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Article

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A Model Suggestion for Determining the Values of Firms the Energy Sector: An Application in BIST Electricity Index

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ABSTRACT

Investors in financial markets have recently sought rational investment decisions with advanced technology and information obtained from various sources. Therefore, investors need to accurately determine the value of the firm. The value of companies in the energy sector contains different dynamics than companies in other sectors. The aim of this study is to develop models that best represent the values of companies in the energy sector and make them available to shareholders. For this purpose, OLS regression and Panel Data Analysis were used in the study. The data of the models to be tested in the study were obtained from the data of 11 companies traded in the Borsa Istanbul (BIST) Electricity Index between 2009 and 2018. In the analysis of the study, 3 models, namely Market to Book Value, Standardized Economic Value Added and Standardized Market Value Added, were created to represent the company value, and the model that best represents the company value for the shareholder was presented.

Keywords: Panel Data Analysis, Economic Value Added, Market Value, Market Value Added, Energy Sector
JEL Classifications: G20, G32, M41, Q43

1. INTRODUCTION

Correct determination of the market values of the companies in the energy sector is very important for the sustainability of these companies. While the aim of companies was only profit maximization between the years 1930 and 1960, today the main purpose of companies is to maximize the value of the company. It is also a very complex issue for shareholders to determine what the value of the company is and to measure it realistically. Because the value of a company will vary according to the situation of the company, the position of the companies against its competitors, the people who will make the valuation of the company, the purpose of the valuation and what methods will be used in the valuation. Therefore, there are different factors that affect the value of companies in the energy sector. For example, Lucas and Mendes-Da-Silva (2018) analyzed the effect of climate change on firm value and found that temperature and precipitation affect firm value in the energy sector.

Shareholders expect a higher return than the risk they bear when investing in a company. Each strategic decision made by the company management in response to these demands of the shareholders should be aimed at increasing the value of the company (Topak, 2010. p. 14). When investors invest their savings in a company, their most important goal is to get the highest return on their investments in line with the risk they bear. This can be achieved by managing the company value effectively and by maximizing the company value for shareholders as a result of this effective management. In addition to the problem of how to determine the value of the company in a healthy and realistic way, it is also important to use the company value as a tool for investors to make better decisions (Demirkol, 2006. p. 13). When this issue is handled in terms of the energy sector, different dynamics emerge from other sectors.

Many performance criteria have been developed to determine the value of any company. With the help of these performance

criteria, investors want to make their investments at the optimal level by determining the real company value. Likewise, company executives are looking for the answer to the question of what the value of their company contributes to the shareholders and stakeholders associated with the company. At this point, the performance criteria developed can be very useful to those who are interested in the value of the companies. When the literature is examined, it is seen that although there are performance criteria that are traditionally called and need accounting data, in recent years, value-based performance criteria have also been developed with value-oriented management approach.

In recent years, a value-based management approach has emerged, which argues that companies are elements that create value and that these factors directly contribute to economic profit. In the infrastructure of the value-based management approach, it is stated that all strategies of companies should be about creating shareholder value. This situation has brought along the necessity of determining the value of the intangible assets of the companies, which only create value for the company, and to investigate the contribution of these assets to the company and shareholder value. With the establishment of the mentioned value-based management approach in financial markets, value-based criteria have started to be used in company valuation.

The issue of determining company value is not a new phenomenon. Various criteria have been used to determine the value of the company for more than a century. Ampuero, Goranson and Scott have historically described the approaches used in company valuation and the process of using valuation criteria as in Table 1.

In this study, it is aimed to create various econometric models from company valuation methods for shareholders and related parties, to present a model that best explains the value of companies in the energy sector and to gain a new perspective to the literature. For this reason, three econometric models have been developed with a total of 10 variables consisting of value-based and traditional performance criteria.

