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Article

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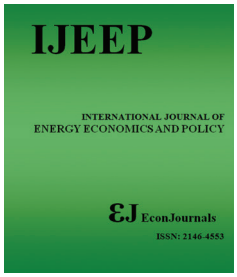

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Crude Oil Prices and Currency Exchange Rates' Impact on the Indonesian Energy Stock Market during the Covid-19 Pandemic

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ABSTRACT

This study examines the effect of oil prices and currency exchange rates on the Indonesian Energy Stock Market, which was listed on the Indonesian Stock Exchange from 2020 to 2022. The purpose of this study is to select samples from the entire population. This study employed the ADF and Zivot-Andrews (1992) unit root test analyses. To begin, causality between the variables was established. The data suggested that alternate fees, closing price, and trade rat are causally related. The VAR method was used to investigate the short-term effects of the variables. At the same time, oil prices have a beneficial effect on closing costs, trading prices experience closing post costs and Currency Exchange Rate prices During the Covid-19 Pandemic.

Keywords: Covid-19, Crude Oil Prices, Stock Closing Prices, Exchange Rate
JEL Classifications: Q47, E22, Q41, E44

1. INTRODUCTION

During the Covid-19 outbreak, the oil subsector file certified the 38% charge and evolved into one of the columns that became the Jakarta Composite File's booming length (IHSG). Between 2022 unand the end of today's epidemic in 2022, the depreciation of share repayments in the electrical energy sub-sector is inextricably linked to the devaluation of oil and coal expenses. This is because oil, as the most valuable source of electricity, is critical to the modern economy. Petroleum, an essential input for various industries, is critical for the smooth operation of the monetary system. Due to the item's vital importance, fee adjustments must be closely monitored. According to the conventional grant perspective, an increase in oil expenditures increases production costs and a decrease in output. As a result, they increase the charge level specified. Prices are standardized to than unknown degree.

Increased oil fees result in fee inflation, and the central financial institution responds by increasing hobby fees to prevent inflation. This results in a decrease in patron purchasing power and a negative influence on demand, resulting in a decline in investment. Additionally, excessive activity fees distract buyers to various places, resulting in a decrease in demand for shares and a cap on share prices.

Numerous studies in the literature examine the effect of oil prices on the Indonesian stock market index, with inconsistent findings. Numerous studies demonstrate a linear relationship between oil prices and the electrical energy supply market index, while others suggest a nonlinear relationship. Additionally, this data is segmented according to the relationship between oil prices and the S&P 500 index. As a result, variations in the econometric methodology or statistical units used must be defined. However, variations in the internal dynamics of numerous countries or the United States groupings also produce inconsistent results.

Numerous studies examine the relationship between oil prices, preferential exchange rates, and stock prices. According to (Sheikh

et al., 2020), the prevalence of excellent oil fee variations tends to constrain trade and inventory price rates in increasing markets. (Chang et al., 2013) and (Hussain et al., 2017) demonstrate that the price of crude oil and alternative tariffs are relatively stable over the long run and that the variants tend to be balanced. Similarly, believe that the stock market's response to changes in oil prices aredependentt on a variety of variables, including broader financial trends, the volume of oil exports and imports, and the degree of monetary development. Additionally, (Singhal et al., 2019) and (Kumar, 2019) investigate the effect of oil price volatility on the furnishing market. Given that the modern country's monetary system is mostly based on oil, changes in crude oil spending are expected to have an effect on a variety of financial features, most notably the alternative rate and stock markets, during the Covid-19 pandemic's course.

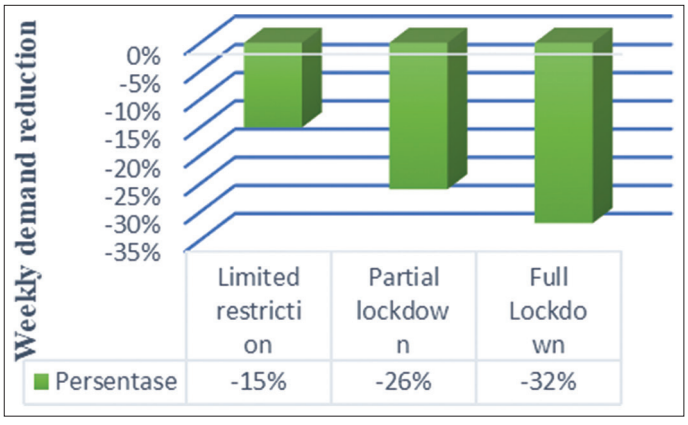
The influence of the approach of decreasing share prices during the covid-19 epidemic in the power industry is the inequality of petroleum merchandise (Hatane et al., 2020). The frequency of statistics linked with routine inventory returns is depicted in Figure 1.

Additionally, all human activity is restricted to prevent the infection from spreading. Several foreign locales have implemented partial and simultaneous curtailment programs, affecting electricity demand.

