

The intricate and indirect linkage between Covid-19 global pandemic and the oil and gas trade balance of Indonesia

by Mustamina Maulani



Submission date: 24-Nov-2021 05:07PM (UTC+0700)

Submission ID: 1711923462

File name: 5.0061963.pdf (610.69K)

Word count: 3154

Character count: 17362

The intricate and indirect linkage between Covid-19 global pandemic and the oil and gas trade balance of Indonesia

Cite as: AIP Conference Proceedings **2363**, 020004 (2021); <https://doi.org/10.1063/5.0061963>
Published Online: 23 November 2021

Mustamina Maulani, Andry Prima, Lisa Samura, et al.



View Online

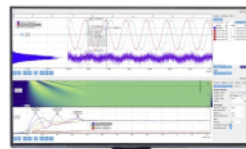


Export Citation



Challenge us.

What are your needs for periodic signal detection?



Zurich Instruments

The Intricate and Indirect Linkage Between Covid-19 Global Pandemic and the Oil and Gas Trade Balance of Indonesia

Mustamina Maulani ¹⁾, Andry Prima¹⁾, Lisa Samura ¹⁾,Astri Rinanti ²⁾, Bayu Satiyawira¹⁾ Onnie Ridaliani ¹⁾ Cahaya Rosyidan ¹⁾ and Havidh Pramadika ¹⁾

¹ *Petroleum Department, Faculty of Earth Technology and Energy, Universitas Trisakti, Indonesia*
² *Faculty of Landscape Architecture and Environmental Technology, Universitas Trisakti, Indonesia*

¹Corresponding author: andry.prima@trisakti.ac.id

Abstract. By far, over the last couple of months, the day-to-day business activity of crude supply and demand in Indonesia has been in the position of barely touching the bottom line, moving disproportionately with the government's long-run strategic plan in providing sufficient energy supply for the consumers. The statistics have revealed the current energy supply realization is different than that of the last year. In brief, the performance of oil and gas export-import has been deeply disturbed since the global pandemic of Covid-19 broke out. This particular paper aims at portraying, from a macro perspective, the intricate nature of the oil and gas phenomenon, having many complexly interrelating variables. The methodology opted in this particular study is the multivariate linear regression to draw the complete picture of the relationship between the global pandemic and its profound impact on the oil and gas trade balance. The value of the originality of this study is to reveal the effect of a global pandemic to the Indonesia Economy at large and also to make suggestions to the policymakers, or other stakeholders in an effort to support the initiative of developing a strategic plan for the long-term sustainability of petroleum energy in Indonesia.

Keywords : oil and gas, export, import, trade balance, predictive trend, regression, multivariable

INTRODUCTION

Several months ago, beginning in March until the end of May, various resources of information and countless reports have reported the impact of a global pandemic of covid-19 on the economy of Indonesia at large. In this particular paper, the authors studied the presumed correlation between the pandemic of the import demand of crude presumably as the primary feed to ensure the operable capacity of refineries in Indonesia. In this particular research paper, the work is directed to find the indirect coexistence of diverse variables of prior progress and the current expansion of oil supply and demand nationwide (during the outburst pandemic of Covid-19). As a comprehensive overview of the oil business, one needs to comprehend the cycle of the imported crude is set as the target in relation to the challenge on how to improve the performance of crude processing units operating in different locations in Indonesia.

Concerns related to the topic of this study should address questions whether the imported crude, which was at a declining rate during the pandemic could impact the output of the refinery operating in Indonesia.

The uniqueness, the novelty, and the significance of the newness of this work are to unleash the information of the chain of co-related data that will eventually explain the predictors; from the most significant to the least prioritized one. The ultimate goal of this particular study is the opportunity to offer solutions to the executive, policymakers, professionals, and other stakeholders as a concrete answer to strike the balance between the state's oil export and import. The limitations of the study – due to the inaccessible data publicly, the assumption drawn before the conclusions that available data published by any government agency is valid.

