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The Model of Natural Gas Market

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Abstract: Playing a significant part in the Indonesian economy, the oil and gas industry serves as a vital source of state revenue and energy for various sectors, specifically fuel. Consequently, a study has been conducted to scrutinize the impact of crude oil prices on natural gas in Indonesia during the Covid19 pandemic. Using Kilian's (2009) innovative approach of crude oil price decomposition, the explanatory method has been adopted as the research methodology. The study includes four variables for both oil and natural gas market via a structural vector autoregressive model (SVAR). During the Covid-19 pandemic, it was discovered that the natural gas market in Indonesia is influenced by the crude oil market, but not because of changes in oil supply. The analysis showed that changes in demand played a larger role. As a result of the pandemic, the oil market became unpredictable, leading to an increase in natural gas prices as a substitute. Additionally, fluctuations in oil and gas prices were both affected by changes in demand in Indonesia during this time.

Keywords: Crude Oil, Natural Gas, Demand Requirement, Supply Management

INTRODUCTION

The world was struck by a crippling health crisis that affected nearly every corner of the planet. Observers are pointing to various economic indicators signaling a global recession that's putting immense pressure on the world economy. Business growth is sluggish and unemployment rates are skyrocketing, leading many to believe that we're facing a situation as dire as the one that occurred during the Great Depression in the 1930s. Since the start of 2020, the COVID-19 pandemic brought considerable alterations to the supply and demand of energy fuel. Consequently, the prices of crude oil took a hit and nosedived from about $60 per barrel to $15 per barrel in a short period. This decline was primarily due to the economic fallout brought about by the pandemic, according to Sukarno, Matsumoto, Susanti, & Kimura (2015).

According to US Energy Information Administration (EIA) reports, the international fuel usage has taken a noticeable dip, beginning in Q4 of 2019 and persisting throughout Q1

of 2020. This downturn was further magnified by the repercussions of COVID-19 and is anticipated to reach its climax in the earliest months of this year (Sembiring & Krisna, 2019).

In 187 countries and territories, the lockdown policy was instituted in order to curtail the movement of individuals. In all regions, the utilization of crude oil as a backbone for activities in transportation, manufacturing, and industry have taken a significant nosedive. This has resulted in the EIA issuing a cautionary message to the market regarding the anticipation of oil demand plummeting to its lowest point in 25 years (Marchetti & Palahí, 2020).

In Q1 of 2020, global consumption is predicted by EIA to drop by 5.6 million barrels per day when compared to 2019. This decline serves as the foundation for EIA's forecast that for the entire year of 2020, global oil consumption will plummet by 9.3 million BPD, with a new average of 90.5 million BPD. This alteration effectively negates the consumption growth rate typical over the past decade, as reported by Chiaramonti and Maniatis in 2020. From tension between top oil producers, a price war has arisen and further compounded the effects of COVID-19 on the crude oil market during this unpredictable era. When OPEC + got together, Russia wasn't keen on reducing oil production to handle the demand downturn of COVID-19. Consequently, Saudi Arabia decided to launch a price war by surprising markets with unprecedented price cuts of $6 to $8 per barrel in Europe, Asia, and the US. This was done to put financial pressure on Russia's sustained production of crude oil and make it a less attractive option (Marchetti & Palahí, 2020).

In March of 2020, crude oil's price plummeted over 20% in a solitary trading session, marking the most dramatic decrease for a commodity since the Gulf War of '91. Affected by this were both the financial and equity markets. After Trump issued warnings to OPEC leaders and implemented oil tariffs, the situation began to improve. His actions were prompted by pressure from the US oil industry. Recently, all members reached an agreement to decrease production by 9.7 million barrels per day during May and June following lengthy negotiations. In a historic move, OPEC + has announced a deal that aims to reduce oil production levels by a whopping 5 million barrels per day, along with a call for producers outside the group like Canada, Brazil, Norway and the United States to take the same action. With hope for the stabilization of the troubled oil industry, some experts suggest that this move could be seen as the largest ever recorded reduction in production levels, thus hopefully avoiding a much worse scenario.

