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RESEARCH ARTICLE

The impact of Indonesian oil price (CPI) and macroeconomics on investments in the manufacturing sector in Indonesia

[version 1; peer review: 2 approved with reservations]

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Abstract

Background: Indonesia consumes oil as the main energy source in the production process and as a result of the development of the manufacturing industry. Thus, investment in manufacturing stocks will be affected by oil price fluctuations and macroeconomic conditions. Changes in oil prices will affect the performance of the manufacturing sector which in turn affects manufacturing stock prices. This paper aims to examine the impact of Indonesia's oil price shocks and macroeconomic factors on stock price movements in the manufacturing sector.

Methods: This study uses monthly data for the 2009-2016 period in the manufacturing sector, and 67 stocks were selected on the basis consistently available in the period of the research. The cointegration and causality technique was used in this paper; firstly we applied a unit-panel root test, Secondly, we performed a residual test to indicate whether there was cointegration among variables in the long run equilibrium, and short the short run, we used a Granger causality test.

Results: The panel unit root test (both Shin and Fisher) and the Pedroni cointegration residual test show that the data is stationary at 1% level of significance, thus all variables simultaneously achieve long-run equilibrium, and in the short run, the Granger causality test shows that there is one way direction causality

Conclusions: For long-term investment in manufacturing stocks, investors must consider the exchange rate, as it is also as a determining factor in influencing the movement of manufacturing stock prices, inflation, and the production index. Meanwhile, weakening of the rupiah in the short run will also determine investment conditions due to the dependency on raw materials for production from foreign sources. The price of oil as an energy source

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Approval Status ? ?

	1	2
version 1		
04 May 2021	view	view
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Any reports and responses or comments on the article can be found at the end of the article.

in the manufacturing sector does not have a long-term relationship with other variables.

Keywords

Oil price (CPI), stock price, macroeconomics, cointegration, causality

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Mulyaningsih HD: Conceptualization, Investigation, Methodology, Validation, Writing – Original Draft Preparation; Hidayat AK: Methodology, Software, Writing – Original Draft Preparation; Kurniawan R: Data Curation, Formal Analysis, Methodology, Software; Rachmawati AW: Project Administration, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing

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Introduction

Oil is probably the most important source of energy in the economy, and also an important component of the production cost of companies in the manufacturing sector. Fluctuations in oil prices will therefore affect the performance of the manufacturing sector. Disruption of the sector's performance will also cause fluctuations in the share price of the manufacturing sector. Furthermore, as far as we know, stock price movements are influenced by internal and external factors caused by macroeconomic conditions. However, investors can still invest even in unstable macroeconomic conditions, but need to be more prudent.

As a developing country, the manufacturing sector in Indonesia has an important role in producing goods to meet the needs of a growing market. To attract investors, macroeconomic conditions need to be the focus of companies and investors in developing investments. The macroeconomic conditions which were chosen as the focus of this study were inflation, the exchange rate of the rupiah against the dollar, the index of large and medium production and fluctuations in Indonesian oil prices (CPI).

Changes in oil prices are important because they have implications for stocks as a whole and in general are a portfolio strategy. This information is very important for investor strategies, so that investors are still able to get a return on investment by minimizing risk while oil prices are still uncertain.

The results of the study, which show the causality and cointegration relationship of oil price shock and macroeconomics to the dynamics of manufacturing sector stock price fluctuations, can be a long- and short-term consideration for companies and investors. It can also be a guideline for companies in developing production and a consideration for investors.

Theoretically, there are various reasons for which oil price can affect stock prices (Cai *et al.*, 2017; Hamilton, 2008; Jones & Kaul, 1996; Rafailidis & Katrakilidis, 2014; Ramos & Veiga, 2013). One of the reasons relates to the impact of changes in oil price on the future expected discounted earnings of companies. An increase in oil price will increase the cost of production which in turn will reduce the profit and the future expected discounted earnings and, therefore, the stock prices. Another reason is related to the effect of changes in the stock prices of oil producing companies on the stock prices of other companies whose expected future earnings flows are adversely affected by the increase in oil prices. An increase in oil price will be beneficial for oil producing companies and will increase their stock prices. However, this puts pressure on the stock prices of other non-oil producing companies. Moreover, increased oil prices may create uncertainty for the economy and also for non-oil companies, which may result in delayed investment decisions which will adversely affect their stock prices.