The data of the models to be tested in the study were obtained from 11 companies traded in the BIST Electricity index. The 10-year period including the years 2009-2018 has been chosen as the analysis period. The data of the companies in the relevant years were obtained from the Public Disclosure Platform (KAP), Finnet Share Export and IS Investment web database. In the application part of the study, Ordinary least squares Regression and Panel data analysis method was used and the hypotheses of the models were tested. STATA 16.0 and E-VIEWS 9.0 programs were used for panel data analysis in the econometric model tests used in the study.

Table 1: The process of using company valuation method

Period	Methods used
1920s	*Du Pont Model *ROI (Return on investment)
1970s	* EPS (Earnings per share) * P/E (Price-to-earnings ratio)
1980s	*M/B (Market-to-book ratio) *ROE (Return on equity) *ROCF (Return on cash flow) *Cash flow
1990s	*EVA (Economic value added) *EBITDA (Earnings Before Interests, Taxes, Depreciation and Amortization) *MVA (Market value added) *CFROI (Cash flow return on investment) *Total shareholder return

Source: Gürbüz & Ergincan, 2008: 88

2. LITERATURE REVIEW

Measuring company value is an issue that gains importance day by day. Many academicians and consultancy companies have carried out various studies on the realistic determination of the company value. Some of the studies in the literature are included in this section.

Considering the studies conducted to determine the values of the companies in the energy sector; Perez-Gonzalez and Yun (2013), and Auffhaummer and Mansur Erin (2014) investigated impacts of the climate on the value of the firm in the electric sector and found that firm values were affected by climate changes. Similarly, as mentioned before, Lucas and Mendes-Da-Silva (2018) found that temperature and rainfall affect the value of companies in the energy sector.

Looking at the subject from a financial perspective; Bayraktaroğlu (2009), using the data of 96 companies in the BIST manufacturing industry between 1998 and 2007, researched which criteria can best explain stock returns. As a result of the study using the logistic regression method, a very low relationship was found between stock returns and financial performance criteria. Sharma and Kumar (2012) conducted a panel data analysis to test that the EVA is superior to traditional accounting-based performance measures in explaining the change in MVA in their studies, which they carried out using the data of manufacturing companies in India between 2000 and 2009. As a result of his work; They could not find a significant difference between EVA and accounting-based performance measures. Khan et al. (2012), using the data of 60 non-financial companies registered on the Pakistan Karachi stock exchange between 2004 and 2010, the relationship between stock returns and financial metrics were investigated. As a result of the study, a positive relationship was found with Cash Flow from Operations, while a negative relationship was found with EVA in explaining stock returns.

Alsaboa (2017) investigated the relationship between the created shareholder value and the value-based measure, EVA, and the traditional accounting-based ROA, using multiple regression analyzes. As a result of his study, he found a significant positive and very strong relationship between the created shareholder value and both criteria. Kurmi and Rakshit (2017) investigated whether value-based or accounting-based criteria are better in explaining changes in market value. They carried out their studies by using the data of 50 companies registered on the Indian stock exchange between April 1, 2000 and March 31, 2016. As a result of their studies, they revealed that the EVA is a superior criterion compared to traditional accounting-based criteria.

Gounder and Venkateshwarlu (2017) investigated the criteria that best explain shareholder value by using the data of public and

private banks in India between 2001 and 2015. In their studies, MVA dependent variable, traditional ROE based on value-based EVA and accounting, EPS and TV (Dividend Yield) were taken as independent variables. As a result of their studies, while EVA explained the change in MVA in public banks, "traditional DY based on accounting" explained the change in MVA in private banks. Behere (2019) econometrically compared the relationship between EVA and traditional accounting-based benchmarks and stock market values, using data from 69 large-capital companies on the Bombay Stock Exchange. As a result of his study, they found a relationship with R^2 42% between EVA and stock market values. Traditional measures have been insufficient to explain the market value. The most successful of the traditional metrics was the FCFE method with R^2 18% correlation value.