For Indonesia, the oil and gas industry is significant both in terms of funding the state budget and supporting local economies in regions where exploration, production, refining, and distribution activities are carried out. This industry's most eminent responsibility is to supply energy, especially fuel, that powers many sectors in Indonesia. Numerous research efforts have analyzed the association between crude oil and natural gas and their correlation. Researchers aim to determine whether the prices of crude oil and natural gas are interconnected. Human life has been impacted by Covid-19, and the oil and gas industry is no exception. Due to restrictions on movement, the demand for fuel has decreased. Furthermore, the industry is experiencing several other Covid-19 related issues.

LITERATURE REVIEW

Several sectors, including transportation, industry and manufacturing, are expected to gradually return to normal business activities resulting in a projected recovery of global crude oil demand in 2021 according to the IMF. Analysts predict that the second quarter of 2020 will experience the biggest impact from lockdown measures caused by the spread of COVID-19. This projection is based on economic expectations that align with the IMF's global economic forecast. (Kingsly & Henri, 2020)

Strategically aiming to curb the buildup of crude oil stocks, the OPEC + coalition's production cut accord from May/June limits global crude oil availability. Additionally, China,

India, Korea, and the United States, the four G20 member nations, have stepped forward with temporary offerings of their storage capacity to accommodate excess crude oil stocks that the current market does not require (Boden, Marland, & Andres, 2016).

The G20 members are anticipated to bring positive sentiment to crude oil prices globally, along with the restraint of crude oil production by OPEC + member countries. This has led some analysts to remain optimistic about the situation until the latter half of 2020. Meanwhile, the disruption of global crude oil supply and demand during mid-year poses a threat, but it is believed that this will have a minor impact on the market in the medium term. As a result, normal conditions are expected to return soon (Naifar & Al Dohaiman, 2013).

Sporadic fluctuations in global crude oil prices have been commonplace, often within wide margins. However, the recent occurrence of oil prices plummeting below zero - exemplified in the case of WTI - is an unprecedented phenomenon. Moreover, the consistent decline in oil prices observed over the course of 2020 is evident in the accompanying visual. The sale of oil at a negative value of US $ 37.63 is perplexing to many, and represents a wholly novel occurrence (Hooijer et al., 2006). The "conflicts" that caused the decrease in oil prices were not just related to the Covid-19 pandemic, but to disagreements within the oil industry itself. Saudi Arabia and Russia, in particular among producers, engaged in a dispute over production quotas, leading to the decline in crude oil output (Chiaramonti & Maniatis, 2020).

METHOD

The goal of this study is to utilize SVAR to explore the connection between natural gas prices and crude oil prices and analyze the impact of different types of crude oil shocks on natural gas. Our model makes use of monthly data for zt = (Δprodt, reat, rpot, rpgt), where Δprodt signifies the shift in global crude oil production in percentage, reat represents an index of actual economic activity, rpgt is the true cost of natural gas, and rpot denotes the actual oil price (Nick & Thoenes, 2014). Our model is abbreviated as a reduced-form representation.

$$z_t = \delta + \sum_{i=1}^{p} B_i z_{t-i} + e_t \qquad (1)$$

where e_t is the vector of reduced-form errors. We estimate the reduced-form VAR model using the least-square method, which is used in the structural VAR model. The model in its structural VAR representation is written as:

$$A_0 z_t = \alpha + \sum_{i=1}^{p} A_i z_{t-i} + \varepsilon_t \qquad (2)$$

where ε_t is the vector of serially and mutually uncorrelated structural errors. We postulate a recursive structure for our model, A^{-1} such that the reduced form errors e can be written according $^{0-1\ t}$ to:$e_t = A_0 \varepsilon_t$.

RESULTS AND DISCUSSION

Using SVAR analysis, we can observe the effects of changes in oil supply, aggregate demand shocks, oil-specific demand shocks, and natural gas price shocks on various factors in oil production such as real activity, real oil prices, and real natural gas prices. Normalization has been employed to ensure consistency across all our findings. Our model is based on a recursive wild bootstrap design with 2000 replicates, derived from the VAR error reduced form, as outlined in Gonçalves & Kilian's 2004 research.

Several months showed a significant increase in oil and gas prices after there were changes in demand due to Covid19. A rise in global aggregate demand unexpectedly caused oil price to top during the initial 3 months. Following that, oil price dropped to its original amount. For almost a year, natural gas prices gradually rose due to global aggregate demand shocks; however, the prices plummeted after nearly two months had passed. Furthermore, the increase in oil prices happened more quickly than the rise in natural gas prices (Nct, 2020).