Methods

Our dataset is monthly, beginning with January 2009 and ending with December 2016, a relatively rich sample sufficient

for conducting the type of econometric modeling in this paper. Like most previous studies on the same topic, this study employs variables that include oil prices, stock prices, real output, inflation and exchange rates. As the proxy for the oil prices we use the CPI index, which is an average price of a basket of internationally traded Indonesian crude oils that is still used in some contracts today. The proxy for the manufacturing sector stock prices is the manufacturing sector closing price index obtained from the Indonesian Stock Exchange. For the output, because data on real output or real GDP are only available quarterly, then the industrial production index, which is available monthly, is used as a proxy. Inflation is calculated as the percentage change of the consumer price index.

To investigate the impact of changes in oil price on manufacturing sector returns, we perform cointegration and Granger causality analysis. Prior to both analysis it is necessary to investigate the stationarity properties of panel data by performing unit root tests. The software used in calculating the econometric model of the study is *eviews10*.

The first test of the data is carried out using the unit root test to determine whether the data is stationary at the level, this is the unit root test which is performed to avoid spurious regression results. The unit-panel root test method used in this study consisted of the Im, Pesaran and Shin methods together with the Fisher method. In the latest literature, the panel-based unit root test has higher strength than the time series-based unit root test.

Panel unit root tests

It is important to check the stationarity of data before proceeding with further analysis because often a method designed for stationary series is not suitable for non-stationary series, and if applied one may run the risk of obtaining completely misleading results (Nason, 2013). We check the stationarity of the data involved by employing the Im, Pesaran, and Shin (IPS) unit root test which is based on the following equation:

$$\Delta y_{i,t} = \alpha_i + \beta_i y_{i,t-1} + \sum_{j=1}^k \gamma_{i,j} \Delta y_{i,t-j} + \mu_{i,t} \dots \dots \dots (1)$$

Where $\Delta y_{(i,t)}$ is the first difference of the dependent variable, β_i is the coefficient of the lagged of the dependent variable. The null hypothesis of the test is all series follow a unit root process: $\beta_i = 0$ for all i , against the alternative that some (but not all) have unit roots. Rejecting the null implies that series in the panel are stationary.

As an alternative approach to panel unit root tests, we also use Fisher's (1932) results to derive tests that combine the p-values from individual unit root tests. This idea has been proposed by Maddala & Wu (1999), Choi (2001) and Hurlin (2010). The null and alternative hypotheses are the same as IPS.

Panel cointegration analysis

To check whether a cointegrating, or long-run, relationship exists among variables, the methodology introduced by Pedroni (1999) is employed. This is a residual based test that

includes several tests that allow heterogeneity of error variance and deterministic trend across panel members. Hence, the first step is to obtain the residuals from the following regression for each of the panel member:

$$y_{i,t} = \alpha_i + \delta_i t + \sum_{m=1}^M \beta_{mi} x_{mi,t} + \epsilon_{i,t} \dots\dots\dots(2)$$

Where $t = 1, \dots, T$; $i = 1, \dots, N$; $m = 1, \dots, M$, where M is the number of regressors; $\epsilon_{i,t}$ are residuals that indicate deviations from the long-run equilibrium. Variables y and x are assumed to be integrated of order one, or $I(1)$. In the test equation, intercept α , coefficient of time trend and slope coefficients β are allowed to vary across panel individuals. The following step is to pool residuals from the previous stage and test for their order of integration by estimating following equation:

$$\epsilon_{i,t} = \rho_i \epsilon_{i,t-1} + u_{i,t} \dots\dots\dots(3)$$

$$\epsilon_{i,t} = \rho_i \epsilon_{i,t-1} + \sum_{j=1}^p \gamma_{i,j} \epsilon_{i,t-j} + v_{i,t} \dots\dots\dots(4)$$

The null hypothesis of the test is that $\rho_i = 0$ for all i , i.e. there is no cointegration relationship. The alternative hypothesis is that $\rho_i < 0$ for $i = 1, \dots, N$ and $\rho_i = 0$ for $i = N + 1, \dots, N$.