3. ANALYSIS

3.1. Data and Methods

In the study, three models were created by using the 2009-2018 data of the companies in the BIST Electricity Index, using OLS Regression and panel data analysis methods. M/B, SEVA, and SMVA values of companies are dependent, MVNS, PE, PCF, DY, TOBINQ, EPS, MVNSG criteria were used as independent variables in the models. In the study, the relevant variables were created using the data of 11 companies and converted into a suitable format for analysis. Since there are both time series (t = 10 years) and cross-sectional series (n = 11 companies) in the generated data, the study data are suitable for creating econometric models.

The 10-year period including the years 2009-2018 has been chosen as the model for which the analysis period was created is planned to be tested during the after the global crisis period. The data of the companies in the relevant years were obtained from the Public Disclosure Platform (KAP), Finnet Share Export, and IS investment web database.

Within the scope of the study, the models created as Model A, Model B, and Model C representing the value of the company are as follows.

Model A:

$$MBRatio_{it} = \beta_0 + \beta_1 PE_{it} + \beta_2 PCF_{it} + \beta_3 EPS_{it} + \beta_4 MVNS_{it} + \beta_6 DY_{it} + \beta_7 TOBINQ_{it} + \beta_8 MVNSG_i + \ldots\ldots\ldots + \mu i_{tl}$$

Model B:

$$SEVA_{it} = \beta_0 + \beta_1 PE_{it} + \beta_2 PCF_{it} + \beta_3 EPS_{it} + \beta_4 MVNS_{it} + \beta_6 DY_{it} + \beta_7 TOBINQ_{it} + \beta_8 MVNSG_i + \ldots\ldots\ldots + \mu i_{tl}$$

Model C:

$$SMVA_{it} = \beta_0 + \beta_1 PE_{it} + \beta_2 PCF_{it} + \beta_3 EPS_{it} + \beta_4 MVNS_{it} + \beta_6 DY_{it} + \beta_7 TOBINQ_{it} + \beta_8 MVNSG_i + \ldots\ldots\ldots + \mu i_{tl}$$

The literature was used while determining the models and variables developed in line with the purpose of the study. 1 dependent 8 independent variables were created to be used in the analysis of the study. Table 2 shows the dependent and independent variables used in the analysis of the study.

The data of the variables used in the study were taken from three databases and formed by the formulas shown in Table 2. EVA and MVA, which are dependent variables, have been standardized by proportioning to total assets and used in the analysis by coding as SEVA and SMVA. Since the calculation of the SEVA is complex, the process of creating the variable is explained in detail in the following section.

SEVA Calculation: In the calculation of SEVA, first of all, NOPAT (Net operating profit after tax) criterion was calculated. In calculating NOPAT, net profit, other profit/loss and financing expenses were found. The after-tax value has been calculated to clear the financing expenses from tax effect. In the study, the NOPAT values of the companies are reached by the sum of net profit, other profit/loss, and after-tax financing expenses. The capital invested criteria are derived from the sum of net working capital and fixed assets.

Weighted Average Cost of Capital (WACC) is used in the calculation of the EVA. In the WACC calculation, companies' equity costs were calculated first. Capital Asset Pricing Model (CAPM) has been applied while calculating the equity costs of companies. After all the specified criteria were calculated, individual EVA values of the companies were calculated. Finally, the SEVA variable was obtained by dividing these EVA values by total assets.

