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The International Gas and Crude Oil Price Variability Effect on Indonesian Coal Mining Companies Listed at IDX

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ABSTRACT

This study investigates the influence of gas price, crude oil price and international coal demand on coal sales volume, coal selling price, coal sales revenue, financial performance, business risk and stock price Indonesia coal mining is listed on Indonesia Stock Exchange (IDX). The sample is Indonesia coal mining companies listed on IDX in the period 2014-2018. This study employs a structural equation model using GeSCA software to examine the relationship and effect between research variables. The empirical result shows that Crude Oil Price has a significant positive effect on Gas Price and International Coal Demand, bidirectionally. Gas Price has a significant negative effect on International Coal Demand, bidirectionally. International Coal Demand has no significant positive effect on Coal Selling Price and Sales Volume. Coal Selling Price has not a significant positive effect on Sales Volume. Production Cost has a significant positive effect on Coal Selling Price. Coal Selling Price and Sales Volume have a significant positive effect on Sales Revenue. Coal Sales Revenue has a significant negative effect on Enterprise Risk. The originality of this study investigates a relationship between International Coal Demand, Coal Selling Price and Coal Sales Volume which has never been done in previous research.

Keywords: Oil Price, Gas Price, Coal Price, Coal Sales, Enterprise Risk, Stock Price, Financial Performance
JEL Classification: Q41, G30, G32, N25, O13, O16, R53

1. INTRODUCTION

Coal mining companies in Indonesia have an important role in contributing to the Gross Domestic Product (GDP). The contribution of coal and lignite mining to GDP in 2011 and 2016 decreased, from 3.23% in 2011 to 1.87% in 2016. The contribution of coal and lignite mining to GDP began to increase again in 2017 to 2.38%. Coal mining companies in Indonesia are required to pay royalties to the Indonesian Government for all coal sold. This royalty constitutes Non-Tax State Revenue. Also, coal mining companies must pay taxes following the applicable tax provisions in Indonesia, namely the Income Tax and Value Added Tax. If the coal mining company imports equipment from abroad, it will incur a Value Added Tax on the import duty.

The international coal market has been segmented for a long time, especially between the Atlantic and Pacific basins, but also concerning coal quality, shipping vessel size, and sectoral demand (Zaklan et al., 2012). Coal prices are generally influenced by three main factors, namely coal demand and supply, coal substitution commodity prices, and seasonality. Indonesia is one of the largest coal producers in the world (Gokkon, 2018) and one of the largest coal exporters in the world also. Average Coal Benchmark Prices (HBA) and Average Newcastle Coal Index Prices have decreased from 2014 to 2015 and have increased in 2016, 2017 and 2018.

Coal remains the most important energy source in the world and reaches the highest share of global primary energy consumption (29.9%) in 2012 (Lei et al., 2014). Coal provides more than 23% of global primary energy needs (compared to 36% for oil) and accounts for 39% of the world's electricity industry (Hasan and Ratti, 2014).

Currently, there are not many researchers who research the coal business both at the national or international level and research results on Gas Prices, Petroleum Prices, International Coal Demand, Coal Sales Volume and Coal Sales Prices, Coal Sales Revenues, Financial Performance, Business Risks and Stock Prices are not yet conclusive, therefore researcher feels the need to examine The International Gas and Crude Oil Price Variability Effect on Indonesian Coal Mining Companies Listed at IDX.

2. LITERATURE REVIEW

2.1. Crude Oil Price, Gas Price, Coal Demand and Coal Price

Coal, oil and gas are used to drive economic activities. Most of this power is provided in the form of heat processing. The amount of process heat produced depends on the fuel energy content, which is measured in BTU or calories. Using coal, oil, and natural gas as sources for heat processes implies that their prices must be related because the factors of production are generally valued according to the value of their marginal products. A smaller price increase for natural gas relative to an increase in coal and oil prices will support the substitution of natural gas. An increase in the price of wellhead crude oil increases the price of oil and coal in power plants (and possibly other end users). Likewise, an increase in coal prices at the mouth of a mine will reduce the price of natural gas in power plants (Kaufmann and Hines, 2018).

Demand is a schedule or curve showing various quantities of products that are willing and can be bought by consumers at every possible set of prices over a certain period. Demand shows the number of products to be purchased at various possible prices, assuming other things are the same (McConnell et al., 2018). The price of thermal coal is determined by the price of electricity (Cui and Wei, 2017), calorie value and tonnage needed as well as transportation and insurance rates (Thomas, 2013). The price elasticity of electricity demand and the price elasticity of thermal coal supply also have an important influence on coal prices (Cui and Wei, 2017).

