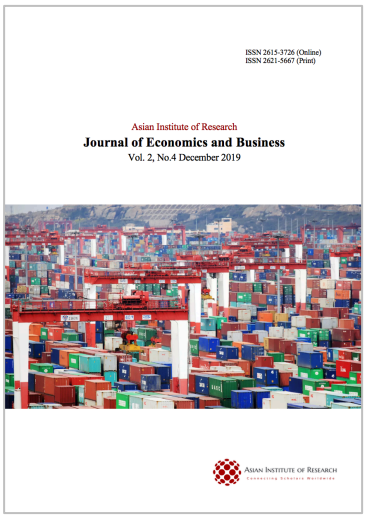

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Oil Prices and Sectoral Stock Prices with Mining Sector Stock Prices in the Exporting Countries as well as Oil Importers

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Abstract
This paper uses the panel vector autoregressive (PVAR) to find out the dynamic relationship between oil prices, inflation, exchange rates, industrial production and the stock prices of 18 mining sector companies in Indonesia. The data covers the period of January, 2009 to December, 2016. In the long run, oil price fluctuations do not coincide with sector stock prices. In the short term, oil prices are not directly related to the stock prices of the mining sector. The price of oil is co-integrated with the exchange rate and the consumer price index, while in the short term the price of oil is reciprocal with the exchange rate, while the value is reciprocally related to the consumer price index. Heterogeneous coefficient relations show the exchange rate to be a central point for the relationship of oil prices and the consumer price index in influencing the share price of the mining sector. This finding becomes an important consideration for investors to calculate exchange rate fluctuations in developing their investment.

Keywords: Oil Prices, Industrial Production, PVAR

INTRODUCTION

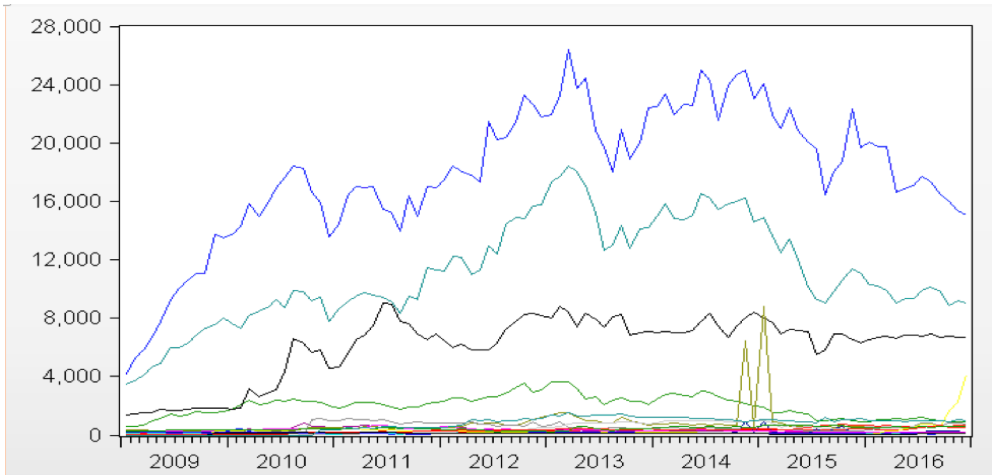
The mining sector is a sector that plays a role in providing and determining the energy needs of Indonesia. Increased industrial growth triggers an increase in energy consumption so that the use of energy derived from petroleum cannot be met from the production capacity of the mining sector in Indonesia. To fulfill this, the government must import 20-30% from abroad. Changes in oil prices are reaching the highest point.

Issues of the global world with continuous heterogeneity is very interesting for policymakers to understand and monitor national and international developments. Policy evaluation must be conducted interdependently of all sectors, markets, and economic problems nationally. The relationship between the share price of the sector needs to be seen in the long term and short term. Problems, in the long run, need to be seen the relationship and its influence in the short term, so that investors can reduce risk in the long run. As for the government, it is very important in taking short-term policies so that they do not interfere with the economy in the long run.