METHODS

In general, issues of cases in this particular study will be investigated by analyzing the set of data pulled off from various resources providing credible information publicly i.e. authoritative government bodies. Thus, a computational study is needed to reveal the correlation between several predictive variables corresponding to other variables. Thus, analysis tools namely regression is technically used to collect information and then arrange them all in a logical way to identify which variables act as independent while others function as dependent variables. The regression eventually will build the model that will represent the correlation between the independent and predictors variables based on our data in this work [1]-[6]. The type of regression that will highly likely serve the portrayal of the intricate and yet indirect linkage between Covid-19 global pandemic and the balance of crude supply and demand in Indonesia

For the purpose of finding the results of this scientific work, data certainly is needed. Due to the fact that primary data related to oil and gas sector activity is restricted only to the authority, not freely available in the public domain, thus all data was collected from publications published by a number of credible resources of information, primarily government-owned institutions such as the bureau of statistics of Indonesia. Then the regression will be used to incorporate dependent and independent variables and subsequently process and compute all the collected data to generate a linear model based on multivariable.

All authors unanimously agreed to refer to a model previously introduced by Paikun, Kadri, T., & Sugara, R.D. (2017) [6]. The said model can be used to integrate more than one variable or known as multivariable in order to generate the desired linear equation, as confirmed by other studies [7]-[18].

The data, first, to be collected as thus classified and tabulated into a dependent or independent variables. Next, is to compute the feed data. The results, in the end, have to be analyzed before drawing conclusions. We will direct this particular work in the direction of finding the linear relationship between the dependent and dependent models as globally shown in figure 1 [19]-[21].

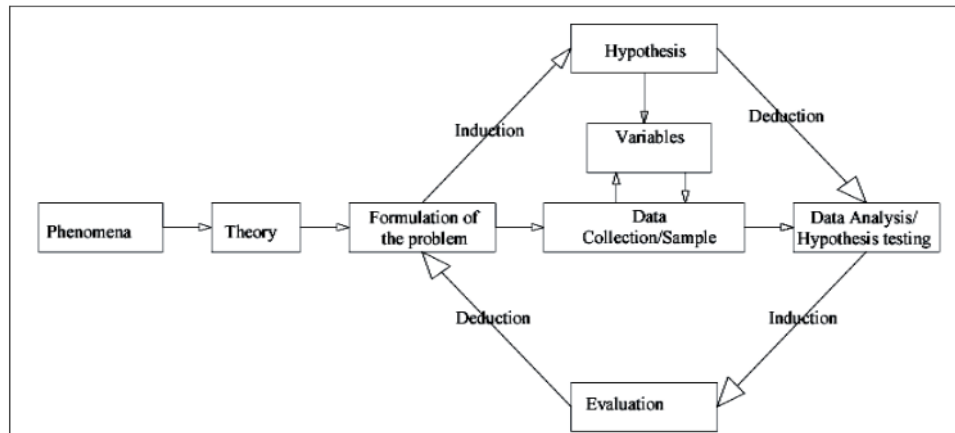


FIGURE 1. Linear Regression Model

The data will be explored statistically by using the following model [22],[23],[24],[25],[26]:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + e_i \quad (1)$$

Where Y_i represents the scalar of dependent variables.

The beta (β)_i is the symbol of an uncategorized parameter.

The X_{i1} functions as an independent variable.

DISCUSSION

In this section, we focused on the segment of time that contained, on one hand, a normal trend and on the other hand incorporated the trend during the pandemic of Covid-19.