Coal prices have jumped during the recent "oil price crisis," where coal prices have peaked as dramatically as oil prices. Increased coal price pressures on the main buyers of steam coal types, namely utility/electricity generation, are additional factors that are driving toward price integration, (Zaklan et al., 2012). Mohammadi (2011) found that the price of crude oil was not affected by events in the coal and/or natural gas market, the price of natural gas is affected by events in the crude oil market, and coal prices are not affected by events on the crude oil and/or natural gas markets. Shafiee and Topal (2010) found a positive and significant relationship between oil and natural gas prices, while Bachmeier and Griffin (2006) and Hulshof et al. (2016) only found a weak relationship between the price of crude oil and natural gas. Adi (2022) when a certain fuel price of generation has increased significantly, PLN optimized other types of generators with cheaper fuel prices of generation. Furthermore, Adi (2022) found a significant negative effect of the fuel price of generation on the fuel consumption of the generation, if oil prices increase, electricity production will shift to more coal-fired power plant usage or hydropower. Oil prices are generally higher than coal prices on an energy basis (Btu).

Guo et al. (2016) crude oil is a major substitute for coal, fluctuations in the price of crude oil will affect demand and coal prices. When the price of crude oil rises, the demand for coal will increase accordingly as a substitute, fluctuations can also occur in prices. Zamani (2016) found that coal prices are affected by the supply and demand shocks of the oil market, and Narjes (2016) found a high interaction between the crude oil market and the coal market, while Shafiee and Topal (2010) and Tie and Chien (2018) found different results, the relationship between coal and crude oil prices had a weak relationship, and Hulshof et al. (2016) found no effect.

Jordan et al. (2018) declined natural gas prices and slower growth in electricity consumption reduced coal demand and mining profitability, raising closures. While Shafiee and Topal (2010) found a relationship between natural gas and coal prices to be weak, in line with (Li et al., 2017) finding the effect of coal prices on natural gas prices was very small, but the effect of natural gas prices on coal prices was very strong in North America and Germany, but in Japan, the effect of natural gas on coal is weaker compared to other regions. According to Bachmeier and Griffin (2006), for energy products that are included in the same integrated product and geographical market, usually, as opposed to different, a series of supply/demand factors determine the formation of prices and product flows.

2.2. Coal Price Index, Coal Selling Price, Coal Sales Volume and Coal Sales Revenue

The Coal Selling Price will be determined based on the current market price level, the Coal Price Index, which is determined by government authorities or by an independent commercial organization (Thomas, 2013). The quantity demanded decreases when the price rises and rises when the price falls, the quantity demanded relates negatively to the price (Gans et al., 2018), the relationship between the price and the quantity demanded is following the law of demand. Papież and Śmiech (2015) distinguish two types of coal prices, namely price setters and price takers. According to Song and Wang (2019), the main factors that motivate coal resources to flow throughout the world are the spatial distribution of resources, the level of supply-demand suitability, spatial distance, market factors and national policies, etc.

The increase in coal prices caused an increase in the cost of the electric power industry, but its influence gradually declined with the increase in coal prices (He et al., 2010). The coal mining company's profit equilibrium will decrease if the price of coal rises. Coal-fired power companies choose a strategy to maximize profits or secure a supply strategy (Fan et al., 2018). Larger scale production and better efficiency allow higher sales volumes and lower price offerings (David, 2011). Consumers "replace" this commodity with others when prices change but purchasing power remains constant. Demand can go up or down when prices go up, and demand can go up or down when income rises (Varian, 2014). Demand for the mine's coal is a function of the mine's coal price and residual demand after accounting for supply from other mines (Jordan et al., 2018). The electricity company will optimize power plants that have cheaper fuel and reduce electricity supply from power plants with more expensive fuels.

Getting prices right is one of the most basic and important management functions. A very small change in the Average price translates to a large change in operating profit. Appropriate pricing is the fastest and most effective way for companies to grow profits. The right price will increase profits faster than increasing volume; False prices can shrink profits quickly (Marn et al., 2004). A price increase will cause an increase in operating profit, an increase in sales volume will increase profit, a decrease in variable costs will increase operating profit, and with a decrease in fixed costs, profit will increase (Baker et al., 2010). Increased volatility in energy prices can reduce the production of each commodity and may lead to a reduction in profits in the short term (Ulrich, 2009).

2.3. Production Cost and Coal Selling Price

Production Cost is the total Production Cost incurred during a period of raw materials, direct labour, production overhead and reported in the income statement as the cost of goods sold (Ross et al., 2016). If the fixed costs of production are high and the sales volume is low, the company cannot cover the fixed costs and the company will not be profitable (Hill and Jones, 2009). When output prices decline, companies generally take action to reduce costs (Hong and Sarkar, 2008), this creates costs that vary positively with output prices (Petersen and Thiagarajan, 2000), thus operating costs tend to be partly constant (not dependent on output prices) and some vary with output prices (Hong and Sarkar, 2008).