3.2. Findings

In this part of the study, the findings obtained as a result of OLS regression analysis and panel data analysis are included. In the study, some assumptions should be investigated to perform OLS and panel data analysis. These assumptions are that there are no autocorrelation, heteroscedasticity and cross-section dependency

Table 2: The variables used in this study and their calculation methods

Variables	Calculation methods
Market to book ratio (M/B) (End of the term)	Market value per share/Book value per share
Standardized economic value added (SEVA)	(Net Operating Profit After Tax - Weighted Average Cost of Capital * Invested Capital)/Total Assets
Standardized market value added (SMVA)	(Market value – book value of company)/Total assets
Price to earnings ratio (P/E)	Market value per share/earnings per share
Price to cash flow ratio (P/CF)	Market value per share/operating cash flow per share
Earnings per share (EPS)	Net income/end of period common shares outstanding
Market value/net sales (MVNS)	Market value/net sales
Dividend yield (DY)	Annual dividends per share/ market value per share
TOBINQ ratio	(Market value + total debt)/ total assets
Market value/net sales growth (MVNSG)	Market value/net sales growth %

problems between variables. Making predictions by ignoring the mentioned problems will cause the standard errors to be deviated and cause the t values to lose their validity (Tatoğlu, 2016. p. 8). Therefore, these assumptions need to be tested beforehand. Pesaran (2006) test was used in the study for the cross-section dependency test, which is the first assumption. Modified Wald Test was used for the heteroscedasticity problem. Likewise, Durbin Watson and Baltagi-Wu LBI tests were used to determine the autocorrelation problem and the statistics of all models regarding the assumptions (Wooldridge, 2002: 211) are shown in Table 3.

When Table 3 is examined, it is observed that there are autocorrelation, heteroscedasticity and cross-section dependency problems in all 3 models created in the study. All these problems were solved with robust estimators after the panel data analysis model was selected. This situation is shown in Table 5. In addition, it is important that the variables are stationary in panel data analysis. The Peasaran (2007) unit root test, one of the second generation unit root tets, was applied to determine the stationarity of the variables. With this application, it was decided whether the variables were stationary or not, by looking at the CIPS test statistics and CIPS critical values. All variables used in the models were used in the analysis with their stationary values.

After all the tests mentioned in the application phase of the study were carried out, variables were created using the data of the companies included in the BIST Electricity Index between 2009 and 2018 and converted into a suitable format for analysis. Later, 3 models were created for analysis. Table 4 shows the OLS regression results analyzed with the relevant models.

As can be seen in Table 4, the explanation power of Model A established with M/B for the changes in M/B value is 92.12%. This rate is quite high and means that the variables in the model can explain the entire M/B criterion, which is the dependent variable. In Model A, MVNSG and TOBINQ criteria have a significant positive effect on the M/B criterion. The explanation power of the changes in SEVA value of Model B established with SEVA has reached 98.38% R2. This ratio is higher than other models established in the other study, and it shows that the variables in the model explain the dependent variable SEVA almost completely. In Model B, EPS and TOBINQ criteria have a significant positive effect on the SEVA criterion. The explanation power of Model C, which was established with the last model SMVA, for the changes in the SMVA value has reached 83.01%. Although this rate is high, Model C's explanatory power is low compared to the other two models established in the study. As in Model A, the MVNSG and TOBINQ criteria have a significant positive effect on the SMVA criterion.

When the OLS test results are examined in general, it is seen that all 3 models are successful and can explain the selected criteria to represent the value of the company very well. In addition, the models in the study suggest that individuals or organizations interested in company values, such as shareholders should focus specifically on the EPS, MVNSG and TOBINQ criteria.

Table 3: Statistical results of the hypothesis tests

Modified Wald statistic for groupwise heteroscedasticity		
Models	**Test statistic value**	**Probability value**
Model A	3978.81	0.0000*
Model B	2.0e+05	0.0000*
Model C	0.4e+07	0.0000*
*Significant at the 0.05 level		
Autocorrelation		
Models	**Durbin Watson value**	**Baltagi-Wu LBI value**
Model A	2.616602	2.6767842
Model B	1.942094	1.9611044
Model C	1.6507481	1.8952307
Cross-section dependency (Pesaran CD_{LM} Test)		
Models	**Test statistic value**	**Probability value**
Model A	-1.023	0.0000*
Model B	2.547	0.0000*
Model C	1.185	0.0000*