Certain nations subjected to severe lockdown measures perceive demand as lower in energy than nations subjected to less severe lockdown policies. In 2021, it was anticipated that there would be a 5.7% decrease compared to the previous year. This is considered the worst-case scenario 70 years after World War II. At the same time, Indonesia is one of the severe worldwide places with stringent regulations affecting electricity demand (Aloui and Jammazi, 2009).

While some studies have explored the effect of oil taxes on inventory markets in rich (Hammoudeh and Aleisa, 2004); (Basher and Sadorsky, 2006), others have researched them in developing countries (Abraham, 2016); (Chang et al., 2013); (Degiannakis et al., 2017); (Baimaganbetov et al., 2021); (Wang et al., 2021).

Figure 1: Impact of COVID-19 on world energy demand



The foremost goal of this learns to decide the impact of oil fees and rate adjustments on the Indonesian Energy Stock Market for the duration of the Covid-19 said emic, which was earlier listed on the Indonesia Stock Exchange in 2020-2022 usage of the VAR model. The second chapter highlights lookup on this problem through the home and global researchers. The third chapter discusses the study's econometric approach. The fourth chapter discusses the methodology for presenting the data and the analysis's conclusions. The discovery closes with a decision that summarizes the findings.

2. LITERATURE REVIEW

(Hoyyi et al., 2018), (Park and Ratti, 2008) used the VAR Model to evaluate the United States and thirteen European overseas locations in their research. They discover that higher oil prices have a beneficial effect on Norwegian stock market results. On the other hand, increased volatility negatively impacts actual inventory returns in several Eurseveralries.

(Günay, 2015), (Aloui and Jammazi, 2009) used the EGARCH Markov regime-switching Model to investigate England, France, and Japan. They conclude that rising oil prices are critical for inventory return volatility and regime transition.

(Grubb and Easterbrook, 2011) the impact of oil price fluctuation on infrastructure spending in Nigeria from 1960 to 2012. As a result of these findings, authorities should make an effort to identify alternative methods of financing infrastructure, as oil prices are unpredictable.

(Azretbergenova and Syzdykova, 2020) benefits the oil sector's importance in the Kazakh financial system and the non-oil sector's current state of affairs. Additionally, they provide critical information on the non-oil and gasoline sector's export growth.

(Ursuleanu et al., 2021), (Abubakirova et al., 2021) employed the Hatemi-J, Dickey-Fuller (ADF), and Phillips-Perron (PP) unit root tests to determine unequal causality. The uneven causality check demonstrates the presence of unequal records by discriminating between pleasant and unpleasant shocks. As a result, it can detect hidden linkages that are not detectable using the asymmetric causality test.

(Baimaganbetov et al., 2021), their lookup, makes use of month-to-month facts from 2004 to 2019 and produces a lookup that the motive of the lookup effects is to analyze the influence of oil charges on meals costs. They determined that the price of crude oil had an oblique impact on the amount of food.

3. METHODOLOGY AND DATA

The search is quantitative. The population in this discovery is the Indonesian Energy Stock Market at some point during the Covid-19 epidemic, which was previously listed on the Indonesian

Stock Exchange in 2020-2022. Where the sampling willpower is demonstrated through a purposeful sampling approach. The examination standards are defined by three factors: (1) An electrical sub-sector oil company on the Indonesia Stock Exchange was not delisted throughout the Covid-19 pandemic's 2020-2022 duration. Establish a strong sub-sector organization that will deliver entire financial reviews sequentially from 2020 to 2022 throughout the Covid-19 epidemic. Three Does not exclude statistical data from economic assertion records. If an enterprise possesses exception data, the effects will be unilateral.

This study utilizes monthly data on variables such as oil prices, foreign currency exchange rates, and stock closing fees from March 2, 2020 to February 2, 2022. Petroleum prices are obtained from the International Energy Indonesia database, whilst closing prices are obtained from the company's financial announcement database. Additionally, exchange rates are derived from the central bank of Indonesia's database. The following diagram depicts how these variables are configured (Graph 1).

The graph in Graph 1 depicts changes in oil prices. We may like to witness a precipitous decrease in 2019. The primary reason for this reduction is a supply-demand imbalance. The advancement of shale oil manufacturing technology enabled the United States to transition from an importer to an online oil exporter.

As indicated in Graph 2, the cost of closing the stock market continues to increase. Prices were relatively stable in 2020 thanks to COVID 19, but began to increase once more in 2022. Additionally, the illustration indicates that when oil costs climbed, closing expenditures grew proportionately; conversely, as oil fees declined, charges remained constant.

As illustrated in Graph 3, the alternate price is highly erratic. The primary drivers are US economic policies, Russia's rate of change, and the cost of oil. If we look at Graph 3, we can observe that the Indonesian alternative pricing is seeing a significant fall in 2020.