Large coal-producing countries, such as Indonesia and South Africa, are vulnerable to heavy rains and floods, which lead to coal production constraints and export disruptions (Song and Wang, 2019). The Indonesian Coal Mining Association (APBI) states that "nearly 80% of Indonesian coal miners have temporarily suspended production because the Production Cost margin has changed Negatively" (Indonesia Investments, 2015). A decline in the competitiveness of coal prices results in a decrease in domestic sales and a reduction in exports (Kowalska and Turek, 2017). The price of coal in the market and the cost of coal mining are one of the factors that will determine the selling price of coal and the volume of production and sales to be carried out by coal mining companies.

2.4. Coal Selling Price, Coal Sales Volume and Financial Performance

Measuring the Profitability of the income statement allows us to estimate how profitable a company is in absolute terms, it is equally important for us to measure the profitability of a company in terms of percentage of returns (Damodaran, 2012). A price increase will cause an increase in operating profit, an increase in sales volume will increase profit, and a decrease in variable costs will increase operating profit and decrease fixed costs so that profit will increase (Baker et al., 2010). For commodity producers, it seems reasonable to assume that income is a function of increasing output prices, costs are fixed or increasing with output prices, and net operating cash flow is a function of increasing output prices (Hong and Sarkar, 2008). A 1% increase in coal prices increases coal company revenues between 0.15% and 0.17% (Hasan and Ratti, 2014) and a 1% increase in coal price raises the return of coal sector returns by between 0.22% and 0.30% (Hasan and Ratti, 2015).

Guo et al. (2016) found that the constant low coal prices affect the profits of coal companies and the use of coal from downstream companies; the accuracy of coal pricing provides a reference for these companies to make their management strategies. Sales volume affects Coal Selling Price. Consumers anticipate price increases or limited transportation capacity; they will increase the number of coal purchases in the same month. Meanwhile, coal companies can reduce coal prices to increase Coal Sales Volume.

2.5. Coal Sales Revenue, Financial Performance, Enterprise Risk and Stock Price

Sales income is the main source of income for trading companies (Kimmel et al., 2013). Hasan and Ratti, (2014) found an increase in revenue from an increase in coal prices and oil prices had a statistically significant positive effect on coal company stock returns.

Risk can mean different things to different people. Risk is a variable that can cause deviations from the expected results and therefore can affect the achievement of business goals and overall organizational performance (Lam, 2017), dealing with uncertainty is very important, reflecting the choices and behaviour and attitudes of individuals towards risk (Tapiero, 2004). The Degree of Operating Leverage (DOL) is a numerical measure of a company's operating leverage. Degree of Operating Leverage (DOL) is a function of the company's cost structure and is usually defined in the relationship between fixed costs and total costs. Companies that have fixed costs that are relatively high to total costs are said to have high operating leverage. Companies with high operating leverage will also have higher variability in operating income than companies that produce similar products with low operating leverage (Damodaran, 2012). Debt to Equity Ratio or the ratio of debt to the capital with the formula of total debt divided by total equity (Brigham and Houston, 2019), Increasing company DER increases equity risk (common stock) (Bhandari, 1988). Beta (coefficient) is a measure of market risk/non-diversification associated with securities provided in the market (James, 2003).

Patel (2014) found that financial performance measured using ROCE, ROE and EPS has a positive correlation with enterprise risk as measured using DOL, DFL and DTL. ROA also has a positive correlation with DOL and DTL while ROA has a negative correlation with DFL. This is contrary to Khushbakht (2013), who found that there is a positive correlation between ROA and DFL while there is a negative correlation between ROA and DOL. Asiri and Hameed (2014) found a significant negative relationship between ROA and Debt to Assets Ratio and Financial Leverage calculated using the Total Assets formula divided by Total Equity, but ROA was not negatively related to Stock Beta. Hasan and Ratti (2014) found the beta coefficient of market returns of companies in the primary energy sector is significantly greater than 1, which confirms that companies in the sector are riskier than risks in the market in general. This finding is in line with Ball and Brown (1980) who found that the mining equity performance of the mining industry in Australia is relatively risky.

Investors like higher cash flow, but they don't like risk; so the greater the expected cash flow and the lower the perceived risk and the higher the Stock Price (Brigham and Houston, 2019). Stock Price reflects all information known to the public about the expected future benefits of the intended stock (Salvatore, 2005). The volatility of a company's stock returns is a function of the level of stock prices which is itself a function of Firm Value and is not considered constant (Rogers, 2013).

The increase in revenue from rising coal prices and oil prices has a statistically significant positive effect on the stock returns of coal companies (Hasan and Ratti, 2014). Net Profit Margin, Return on Assets has a significant positive effect on stock returns, while Return on Equity has no significant effect on stock returns (Anwaar, 2016). The role of Enterprise Risk is measured using DOL and DFL in enlarging the business risks of the intrinsic of the common stock. Mandelker and Rhee (1984) The DOL and DFL levels explain a large part of the variability of stock beta. DOL and DFL have a significant correlation with common stock beta. Adi et al. (2013), used the stock beta indicator as an indicator to calculate Market Risk, the smaller the beta stock of a mining company the lower risk, and the greater the beta stock the greater the risk.