The pandemic has dealt a severe blow to global petroleum demand, but has left natural gas demand relatively unscathed. This can be attributed to a couple of key factors. Firstly, the bulk of the decline in fuel consumption is linked to transportation activities, including gasoline, diesel fuel for passenger vehicles, and avtur for airplanes; whereas the use of natural gas for transportation purposes is minuscule in comparison. On the flip side, natural gas is commonly used in households for cooking and heating, which makes up a larger portion of its usage compared to fuel. With social distancing and lockdown measures in place, the consumption of natural gas in households has increased. Because natural gas production and distribution cannot be halted as easily as petroleum, it poses unique challenges. The distribution of natural gas relies on specific infrastructure such as pipelines and LNG ships, which is less adaptable than transporting crude oil and fuel. Additionally, the Gas Sales & Purchase Agreement typically includes a clause known as TOP (take or pay), which ensures that consumers must compensate for their natural gas shipment whether or not it is ultimately delivered. The findings of this study reveal a similarity to the results indicated in Zamani's (2016) study for oil prices, in relation to global aggregate demand shocks. Nonetheless, it is worth noting that these shocks impact oil production differently from yield, as noted by Zamani (2016).

As we all know, the global crude oil price situation went through a notable downturn in the first half of 2020 due to COVID-19, with prices only starting to make a gradual recovery in the second quarter. It's anticipated that supply of crude oil will boom in the short term, following the decision to postpone the agreed production cuts between OPEC + until the coming May. This could potentially become an influential factor for relevant market actors as they make decisions going forward. Predicted to remain low until the first half of 2020, global crude oil prices are influenced primarily by two factors. Within uncertain and volatile markets, traders can anticipate an increase in fluctuation and utilize this to maximize trading potential within WTI crude oil futures products. Over the past month, the WTI oil futures contract has been traded at a price range of 17.31 - 29.13 US dollars per barrel, as reported by Kingsly and Henri in 2020.

Indonesia, like many nations, was not immune to the economic ramifications of Covid-19. The implementation of large-scale social restrictions known as PSBB has caused community travel to plummet in various regions of the country. As a result, Indonesia's fuel demand has decreased by a significant 35%, notably with avtur experiencing a whopping 45% drop. This historic low in the nation's petroleum industry has greatly affected the tourism and transportation sectors, which were hit the hardest. In Indonesia, demand for fuel has been stifled due to the halt of tourism and transportation. Interestingly, the study reveals that a sudden upsurge in oil demand surprisingly had a significant impact on actual activities. During the two-month period, real activity spiked but then gradually decreased, as per Rao's findings in 2020.

Due to the decline in economic and societal activity resulting from the corona outbreak, the global price of crude oil has plummeted. The root of this issue is based on the principles of supply-and-demand. There has been a significant decrease in the demand for oil as companies reduce their fuel orders, airlines no longer require fuel since the majority of their planes are grounded, and citizens are staying home, therefore, driving less. Transactions for oil purchases on the world market are diverse. One type of purchase is made for upcoming dates, known as futures transactions. The transaction certificate enables trading of contracts for both the seller

and the buyer involved. This certificate facilitates an agreement in which the purchased oil can be delivered by the seller on a particular date at a predetermined cost. Moreover, it is also negotiable on the stock market.

Several recommendations were proposed in response to the study about the global and Indonesia-specific impact of Covid-19 on the oil and gas industry. The results of this study ultimately concluded that Covid-19 has had an effect on this sector. Chiaramonti and Maniatis (2020) took a close look at the issues facing the Indonesian oil and gas industry to determine viable solutions. Back in 1977, Indonesia achieved its peak crude oil production by producing 1.7 million BPD even with minimal local demand for fuel, but nowadays they're only producing a little over 700,000 barrels per day. Regardless of this significant decrease, the government still operates on the assumption that petroleum generates sufficient revenue by regulating the amount of production and the cost of the oil in Indonesia. However, with the current decline in oil production and an unstable price, the APBN profile is significantly impacted.