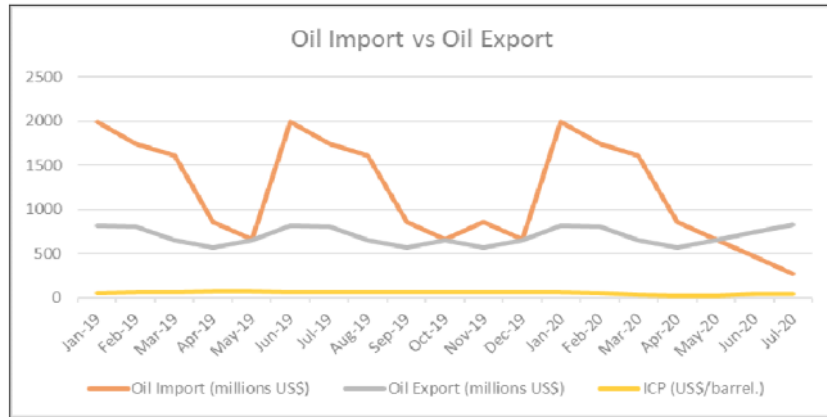


FIGURE 2. The Oil Import vs Oil Export (Central Bureau of Statistics)

If we zoomed in from the month of March to July 2020, the effect of the pandemic was noticeable and significant lead to proof of the effect of the pandemic (FIGURE 2).

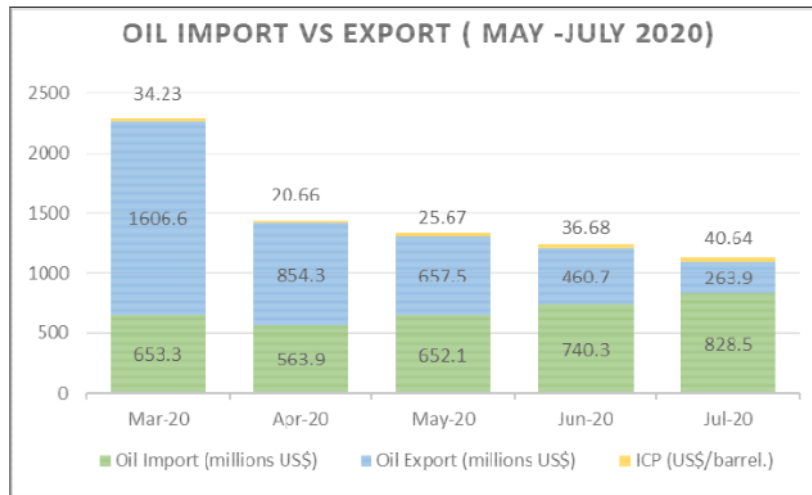


FIGURE 3. The Oil Import vs Oil Export May to July 2020 (Central Bureau of Statistics)

The available data between March and July 2020 was downloaded from the Central Bureau of Statistics of Indonesia. We then collected and classified the data into dependent and independent variables. Next, the process of entering a linear model began. After computing all the data by using the feature of regression analysis, the equation as the model was subsequently generated (FIGURE 4)

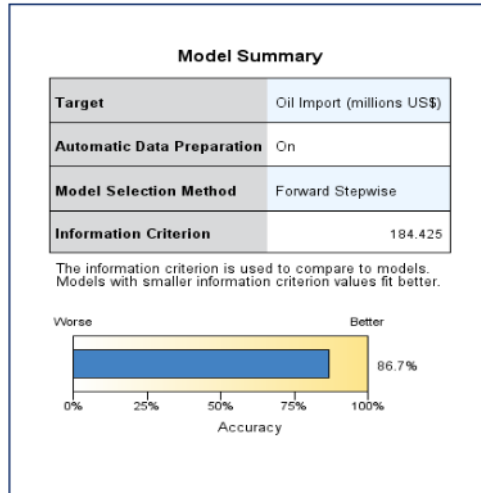


FIGURE 4. Model Summary

The summary of the regression can be seen in the following TABLE 1. As dependent variables, Oil import or in this particular study the crude being imported is dependent on other predictors that are divided into several other variables; the crude to be exported and the official crude price index of Indonesia (ICP).

TABLE 1 . Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.940 ^a	.884	.867	198.4591	.884	53.239	2	14	.000	1.962

a. Predictors: (Constant), Oil Export (millions US\$), ICP (US\$/barrel.)

b. Dependent Variable: Oil Import (millions US\$)

The analysis of variance can be seen in TABLE 2.

