134*	-2.424	-3.354***	-3.524***	I(1)
ICR	-3.551***	-3.751***	-	-	I(0)
QR	-2.180**	-2.669*	-2.180**	-5.465***	I(1)
EBM	-3.397***	-3.610***	-	-	I(0)
CSR	-2.291**	-2.519	-2.291**	-3.650***	I(1)

*** , ** and * illustrates that the null hypothesis is rejected at 1%, 5% and 10% significance levels. Null hypothesis: non-stationarity (assumes individual unit root process).

Source: Own work.

The estimation results for Model 1 are shown in Table 7. In order to overcome the heteroskedasticity, estimation was made using the Cross-Section SUR method. As a result of the estimation made with the random-effects model, it was seen that the DW value is about 1,923, so we can conclude that there is no autocorrelation problem in the model. The model is statistically significant and valid. Explanatory variables of the ROE, CSR (at the significance level of %10), QR, LR, RTO, ITR and TA (at the significance level of %1) explain about 18% (R2) of the return on equity-dependent variable changes. In the model, as expected, statistically significant and negative relationships were found between the explanatory variables of ROE; LR, QR, RTO and ITR. Also there is a positive relationship between ROE and TA. However, ATR, EBM, ICR, RTD, PE and PB is not significantly affect the ROE in energy companies.

Table 7: Model I Estimation Results: Dependent Variable is ROE

Variable	Coefficient	t-Statistic
ATR	-3.02E-05 (0.000101)	-0.2981
D(CSR)	0.003965 (0.002049)	1.9352*
EBM	9.12E-08 (1.23E-07)	0.7398
ICR	-0.000442 (0.000589)	-0.7506
D(QR)	-0.000269 (5.08E-05)	-5.2976***
D(LR)	-0.029039 (0.003320)	-8.7469***
D(PB)	8.90E-05 (0.000251)	0.3540
PE	-2.79E-07 (3.35E-07)	-0.8317

D(RTD)	0.000507 (0.001166)	0.0011
RTO	-0.004538 (0.000663)	0.4349***
D(ITR)	-0.005012 (0.001814)	-6.8465***
D(TA)	0.024055 (0.005279)	-2.7622***
C	0.004014 (0.000904)	4.5564***

Notes: *, **, *** indicate significance at the 1%, 5% and 1%0, respectively. R^2: 0.179499; Adjusted R^2: 0.163385; F: 11.13893; p > F: 0,000; DW: 1.923, std errors in parentheses.

Source: Own work.

The diagnostics tests performed before the Model I estimation were also performed before the Model II estimation. According to the diagnostics test results in Table 8, the cross-section dependency tests show the cross-dependence in the panel. Homogeneity tests show heterogeneity in the panel. Since the statistic value in Table 8 is significant at the 1% level, the H0 hypothesis that states the pooled model is appropriate was rejected. The comparison of the Hausman Test, the fixed effects, and the random-effects model was made in the second stage. According to Table 4, the H0 hypothesis that states the model is suitable for the random-effects model was rejected because the statistic value is significant at the 1% level. As a result of the F and Hausman tests, it was seen that the Fixed Effects Model was the most suitable.

Table 8: Diagnostics Tests for Model II

Cross-Section Dependence	Breusch-Pagan LM	491.9470***
	Pesaran scaled LM	24.0090***
Homogeneity Tests	Slope heterogeneity	Δ 12.8420***
		Δadj 14.1380***
	Swamy S	χ2 457.9800***
Heteroskedasticity LR	Cross-Section	59.5896***
	Period	118.6470***
Model Selection	F Test	19.4858***
	Hausman	110.6724***

*** Indicates significance at the 1% level, the cross-sectional dependence test null hypothesis is that no cross-sectional dependence and the slope homogeneity test null hypothesis is that slope coefficients are homogenous. The Swamy S homogeneity test null hypothesis is that parameters are homogeneous.

Source: Own calculation.

The estimation results for Model II are shown in Table 9. In order to overcome the heteroskedasticity, estimation was made using the Cross Section SUR, AR (1) and AR(2) processes. As a result of the estimation made with the random-effects model, it was seen that the DW value is about 2,00, so we can conclude that there is no autocorrelation problem in the model. The model is statistically significant and valid. Explanatory variables of the ROA; RTO, CSR, LR, QR (10%) and PB explain about 85% (R^2) of the return on assets-dependent variable changes. In the model, statistically significant and negative relationships were found between the explanatory variables of ROA; LR, QR and RTO. However, ATR, EBM, ICR, PE, RTD, ITR and TA are not significantly affect the ROA.