As explained by the theory and research results above, previous research has tried to explain the relationship between oil prices and macroeconomic variables, from various studies the data used varies. From developing countries to developed countries. both as an importer of pure oil and as an oil exporter. The results of the study also varied, then the study turned to the relationship between oil prices and the stock market, stock prices. Very little research has been done on the sectoral share prices of one country. From all of the above studies have not produced consistent conclusions.

The movement of share prices in the mining sector in the period 2009 to December 2016 can be seen from Figure 1

Figure 1.3: Mining Sector Company Stock Price (Rupiah) 2009 - 2016



Source: processed from data sources

(Hamilton, 1983) and followed by (Mork, 1989), (Ferderer, 1996), (Cologni and Manera, 2009), are researchers who look at the impact of oil prices from the supply side, can it was concluded that the increase in oil prices had a negative impact and the decline in oil prices had a positive impact on economic growth in developing and developed countries.

The relationship of oil prices with the stock market was initiated reseach by (Jones and Kaul, 1996), (Huang, Masulis and Stoll, 1996), (Sadorsky, 1999), (You *et al.*, 2017), (Silvapulle *et al.*, 2017), (Koh, 2017), (U, 2001), (Park and Ronald A. Ratti, 2008) oil prices harmed the stock market, industrial production, and employment. But (Gjerde and Sættem, 1999), (Sadorsky, 2001), (El-Sharif *et al.*, 2005), (Basher and Sadorsky, 2006), (El-Sharif *et al.*, 2005), (You *et al.*, 2017), (Journal *et al.*, 2010), (Li, Zhu and Yu, 2012), (Le and Chang, 2015) found that changes in oil prices had a positive impact on the stock market.

The impact of oil prices for sectoral stocks is still very few researchers who do so, including (Luo and Qin, 2017), Cong, Wei and Fan 2014, (Li, Zhu and Yu, 2012), (Keane and Prasad, 2017), with the panel model of the relationship of oil prices with long-term sectoral shares have a positive impact.

Previous research has varied greatly, from the different methods used such as time series, non-linear vector autoregression, oil prices as exogenous, oil prices as endogenous, oil prices from the supply side, oil prices from the demand side. Research objects also vary from changes in oil prices in developed countries, developing countries, oil-importing countries, and exporting countries.

Research that looks at the relationship of oil prices with sectoral shares is very little and studies that look at the relationship of oil prices and sectoral shares in countries that are exporters and at the same time as importers have not examined PVAR. While Indonesia in the category of developing countries, also has a uniqueness, where it was once the largest oil exporter and changed countries as well as being an oil importer.

LITERATURE REVIEW

The Indonesian Capital Market since it was formalized again in 1997, has developed quite rapidly, where the number of listed stocks has increased and can be seen from the data in 2004 the number of listed companies listed on the exchange reached 417 issuers (Dan, Emiten and Perusahaan, 2004). While (Sharpe *et al.*, 2002) said: *"Capital market is the market in which longer-term debt (original maturity of one year or greater) and equity instruments are traded*." According to Tandelilin (2010), a capital market is a meeting place for securities sellers and buyers, which facilitates those who have funds with those who need funds. Thus, it can be interpreted that the capital market is a market for buying and selling securities, with a period of shares and bonds that have a life over one year.

The operational variable used is 1). I_P oil is the price of Indonesian oil on the world market which refers to Platts, RIM, and RIM. 2). I_hk is a change in the purchase price for goods and services from public consumption at the consumer level. 3). I_Er is the value of the rupiah against the dollar with the base year 2009. 4). I_p is an index of the mining sector with the base year 2009. 5). I_Pclose is the share price of the mining sector with the base year 2009 of the closing stock price.

Hamilton, as a forerunner of how the impact of oil prices on macroeconomics, was found for importing countries. The shock of oil prices was the cause of the global economic slowdown supported by research by (Gisser and Goodwin, 2016). The relationship between oil prices and the stock market was carried out by (Sadorsky, 1999), (Gjerde and Sættem, 1999), (Park and Ronald A Ratti, 2008) found that oil price fluctuations on the stock market had a significant impact, because oil as an energy input as fuel to support the industry would affect production costs.