TABLE 2 . ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4193732.647	2	2096866.324	53.239	.000 ^b
	Residual	551404.373	14	39386.027		
	Total	4745137.020	16			

a. Dependent Variable: Oil Import (millions US\$)

b. Predictors: (Constant), Oil Export (millions US\$), ICP (US\$/barrel.)

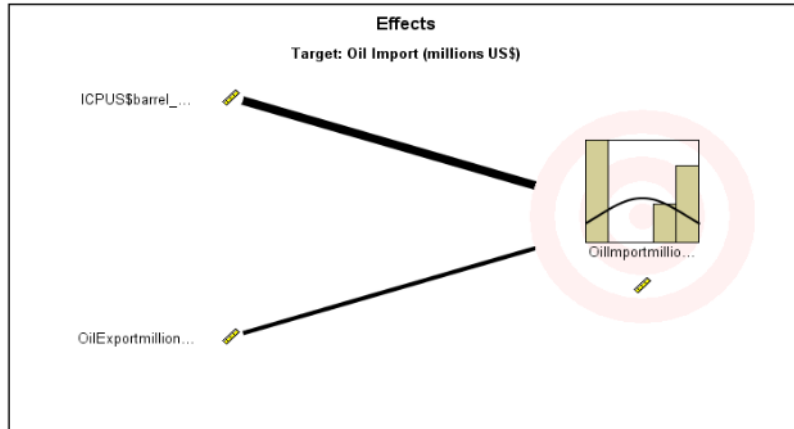


FIGURE 5. Effects of predictors

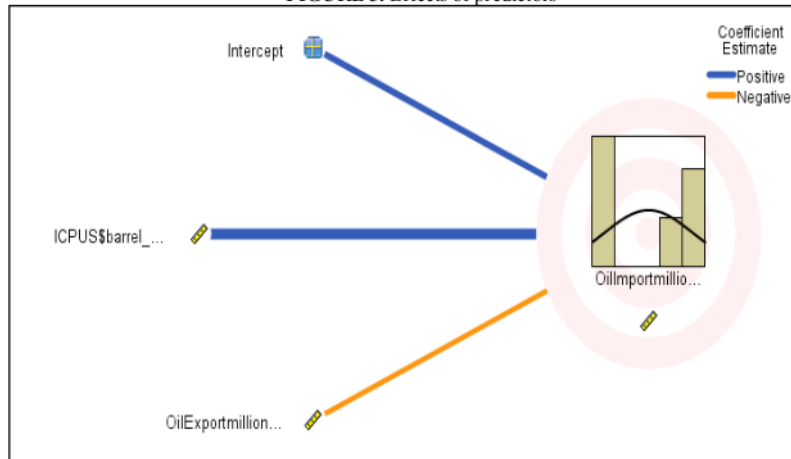


FIGURE 6. Coefficients

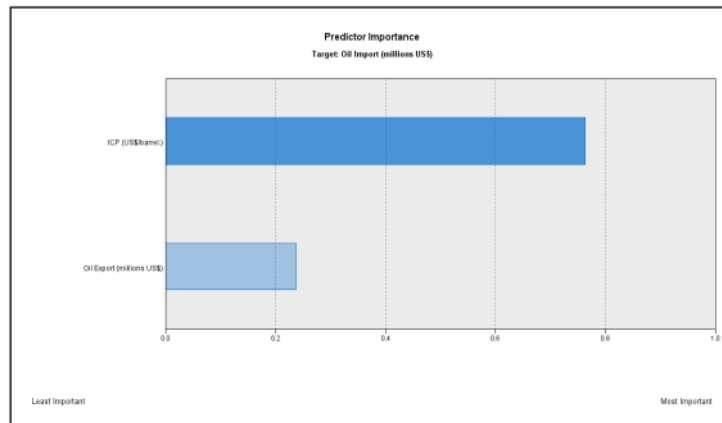


FIGURE 7. Predictor Importance

Perini

The information can be comprehended from **FIGURE 4** into several parts. We found that ICP and Crude to be Exported plays an important role. A more in-depth analysis of the subject matter discovered that ICP was the most important predictor of our model, whereas the crude to be exported was the least important (**FIGURE 5**). Thus, the oil imported was affected by the volume of oil to be exported (**FIGURE 6**). As far as the balance of oil and gas, during this particular work, the relationship between the oil import and export and price found to be linear. The dependent variable obviously was found to be the oil import. The aspect of oil import was by and large affected by two other independent variables. To the contrary from oil import, the oil to be exported could disrupt the import activities. Another variable, the ICP was unquestionably the most significant predictor.

Our work was directed to build a model in an effort to explain which fields of independent variables substantially ranked as the most significant predictor. Automatically, as a consequence, we simultaneously discovered the least important predictor. The chart showing the predictor importance might lead to any decision to be made. In day to day business, a decision-maker should consider both the most and least important predictors. By doing so, the analysis would be more accurate as of the importance of the predictor in making necessary predictive oil and gas trade balance.

During the work of observations, both the unpredictability and the predictability of the variables could be explained by the r square. We discovered the specific r square for this model was 0.940. Such a number was beneficial in predicting the results of the multivariable linear regression (**TABLE 1** and **TABLE 2**). Having specifically r square that exceeded ninety percent can help explain explicitly that our multivariable linear model was statistically stable. Moreover, the r square is significant in terms that more than ninety percent of predictors should accurately fit our multivariable linear regression model.

The residuals of data in our model also sent an important message to any user of our equation or model. The residuals were found to be organized in a well-ordered manner. As a result, our observation of residuals was independent of time to time. On top of the fact, we discovered from the residuals, there were no argumentations to disagree that autocorrelation occurred between the data (**FIGURE 8**).