For public companies, Firm Value is reflected at any time in Stock Price. Therefore, management must act only on the opportunities expected to create value for company owners by increasing Stock Prices (Gitman and Zutter, 2012). Kim et al. (2019), examined the energy price index consisting of crude oil prices, natural gas and coal prices to predict stock returns. The results show that coal prices have insignificant coefficients in each regression model, while the energy price index is a positive prediction for stock returns in the coming 1 month. This finding contradicts the conventional view that the reduction (increase) in energy prices is good (bad) news for clean energy importing economies such as the US. Baker and Wurgler (2006), when sentiment is high, on the other hand, these stock categories will get a relatively low subsequent return.

3. METHODOLOGY

3.1. Research Design

The research conducted was included in the type of explanatory research, namely explaining the effect of variable X on Y through testing the structural model. In general, the data presented is in the form of figures that will be calculated through a statistical test. The sample in this study were coal mining companies listed on the Indonesia Stock Exchange in the period 2014-2018, which were represented by audited company financial statement data and Stock Price historical data on the Indonesia Stock Exchange.

3.1.1. Sampling

The population of coal mining companies listed on the Indonesia Stock Exchange is 19 companies. The sample in this study were coal mining companies listed on the Indonesia Stock Exchange in the period 2014-2018 totalling 15 companies. The companies that were sampled in this study were selected based on certain criteria (purposive sampling), namely:

1. Coal mining companies are listed on the Indonesia Stock Exchange and have published financial reports for the period ending December 31 during the period 2014-2018 and provided all the information needed for the calculation of the indicators used in this study.
2. Coal mining companies listed on the Indonesia Stock Exchange have a summary report from the Indonesia Stock Exchange in the period 2014-2018.

Based on the sample selection criteria mentioned above, the coal mining companies that meet the criteria as a sample of 9 companies.

3.1.2. Research variables

The research problem in this paper is formulated into a simultaneous model, which is a model formed through more than one dependent variable explained by one or several independent variables, where a dependent variable at the same time will act as an independent variable for other tiered relationships (Ferdinand, 2002).

The research variables in this study are as below:

1. Crude Oil Price (X1) as measured using formative indicators as follows:
   (1) Dubai Oil Price (X1.1), (2) Brent Oil Price (X1.2), (3) WTI Price (X1.3)
2. Gas Price (X2) as measured using formative indicators as follows:
   (1) Japan Price (X2.1), (2) Japan Korea Maker Price (X2.2), (3) OECD Price (X2.3)
3. International Coal Demand (X3) as measured using formative indicators as follows:
   (1) Import Coal Demand (X3.1)
4. Coal Price Index (X4) as measured using formative indicators as follows:
   (1) Average Coal Benchmark Prices (HBA) (X4.1), (2) Average Newcastle Index (4.2)
5. Coal Selling Price (X5) as measured using formative indicators as follows:
   (1) Average Coal Selling Price (X5.1)
6. Coal Sales Volume (X6) as measured using formative indicators as follows:
   (1) Coal Sales Volume (X6.1)
7. Coal Sales Revenue (X7) as measured using formative indicators as follows:
   (1) Domestic Sales Revenue (X7.1), (2) Export Sales Revenue (X7.2)
8. Production Cost (X8) as measured using formative indicators as follows:
   (1) Production Cost Per Ton (X8.1)
9. Financial Performance (X9) as measured using formative indicators as follows:
   (1) *Net Profit Margin* (X9.1), (2) *Return on Asset* (X9.2), (3) *Return on Equity* (X9.3).
10. Enterprise Risk (X10) as measured using formative indicators as follows:
    (1) *Degree of Operating Leverage* (X10.1), (2) *Debt to Equity Ratio* (X10.2), (3) Stock Beta (X10.3).
11. Stock Price (X11) as measured using formative indicators as follows:
    (1) Closing Stock Price (X11.1)

3.2. Inferential Statistical Analysis

Inferential statistical analysis is an analysis that focuses on the field of analysis and interpretation of data to conclude. The inferential statistical method used to analyze in this study is covariance-based or component-based using Generalized Structured Component Analysis (GeSCA) software. GeSCA is an alternative method to partial least squares for path analysis with components. This method employs a well-defined least-squares criterion to estimate model parameters. The method avoids the principal limitation of partial least squares (i.e., the lack of a global optimization procedure) while fully retaining all the advantages of partial least squares (e.g., less restricted distributional assumptions and no improper solutions). The method is also versatile enough to capture complex relationships among variables, including higher-order components and multi-group comparisons (Hwang and Takane, 2004).