Table 9: Model II Estimation Results: Dependent Variable is ROA

Variable	Coefficient	t-Statistic
ATR	-0.029432 (0.048943)	-0.6014
D(CSR)	1.833553 (0.579244)	3.1654***
EBM	4.27E-05 (3.80E-05)	1.1236
ICR	-0.244794 (0.198271)	-1.2346
D(QR)	-0.062033 (0.032357)	-1.9172*
D(LR)	-2.603445 (0.866066)	-3.0061***
D(PB)	0.024059 (0.004829)	4.9828***

PE	-5.77E-05 (6.03E-05)	-0.9584
D(RTD)	-0.356563 (0.401170)	-0.8889
RTO	-0.683866 (0.335731)	-2.0369**
D(ITR)	-0.196263 (0.347423)	-0.5649
D(TA)	1.313495 (1.112711)	1.1805
C	2.822866 (0.468398)	6.0266
AR(1)	0.981574 (0.042152)	24.7860
AR(2)	-0.261795 (0.041524)	-4.7593

Notes: *, **, *** indicate significance at the 1%, 5% and 1%0, respectively. R^2: 0.852863; Adjusted R^2: 0.845271; F: 112.3302; p > F: 0,000; DW: 1.998181, std errors in parentheses.

Source: Own calculation.

Conclusion

The energy sector is one of the sectors that make a significant contribution to the Turkish economy. There is support provided by the state for the development of the energy sector in Turkey. In this respect, the importance of energy efficiency and green energy is gradually increasing. Important steps are being taken in this area in Turkey, and it is seen that there are action plans in this area in the Economy Reform package, which was announced on March 12, 2021 (Retrieved from hmb.gov.tr, Accessed: 11.20.2021).

It has become even more difficult for companies to carry their financial performance, assets and return on equity to a sustainable position, in today's market conditions where the intensity of competition is increasing. The financial performance of companies is also strongly related to the decisions they make about the future. It is important to consider which indicators should be taken into account when making decisions about the future. Financial ratios are frequently used in making the most accurate decisions about the financial performance of companies and in this context, about the future. In this study, panel data analysis was carried out in the context of companies with different fields of activity in the sector, based on the importance of the energy sector today and the importance of return on assets and equity capital in this sector. As a result of the study, the ratios affecting the return on equity are the quick ratio and the leverage ratio. While the increase in the quick ratio affects the equity capital of the energy sector companies negatively, its decrease has a positive effect on ROE. Although this result contradicts the study conducted by Pervan et al. (2019), it is similar to the results of the studies conducted by Muhani et al. (2022) in Indonesia, and by Demirhan (2022), Turaboğlu and Timur (2018), Korkmaz and Karaca (2014) in Turkey. In the study conducted by Alavinasab and Davoudi (2013), a insignificance relationship was found between these two variables. The results also show that ROE and leverage are negatively related. Although this result contradicts the study conducted by Bunea et al. (2019) in Romania, it is in line with the results of the study conducted by Toraman and Sönmez (2021) on manufacturing sector firms and by Ayyıldız (2013) on energy sector firms in Turkey. Apart from these two basic ratios, ROE and CSR, RTO, ITR and TA ratios were also found to be correlated. Among these ratios, TA has a positive effect on ROE, while other ratios have a negative effect.

Return on assets is positively related to the PB and CSR and negatively related to the LR, QR and RTO. It is consistent with the findings of studies on different sectors by Çakır and Küçükkaplan (2012), Korkmaz and Karaca (2014), and Ahmad et al. (2015) and Demirci (2017).

Financial actors who want to evaluate especially the energy sector companies' performance in Turkey can benefit from this study's results. It is possible to improve the financial performance of the companies in the future by evaluating the current situation and determining their positive and negative aspects. Companies that evaluate their financial performance in a planned manner within a certain period are likely to be prepared for possible financial risks and to have a competitive advantage over other companies that do not make these assessments.

In this study, unlike the literature, financial ratios that have not been discussed together before, but which are thought to have an impact on profitability, are also included. In this context, it is expected that the results of this study will be useful for managers and policy makers who are interested in the subject and need information in the decision-making stages. In future studies, especially during the pandemic period, the effect of the increase in inflation rates and stagnation in interest rates, on the asset and equity profitability of companies in the energy sector can be investigated.

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