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Financial Risk Analysis in Renewable Energy Companies

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Abstract
Global energy demand increases every year. It is needed new energy sources. Renewable energy companies play an essential role in producing or storing alternative energy sources. As they have high assets and liabilities, there can be financial risk. This study examined the financial risks of alternative energy companies for Alternative Energy Foreign Equity Fund. It comprises publicly traded renewable energy companies operating in different countries. The study employed the least-squares method for a panel data analysis of financial ratios calculated from companies' financial statements between 2017 and 2021. The data were obtained from the Wall Street Journal Market database, Yahoo Finance, and the companies' financial statements. Financial expenses coverage ratio and financing ratios were included in the model to examine the financial structure. Financial risk ratio, financial leverage ratio, and total assets were included in the model to evaluate the financial risk status of the companies. The results showed that financial risk ratio, capital structure, financing costs, and debt repayment ability affected alternative energy companies' performance.

Keywords: Alternative Energy, Financial Risk Analysis, Investment, Market Value

1. Introduction

Global energy demand is increasing rapidly due to the industrialization and growth of the world population. Economic growth means an increase in the production of goods and services in a country, resulting in more energy production and consumption. We need new sources to meet the demand for energy (Alessio, 1981). Climate change affects the financial risks of countries. Therefore, G20 countries should take measures for global carbon management, such as funding sustainable development and increasing renewable energy production (Bak, 2017). However, governments also need to consider climate change and environmental pollution when they take initiatives to meet the energy demand. The worst-case scenarios scientists warned us about are becoming a reality. This has urged countries to give priority to eco-friendly and sustainable policies. The Paris Agreement have influenced the green management policies of numerous countries. The most prominent reflection of this change has occurred in the European Union (EU). The EU targets to decrease its net greenhouse gas emissions 55% until 2030 (European Comission, 2019).

Fossil fuels cause environmental pollution. Therefore, governments and companies have focused on green energy to reduce carbon emissions. According to Bloomberg New Energy Finance (BNEF), "new energy" is about not only renewable electricity generation and storage but also encompasses electric transportation, electric heating, and recycling (BNEF, 2022). A report published by the International Energy Agency (IEA) (2019) states that energy efficiency contributes to the world's total energy consumption, equivalent to the annual energy consumption of the European Union.

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Therefore, it is not enough to use only renewable resources in energy production. In other words, we must carry out all transformation activities together to cut greenhouse gas emissions to as close to zero as possible (IEA, 2019). These concerns and policy changes have rapidly increased the global renewable energy supply and demand. Although renewable energy production has grown by 2.1 percent each year since 1990, less than 15 percent of global energy is supplied from renewable energy sources today (IEA, 2021). Governments implement many economic policies to promote alternative energy production, triggering private sector investments. According to BNEF (2022), low-carbon transformation investments increased by 27% and reached $755 billion in 2021. Equity markets and individual investors provided $165 billion in funds for those investments. However, many factors (high investment and financing costs, long payback times, etc.) increase the financial risks of companies investing in this field, affecting their performance (BNEF, 2022). Energy companies had sustainable investments and good performance before the COVID-19 pandemic. However, the financial situation of companies has changed significantly since the pandemic (Rutkowska-Tomaszewska et al., 2022). The pandemic has adversely affected the global economy and hence, the financial structure of energy companies. This study investigated the financial risk levels of alternative energy companies. The sample consisted of 20 international companies in the Alternative Energy Foreign Equity Fund issued by AK Portfolio Management Co. Inc., one of the largest fund management companies in Turkey.

2. Literature

There is a large body of research on the relationship between the financial performance, financial risks, and market values of energy companies. Green credit plays a vital role in reducing environmental degradation and energy consumption. It also contributes to the financing of energy companies and strengthens their financial structure (Lai et al., 2022). Although high costs negatively affect financial performance, companies bear them (Walley and Whitehead, 1994). Increasing environmental investments provide companies with competitive and cost advantages. Therefore, companies invest more and more in renewable energy (Porter and Linde, 1995). The renewable energy sector grows, and companies have more investments and costs. Renewable energy companies are at high risk. Changes in oil prices also have a significant impact on companies' returns. Increases in sales revenues and oil prices reduce the risk (Sadorsky, 2012b). Energy companies with high capital play an important role in economic management. We should focus on beta value and accounting data to examine the financial risks of listed and/or non-listed energy companies (Rutkowska-Ziarko and Markowski, 2022). The size of European energy companies does not affect their financial performance. Borrowing is expected to affect their financial performance positively (Iovino and Migliaccio, 2019). As the size of the company increases, the level of indebtedness also increases. On the other hand, the fewer financial risks the sector faces, the higher the indebtedness of companies (Jaworski and Czerwonka, 2021).