3.2.1. Development of structural charts

The structural model analysed is presented in the flowchart as in Figure 1. Based on the literature review and previous studies, the hypotheses in this study are as follows:

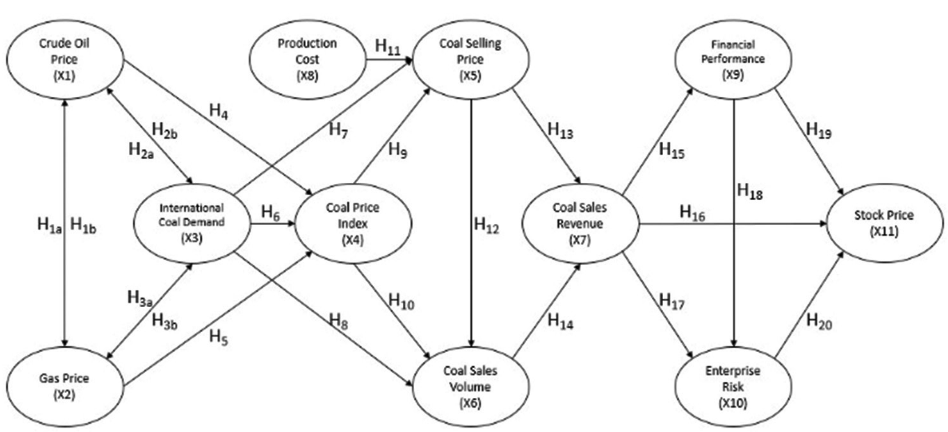
H1a : Crude Oil Price has a significant positive effect on Gas Price.
H1b : Gas Price has a significant positive effect on Crude Oil Price.
H2a : Crude Oil Price has a significant positive effect on International Coal Demand.
H2b : International Coal Demand has a significant positive effect on Crude Oil Price.
H3a : Gas Price has a significant negative effect on International Coal Demand.
H3b : International Coal Demand has a significant negative effect on Gas Price.
H4 : Crude Oil Price has a significant positive effect on Coal Price Index.
H5 : Gas Price has a significant positive effect on Coal Price Index.
H6 : International Coal Demand has a significant positive effect on Coal Price Index.
H7 : International Coal Demand has a significant positive effect on Coal Selling Price.
H8 : International Coal Demand has a significant positive effect on Coal Sales Volume.
H9 : Coal Price Index has a significant positive effect on Coal Selling Price.
H10 : Coal Price Index has a significant positive effect on Coal Sales Volume.
H1 : Production Cost has a significant positive effect on Coal Selling Price.
H12 : Coal Selling Price has a significant positive effect on Coal Sales Volume.
H13 : Coal Sales Volume has a significant positive effect on Coal Sales Revenue.
H14 : Coal Selling Price has a significant positive effect on Coal Sales Revenue.
H15 : Coal Sales Revenue has a significant positive effect on Financial Performance.
H16 : Coal Sales Revenue has a significant positive effect on Stock Price.
H17 : Coal Sales Revenue has a significant negative effect on Enterprise Risk.
H18 : Financial Performance has a significant positive effect on Enterprise Risk.
H19 : Financial Performance has a significant positive effect on Stock Price.
H20 : Enterprise Risk has a significant negative effect on Stock Price.

4. RESULTS AND DISCUSSION

4.1. Evaluation of Model Measurement

The generalized structured component analysis involves the specification of three submodels to specify a structural equation model. The three submodels are measurement, structural, and weighted relation models (Fornell and Bookstein, 1982). An indicator is considered reflective if it is influenced by the corresponding latent variable, whereas it is considered formative if it forms its latent variable. In the GeSCA, the measurement model is specified only when there exist reflective indicators because formative indicators are dealt with by a different submodel - the weighted relation model (Hwang and Takane, 2015). A measurement model specifies a structural model connecting latent variables to one or more measures or observed variables. The latent variable is the formal representation of a concept. The measurement model describes the relationship between the measure and latent variables (Bollen, 1989). When

Figure 1: Structural research model



an indicator is formative, it entails no loading in the measurement model, while its weight denotes how the indicator contributes to forming the corresponding latent variable. FIT shows the proportion of the total variance of all indicators and latent variables explained by a given particular model specification. The values of FIT range from 0 to 1. The larger this value, the more variance in the variables is accounted for by the model specification (Hwang and Takane, 2015).

Then the data is processed using the online GeSCA application and the results are as follows in Table 1.

Indicators X1.1 (Dubai Oil Prices), X10.1 (DOL) and X10.3 (Beta Stocks) are not significant and all indicators on formative constructs X4 (Coal Price Index) and X9 (Financial Performance) are not significant and should be dropped from the model, then data processing was run again using the GeSCA application and the results are as in Table 2.

Based on the results in Table 2, the Brent Oil Price Indicator (X1.2) and WTI Price (X1.3) on the Crude Oil Price (X1) variable have the opposite effect, the Brent Oil Price has the greatest influence in the construct formation formative Crude Oil Price. Japan Korea Maker indicator (X2.2) has the opposite effect with Japan Price indicator (X2.1) and OECD Price indicator (X2.3) in the formation of Gas Price (X2) formative constructs, OECD Price has the most influence on the formation construct formative Gas Price (X2). Export Coal Sales Revenue Indicator (X7.2) has the most influence in forming the formative construct of Coal Sales Revenue (X7), in other words, most coal sales are for export so the largest Coal Sales Revenue comes from exports.