RESEARCH METHOD

To describe the dynamic behavior of individuals and between variables using the Holt-Eakin 1988 method where the PVAR estimator concept with data i = 1, 2, 3 .... from individuals N. The time of each individual is expressed by t = 1, 2, 3 ... T research. If the variables used are y_{it}, $z_{it,}$ and Pit from the matrix W, the PVAR model is stated as follows :

$$W_{it} = \beta o + \sum_{j=1}^{m+1} \beta itWit_{\,it-1} + \varepsilon_{it} \quad \ldots\ldots \qquad (1)$$

W is the equation as follows:

$$y_{it} = \beta_{17} + \beta_{18}\, y_{it-1} + \beta_{19}\, y_{it-1} + \beta_{20}\, y_{it-1} + \alpha_{16} P_{it-1} + + \varepsilon_{y,it} \quad \ldots\ldots (2)$$

$$y_{it} = \begin{bmatrix} Y_{1,m+2} \\ \cdots\cdots \\ Y_{N,m+2} \\ Y_{1,m+3} \\ \cdots\cdots \\ Y_{N,m+3} \\ \cdots\cdots \end{bmatrix} \qquad \begin{bmatrix} Y_{1,m+1} \\ \cdots\cdots \\ y_{it-1} = Y_{N,m+1} \\ Y_{1,m+2} \\ \cdots\cdots \\ Y_{N,m+3} \\ \cdots\cdots \end{bmatrix} \quad \ldots\ldots (3)$$

$$Y_{1,r} \qquad\qquad\qquad Y_{1,r-1}$$

$$Y_{N,T} \quad \{T-(m+2)+1\}N\text{x }1 \qquad Y_{N,T} \quad \{T-(m+2)+1\}N\text{x }1$$

Research on Panel Data Cointegration Test Long-Term Relationship

Cointegration test was first introduced by (Engle, Granger and Mar, 2007), which stated two or more linear

variables that were not stationary to be stationary variables. If between variables cointegrate, it can be interpreted that two or more variables move together between variables in achieving balance in the long run. Furthermore, (Johansen, 1988) developed this cointegration technique, and in (Johansen and Juselius, 1990), then perfected this cointegration technique. Cointegration technique becomes the solution if there is an un-stationarity in the data *time series.*

Pedroni Cointegration test method uses a hypothesis to express the initial hypothesis and an alternative hypothesis as follows:

Ho: ⟩i = 1 applies to all i
H1: ⟩i <1 applies to all I in the panel dimensions
H1: (⟩i = ⟩) <1 applies for all i inter-dimensional statistical tests

If the cointegration statistical test results are obtained, the probability value is less than 5%, then rejecting Ho which can state that there is cointegration in the long run, the existence of cointegration can be interpreted that the variables used to move together in the long run to reach the point of balance.

Short-term Relationships (*Granger Causality Pairwise*)

Causality *granger* is a test conducted to determine the relationship in the short term. Causality relationship between variables, there can be no one-way, two-way relationship or no relationship at all of the variables studied.

Granger causality test uses the null hypothesis, which states the variables tested together, otherwise, do not have a causality relationship.

Table 2: Relationships of Pairwise Granger Causality Between Directional Variables

Causality	(X → Y, Y → X)
Bidirectional Causality	X ⇄ Y
No causality	-

Source: processed from various sources

FINDINGS AND DISCUSSION

Root Unit Test Results for the Im, Pesaran and Shin and Fisher Method in the Mining Sector The Results of the unit panel root test of the Fisher method in the manufacturing sector are known to the statistical value of the ADF - Fisher Chi-square test of 495.12 having a probability at a significance level of 1 %. For the results of the ADF - Choi Z-stat test results of -18.58 have a probability at a significance level of 1%. Thus, the null unit panel root hypothesis can be rejected, meaning that panel data on all mining sector variables are stationary at the level.