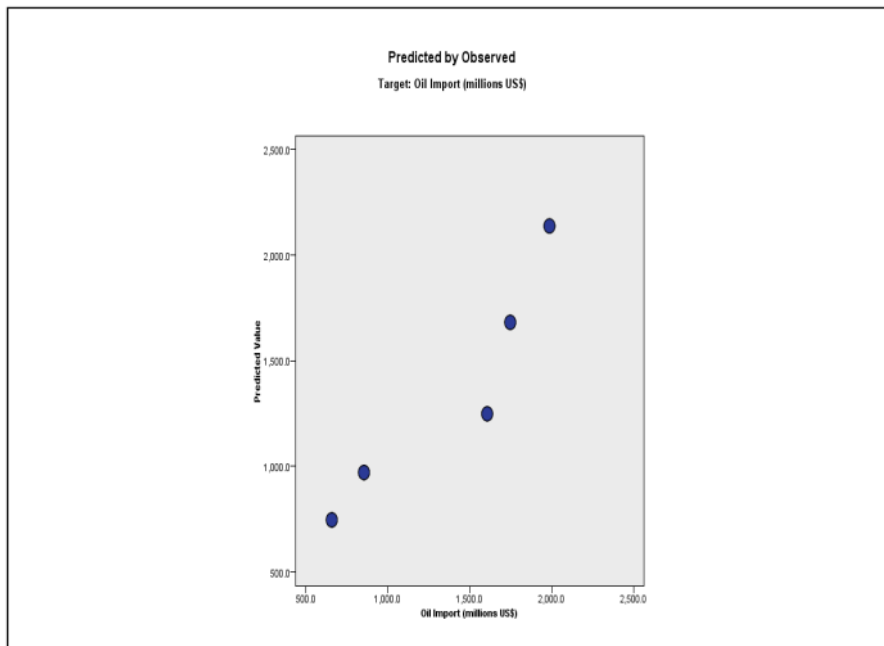


FIGURE 8. Residuals of the data

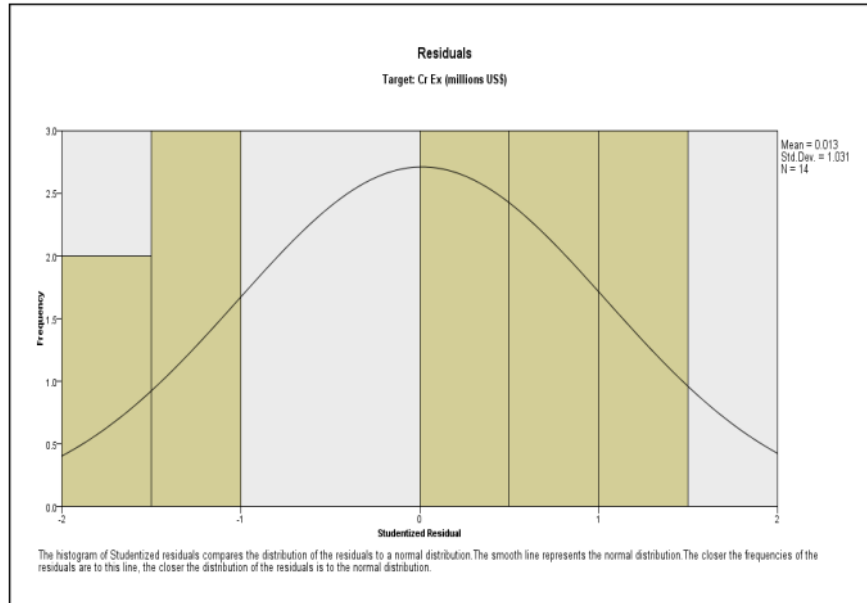


FIGURE 9. Normal Distribution

One of the most important discussions during this particular work was the distribution of variables. We later found that the distribution resembled the pattern of a bell-shaped curve (**FIGURE 9**). The said graph could describe a graphical illustration of a normal probability distribution. The normally – distributed environment reflected the average data points in the data set. Interestingly enough, all data have moved proportionally deviated to the mean, which eventually formed a bell-shaped curve. The linear model in this study generates frequencies of residuals that are closer to the line of normal distribution. Thus, the linear model is applicable to the subject matter in this study.

The equation or the model generated from our work can be used by any decision or policymaker in making in-depth anticipative and predictive investigation when analyzing the oil and gas trade balance sensitivity. For instance, the profound impact of Covid-19 global pandemic occurred from April to July 2020. During those periods of time, our model could accurately predict the desired trade balance between the imported, exported, and ICP. Therefore, a certain level of export should have been held, to preserve the desired crude import.

CONCLUSIONS