Panel Granger causality test

A variable is said to be Granger-caused by another variable if including the second variable in the information set will improve the forecast of the first variable. The validity of causal test is conditional upon testing the unit root and cointegration among the variables. To undertake the Granger causality test, we consider a k -variate panel vector Autoregression (pVAR) model as follows:

$$Y_{i,t} = Y_{i,t-1} A_1 + Y_{i,t-2} A_2 + \dots + Y_{i,t-p} A_p + u_i + e_{it} \dots\dots\dots(5)$$

Where $Y_{i,t}$ is $(1 \times k)$ a vector of variables of interest, $A_1, A_2, \dots, A_p$ are $(k \times k)$ matrices of parameters to be estimated, u_i and $e_{i,t}$ are $(1 \times k)$ vectors of dependent variables-specific panel fixed-effects and idiosyncratic error terms, respectively. The order of the model can be determined according to Schwarz's Bayesian information criterion (BIC) which is one of the most successful criteria.

Pairwise Granger causality (Table 1) is a short-term variable relationship test conducted jointly, and the null hypothesis

states that there is no joint causality relationship. The causality relationship is found in the second equation where y is not Granger to the variable x . If, statistically, the x and y coefficients are not significant, then there is another relationship between x and y . While if there is a one-way relationship from x to y , then the estimation coefficient is at lag y . Conversely, the one-way relationship from y to x is an indication of the estimated coefficient on lag x .

Stacked causality test (typical coefficient) panel data. The short-term relationship in this study uses the Granger causality pairwise test, the first step taken is the stacked causality test approach (Dumitrescu & Hurlin, 2012), where the causality is stacked in a panel data set using the assumption of the same coefficient in all sections with the following equation:

$$\beta 0_i = \beta 0_j, \beta 1_i = \beta 1_j, \beta 2_i = \beta 2_j \dots\dots\dots(6)$$

Dumitrescu-Hurlin (heterogeneous or unequal coefficients) panel causality test. The second approach uses heterogeneous coefficients with the Dumitrescu-Hurlin method, in this method, all coefficients are different, in other words, there is transverse heterogeneity with the following equation (Dumitrescu & Hurlin, 2012):

$$\alpha 0_i \neq \alpha 0_j, \alpha 1_i \neq \alpha 1_j, \dots\dots\dots \alpha m_i \neq \alpha m_j, J = i, j \dots\dots\dots(7)$$

Results

Based on descriptive statistics, all variables have varying averages and standard deviations. The monthly average of stock prices of the manufacturing sector moves following a parabolic pattern, and ranges from 135 to 307.85 during the study period. The sub period from 2009 to 2013 has the highest standard deviation with an average of 65.63. The maximum standard deviation of 288.3 is reached in 2014.

The oil price index shows an increasing trend with a maximum of 238.63 in 2013. The standard deviation of the oil price index fluctuates within the range from 29.71 in 2009 to the highest of 34.33 in 2014, which suggests a quite large fluctuation in the oil price.

The consumer price index shows an increasing trend until 2012 with an average of 141.66, and after that follows a decreasing trend with an average of 185.2. The standard deviation during the study period fluctuates within the range from 21.26 to 29.71. The monthly production index fluctuates, with a tendency to decrease in 2009 with monthly average of 103.7, decreasing further in 2010 with a monthly average of 80.5, and then continually increasing to reach a monthly average of 105.1 in 2016. The exchange rate index fluctuates within a range from 81.78 to 119.74, which is a quite large.

Having examined the descriptive statistics, we proceed to test for the stationarity properties of the data relying on the IPS and Fisher panel unit root test. The results are presented in Table 2 and as can be seen in the table, at the 1% significance level, both the IPS and Fisher unit root tests provide strong

Table 1. Granger pairwise causality relationship between variables.

Unidirectional causality	$(X \rightarrow Y, Y \rightarrow X)$
Two-way causality	$X \rightleftarrows Y$
There is no causality	-

Source: compiled from various sources.

evidence that the variables under study are unit-root variables of order one. In other words, they are integrated of order one.

Stationary data are an important factor for getting estimates in the long run to avoid false regression results. The unit root test is performed at the beginning before estimation is done to find out whether the data has been stationary at the level or not.

Based on panel unit root statistics we proceed to panel cointegration analysis in order to examine long-run relationship among the variables. The first stage is to determine that the relationships among variable are not spurious, the panel unit root result should be tested by the Fisher and Shin method in stationary at level. The result of the panel unit root test can be seen in Table 2 below.

The results of the Lm test, Shin and Fisher for all variables in the table above show that the data is stationary at the significance level of 1%.