Due to declining domestic oil production and a subsequent increase in consumption, Indonesia has resorted to importing both crude oil and petroleum products to bridge the gap. As imports continue to surge, the country's balance of payments deficit widens, especially since the rupiah has weakened against the dollar. To make matters worse, the government is increasing the Premium quota for 2018 and expanding the premium fuel market in Java, Madura, and Bali, which is only adding to the import growth. In 2018, an astonishing 13.5 percent surge in fuel consumption saw it jump to 80.5 million kiloliters. Interestingly, between 2010-2017, the country's fuel consumption remained stagnant at an average of roughly 70 million kiloliters. Due to the Covid-19 pandemic and a disagreement over oil production between Saudi Arabia and Russia, many countries have seen a drop in fuel prices. However, Pertamina's prices at gas stations for consumers haven't budged. Interestingly, online ojeg drivers do get a limited 50 percent discount. Additionally, Pertamina has a plan to offer a 30% discount during Ramadan 2020 for the general public.

In all ASEAN countries, Malaysia holds the title for the lowest selling price of fuel. Various reductions in fuel prices have been implemented since the outbreak of Covid-19. However, unlike Malaysia, Shell in Indonesia has chosen not to decrease their retail price. The decision not to lower fuel prices doesn't guarantee an increase in revenue for Indonesia's leading fuel company, Pertamina. This is because there was a noticeable decline in sales volume, in addition to the expenses incurred to maintain up-to-date assets and refining activities whose productivity has decreased. Nevertheless, to address the demand for reduced fuel prices, SOEs in the state oil sector should be transparent about the costs and revenues affected by the Covid-19 situation. This awareness should be brought to public attention. Several policy recommendations can be proposed as below, based on our understanding of the globally felt impact of Covid-19 on the oil and gas industry conditions and the resultant problems witnessed in Indonesia's oil and gas sector (Widyastuti & Nugroho, 2020).

- Consideration of the current extremely low oil prices has prompted a shift in production activities towards economically-valuable fields. Admittedly, this will result in a reduction of production targets previously established in RPJMN, APBN, and the Company Work Plan. However, given the simultaneous decrease in demand for fuel, this action is deemed economically sound.
- Given the disruption in the supply chain of exploration projects and production facility preparation, postponing these activities might be a wise decision. Achieving project delivery targets may prove to be difficult otherwise.
- Utilize the low global oil prices to establish "strategic reserves" within Indonesia. Convert unproductive wells into storage for imported crude oil and repurpose tanks in depots and refineries throughout Indonesia to store fuel stocks which will extend BBM

reserves. The creation of strategic reserves has the goal of enhancing Indonesia's energy security.

- According to fuel demand and operational needs, refineries can be adjusted or suspended temporarily for maintenance. Inefficient refineries are typically the ones that get put on hold. Such measures can be taken to decrease oil production.
- Supporting activities for Refinery Development and Development in the 2020-2024 RPJMN are currently underway, albeit with limitations in place. Negotiations, preparation of agreements, and similar tasks are in progress, while procurement and construction activities have been postponed for the time being.
- • The 2020-2024 RPJMN intends to develop renewable energy through a major project utilizing green fuel based on palm oil economics. Its recalculation, however, is imminent.
- Lowering the selling price of fuel is not recommended. The dip in demand has played a role in slashing oil revenues, affecting both the company and the Government's share. To cover the costs of reduced production and refining activities, various funds are still necessary. Nonetheless, it's feasible to offer discounts to insignificant consumers such as ojol drivers and small-scale industrialists. Good communication and transparency are essential when it comes to creating public policies related to fuel prices. It is worth keeping in mind that any excess funds generated from fuel sales may be given to the Government. This was particularly relevant amidst the Covid-19 pandemic when the Government required significant financial resources. The Social Safety Network (Social Safet Net) program was one such initiative that needed considerable funding.

CONCLUSION

Falling petroleum demand was a victim of Covid-19's wrath but natural gas demand seemed to hold up better. The reasoning behind this phenomenon can be ascribed to a few factors. First up, the steepest drop in consumption of fuel was noted in transportation activities (which includes gasoline and diesel consumption for cars, airplane engines' avtur) while natural gas usage for transportation is scarcely observed. Conversely, natural gas consumption in homes (for heating and cooking) supersedes its usage in fuel, and during the social distancing or lockdown era, household natural gas usage goes up. Firstly, the extraction and distribution of natural gas poses more challenges than petroleum due to its complex infrastructure, consisting of pipelines and LNG ships that offer less flexibility compared to transporting crude oil or BBM. Secondly, stopping the production and supply of natural gas is not as feasible as doing the same for other fuels. Finally, the Gas Sales & Purchase Agreement typically outlines the TOP (take or pay) policy which obligates consumers to pay for undelivered natural gas shipments.

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