

*Research Article*

## The Effect of Coal Production, Profitability, Leverage, Newcastle Price on Firm Value with Renewable Energy Moderation

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### Abstract

The flow of investment funds from global fund managers to energy sector stocks is increasing and is focused on renewable energy. Regarding this, several energy sector companies in Indonesia have started to diversify their business into renewable energy. This research uses panel data analysis, which aims to see the influence of various variables, including coal production, profitability, leverage, and Newcastle coal price with renewable energy as a moderator on the value of energy sector companies. The companies in the sample are the coal sub-sector energy sector listed on the Indonesia Stock Exchange in 2018-2022. The results of this research show that profitability has a positive influence on firm value. For coal production, leverage and Newcastle coal prices do not affect firm value. Apart from that, renewable energy is also unable to moderate the influence of coal production, leverage, and Newcastle coal price on Firm value. The managerial implication of this research is that companies in the energy sector need to pay attention not only to traditional factors such as coal production, profitability, and leverage but also to new factors such as Newcastle coal prices and renewable energy as moderators.

Keywords: Firm Value, Renewable Energy, Profitability, Leverage, Newcastle Coal Price

JEL Classification: Q41, G32, Q35

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## 1. Introduction

We know that renewable energy can reduce air pollution so that people are less susceptible to disease. Around 4.2 million deaths each year are related to air pollution and exposure. At the same time, research conducted by Harvard University and the BBC (2022) shows that the risk of death from Covid-19 is higher for people in contaminated cities. Renewable energy can also reduce greenhouse gas emissions and protect society from the harmful effects of climate change. For more than two-thirds of countries in the world, renewable energy is the cheapest alternative source of electricity without additional fuel costs. It is important to know how to increase Firm value as a marker of good Firm performance, apart from high levels of profit and prosperity for Firm owners and shareholders (Hartati et al., 2021).

To maximize the firm value, the positive information regarding the firm's performance must be disseminated so that investors can shape and increase the firm value itself. To get positive performance, financial managers must make the right financial decisions. With better Firm performance and Firm value, it will provide greater profits for shareholders (Aamir et al., 2022). Mulyana and Adidarma (2020) (Santosa, 2020) stated that many factors can influence Firm value, one of which is the profitability variable. Profitability is a Firm's ability to generate profits which is considered a signal for the firm to attract the attention of investors in investing their capital. Profitability is an important indicator for assessing a Firm. Profitability is not only used to measure a Firm's ability to generate profits but also to determine the firm's effectiveness in managing its resources (Santosa, 2019)(Mulyana & Adidarma, 2020).

Based on previous research conducted by Afinindy et al. (2021), Mulyana and Adidarma (2020), and research by Putra and Putra (2021) stated that profitability has a significant positive effect on firm value. A positive direction means that greater profitability will increase Firm value. However, this is different when compared to research conducted by Salim and Susilowati (2020), Siahaan and Muslih (2020), and Yuniastri et al. (2021), which stated that profitability does not affect firm value.

Many ways can be used to assess whether a Firm is good or not, one of which can be seen from its share price. According to Brigham and Houston (2019), the higher the share price, the higher the firm value, and the more prosperous the shareholders. Debt is considered to provide benefits as a source of Firm funding because it reduces the taxes that must be paid. However, according to Hidayat (2018), debt must still be paid attention to the interest burden arising from the debt. Leverage (debt use ratio) is considered to have an impact on Firm value, although the results of studies are mixed. The research results of Detama and Laily (2021), (Panjaitan & Supriyati, 2023), Harahap et al. (2020), and Hidayat (2018) show that the leverage ratio has a positive influence on firm value. However, the results of research from Senan et al. (2022), Awan et al. (2018), and Sukmawardini and Ardiansari (2018) show the opposite results, namely that the leverage ratio has a negative effect on Firm value.

## **2. Literature Review and Hypothesis**

### **Understanding Capital Markets**

The general definition of the capital market is an organized financial system, including commercial banks and all intermediary institutions in the financial sector, as well as all securities in circulation. In a narrow sense, the capital market is a market (place in the form of a building) prepared for trading shares, bonds, and other types of securities using the services of securities brokers (Sunariyah, 2020). According to Husnan (2023) and Sihombing et al. (2023), the capital market is a market for various long-term financial instruments that can be bought and sold, both in the form of debt and own capital, whether issued by the government, public authorities, or private companies.