*Significant at the 0.05 level

Table 4: OLS regression results

Variables	M/B ratio	SEVA	SMVA
PE	10.99718	0.0022874	0.0113436
	(−0.45)	(1.48)	(−0.37)
PCF	13.83313	0.0028773	0.0142688
	(0.60)	(−1.51)	(0.17)
EPS	1.963003	0.0004083*	0.0020248
	(1.54)	(23.16)	(2.41)
MVNS	4.909274	0.0010211	0.0050639
	(−0.68)	(0.76)	(1.26)
DY	0.4131694	.0000859	0.0004262
	(1.46)	(0.01)	(−0.95)
MVNSG	6.078448*	0.0012643	0.0062699*
	(−2.65)	(2.10)	(−3.21)
TOBINQ	0.4253427*	0.0000885*	0.0004387*
	(16.33)	(24.99)	(9.26)
Number of observ.	110	110	110
R^2	0.9212	0.9838	0.8301
F- probability	0.0000	0.0000	0.0000

*1%, **5% and ***10% mean significance level. The Table was created from the models representing the company value. Standard error and t statistic value are shown in the table

Table 5: Panel data analysis results

Variables	M/B ratio	SEVA	SMVA
PE	10.58986	0.002622***	0.0100053
	(−0.71)	(1.93)	(−1.11)
PCF	15.70529	0.00354***	0.0152044
	(0.87)	(−2.01)	(1.25)
EPS	10.8292	0.0043451***	0.0134321**
	(0.15)	(1.88)	(2.07)
MVNS	7.032896	0.0011993	0.005948
	(−0.77)	(1.63)	(−1.21)
DY	0.3232099	0.0001645	0.0003382
	(1.26)	(−0.01)	(0.01)
MVNSG	6.072411*	0.0007813*	0.0024223*
	(−3.20)	(3.40)	(−4.16)
TOBINQ	1.906606**	0.0004318*	0.0009771*
	(3.31)	(4.93)	(6.92)
Number of obs.	110	110	110
R^2	0.6895	0.7223	0.6132
F- probability	0.0000	0.0000	0.0000
Hausman Test	0.0005**	0.0005**	0.0005**

Significant at the *%1, **%5 and ***%10 level. The Table was created from the models representing the company value. Drisscoll-Kraay standard error and t statistic value are shown in the table. Robust estimator, Drisscoll-Kraay robust estimator

In this section, the results of the study found by the panel data analysis method are shown. Which of the basic models used in panel data analysis should be used for analysis can be tested with Hausman (1978) test. For the models to be created according to various situations in the study, the appropriate panel data model was selected by Hausman test. In addition, in the study, it was assumed that all problems occurring in the basic assumptions shown in Table 3 were resolved with the Drisscoll-Kraay robust estimator. The results of the 3 models created in the analysis, performed by panel data analysis, are presented in Table 5.

Hausman test statistics were calculated for each model in the study, and it was accepted that there was a Fixed Effects Model at a significance level of 0.05 (Table 5). Since variance, autocorrelation and inter-unit correlation problems were encountered in the panel models created in the study, it was assumed that the related problems were corrected by using the Drisscoll-Kraay resistive estimator, which is the only test that can correct the problems for the Fixed Effects Model.

Among the models estimated according to the fixed effects model, the explanation power of Model A for the changes in the M/B value is 68.95%. In other words, the variables in the model explain about 69% of the changes in the M/B value. The criteria associated with the M/B value in the model are MVNSG at the 1% significance level and TOBINQ at the 5% significance level, respectively. In the model, it has been determined that the coefficients of these criteria are positive and have an increasing effect on the M/B value.

According to the fixed effects model, the explanation power of Model B for the changes in SEVA value was calculated as 72.23%. In other words, the variables in the model explain about 72% of the changes in the SEVA value. In the model created, the criteria related to the SEVA value are MVNSG and TOBINQ at 1% significance level, PE, FNAO and MCI at 10% significance level, respectively. It has been determined that all of the criteria in the model have a positive coefficient and increase the SEVA value.