4.2. Structural Model Results

Evaluation of structural models resulting from GeSCA output is as follows as presented in Table 3.

The results of the Path Coefficient Structural Model above are presented in the form of a path diagram as follows.

Based on Table 3 and Figure 2 above, we find the research results as follows:

Hypotheses H1a that examines the effect of Crude Oil Price has a significant positive effect on Gas Price is received due to the path coefficient from Crude Oil Price to Gas Price was 1.164 and CR = 22.86. This means that an increase in Crude Oil Price of 1.164

Table 1: Measurement model of variables

Variable	Loading			Weight			SMC		
	Estimate	SE	CR	Estimate	SE	CR	Estimate	SE	CR
X1	AVE=0.000, Alpha=0.999								
X1.1	0	0	0	0.11	0.101	1.09	0	0	0
X1.2	0	0	0	1.703	0.131	13.01*	0	0	0
X1.3	0	0	0	-0.817	0.047	17.32*	0	0	0
X2	AVE=0.000, Alpha=0.987								
X2.1	0	0	0	0.109	0.007	16.75*	0	0	0
X2.2	0	0	0	-0.23	0.017	13.17*	0	0	0
X2.3	0	0	0	1.125	0.022	50.94*	0	0	0
X4	AVE=0.000, Alpha=0.986								
X4.1	0	0	0	-5.755	4.114	1.4	0	0	0
X4.2	0	0	0	5.908	3.781	1.56	0	0	0
X6	AVE=0.000, Alpha=0.000								
X6.1	0	0	0	1	0	-	0	0	0
X9	AVE=0.000, Alpha=0.691								
X9.1	0	0	0	0.143	0.345	0.42	0	0	0
X9.2	0	0	0	-0.662	0.628	1.05	0	0	0
X9.3	0	0	0	1.25	0.632	1.98	0	0	0
X10	AVE=0.000, Alpha =-0.299								
X10.1	0	0	0	-0.13	0.122	1.07	0	0	0
X10.2	0	0	0	0.931	0.159	5.87*	0	0	0
X10.3	0	0	0	0.111	0.217	0.51	0	0	0
X11	AVE=0.000, Alpha=0.000								
X11.1	0	0	0	1	0	-	0	0	0
X3	AVE=0.000, Alpha=0.000								
X3.1	0	0	0	1	0	-	0	0	0
X5	AVE=0.000, Alpha=0.000								
X5.1	0	0	0	1	0	-	0	0	0
X8	AVE=0.000, Alpha=0.000								
X8.1	0	0	0	1	0	-	0	0	0
X7	AVE=0.000, Alpha=0.554								
X7.1	0	0	0	0.254	0.087	2.91*	0	0	0
X7.2	0	0	0	0.824	0.067	12.22*	0	0	0