### **The firm value**

Firm value can be interpreted as the present value of future free cash flow at a discount rate according to the weighted average cost of capital. According to Febriyanto (2018), free cash flow is the cash flow available to investors, creditors, and owners after taking into account all expenses for Firm operations and expenses for investments as well as net current assets. Natalia et al. (2021) find that firm value is considered very important because investors use firm value as a measure of firm performance, which is usually linked to the firm's share price. Many companies try to continue to improve and maintain their Firm performance so that their firm value stays the same. The financial ratio used in this research to obtain a Firm value is using Price Book Value (PBV). Price book value is an indication of investors' views on a Firm. According to Ayu et al. (2021), firms that are considered good in the eyes of investors are companies that have secure profits and cash flows and continue to experience growth. Apart from that, research from Narwastu & Rusli (2023) and Tamala and Hermanto (2021) state that a Firm value with a high PBV is the desire of Firm owners because it will increase the prosperity of shareholders or stockholder wealth maximization.

**Agency Theory**

Sutedi (2021) and (Sihombing et al., 2023) argue that agency theory emerged after the phenomenon of separate Firm ownership and management. The aim of separating management from Firm ownership is so that the owner obtains the maximum possible profit at the most efficient cost possible by managing the firm with professional staff. Furthermore, in his research, Sutedi (2021) describes that agency theory can help find solutions to agency problems that arise between agents (managers) and principals (shareholders) so that investors are confident to invest their capital in the firm with the hope of getting maximum profits in the future will get. In this research, the relationship between agency theory and Firm value as a dependent variable occurs because Firm value is an important indicator in the eyes of investors in making capital investments. After all, increasing Firm value becomes a hope for shareholders. Managers as administrators and decision-makers in the running of the firm will get returns because they optimize the profits of shareholders as Firm owners (Khaniya et al., 2023).

**Signaling Theory**

Santosa et al. (2021) and Yuniastri (2021) state that signaling theory explains the relationship between investment expenditure and Firm value, where investment expenditure provides a positive signal about the firm's growth in the future so that it can increase share prices as an indicator of Firm value. The Firm value in this research is calculated using the price-to-book value (PBV) ratio because the higher the PBV, the higher the firm is in the eyes of investors. Signaling theory also explains the relationship between Firm performance and Firm value (Sihombing et al., 2023).

**Coal Production**

Production is the combination and coordination of materials and forces (input factors, resources, production services) in the manufacture of goods or services (output or product) (Robert, 2019). According to Alvionita et al. (2021), Coal production is an effort to explore coal content in an area using mining methods. In this research, one of the variables used is coal production from energy sector companies in the coal subsector in Indonesia. The production data used is the production of each firm between 2018-2022. Based on Minerba One Data Indonesia (MODI) data from the Ministry of Energy and Mineral Resources (ESDM), Indonesian coal production was recorded as having reached 671.75 million tonnes or exceeding the 2022 target, which was set at 663 million tonnes or 101.32% of the initial target (Chasanah & Adhi, 2017). This study is what makes coal production factors interesting to research in relation to Firm value.

**Renewable Energy**

According to Hamdi (2018), renewable energy is a natural energy source that can be used freely and can be renewed continuously and indefinitely. Renewable energy sources are energy sources that come from nature and can be renewed, for example, wind energy, wave energy, biogas, biomass, and solar light energy. Meanwhile, non-renewable energy is energy that comes from nature but cannot be renewed, for example coal, natural gas, and petroleum. The development of renewable energy is increasing day by day because the availability of non-renewable energy is becoming increasingly scarce (Jaelani et al., 2017). Another reason for the development of renewable energy is that it is more environmentally friendly compared to non-renewable energy (Kishore and Barath, 2019).

**Hypothesis****The Effect of Coal Production on Firm Value**

According to Fauziah & Sudiyatno (2020), coal production is a standard that needs to be studied if we refer to the performance of a Firm in the coal sub-sector energy sector. This finding is an important variable where a Firm in the coal subsector will be seen as good if its production is large and the level of sales or sales growth is also large. Based on research conducted by Fery (2018) and Bambang et al. (2020) states that the level of sales growth has a positive effect on Firm value. Based on the presentation and research results, the following hypothesis can be developed:

**H1: Coal Production has a positive effect on Firm Value**

**The Effect of Profitability on Firm Value**

In accordance with signal theory, companies that provide continuously growing profits will be seen as a good signal for investors because a firm with a growing profit level will reflect that the firm's performance is also good so that investors will be confident to invest their money in the firm, which will ultimately increase the share price as a proxy for Firm value (Djashan and Agustinus, 2020) (Santosa et al., 2022). Profitability is also referred to as the result of management efforts for funds entrusted by investors. This result is very important because investors can assess how the firm is able to provide returns for investors (Sukmawardini and Ardiansari, 2018). Based on previous research results from Awan et al. (2018), Djashan and Agustinus (2020), Artamevia and Almalita (2021), Detama and Laily (2021), Putra and Putra (2021), and Aamir et al. (2022), all of whom have shown that profitability has a positive effect on Firm value. So, based on the description above and the results of previous research, the following hypothesis is proposed:

**H2: Profitability has a positive effect on Firm Value**

**The Effect of Leverage on Firm Value**

Leverage, which can be expressed as a debt usage ratio, is also considered to have an impact on Firm value, although study results are inconsistent. Debt is profitable as a source of funding. Firm, because it reduces the taxes that must be paid. However, you still must pay attention to the interest burden arising from debt (Albart et al., 2020) (Hidayat, 2018). In Firm financing, both operations and assets, sometimes the firm's funds need to be bigger (Harahap et al., 2020). So, companies need to rely on external sources of funds where the cheapest funds are in debt in accordance with the pecking order theory (Donaldson, 2019). Based on the results of a study by Prabowo et al. (2016), Hidayat (2018), Harahap et al. (2020), Artamevia and Almalita (2021), and Detama and Laily (2021) show that leverage has a positive influence on firm value. Based on the presentation and research results, the following hypothesis can be developed:

**H3: Leverage has a positive effect on Firm Value**

**The Effect of Coal Prices on Firm Value**

Investors and Firm management in the coal sub-sector energy sector closely monitor global coal price movements. This is because if the price of coal rises, assuming production costs are the same as before, it can be concluded that the firm will make more profit than if the price of coal was at the previous price. If we refer to the global situation in 2020-2022, where the Covid-19 pandemic and the effects of the Russian-Ukrainian war have created a dire need for energy supplies, this has caused global coal prices also to increase. In line with research by Fery (2018) and Bambang et al. (2020), which states that the level of sales growth and price increases of a product has a positive effect on Firm value, the following hypothesis can be developed below:

**H4: Coal Price has a positive effect on Firm Value**

**The Effect of Coal Production on Firm Value**

Renewable energy is new to this research so there are no references and links between renewable energy moderating the influence of coal production and Firm value. However, if we refer to close research, namely research from Dian and Wahidahwati (2021), it is stated that sustainability reports do not affect Firm value. Based on the presentation and research results, the following hypothesis can be developed below:

**H5: Renewable Energy can moderate the (negative) influence of Coal Production on Firm Value**

**The Effect of Profitability on Firm Value**

Renewable energy is new to this research so there are no references and links between renewable energy moderating profitability and Firm value. However, we refer to research on the relationship between profitability and Firm value. In that case, the results of this research are in line with the results of previous research conducted by Jihadi et al. (2021) and Afinindy et al. (2021), which stated that profitability has a positive and significant effect on firm value. Other research from Mulyana and Adidarma (2020) suggests that many factors can influence Firm value, one of which is the profitability variable. Based on the presentation and research results, the following hypothesis can be developed below:

**H6: Renewable Energy can moderate the (positive) influence of Profitability on Firm Value**

### The Effect of Leverage on Firm Value

In Firm financing, both operations and assets, sometimes the firm's funds need to be larger (Harahap et al., 2020). So, companies need to rely on external sources of funds where the cheapest funds are in debt in accordance with the pecking order theory. Based on the results of a study from Prabowo et al. (2016), Sihombing, Hutajalu, et al. (2023), Hidayat (2018), Harahap et al. (2020), Artamevia and Almalita (2021), and Detama and Laily (2021) show that leverage has a positive influence on firm value. Based on the presentation and research results, the following hypothesis can be developed below:

**H7: Renewable Energy can moderate the (positive) influence of Leverage on Firm Value**

### Framework

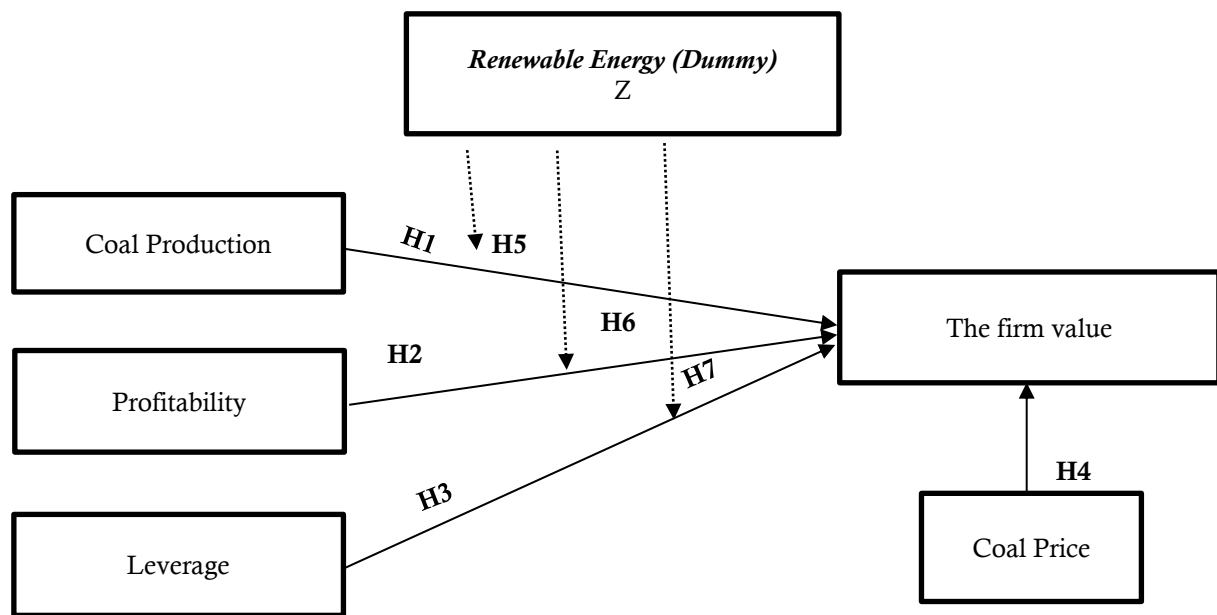


Figure 1. Research Framework

## 3. Data and Method

### Research Population

The population is all subjects (objects, companies, events) or things that are the focus of research. The population in this study are coal sub-sector energy sector companies listed on the Indonesia Stock Exchange for the 2018-2022 period. The population in this study was 23 energy sector companies listed on the Indonesian Stock Exchange.

### Research Sample

The sample is part of the population's number and characteristics. Firm sampling in this research uses a purposive sampling method; namely, samples will be taken based on certain criteria with the aim of obtaining a representative sample according to predetermined criteria.

Table 1. Sample Selection Criteria

Information	Amount
Energy sector companies (coal subsector) registered during the observation period	23
Number of energy sector companies (coal subsector) that experienced losses during the observation period	(12)
<b>Number of observation samples</b>	<b>11</b>

Source: Processed Data (2022)



Based on the criteria table above, the research sample size was 11 companies from a total population of 23 companies in the energy sector (coal subsector) listed on the Indonesia Stock Exchange during the research period. The following is a list of sample companies observed in this study:

### Data collection technique

#### Data Type

The data used in this research is panel data for the period January 2018 - December 2022. This data is obtained from secondary sources, namely, Financial Report data published by the Indonesian Stock Exchange and the firm concerned.

#### Data source

The data sources used come from secondary data that has been published and issued by the Indonesian Stock Exchange and the official websites of related companies during the period January 2018 - December 2022, which includes influence data Coal Production, Profit – Return On Equity (ROE), Leverage – Debt to Equity Ratio (DER) and Coal Prices in the process of diversifying the renewable energy business on the value of energy sector companies listed on the IDX for the period January 2018 - December 2022. The data collection method used in this research uses the purposive sampling method, which is a type of non-random sample selection whose information is obtained using certain considerations or criteria (Sugiyono, 2016).