Stock prices and public offerings of energy companies can increase financial risk. Energy prices are affected by many factors, such as important news. Energy companies may also affect stock prices (Wen et al., 2014). According to Anderloni and Tanda (2017), the financial performance of green energy companies is not different from traditional companies. However, the return behavior of alternative energy companies has similar characteristics to that of high-tech stocks. An unexpected result is that alternative energy sources, which are accepted as a substitute for oil, are more sensitive to technology (Henriques and Sadorsky, 2008). The increase in the sales revenues of alternative energy companies has a significant and positive effect on the beta coefficient of stocks (Sadorsky, 2012a). Rapid changes in alternative energy expose investors to technological risks. Alternative energy companies are sensitive to changes in both the energy market and technology (Bolton and Kacperczyk, 2020).

3. Materials and Methods

The sample consisted of 20 international companies in the Alternative Energy Foreign Equity Fund (in Table 1) issued by AK Portfolio Management Co. Inc. (Ak Portfoy, 2022). Alternative Energy Foreign Equity Fund comprises publicly traded renewable energy companies operating in different countries. Financial ratios were calculated using the financial table data of the companies for the last five years (2017-2021). The data were obtained from the Wall Street Journal Market database, Yahoo Finance, and the companies' financial statements (WSJ, 2022) (Yahoo Finance, 2022). Panel data analysis was performed on the data set.

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Table 1: AK Portfolio Alternative Energy Fund's Firm Portfolio

No	Company	Ticker
1	Aptiv PLC	APTV
		(U.S.: NYSE)
2	Samsung SDI Co Ltd	00.6400
		(S. Korea: KRX)
3	Siemens Gamesa Renewable Energy	SGRE
		(Spain: Madrid)
4	Advanced Energy Industries Inc	AEIS
		(U.S.: Nasdaq)
5	Nordex SE	NDX1
		(Germany: Xetra)
6	Array Technologies Inc	ARRY
		(U.S.: Nasdaq)
7	NIO Inc	9866
		(Hong Kong)
8	Plug Power Inc	PLUG
		(U.S.: Nasdaq)
9	Eaton Corp PLC	ETN
		(U.S.: NYSE)
10	Generac Holdings Inc	GNRC
		(U.S.: NYSE)
11	Chart Industries Inc	GTLS
		(U.S.: NYSE)
12	First Solar Inc	FSLR
		(U.S.: Nasdaq)
13	NEL ASA	NEL
		(Norway: Oslo)
14	Enphase Energy Inc	NPH
		(U.S.: Nasdaq)
15	Sunnova Energy International I	NOVA
		(U.S.: NYSE)
16	Microchip Technology Inc	MCHP
		(U.S.: Nasdaq)
17	Orsted A/S	ORSTED
		(Denmark: OMX)
18	Ballard Power Systems Inc	BLDP
		(Canada:Toronto)
19	SolarEdge Technologies Inc	SEDG
		(U.S.: Nasdaq)
20	Vestas Wind Systems A/S	VWS
		(Denmark: OMX)

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The analysis was conducted on 17 companies because three companies had missing data. Table 2 shows the type and name of variables in the model and the calculation methods. The market values of stocks were used in the model to evaluate the effect of the companies' financial risk status on their value. Financial risk can affect the market value of companies (Hankins, 2011). Financial expenses coverage ratio and financing ratios were included in the model to examine the financial structure. Financial risk ratio, financial leverage ratio, and total assets were included in the model to evaluate he financial risk status of the companies (Dayi, 2019).

Table 2: Variables Type and Name

Type	**Name**	**Variable Calculation Method**
Dependent variable	Market Value (MV)	The logarithm of stock market closing prices on the last day of the year
Independent variable	Financial Risk Ratio (FRO)	Total equity / (total payables - total receivables)
Independent variable	Financial Leverage Ratio (FLR)	(Short-term liabilities + long-term liabilities) / total assets
Independent variable	Financial Expenses Coverage Ratio (FECR)	Earnings before interest and taxes (EBIT) / financing expenses
Independent variable	Total Assets (TA)	Total assets (Napierian logarithm)
Independent variable	Financing Rate (FR)	Total equity / (short term liabilities + long term liabilities)

Financial risk management requires an effective liquidity management policy. Effective use of cash assets provides flexibility in the management of expenses. Increases in carbon costs reduce the profitability and liquidity of energy companies (Zimon, 2020). The stronger a company's liquidity, the higher its solvency and the lower its financial risk levels.

4. Results and Discussion

The Variance Inflation Factor (VIF) test was used to determine the multicollinearity between the variables (Table 3). The Variance Inflation Factor is a tool developed to measure the degree of correlation between variables in multiple linear regression models. The larger the VIF coefficient, the stronger the multicollinearity between the variables (Vu et al., 2015). A VIF greater than 10 indicates multicollinearity (Gómez et al., 2020). The test did not yield multicollinearity.