CR*=Significant at 0.05 level. Source: Secondary data processed

Figure 2: Test results path chart

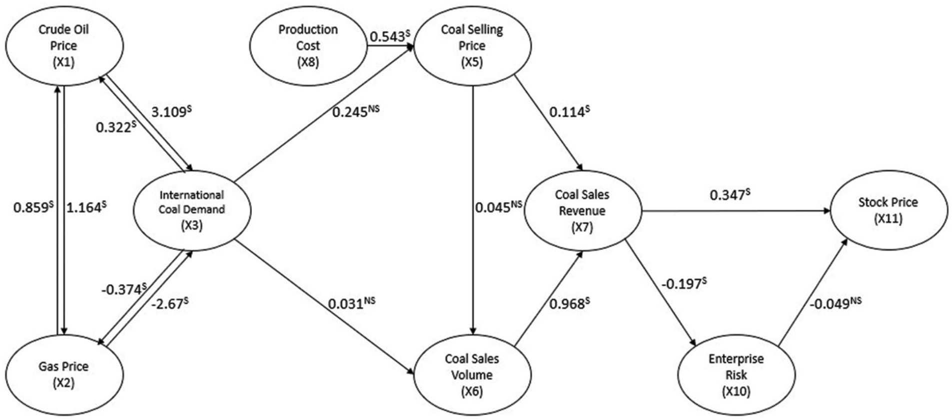


Table 2: Measurement model of variables

Variable	Loading			Weight			SMC		
	Estimate	SE	CR	Estimate	SE	CR	Estimate	SE	CR
X1	AVE=0.000, Alpha=0.997								
X1.2	0	0	0	3.352	0.125	26.81*	0	0	0
X1.3	0	0	0	-2.371	0.125	18.94*	0	0	0
X2	AVE=0.000, Alpha=0.987								
X2.1	0	0	0	0.637	0.053	11.92*	0	0	0
X2.2	0	0	0	-1.501	0.14	10.71*	0	0	0
X2.3	0	0	0	1.878	0.088	21.3*	0	0	0
X6	AVE=0.000, Alpha=0.000								
X6.1	0	0	0	1	0	-	0	0	0
X10	AVE=0.000, Alpha=0.000								
X10.2	0	0	0	1	0	-	0	0	0
X11	AVE=0.000, Alpha=0.000								
X11.1	0	0	0	1	0	-	0	0	0
X3	AVE=0.000, Alpha=0.000								
X3.1	0	0	0	1	0	-	0	0	0
X5	AVE=0.000, Alpha=0.000								
X5.1	0	0	0	1	0	-	0	0	0
X8	AVE=0.000, Alpha=0.000								
X8.1	0	0	0	1	0	-	0	0	0
X7	AVE=0.000, Alpha=0.554								
X7.1	0	0	0	0.264	0.105	2.52*	0	0	0
X7.2	0	0	0	0.816	0.079	10.3*	0	0	0

CR* = significant at 0.05 level

Table 3: Path coefficient structural model

	Path coefficients			
	Estimate	SE	CR	Remarks
X1→X2	1.164	0.051	22.86*	Significant
X1→X3	3.109	0.471	6.59*	Significant
X2→X1	0.859	0.036	24.02*	Significant
X2→X3	-2.67	0.48	5.56*	Significant
X3→X1	0.322	0.052	6.22*	Significant
X3→X2	-0.374	0.076	4.96*	Significant
X3→X5	0.245	0.139	1.76	Not Significant
X3→X6	0.031	0.18	0.17	Not Significant
X5→X6	0.045	0.145	0.31	Not Significant
X5→X7	0.114	0.047	2.42*	Significant
X6→X7	0.968	0.022	43.61*	Significant
X7→X10	-0.197	0.099	1.99*	Significant
X7→X11	0.347	0.149	2.33*	Significant
X8→X5	0.543	0.123	4.42*	Significant
X10→X11	-0.049	0.062	0.79	Not Significant

CR*=Significant at 0.05 level

will increase Gas Price by one unit. This result is consistent with a previous study by Shafiee and Topal (2010) and Mohammadi (2011).

Hypotheses H1b that examine the effect of Gas Price has a significant positive effect on Crude Oil Price is received due to the path coefficient from Gas Price to Crude Oil Price was 0.859 and CR = 24.02. This means that an increase in Gas Price of 0.859 will increase Crude Oil Price by one unit. The effect of the increase in Gas Price on Crude Oil Price is smaller than the effect of the increase in Crude Oil Price on Gas Price, to the best of our knowledge, this is a novelty in the literature.

Hypotheses H2a that examine the effect of Crude Oil Price has a significant positive effect on International Coal Demand is received due to the path coefficient from Crude Oil Price to International Coal Demand was 3.109 and CR = 6.59. This means that an increase in Crude Oil Price of 3.109 will increase International

Coal Demand by one unit. This result is consistent with a previous study by Guo et al. (2016).

Hypotheses H2b that examine the effect of International Coal Demand has a significant positive effect on Crude Oil Price is received due to the path coefficient from International Coal Demand to Crude Oil Price was 0.322 and CR = 6.22. This means that an increase in International Coal Demand of 0.322 will increase Crude Oil Prices by one unit. The effect of the increase in International Coal Demand on Crude Oil Price is smaller than the effect of the increase in Crude Oil Price on International Coal Demand, to the best of our knowledge, this is a novelty in the literature.

Hypotheses H3a that examine the effect of Gas Price has a significant negative effect on International Coal Demand is received due to the path coefficient from Gas Price to International Coal Demand was –2.67 and CR = 5.56. This means that a decrease in Gas Price of –2.67 will increase International Coal Demand by one unit. This result is consistent with a previous study by Jordan et al. (2018).

Hypotheses H3b that examine the effect of International Coal Demand has a significant negative effect on Gas Price is received due to the path coefficient from International Coal Demand to Gas Price was –0,374 and CR = 4.96. This means that a decrease in International Coal Demand of –0,374 will increase Gas Prices by one unit. The effect of the increase in International Coal Demand on Gas Price is smaller than the effect of the increase in Gas Price on International Coal Demand, to the best of our knowledge, this is a novelty in the literature.

Hypotheses H7 that examine the effect of International Coal Demand has a significant effect on Coal Selling Price is rejected due to the path coefficient from International Coal Demand to Coal Selling Price was 0.245 and CR = 1.76. This means that an increase in International Coal Demand will not increase significantly on Coal Selling Price. This result is opposite with a previous study by Varian (2014) and Jordan et al. (2018).

Hypotheses H8 that examine the effect of International Coal Demand has a significant positive effect on Coal Sales Volume is rejected due to the path coefficient from International Coal Demand to Coal Sales Volume was 0.031 and CR = 0.17. This means that an increase in International Coal Demand will not increase significantly on Coal Sales Volume, to the best of our knowledge, this is a novelty in the literature.