#### Panel Data Regression Analysis

The data used in this research is panel data. Panel data is a combination of time series and cross-section data. Panel data has the main advantage of being robust to several types of violations of classical assumptions, so panel data does not need to test classical assumptions. Another advantage of using panel data, according to Gujarati (2018), is that by combining time series and cross-section data, the data obtained is more informative and more varied, there is less collinearity between variables, more degrees of freedom so that the estimated data is more efficient, you can see the dynamics of change and able to learn complex behavioral models and minimize bias. Panel data regression analysis is used in this research to predict the relationship between the independent variable and the dependent variable. The analytical tools used are EViews 9.0 software. The relationship between independent variables, namely Coal Production, Profit - Return on Equity, Leverage - Debt to Equity Ratio, Coal Price, and Renewable Energy as dummy variables, on the resulting stock returns (PBV). (Y) is measured using the following equation formula:

$$PBV = \alpha + \beta_1 Prod + \beta_2 ROE + \beta_3 DER + \beta_4 NCP + \beta_5 Product * RE + \beta_6 ROE * RE + \beta_7 DER * RE + e \quad (1)$$

PBV	: Price to Book Value
$\alpha$	: Constant
$\beta_1 - \beta_7$	: Regression coefficient
Prod	: Ratio to measure coal production
ROE	: Ratio to measure profitability
DER	: Ratio to measure leverage
NCP	: Ratio to measure Newcastle Coal Price
RE	: Dummy variable ratio (Renewable energy)
e	: Error

The panel data used in this research consists of a series of observations collected through observations across time and places. Panel data has the main advantage of overcoming several types of violations of classical assumptions, so there is no need to test classical assumptions. Panel data regression analysis is used in this research to predict the relationship between independent variables and dependent variables. The analysis tool used is EViews 9.0 software. The relationship between independent variables, namely Coal Production, Profit - Return on Equity, Leverage - Debt to Equity Ratio, Coal Prices, and Renewable Energy as dummy variables.

## 4. Results

### Results of Panel Data Regression Analysis

This research utilizes panel data in the form of a combination of cross-section data and time series data. The cross-section data in this study is composed of 11 companies listed on the IDX. The time series data in this research consists of Coal Production (Prod), profitability (ROE), leverage (DER), Newcastle Coal Price (NCP), Renewable Energy (RE), and PBV (Firm value) from 2018 to 2022. The only equations that meet classical assumptions are those that use the Generalized Least Square (GLS) method. In Eviews, the estimation model that uses the GLS method is only the Random Effect Model, while the Common Effect and Fixed Effect use Ordinary Least Square (OLS). Thus, whether it is necessary to test classical assumptions in this research depends on the results of selecting the estimation method. If the selection of the appropriate estimation method for the regression equation is the Random Effect Model, then there is no need to test the classical assumptions. On the other hand, if the regression equation estimation method is more suitable using Common Effects or Fixed Effects (OLS), it is necessary to test the classical assumptions.

### Common Effects Model

The initial stage was data processing by utilizing the Common Effect Model (CEM) perspective in a simple form, combining all times series data and cross-section data, and then estimating the model using the Ordinary Least Square (OLS) method. The results of using the Common Effect Model are as follows:

**Table 2. Testing Common Effects Model (CEM)**

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	-52.14788	74.73671	-0.697755	0.4888
Prod	-273.7770	241.3205	-1.134495	0.2625
ROE	11.16188	1.635158	6.826179	0.0000
DER	0.141933	1.315529	0.107891	0.9146
NCP	-22.34964	58.10678	-0.384631	0.7023
RE	157.5190	124.5989	1.264209	0.2125
Prod * RE	346.8327	350.3391	0.989992	0.3274
ROE * RE	-9.050839	2.490106	-3.634720	0.0007
DER*RE	0.085597	1.833440	0.046687	0.9630

Source: Processed Data (2022)

The Common Effects Model (CEM) test results show that the Return on Equity (ROE) variable has a significant influence on price-to-book value (PBV), with a positive coefficient of 11.16188 and t-statistics of 6.826179 and a probability of 0.0000. However, other variables such as Coal Production (Prod), Leverage (DER), Newcastle Coal Price (NCP), and the dummy variable Renewable Energy (RE) do not have a significant influence on PBV. In addition, there is a significant interaction between ROE and the Renewable Energy dummy variable (ROE \* RE), which shows a negative influence on PBV, with t-statistics of -3.634720 and a probability of 0.0007. Meanwhile, the interactions between Prod and RE, as well as DER and RE, do not have a significant effect on PBV.