Table 4.1: Conclusion of Panel Unit Root Test Results from Mining Sector

Mining Sector	
Variable/ Method Test	Panel Root Unit Results
Im, Pesaran and Shin Fisher	Stationary Level Stationary Level

Source Source: Data processed Outputs Outputs

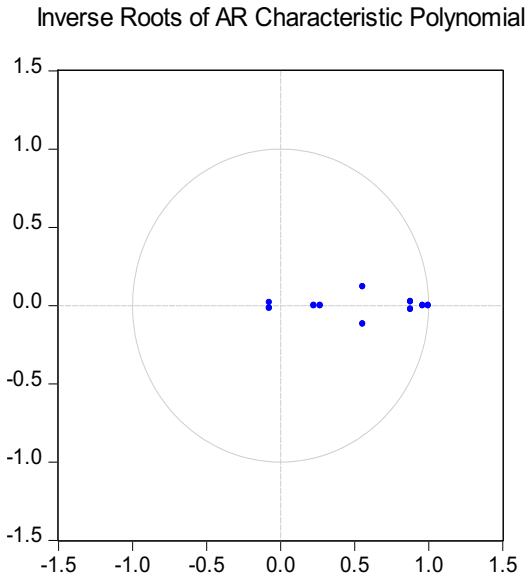
Results of Pedroni Cointegration Tests in the Mining Sector

Panel cointegration test is performed to determine the long-term relationship between the variables studied. If there is cointegration it can be interpreted that there are similarities in movement and achieving the long-term balance between the variables studied.

Panel unit root test results showed no more than one modulus or root value.

Table 1: Mining Sector Model Stability Test Results

Roots of Characteristic Polynomial Mining	
Endogenous variables: I_PCLOSE	
I_Poil I_HK I_P I_Er	
Exogenous variables: C	
Lag specification: 1 2	
Root	Modulus
0.997358	0.997358
0.961397	0.961397
0.879127 - 0.024551i	0.879469
0.879127 + 0.024551i	0.879469
0.556954 - 0.119320i	0.569592
0.556954 + 0.119320i	0.569592
0.268903	0.268903
0.225314	0.225314
-0.074898 - 0.018546i	0.077160
-0.074898 + 0.018546i	0.077160
No root lies outside the unit circle.	
VAR satisfies the stability condition.	



Source: Data processed output results

The first part of the group in dimensions is the static test *Panel v-Statistic, Panel rho-Statistic, PP-Statistic Panel, and ADF-Statistic Panel.* The first four statistical tests are based on the collection of residuals along with the panel test (in dimensions) that allows heterogeneity between manufacturing sector variables taking into account the time factor.

The second part of the group in the dimensions is the *rho-Statistic Group, the PP-Statistic,* and the *Group ADF-Statistic Group.* These three statistical tests are based on the incorporation of residues throughout the group (between dimensions) panel test. In this case, it allows parameters for heterogeneity in all variables used.

The statistical hypothesis of Pedroni cointegration test in the mining sector is as follows:

Ho: there is no cointegration

H1: there is cointegration

The results of the Pedroni panel test results in the mining sector can be seen in Table 4.9 below.

Table 4.2: Pedroni Cointegration Test Results in the Mining Sector

Sector (I_Pclose, I_Er, I_hk, I_P, I_Poil)			
in the Dimensions of the			
Group	Statistics	Prob	Remark
Panel v-Statistic	5.33	***	Co-integration
Panel rho-Statistic	-14.49	***	Co -integration
PP-Statistic Panel	-16.21	***	Co-integration
ADF-Statistic Panel	-6.29	***	Co-integration
Between Dimensions of			
Group	Statistics	Prob.	Remark
Group rho-Statistic	-12.63	***	Co-integration
Group PP-Statistic	-13.49	***	Co-integration
Group ADF-Statistic	-6.34	***	Co-integration

Note: *** significant 1%, ** significant 5 %, significant 10%

The two groups test results on the mining sector mentioned above, reject the null hypothesis which states that there is no cointegration to alternatives, which states that the general autoregression coefficient (in dimensions) and the

individual autoregression coefficient (between dimensions). By rejecting the null hypothesis, it can be interpreted together with all the variables in the long run in the mining sector. Thus together, all variables in the sector in the mining sector go hand in hand in achieving balance long-term.