The objective of the cointegration test is to test the long-term relationship between oil price shocks, macroeconomics, and stock prices in the manufacturing sector. The cointegration test uses the Pedroni method, where the dimensions are grouped into two types, namely dimensions based on “within dimensions” and dimensions “between dimensions”. Dimension testing “within dimensions” is carried out on the respective values of panel v stat, panel rho stat, panel PP stat and panel adf stat. Meanwhile, the “between- dimensions” dimension test was carried out on the group rho stat, group PP stat and group ADF stat.

The relationship of variables in the panel data is of concern at this time. With the cointegration of the Pedroni method, it is known that all variables in this study are co-integrated in the long run, meaning that all the variables used have linear dependence (cointegration), where all variables are cointegrated to achieve mutual balance together in the long run. All the results of the test for both “within dimensions” and “between-dimensions” are shown in Table 3 below.

In Table 3, the Pedroni cointegration residual test indicates cointegration with a significance level of 1%, so we reject the null hypothesis that there is no cointegration. This means that variable oil price shocks, macroeconomics, and stock prices in the manufacturing sector achieve long-run equilibrium.

For the short run we use pairwise granger causality to see the relationship in the short term, whether there is a two-way center, one-way causality, or no causality at all, the result of Pairwise granger causality test can be seen in Table 4 below.

Table 4 shows that there is no bidirectional causality, and only one directional causality relation between variables. One-way direction relation is shown between the production index and inflation, and between inflation and both the stock price and exchange rate,

It can be seen how much influence the cointegration of each variable has on other variables, with further testing the relationships between variables in this study are shown in Table 5.

Discussion

From the results, it can be seen from the exchange rate, inflation and the joint production index, that the price of oil is

Table 2. Test of the panel unit root.

Method	Remark	Stat
Lm pesaran, Shin	Stationary (level)	-24.25***
Fisher choi z stat	Stationary (level)	-18.58***

Information: significance 1%***, significance 5%**, significance 10%*.

Table 3. Pedroni residual cointegration test.

Within-dimension			Between-dimension		
Group	Stat	Remark	Group	Stat	Remark
Panel v stat	1.66**	Cointegration	Group rho stat	-3.31***	Cointegration
Panel rho stat	-4.51***	Cointegration	Group PP stat	-4.57***	Cointegration
Panel PP stat	-6.01***	Cointegration	Group ADF stat	-3.69***	Cointegration
Panel adf stat	-5.66***	Cointegration			

Information: significance 1%***, significance 5%**, significance 10%*.

Table 4. Pairwise Granger causality tests.

Causality	Remark	F stat
Bidirectional causality	not found	-
One-way causality	Inflation-stock price	4.36**
	stock price – oil price	7.69***
	Production index - Inflation	6.83***
	Inflation – exchange rate	1013.17***
There is no causality	Besides the variable above	-

Table 5. Pedroni residual cointegration test.

Variable			Cointegration	Causality			
				F-stat	Remark	W-Stat/Zbar-Stat	Remark
Pclose	→	Er	Cointegration	4.36**	Causality	9.59/29.51***	Causality
Pclose	→	Poil	Cointegration	7.69***	Causality		
Poil	→	PI	Cointegration				
Poil	→	Inf	Cointegration			1.12/-3.62***	Causality
Poil	→	Er				7.06/19.62***	Causality
Inf	→	Pclose		4.36**	Causality	5.31/12.75***	Causality
Inf	→	Er	Cointegration	1013.17***	Causality		
Inf	→	PI				5.71/14.42***	Causality
Inf	→	Er				28.66/104.01***	Causality
Inf	→	Poil				6.65/18.01***	Causality
PI	→	Inf	Cointegration	6.83***	Causality		
PI	→	Er	Cointegration			1.53/-2.01**	Causality
PI	→	Pclose	Cointegration				
PI	→	Poil	Cointegration			5.26/12.58***	Causality
Er	→	Inf	Cointegration				
Er	→	PI	Cointegration			10.87/34.51***	Causality
Er	→	Poil				7.94/23.06***	Causality

co-integrated in the long run. Individually, it is known that manufacturing shares are integrated with oil prices and exchange rates. Furthermore, oil prices are significantly related to production and inflation indexes. This condition illustrates that, if the exchange rate cannot be maintained in stable conditions and is accompanied by high inflation, the shock of oil prices will affect the company's production activities in the long run.