### Fixed Effect Model

The next stage is data processing through the Fixed Effect Model (FEM) perspective to compare the Common Effect Model method. The results of using the Fixed Effect Model are as follows:

**Table 3. Testing Fixed Effect Model (FEM)**

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	-17.90249	120.0041	-0.149182	0.8822
Prod	-378.6437	271.6050	-1.394097	0.1718
ROE	8.547365	2.291105	3.730673	0.0007
DER	0.617873	2.744115	0.225163	0.8231
NCP	8.769807	71.98928	0.121821	0.9037

RE	190.9649	177.2773	1.077210	0.2886
Prod * RE	318.2684	407.9045	0.780252	0.4403
ROE * RE	-7.570196	3.208819	-2.359184	0.0239
DER*RE	-0.239048	2.276439	-0.105010	0.9170

Source: Processed Data (2022)

Test results show that the Return on Equity (ROE) variable has a significant influence on Price-to-book Value (PBV), with a positive coefficient of 10.89828 and t-statistics of 6.411340 and a probability of 0.0000. However, other variables such as Coal Production (Prod), Leverage (DER), Newcastle Coal Price (NCP), and the dummy variable Renewable Energy (RE) do not have a significant influence on PBV. There is also a significant interaction between ROE and the Renewable Energy dummy variable (ROE \* RE), showing a negative influence on PBV, with t-statistics of -3.427517 and a probability of 0.0013. Meanwhile, the interactions between Prod and RE, as well as DER and RE, do not have a significant effect on PBV.

### Random Effect Model

The third stage is data processing through the Random Effect Model (REM) perspective to compare the Fixed Effect Model (FEM). The results of using the Random Effect Model are as follows:

**Table 4. Testing Random Effect Model (BRAKE)**

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	-47.51923	79.58747	-0.597069	0.5534
Prod	-272.8579	242.9326	-1.123184	0.2672
ROE	10.89828	1.699845	6.411340	0.0000
DER	0.151760	1.388770	0.109276	0.9135
NCP	-19.68435	59.14564	-0.332812	0.7408
RE	157.8302	131.0046	1.204768	0.2345
Prod * RE	319.7205	356.1228	0.897782	0.3740
ROE * RE	-8.800971	2.567739	-3.427517	0.0013
DER*RE	0.048662	1.884511	0.025822	0.9795

Source: Processed Data (2022)

The test results using the Random Effects (BRAKE) model show that the Return on Equity (ROE) variable has a significant influence on Price to Book Value (PBV), with a positive coefficient of 10.89828, t-statistics of 6.411340, and a probability of 0.0000. Other variables such as Coal Production (Prod), Leverage (DER), Newcastle Coal Price (NCP), and the dummy variable Renewable Energy (RE) do not have a significant influence on PBV. There is a significant interaction between ROE and the Renewable Energy dummy variable (ROE \* RE), which shows a negative influence on PBV, with t-statistics of -3.427517 and a probability of 0.0013. However, the interactions between Prod and RE and DER and RE did not have a significant effect on PBV.

### Selection of Panel Data Regression Models

#### Chow Test

The Chow test is used with the aim of understanding which model is the best between common effects and fixed effects. Chow's test hypothesis is:

**Table 5. Chow Test Results**

Effects Test	Statistics	df	Prob.
Cross-section F	1.067509	(10.36)	0.4113
Chi-square cross-section	14.283048	10	0.1605

Source: Processed Data (2022)

Based on Table 6 above, referring to the Chow test shown in the table above, there is a significant figure obtained from the Chi-square cross-section, namely  $0.1605 > 5\%$ , so in statistical form,  $H_0$  is accepted. Therefore, the appropriate estimation model used for panel data regression is the



Common Effect Model. Chow test processing shows that the model that is more suitable for use is the Common Effect Model, so the Lagrange test is needed to test the model that is more suitable for use, whether the Common Effect Model or the Random Effect Model.

#### Lagrange test

The use of the Lagrange test is to understand which model is more appropriate, whether the random effect model or the common effect model. The hypothesis for the Lagrange test is:

**Table 6. Lagrange Test Results**

Null (no rand. effect) Alternatives	Cross-section One-sided	Period One-sided	Both
Breusch-Pagan	78.50954 (0.0079)	0.666797 (0.1967)	174.5189 (0.0164)
Honda	-28.01955 (0.0061)	-1.290999 (0.9016)	-1.111003 (0.8667)
King-Wu	-28.01955 (0.0061)	-1.290999 (0.9016)	-1.240865 (0.8927)

Source: Processed Data (2022)

Based on Table 7 above, referring to the Lagrange test shown in the table above, the significance figure is obtained Breusch-Pagannamely  $0.0079 < 5\%$ , then in statistical form,  $H_0$  is rejected. Therefore, the appropriate estimation model used in panel data regression is the Random Effect Model. Because the best model results are the Random Effect Model, which uses estimation with GLS, the model does not require classical assumptions and can be continued to see hypothesis testing.