This study can theoretically be used to help quickly find indicative signs of the effect of the global Pandemic of Covid-19 to the temporary offset in the trade balance between export and import of crude in Indonesia. This study further proved that simultaneously the global pandemic had caused a temporary decline in crude import rates. The first, the R square of 0.940 signifies that 94% of the predictor fit the model built in this particular study.

Next, throughout our study, the pattern of residuals was found to be organized in a well-ordered manner. As a result, our observation of residuals was independent of time to time. On top of the fact, we discovered from the residuals, there were no argumentations to disagree that autocorrelation occurred between the data

Last but not least, we also found that the distribution resembled the pattern of a bell-shaped curve. The said graph could describe a graphical illustration of a normal probability distribution. The normally-distributed environment reflected the average data points in the data set. Therefore, the equation or the model generated from our work can be used by any decision or policymaker in making in-depth anticipative and predictive investigation when analyzing the oil and gas trade balance sensitivity.

ACKNOWLEDGMENTS

All authors wish to thank the head and the secretary of Petroleum Engineering, all vice Deans and chiefly the Dean of Faculty of Earth Technology and Energy for facilitating the whole work of this particular study. Authors are also thankful for the head and all staff of the office of research and development of Universitas Trisakti for providing scientific research writing assistance. Last but not least, all colleagues and all reviewers who have contributed significantly as this manuscript is finally ready to be submitted.