Table 3: VIF Test Results

Variables	**VIF**	**1/VIF**
FR	4.71	0.212314
FRR	3.48	0.287356
FLR	3.21	0.311526
FECR	1.03	0.970874
TA	1.13	0.884956
Mean VIF	2.712	

The Hausman test was used to choose between fixed and random effect models when performing panel data and least-squares analysis. Table 4 shows the Hausman test results. Panel data analysis should be performed using the Random Effects method because the P value was greater than 0.05.

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Table 4: Hausman Test Results

	Coefficients		
	(b)	(B)	(b-B)
	fe	re	
FRR	0.006490	0.005846	0.000643
FLR	-0.378421	-0.701067	0.322647
FR	-0.070592	-0.050185	-0.020406
FECR	0.000142	0.000096	0.000045
TA	0.632335	0.452767	0.179568
chi2(5) =	38.1		
Prob>chi2 =	0.0538		

It is necessary to test whether there is autocorrelation between variables. Durbin Watson and Baltagi-Wu LBI tests were used because the Random Effects method was the method of choice. Durbin Watson and Baltagi-Wu LBI were 2.58 and 2.96, respectively, indicating no autocorrelation. The Levene-Brown-Forsythe test was used to check for heteroscedasticity. The results indicated heteroscedasticity [W0=3.11 df(16, 68) Pr>F=0,0001, W50=1.32 df(16,68) Pr>F=0.210, and W10=3.11 df(16,68) Pr>F= 0.001]. When a model has heteroscedasticity, the Eicker-Huber-White estimator should be used to calculate standard errors that are resistant to heteroscedasticity (Tatoğlu, 2018). Table 5 shows the results;

Table 5: Huber-Eicker-White Estimator Results

r2 =	0.4111			
Number of Observations =	85		Wald chi2(5)=	203.88
Number of Companies =	17		Prob > chi2	0.000
MV	Coefficient	Robust Standard Deviation	z	P > | z |
FRR	0.005846	0.001808	3.23	0.001
FLR	-0.701068	0.247431	-2.83	0.005
FR	-0.050186	0.017784	-2.82	0.005
FECR	0.000096	0.000018	5.26	0.000
TA	0.452767	0.054187	8.36	0.000
Constant	-8.089343	1.148623	-7.04	0.000
sigma_u	0.31817858			
sigma_e	0.18330108			
rho	0.75081534			

The model had an explanatory power (r2) of 41%. It had a Probe>chi2 value of less than 0.05, indicating statistical significance. There was a significant relationship between market value and financial risk ratio, financial leverage ratio, financing rate, financing expense coverage ratio, and total assets. The results indicated that the financial risk ratio of the alternative energy companies positively affected the market value of stocks. The market value of the companies is expected to increase because the higher the financial risk ratio, the lower the risk. In line with the literature, the financial leverage ratio is expected to affect the companies' market values positively. Borrowings up to the optimum debt amount can increase the value of a company. However, borrowings exceeding the optimum amount may negatively affect its value. Our results showed that the financial leverage ratio negatively affected the market value of the companies. The financing rate also negatively affected the market value of the companies by 5%. Increases in equity or decreases in debt positively affected the market value of the companies. There was a significant relationship between the financing expense coverage ratio and the market value. The ability of companies to pay their financial expenses increases their credibility.

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Thus, investors and financing companies trust them more. Low borrowing expenses increase their ability to pay their debts. Meeting their financial expenses also increases their market value. Total assets are expected to increase the market value. The more the assets, the more the resources. Higher shareholder expectations can also increase the stock market value. The growth of a company's assets can also increase its market value. The higher the financial risk ratios, the higher the equity ratio to total debt coverage. Companies prefer financing with equity in high-amount investments. The fact that the companies' equity is higher than their debts also reduces their financial risk.

5. Conclusion

In recent years, alternative energy models have emerged as disruptive innovations. Both companies and investors prefer alternative energy models more due to strict environmental measures and concerns. Many factors (high investment and financing costs, long payback times, etc.) increase the financial risks of energy companies. This study determined the financial risks of alternative energy companies. Our results show that financial risk ratio, capital structure, financing costs, and solvency affect company performance and investor confidence in alternative energy companies as in traditional companies. The financial risk ratio of the alternative energy companies positively affected the market value of stocks. The financial leverage ratio negatively affected the market value of the companies. The financing rate also negatively affected the market value of the companies by 5%. Increases in equity or decreases in debt positively affected the market value of the companies. There was a significant relationship between the financing expense coverage ratio and the market value. However, growing environmental concerns, incentives, and legal regulations will draw investors' attention to the field of alternative energy in the future.

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