#### Panel data analysis conclusion

Referring to the Chow test and Lagrange test, the panel data regression model used for this research is the Random Effect Model.

## 5. Discussion

### The Effect of Coal Production on Firm Value

Coal production in this research also resulted in the conclusion that coal production is not the main factor that can move Firm value in either a positive or negative direction. The size of coal production depends on the level of coal sales itself, so if coal production is large but sales growth is small, then the Firm value will also move in a negative direction. It can be interpreted that the size of sales will greatly influence coal production, so if the coal production variable stands alone, it is considered not to affect Firm value. Coal production does not have a direct effect on Firm value. However, it depends on the level of sales growth, proven by research conducted by Fery (2018) on The effect of leverage, sales growth, and liquidity on the firm value by Bambang et al. (2020) on Determinants of profitability and its implications on corporate values which states that the level of sales growth has a positive effect on the firm value. The results of this research can be used as consideration for companies so that apart from increasing coal production figures, companies must also be able to find ways to increase their sales figures to gain profits from sales growth levels.

### The Effect of Profitability on Firm Value

Hypothesis testing concludes that return on equity has a positive effect on Firm value in coal sub-sector energy sector companies listed on the Indonesia Stock Exchange for the period 2018 - 2022. The results of this research are in line with the results of previous research conducted by Jihadi et al. (2021), Mutiara Sari & Supriati (2024), and Afinindy et al. (2021), which state that profitability has a positive and significant effect on firm value. The positive direction means that greater profitability will increase Firm value. Other research from Mulyana and Adidarma (2020) suggests that many factors can influence Firm value, one of which is the profitability variable. Profitability is a Firm's ability to generate profits which is considered a signal for the firm to attract the attention of investors in investing their capital. In this research, the return on equity

variable has a positive relationship, which means that if the return on equity increases, the condition of Firm value will also increase. This is because investors feel satisfied with management's performance in managing their equity to generate profits. The results of this research also support signaling theory, where companies that can increase their profits from year to year give positive signals to investors regarding the firm's performance so that investors feel attracted to the firm because they assess the firm's prospects will bring profits to investors (Islamiyati & Faruqi, 2023; Putra, 2021).

#### **The Effect of Leverage on Firm Value**

Hypothesis testing concludes that leverage does not affect Firm value research results from Putra et al. (2017), Wahyuni, Alam, and Pakki (2020), Ruwantha (2021), and Kasim et al. (2021). Hartati et al. (2021) show that the debt ratio does not have a direct influence on Firm value. According to Harahap (2020), the DER ratio (Debt Equity Ratio) describes the extent to which the owner's capital can cover debts to outside parties. The smaller this ratio, the better. For external party security, the best ratio is if the capital is greater than the amount of debt or at least the same. DER can influence investors to invest; in general, investors will invest their money in companies that do not have a high debt burden because the debt burden will increase the interest burden on the firm. Leverage or debt levels in this research are also considered not to affect Firm value because if the firm is able to generate large profits from coal sales, the debt level ratio will be covered by the profitability.

#### **The Effect of Newcastle Coal Price on Firm Value**

Based on Table 4.8, the results of hypothesis testing conclude that Newcastle Coal Price has no direct effect on Firm value. According to Kotler and Armstrong (2019), price is the amount charged for a product or service. More broadly, price is the sum of all the values given by customers to gain benefits from owning or using a product or service. In this case, the product in question is coal. There are several factors that cause the price of coal to rise and fall, namely during the Covid-19 pandemic, which requires people to do activities indoors, so the need for energy, especially electrical energy, increases. Another factor is because of the geopolitical tension between Russia and Ukraine, cutting off gas supplies from Russia to European countries, causing European countries to experience an energy crisis. In order to overcome the energy crisis, European countries canceled plans to close coal-fired power plants and reactivate these power plants (Wicaksono, 2022). In this research, the up and down movements in Newcastle Coal Prices are considered to have no direct effect on Firm value because these price movements will only have an effect if coal production is high and the level of sales growth resulting from coal sales is also high.