The exchange rate of the rupiah will affect manufacturing production due to the large dependence on foreign raw materials to meet production goals in achieving long-term production balance. For long-term investment, it is very important to

see changes in the exchange rate and the medium to large production index because these have a two-way causality and a significant positive effect in the short term. If the rupiah strengthens against the US dollar and this continues in the future, it will have an impact on rising production indices in the short term and this condition will also raise the production index in the long run, and vice versa.

While the increased purchasing power of consumers, in addition to reflecting the increased ability to invest in the community, also has a positive effect on the ability of the public to invest in manufacturing stocks, an increase in production will trigger an increase in oil prices.

Furthermore, the significant relationship of oil in the short term is based on the W-stat, but on the other hand, based on the Zbar-stat the price of oil is only related to the production index. It can be interpreted that the price movement of oil is divided due to the supply of oil producers and the demand of producers as consumers who use oil.

Conclusions

When people's purchasing power in the short term has a positive effect on investment, in the long run, this condition will strengthen long term investments, so that investment managers can hope to improve company performance to develop the company in the future.

For long-term investment in manufacturing stocks, investors must consider the exchange rate and the medium to large production index because these variables influence each other significantly in the movement of stock prices. The increase in the production index is an illustration of the improved performance of listed manufacturing companies, this condition is supported by increased output and sales of manufacturing companies, which will increase company profits. Rising corporate profits are a reflection of the company's improved performance. The improvement in performance shows an increase in demand for energy. Fluctuations in exchange rates and increases in the production index are central points in investment considerations.

The continuous weakening of the rupiah in the short run will determine investment conditions in the future. This factor is due to the dependency on raw materials for production from foreign sources, the amount of which will reduce the value of the rupiah.

Since the end of the cycle of Indonesia's mainstay commodities such as petroleum, the Indonesian economy can be strengthened through the manufacturing sector pathway. To do this, policies to improve infrastructure and transportation need special attention from the government, as improved transportation will strengthen investor confidence to re-invest.

Although the manufacturing sector in Indonesia is experiencing liberalization widely and is open to the world of investment,

on the other hand, due to the problem of unequal access to electricity it is necessary to consider renewable energy as a companion in fulfilling Indonesia's energy needs and strengthening the Indonesian economy.

Data availability

Figshare: Data Panel Manufaktur.csv

<https://doi.org/10.6084/m9.figshare.13656005.v1> (Rachmawati et al., 2021)

This project contains the following underlying data:

- Data Panel Manufaktur.csv (Monthly data for January 2009 – December 2016, the operational variable determined in this study is the oil price index which is an index of oil prices (ICP), while ICP oil prices refer to Platts, Rim oil prices.)

Data are available under the terms of the [Creative Commons Zero "No rights reserved" data waiver](#) (CC0 1.0 Public domain dedication).

Author contributions

Handri: Designed the research objectives and variables and analyzed the research findings using the tools

Hendrati Dwi Mulyaningsih: Determined the research objectives, and analyzed the findings.

Achmad Kemal Hidayat: Interpreted the result and enhance in discussion.

Rudi Kurniawan: Interpreted the result and enhance in discussion.

Ani Wahyu Rachmawati: Analyzed the findings, prepare manuscript and submission

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Reviewing Report

About the paper entitle (The impact of Indonesian oil price (CPI) and macroeconomics on investments in the manufacturing sector in Indonesia)

Below are my comments:

Introduction:

The introduction is very weak and it looks like general information, hence the introduction should be rewritten to include the following:

1. Background about the study variables such as oil, manufacturing sector, stock market, and the economy of Indonesia.
2. The importance of the study and how will benefit from the result for instance.
3. Add significance to the study.
4. Add problem statement (research gap) to the study.
5. Each paragraph needs to be supported by references, for example, the first paragraph at least needs six references (Oil is probably the most important source of energy in the economy ([Reference](#)), and also an important component of the production cost of companies in the manufacturing sector ([Reference](#)). Fluctuations in oil prices will therefore affect the performance of the manufacturing sector ([Reference](#)). Disruption of the sector's performance will also cause fluctuations in the share price of the manufacturing sector ([Reference](#)). Furthermore, as far as we know, stock price movements are influenced by internal and external factors caused by macroeconomic conditions ([Reference](#)). However, investors can still invest even in unstable macroeconomic conditions but need to be more prudent ([Reference](#)).
6. Structure of study at the end of the introduction.