REFERENCES

- [1] M.Chesnes,"The impact of outages on prices and investment in the U.S. oil refining industry," *Energy Economics, Elsevier*, vol. 50(C), pages 324-336.,2015. DOI: 10.1016/j.eneco.2015.05.008
- [2] Energy Information Administration Office of Oil and Gas, U.S., Department of Energy ,Washington, DC 20585,"Refinery Outages: Description and Potential Impact on Petroleum Product Prices, March 2007, , page 25, available at :<https://www.eia.gov/analysis/requests/2007/SROOG200701.pdf>
- [3] A Prima and B Satiyawira 2019, Suggested normal production operable day for Kasim oil refinery in Indonesia, 4th Annual Applied Science and Engineering Conference, *Journal of Physics: Conference Series*, doi:10.1088/1742-6596/1402/2/022069
- [4] A Prima, B Satiyawira, C Rosyidan and Samsol, Kajian Rentang Batas Kewajaran Utilisasi Produksi Kilang Minyak Indonesia, *Jurnal Petro*, Volume Vii No. 3, Desember (2018), P-ISSN: 1907-0438 E-ISSN : 2614-7297, available at: <https://trijurnal.llemlit.trisakti.ac.id/petro/article/view/3814/3121>, DOI: 10.25105/petro.v7i3.3814
- [5] U.S. Energy Information Administration 2019 Weekly Inputs & Utilization, available https://www.eia.gov/dnav/pet/pet_pnp_wiup_dcu_nus_w.htm
- [6] Paikun, Kadri, T., & Sugara, R.D. (2017). Estimated budget construction housing using linear regression model easy and fast solutions accurate. *2017 International Conference on Computing, Engineering, and Design (ICCED)*, 1-6. DOI:10.1109/ced.2017.8308095
- [7] Alhajri, Ibrahim & Elkamel, A & Albahri, T & Douglas, Peter. (2008). A nonlinear programming model for refinery planning and optimisation with rigorous process models and product quality specifications. *International Journal of Oil, Gas and Coal Technology*. DOI: 1. 10.1504/IJOGCT.2008.019846.
- [8] Shishkova, Ivelina & Chavdarov, Ivan & Stratiev, Dicho & Ivanov, A & Toteva, Vesislava & Petkov, P & Palichev, Todor. (2014). Impact of refinery economics of processing residual oil and gas oils of different origins in a Commercial FCC unit. *Oil Gas European Magazine*. 40. 154-159.
- [9] Fahim, Mohamed & Alsahhaf, Taher & Elkilani, Amal. (2010). *Refinery Economics*. 10.1016/B978-0-444-52785-1.00018-8.
- [10] V Bukhtoyarov, V & S Tynchenko, V & A Petrovsky, E & G Dokshanin, S & V Kukartsev, V. (2019). Research of methods for design of regression models of oil and gas refinery technological units. *IOP Conference Series: Materials Science and Engineering*. 537. 042078. 10.1088/1757-899X/537/4/042078.
- [11] Quirante, Natalia & Javaloyes, Juan & Caballero, Jose. (2015). Rigorous design of distillation columns using surrogate models based on Kriging interpolation. *AIChE Journal*. 61. 10.1002/aic.14798.
- [12] Bachnas, A & Tóth, Roland & Ludlage, J.H.A. & Mesbah, Ali. (2014). A review on data-driven linear parameter-varying modeling approaches: A high-purity distillation column case study. *Journal of Process Control*. 24. 272–285. 10.1016/j.jprocont.2014.01.015.
- [13] Weber, Gerhard-Wilhelm & Batmaz, Inci & Köksal, Gülser & Taylan, Pakize & Yerlikaya-Özkurt, Fatma. (2012). CMARS: A new contribution to nonparametric regression with multivariate adaptive regression splines supported by continuous optimization. *Inverse Problems in Science and Engineering*. 20. 371-400. 10.1080/17415977.2011.624770.
- [14] Milov, Anton & S Tynchenko, V & V Kukartsev, V & V Tynchenko, V & V Bukhtoyarov, V. (2018). Use of artificial neural networks to correct non-standard errors of measuring instruments when creating integral joints. *Journal of Physics: Conference Series*. 1118. 012037. 10.1088/1742-6596/1118/1/012037.
- [15] Kaiser, M.J. A review of refinery complexity applications.*Pet. Sci.* February 2017, Volume 14, Issue 1, pp 167–194 (2017) 14: 167. <https://doi.org/10.1007/s12182-016-0137-y>
- [16] Kaiser MJ, Gary JH. Refinery cost functions in the U.S. Gulf Coast. *Pet Sci Technol*. 2009;27(2):168–81. doi: 10.1080/10916460701434704.