PVAR Test Results from Mining Sector Test Results Common

1. Effect of Short-Term Relationship Test **Causality Coefficient** results can be seen in the following table:

Table 4.6: Influence of PVAR Short-Term Relationships Based on Ordinary coefficients of the Mining

Sector Mining Sector	Causality	t-Statistic	Prob	Test Results PVAR
I_Er - I_Hk	8.18 ***	77,845	0,000	(+) Significant
I_Poil - I_P	9.08 ***	-2.897	0.003	(-) Significant
I_Hk - I_Pclose	8.78 ***	-4.579	0.000	(-) Significant

Source: Data processed Results of output

2. Effect of Short-Term Relationship in the Mining Sector Test results in Dumitrescu-Hurlin Relations. Causality relationships found based on the Dumitrescu-Hurlin test, then tested on the PVAR model, to determine the effect of each variable that has been known to have a causality relationship. The results can be seen in the following table.

Table 4.7: Test Results Short-term Relationship PVAR

	Causality			**Test Results PVAR**	
Mining Sector	**W-Stat**	**Zbar-Stat**	**Prob**	**t-stat**	**Findings**
I_Er- I_HK	0914	-2228	**	77 845 ***	(+) Significant
I_HK - I_Er	28 657	52 410	***	64 632***	(+) Significant
I_Er - I_Poil	7,891	11,511	***	-22,555 ***	(-) Significant
I_Poil - I_Er	7,083	9,920	***	-30,112 ***	(+) Significant
I_HK - I_Poil	6,605	8,979	**** **	24,806***	(+) Significant
I_Poil - I_P	1,024	-2,011	**	-2,897 ***	(-) Significant
I_Er - I_P	10,871	17,381	***	22,727 ***	(+) Significant

Note: **Ho** = does not homogeneously cause

Estimation of an impulse response that shows the response of another shock variable, up to several periods after the shock shows that the movement approaches the balance point and returns to the previous balance, where the impact of a shock on other variables will disappear longer and is not permanent on that variable. Estimation using assumptions, each innovation variable does not correlate with one another. So the effect of a shock occurs is straightforward.

CONCLUSION

In long-term stock prices are co-integrated with oil prices, meaning that oil prices reach a price balance in the long run following stock price movements. But on the contrary, the price of oil does not coincide with stock prices in the long run. In the long run, oil prices will co-operate with the production index in the mining sector. Whereas in the manufacturing sector oil prices transmit price movements through the exchange rate and the consumer price index, which in turn exchange rates affect each other in macroeconomic variables, but do not affect the equilibrium prices of the two sectors' shares in the long run. Next oil prices go hand in hand in achieving a balance in the long run with the exchange rate. The weakening of the exchange rate, in the long run, will be followed by a decline in share prices in the mining and manufacturing sectors. Thus the relationship of stock prices with oil prices, in the long run, can be ignored, so investors in these two sectors need not worry about their investments in the long run despite oil price fluctuations.

Stock prices with oil prices in the short term are also not related, and vice versa. Stock prices in the short term with the exchange rate in the mining sector there is no relationship. Furthermore, oil prices in the short term are unidirectional with the production index. While oil prices are reciprocally related to exchange rates, in achieving price equilibrium in the mining sector. Whereas in the manufacturing sector oil prices are only related to the exchange rate with the consumer price index. On the other hand, it was also found that the reciprocal relationship between the exchange rate with the consumer price index in the mining sector. The exchange rate against the production index is found to be mutually interrelated in the short run. The important thing for investors, for their decision making, is that the results of this study show that in the short term, oil prices do not have a direct relationship to stock prices.

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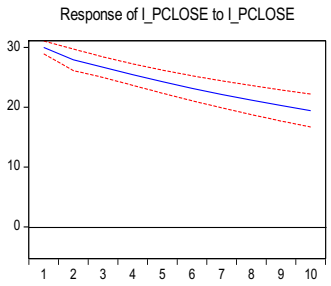
Appendix

Response to Generalized One S.D. Innovations ± 2 S.E.