Literature review (Related Work)

Missing related work in the study should be supported by many previous studies in the same context and in other contexts,

1. Adding a new part of the literature review in the study.
2. Add a paragraph showing the differences between the current study with the previous studies.
3. Support this part by some studies done in the Indonesian context and studies done in the ASEAN region or emerging or developing countries.
4. Adding a theoretical connection between the independent variables and dependent variables.
5. Adding background about the investment sector and stock market in Indonesia.

Methodology

In general methodology part is acceptable but can be better by making more adding the following:

1. Operational definition (variable definition)
2. Hypothesis
3. The objective of the study
4. Underpinning theory of the study.
5. Justification of choosing the study variables.
6. The study mentioned on page 3 (evidence that the variables under study are unit-root variables of order one. In other words, they are integrated of order one), but at the same time mentioned on table 2 that (the test of the panel unit root is stationary at level), so how to solve this contradiction with the studies which mentioned that if non-stationary at level, we need to check cointegration as shown [here](#) and panel autoregressive distributed lag model (PARDL) might be more suitable due to panel unit root test.

Discussion

In discussion, the paragraph does not make any comparison between the current study results and previous studies, to identify whether it is consistent or not with the past studies in the literature review in order to support the current study results in the case in the same line with past studies, also to justify the current study results in the case are in contrary with past studies (This study does not have the comparison between the current study results and the previous studies).

Conclusions:

The conclusions need to rewrite and add the following:

1. Any suggestions for further studies.
2. Any limitations of the study

Other:

1. Check the sentence in methods at abstract on page 1 (equilibrium, and short the short run)
2. Canceling the table (1) on page 4 because it is not necessarily given as they are.
3. Add a year to the reference on page 3 (Im, Pesaran, and Shin) and add to the reference list.
4. Using academic writing such as this study or current study instead of (our, we ...) on pages (3, 4,).
5. Deleting the repeating paragraph on page (5) (Based on panel unit root statistics we proceed to panel cointegration analysis in order to examine long-run relationship among the variables. The first stage is to determine that the relationships among variable are not spurious, the panel unit root result should be tested by the Fisher and Shin method in stationary at level. The result of the panel unit root test can be seen in Table 2 below).
6. Recheck the whole study Grammarly.
7. Adding the table of descriptive statistics in the study.
8. The researcher said in the study on page 3 in methods (like most of the previous studies...) without indicating or supporting by any references.
9. Many sentences and paragraphs need to know who said that on pages 3, 4, 5,
10. Recheck the paragraph (The consumer price index shows an increasing trend until 2012 with an average of 141.66, and after that follows a decreasing trend with an average of 185.2).
11. The study did not cover any diagnostics of intertemporal dependencies, autocorrelation, endogeneity, or any other aspects of statistical problems,

The article should be revised based on the above comments before indexing.

Wish all the best to the researcher.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: The interest of my research: Financial Management, Financial Economics, Stock Markets efficiency, and Foreign Direct Investment, I am writing to confirm my capability to evaluate the whole aspect of the current paper

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 20 September 2021

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The paper the impact of Indonesian oil price (CPI) and macroeconomics on investments in the manufacturing sector in Indonesia

.

My comments are:

- First, the introduction needs more works to make it an informative introduction. The introduction in its current form lacks substance. I will encourage the author(s) to provide a strong motivation for the study. The way to go is to rewrite the introduction to include research question(s) and then motivate the paper on why it is important to address the research question(s), particularly in the context of the investigated economy.
- Second, the author(s) needs to be specific on their contribution to the literature. In a clear and concise manner, they should identify what is lacking in the literature by way of the limitation of the extant studies and how their study adds to this literature. Saying it differently, what is there in the manuscript being reviewed that can be considered innovative compared to what is available in the previous studies.

- Third, the title as well the objective of the paper suggests it is an impact analysis. Hence, I am wondering to what extent is the Granger causality testing procedure is appropriate in the study. Rather a single equation - based namely, panel autoregressive distributed lag model (PARDL) might be more suitable for the objective of the study. More importantly, the author's preference for a particular model or estimation technique should be strongly motivated in terms of its appropriateness for the possible inherent dynamic and statistical features of the variables under consideration.
- Finally, the authors should further add value to their result discussion by relating their findings to those of the earlier studies, how it is different or the same compared to other similar studies done, and what is the implication of the finding?

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Financial Economics & Macroeconomics

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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