#### **The Effect of Coal Production on Firm Value**

Hypothesis testing concludes that renewable energy is unable to moderate coal production. Renewable energy is new to this research, so there are no references and links between renewable energy moderating the influence of coal production and Firm value. However, if we refer to close research, namely research from Dian and Wahidahwati (2021), it is stated that sustainability reports do not affect Firm value. This finding is in line with the results of this research. Renewable energy is considered not to affect Firm value because the percentage of renewable energy in a Firm is currently still very small. Coal production in this research also resulted in the conclusion that coal production is not the main factor that can move Firm value in either a positive or negative direction. The size of coal production depends on the level of coal sales itself, so if coal production is large but sales growth is small, then the Firm value will also move in a negative direction. It can be interpreted that the size of sales will greatly influence coal production, so if the coal production variable stands alone, it is considered not to affect Firm value.

#### **The Effect of Profitability on Firm Value**

Hypothesis testing concludes that renewable energy moderation has the effect of weakening profitability (return on equity) on Firm value. Renewable energy is new to this research, so it is not. There are references and links between renewable energy moderating profitability and Firm value. However, suppose we refer to research on the relationship between profitability and Firm

value. In that case, the results of this research are in line with the results of previous research conducted by Jihadi et al. (2021) and Afinindy et al. (2021), which stated that profitability has a positive and significant effect on firm value. Other research from Mulyana and Adidarma (2020) suggests that many factors can influence Firm value, one of which is the profitability variable. Profitability is a Firm's ability to generate profits which is considered a signal for the firm to attract the attention of investors in investing their capital. In this research, the return on equity variable has a positive relationship, which means that if the return on equity increases, the condition of Firm value will also increase. This result is because investors feel satisfied with management's performance in managing their equity to generate profits. However, after including the Renewable Energy variable, it was concluded that Renewable Energy moderation weakened the level of profitability of coal companies. This finding is likely to happen because the firm's profits generated from Renewable Energy are still relatively small. The firm's focus is divided between having to focus on the main business in the coal sector or having to share focus with Renewable Energy.

### **The Effect of Leverage on Firm Value**

Hypothesis testing concludes that renewable energy is unable to moderate leverage (DER) on Firm value. Renewable energy is new to this research so there are no references and links between renewable energy moderating the influence of coal production and firm value. However, if we refer to close research, namely research from Dian Kartika Sari and Wahidahwati (2021), it is stated that sustainability reports do not affect Firm value. This result is in line with the results of this research. Renewable energy is considered not to affect Firm value because the percentage of renewable energy in a Firm is currently still very small. Research results from Putra et al. (2021), Wahyuni, Alam, and Pakki (2020), Ruwantha (2021), Kasim et al. (2021), and Hartati et al. (2021) also show that the debt ratio does not have a direct influence on Firm value. Leverage or debt levels in this research are also considered not to affect firm value because if the firm is able to generate large profits from coal sales, the debt level ratio will be covered by the profitability variable.

## **6. Conclusion**

Based on the results of this research, it can be concluded that coal production does not affect Firm value (PBV). This finding probably happens because coal production is not the main factor that can move Firm value in either a positive or negative direction. The size of coal production depends on the level of coal sales itself (sales growth). Profitability has a positive effect on Firm value (PBV). It can be interpreted that if a Firm operating in the coal sub-sector energy sector can increase its profitability by increasing sales/sales growth to obtain a higher level of Firm income value, leverage does not affect Firm value (PBV). This result can be explained by the fact that high levels of debt will not have an effect if the firm is still making a profit. The price of coal (Newcastle Coal Price) does not affect firm value (PBV) because global coal price movements are considered to have no impact on the value of coal companies in Indonesia. Renewable energy is unable to moderate the influence of coal production on Firm value (PBV). This condition is possible because the renewable energy factor of each firm is still relatively small when compared to its main core business, namely coal. The managerial implication for a brief conclusion is that in the energy sector, companies must consider not only traditional factors such as coal production, profitability, and leverage but also Newcastle coal prices and the influence of renewable energy as moderators on Firm value.

## **Recommendation**

Based on the research results, the following implications and suggestions can be put forward: Further research can use periods outside of crisis periods, such as the Covid-19 pandemic, or compare the influence of these variables if economic conditions were normal. Future research can also change the proxy variables to obtain more varied results, for example, by using the variables total available coal reserves, reference coal prices in Indonesia, liquidity, Net Profit Margin (NPM), and dividend yield.

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