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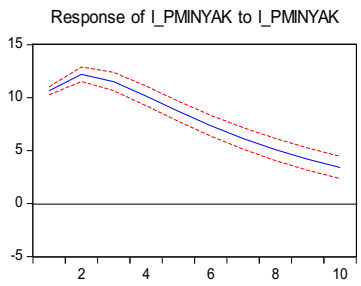

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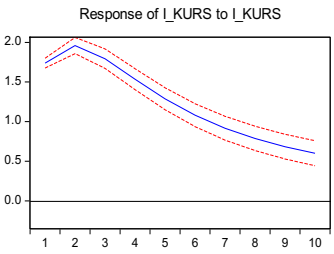

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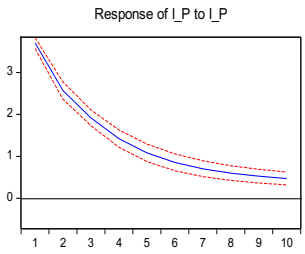

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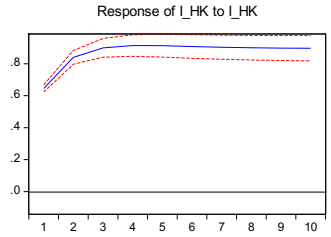
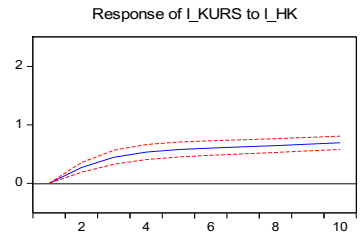
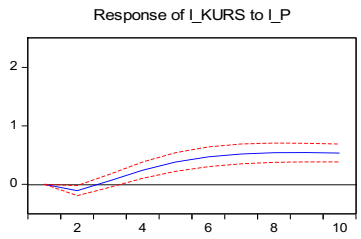


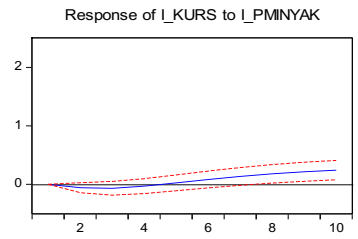
Response to Cholesky One S.D. Innovations ± 2 S.E.



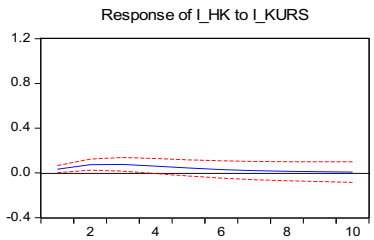
Response to Cholesky One S.D. Innovations ± 2 S.E.



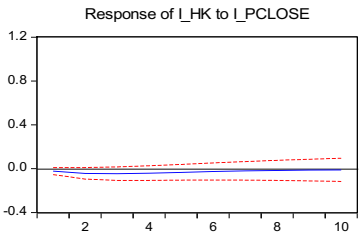
Response to Cholesky One S.D. Innovations ± 2 S.E.



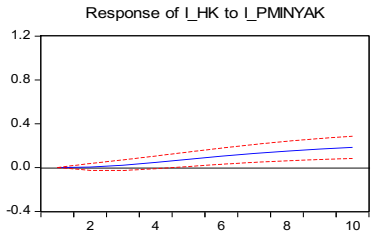
Response to Cholesky One S.D. Innovations ± 2 S.E.



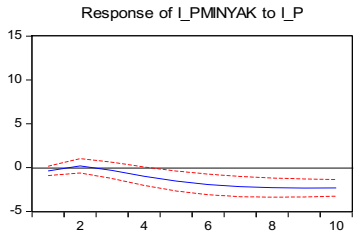
Response to Cholesky One S.D. Innovations ± 2 S.E.



Response to Cholesky One S.D. Innovations ± 2 S.E.



Response to Cholesky One S.D. Innovations ± 2 S.E.



Response to Cholesky One S.D. Innovations ± 2 S.E.