- [17] Buraczewski, Dariusz & Kolesko, Konrad. (2012). Linear stochastic equations in the critical case. [Journal of Difference Equations and Applications](#). 20. 10.1080/10236198.2013.822494.
- [18] Zhu, Z & Lin, C & Zhang, X & Zhao, Q & Xie, J & Wei, S & Cheng, P. (2017). Quantitative evaluation on hydrocarbon favorability of the first member of Dainan Formation at Yong'an area of Gaoyou Sag based on Logistic regression model. [Zhongguo Shiyou Daxue Xuebao \(Ziran Kexue Ban\)/Journal of China University of Petroleum \(Edition of Natural Science\)](#). 41. 41-51. 10.3969/j.issn.1673-5005.2017.05.005.
- [19] Tang, Tang & Le-ping, Shen. (2014). Application of Business Risk Prediction Model: Based on the Logistic Regression Model. [International Journal of Business and Management](#). 9. 10.5539/ijbm.v9n7p139.
- [20] Kerzner, Mark & Daniel, Pierre. (2018). Big Data in Oil & Gas and Petrophysics. 10.1007/978-3-319-53817-4_8.
- [21] Tursunov, Alisher & Saidkarimova, Matlyuba. (2019). Condition And Perspectives Of Development Of The Oil-Gas Industry Of Uzbekistan. 10.25313/2520-2057-2019-8-4960.
- [22] O. Kryukova, I & Ye. Kalyna, T & M. Burdeina, N & M. Romashko, O. (2019). Managing The Financial State Of Oil & Gas Sector Enterprises. [Financial and credit activity: problems of theory and practice](#). 1. 158-170. 10.18371/fcaptp.v1i28.161770.
- [23] Sessu, Andi. (2018). Growth of oil/gas sectors and non oil/gas trade: The impact on labor-force participation rates in Indonesia. 10.31227/osf.io/p9z4k.
- [24] Guérin, Pierre. (2018). [New Energy Revolution for Oil & Gas](#). 10.4043/28255-MS.
- [25] A. Stapran, D. (2018). Evolution Of Outsourcing Relations In The Oil & Gas Industry Of Russia. [MIR \(Modernization. Innovation. Research\)](#). 9. 364-378. 10.18184/2079-4665.2018.9.3.364-378.
- [26] M Alnifro et al (2017). Optimal Renewable Energy Integration intoRefinery with CO2 Emissions Consideration: AnEconomic Feasibility Study. [IOP Conf. Ser.: Earth Environ. Sci.](#)83 012018. doi :10.1088/1755-1315/83/1/012018



The intricate and indirect linkage between Covid-19 global pandemic and the oil and gas trade balance of Indonesia

ORIGINALITY REPORT

4%

SIMILARITY INDEX

4%

INTERNET SOURCES

3%

PUBLICATIONS

1%

STUDENT PAPERS

PRIMARY SOURCES

1

aip.scitation.org

Internet Source

2%

2

Submitted to Higher Education Commission
Pakistan

Student Paper

1%

3

www.gci.or.id

Internet Source

1%

Exclude quotes On

Exclude matches < 15 words

Exclude bibliography On