Hypotheses H11 that examine the effect of Production Cost has a significant positive effect on Coal Selling Price is received due to the path coefficient from Production Cost to Coal Selling Price was 0.543 and CR = 4.42. This means that an increase in Production Cost of 0.543 will increase Coal Selling Price by one unit. This result is consistent with a previous study by Hong and Sarkar (2008) and Baker et al. (2010).

Hypotheses H12 that examine the effect of Coal Selling Price has a significant positive effect on Coal Sales Volume is rejected due to the path coefficient from Coal Selling Price to Coal Sales Volume was 0.031 and CR = 0.17. This means that an increase in Coal Selling Price will not increase significantly on Coal Sales Volume. This result is opposite with a previous study by Baker et al. (2010).

Hypotheses H13 that examine the effect of Coal Sales Volume has a significant positive effect on Coal Sales Revenue is received due to the path coefficient from Coal Selling Price to Coal Sales Revenue was 0.114 and CR = 2.42. This means that an increase in Coal Sales Volume of 0.114 will increase Coal Sales Revenue by one unit, to the best of our knowledge, this is a novelty in the literature.

Hypotheses H14 that examine the effect of Coal Selling Price has a significant positive effect on Coal Sales Revenue is received due to the path coefficient from Coal Sales Volume to Coal Sales Revenue was 0.968 and CR = 43.61. This means that an increase in Coal Selling Price of 0.968 will increase Coal Sales Revenue by one unit, to the best of our knowledge, this is a novelty in the literature.

Hypotheses H16 that examine the effect of Coal Sales Revenue have a significant positive effect on Stock Price is received due to the path coefficient from Coal Sales Revenue to Stock Price was 0.347 and CR = 2.33. This means that an increase in Coal Sales Revenue of 0.347 will increase Stock Price by one unit. This result is consistent with a previous study by Hasan and Ratti (2014).

Hypotheses H17 that examine the effect of Coal Sales Revenue has a significant negative effect on Enterprise Risk is received due to the path coefficient from Coal Sales Revenue to Enterprise Risk was –0.197 and CR = 1.99. This means that an increase in Coal Sales Revenue of –0.197 will decrease Enterprise Risk by one unit, to the best of our knowledge, this is a novelty in the literature.

Hypotheses H20 that examine the effect of Enterprise Risk has a significant negative effect on Stock Price is rejected due to the path coefficient from Enterprise Risk to Stock Price was –0.049 and CR = 0.79. This means that an increase in Enterprise Risk will not decrease significantly in Stock Price. This result is opposite with a previous study by Rogers (2013).

Based on Table 4, The goodness-fit value of the regression model is 0.505 which means that the total variation of all variables that can be explained by the model is 50.5% and the rest is explained by other variables that are not yet in the model. The adjusted FIT value is 0.48. NPAR is the estimated number of parameters 28.

Table 4: Measurement model of goodness FIT

Model fit		Remarks
FIT	0.505	Good
AFIT	0.48	Good
NPAR	28	

5. CONCLUSIONS

Using a sample of Indonesia coal mining companies listed on IDX in the period 2014-2018 and employees a structural equation model used GeSCA software to examine the relationship and effect between research variables, the research outcome concluded as below.

Crude Oil Price has a significant positive effect on Gas Price, and vice versa, but the impact of the increase in Gas Price on Crude Oil Price is smaller than the impact of the increase in Crude Oil Price on Gas Price. Crude Oil Price has a significant positive effect on International Coal Demand, and vice versa, but the impact of an increase in International Coal Demand on Crude Oil Price is smaller than the impact of an increase in Crude Oil Price on International Coal Demand. Gas Price has a significant negative effect on International Coal Demand, and vice versa, but the impact of an increase in International Coal Demand on Gas Price is greater than the impact of an increase in Gas Price on International Coal Demand.

International Coal Demand has no significant positive effect on Coal Selling Price. International Coal Demand has no significant positive effect on Coal Sales Volume. Coal Selling Price has not a significant positive effect on Coal Sales Volume. Production Cost has a significant positive effect on Coal Selling Price. Coal Selling Price has a significant positive effect on Coal Sales Revenue. Coal Sales Volume has a significant positive effect on Coal Sales Revenue. Coal Sales Revenue has a significant negative effect on Enterprise Risk. Coal Sales Revenue has a significant positive effect on Stock Price. Enterprise Risk is no significant negative effect on Stock Price.

The implications result of this study provides input to the government to regulate the coal business governance in Indonesia, and provide input for coal businesses, both miners and consumers concerning production/mining strategies, coal inventory, coal logistics and pricing strategies.

There are some limitations associated with the study that need to be acknowledged, all indicators on formative constructs of Coal Price Index and Financial Performance are not significant and should be dropped from the model in this study. For future research, financial performance indicators should use other indicators. There is no significant relationship between the Coal Price Index and the Coal Selling Price and the Coal Sales Volume, which is interesting for further study.

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