Likewise, the explanation power of the changes in the SMVA value of Model C estimated according to the fixed effects model was calculated as 61.32%. In other words, the variables in the model explain about 61% of the changes in the SMVA value. In the model created, the criteria related to the SMVA value are MVNSG and TOBINQ at the 1% significance level, and the MCI at the 5% significance level, respectively. In the model, it has been determined that these criteria are positive and have an increasing effect on the SMVA value.

According to the results of the panel data analysis, it was determined that the most successful model representing the value of the company is SEVA, one of the value-based criteria. Both the explanatory power of the variables of Model B and the number of significant positive correlated criteria were higher than other models. In addition, the MVNSG and TOBINQ criteria were found to be significant in all 3 models, and it was observed that they had an increasing effect on the value of the dependent variable. Likewise, it was observed that the EPS criterion positively affected Model B and Model C.

This result reached in the study means that EVA, one of the value-based criteria, is the most effective method in determining the value of companies in the BIST Electricity index. However, it was seen that the model established with the MVA criterion, which is related to EVA, is in the last step in the ranking.

4. CONCLUSION

While stakeholders such as company managers and investors are trying to make efficient and optimal investment decisions according to the profitability structure of the companies, but nowadays they are trying to shape their decisions on the value created by companies. All over the world, the understanding that companies can maximize the wealth of their shareholders if they can create value is accepted. At this point, there is a need for criteria that can accurately determine the value of the company.

When the literature is examined, it is seen that although there are performance criteria that are traditionally called and need accounting data, value-based performance criteria have also been developed with value-oriented management approach in recent years. Advocates of value-based performance metrics argue that firm value can only be determined by value-based performance metrics. Stern & Stewart consulting firm is the head of these claim holders. They tried to prove that the criterion they called Economic Value Added, which they developed themselves, is the best criterion that determines the value of companies (Stewart, 1991:136). With the spread of this criterion in the field of finance, other value-based and traditional criteria have also been developed. These developments have enabled hundreds of academic studies to be conducted on the criteria related to the value of the company. In most of the related studies, the superiority of traditional or value-based performance criteria over each other has been tried to be proven.

In the study, analyzes were carried out using the data of 11 companies included in the BIST Electricity Index, covering the 10-year period between 2009-2018. In this study, various econometric models are created by using the criteria that best represent the value of companies for shareholders and other investors, and it is aimed to gain a new perspective to the literature by presenting the model that best explains the value of the company. In the study, three models, namely A, B, and C, were created by using OLS regression and panel data analysis methods. The M/B, SEVA and SMVA values of the companies are dependent, MVNS, PE, FNAO, DY, TOBINQ, EPS, MVNSG criteria were used as independent variables in the models.

In the study, when the results of the OLS Regression test are examined, it is seen that the 3 models established are successful and the M/B, SEVA and SMVA criteria that are chosen to represent the value of the company can be explained very well. In addition, the models created in the study reveal that individuals or organizations interested in corporate values, such as shareholders, should focus on the EPS, MVNSG and TOBINQ criteria. These findings are compatible with the study of Sharma and Kumar (2012).

In the study, when the results of the panel data analysis were examined, it was determined that the most successful model

representing the value of the company was SEVA, one of the value-based criteria (Model B). In other words, Model B's power to explain the variables and the number of significant positive correlated criteria are higher than other models. This result means that EVA is the best benchmark for BIST Electric companies, in line with the Stern and Stewart consulting firm's claim that "EVA, one of the value-based criteria, is the best measure in relation to company values." These findings are consistent with the studies of Kurmi and Rakshit (2017) and Behere (2019). In the academic studies to be carried out after this study, researchers are recommended to perform analyzes with more performance criteria and data covering longer analysis periods.

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