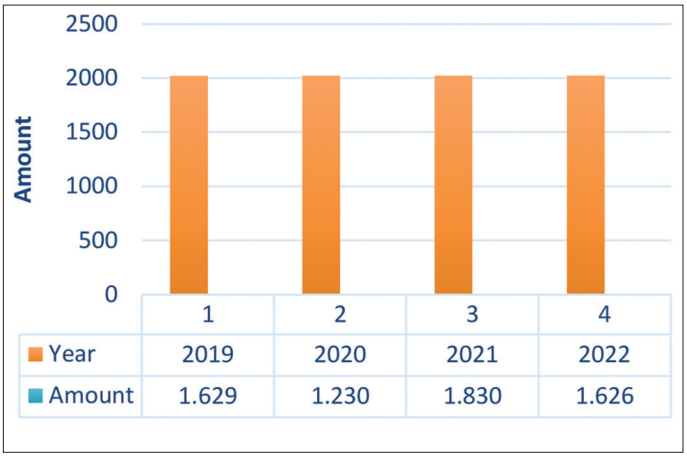
4. RESULTS AND DISCUSSION

4.1. Data Analysis

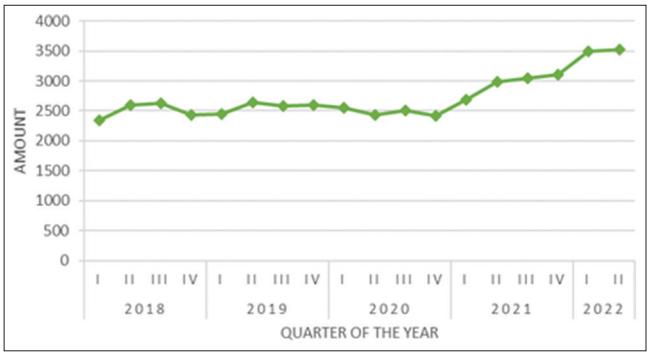
Table 1 describes the description associated with size records from investigative activities concerning the elements in calculating the mean, best possible value, severe value, smallest value, and fashionable deviation value. Whereas the current deviation price is defined as a metric that calculates the method of distributing a sequence of facts relative to the level of normality, the proximity of each and every variable is excellent; however, some versions should be viewed and understood in light of the results that emerge during the search process.

Time series analysis demonstrates that variables have a propensity to increase or decrease in magnitude (Velicer and Molenaar, 2012). In this scenario, the system is made stationary by distinguishing between stochastic and deterministic trends and remodeling it if there is only a stochastic trend. The distinction diploma was previously determined by the use of the unit root test.

Graph 1: Brent crude oil prices 2019-2022



Graph 2: Stock market closing prices



Graph 3: Real Exchange Rate

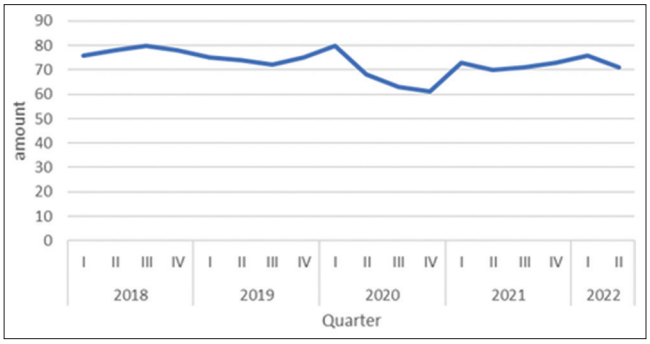


Table 1: Oil consumption in Indonesia 2019-2022

Year	2019	2020	2021	2022
Amount	1629	1230	1830	1626

When the sequence under investigation becomes non-stationary, the impacts are frequently minor. Thus, prior to estimating and obtaining accurate statistical results, the data collection should be examined for stationarity. Assume that the risk of an error occurring in a non-stationary sequence may be ignored. In addition, the unit root checking system is used to decide the stationary nature of the adjustments over the time sequence.

In practice, the Extended Dickey-Fuller (ADF) test is one of the most requested unit root exams. Suppose the ADF approach

Table 2: Result of Zivot-Andrews unit root testing

Variable oil prices	ADF test		First Difference	
	Statistic	Probability	Statistic	Probability
Trend and Intercept BEI	−2.173484	0.5122	−8.0227	0.0349
Trend and Intercept Real Exchange Rate	−4.003218	0.2139	−5.2359	0.0006
Trend and Intercept	−5.020401	0.8620	−7.0424	0.0398

Table 3: Granger causality test results

Dependent Variable: D_{BEI}			
Excluded	**Chi-square**	**df**	**Prob.**
DEER	2.741987	2	0.2032
D_{OP}	1.062434	2	0.4729
ALL	3.129425	4	0.3825
Dependent Variable D_{REER}			
DANI	5.38353	2	0.0142
D_{OP}	0.79428	2	0.5126
ALL	5.92580	4	0.1278
Dependent Variable D_{OP}			
DANI	3.33975	2	0.1012
D_{OP}	3.82739	2	0.0692
ALL	7.18474	4	0.0325

established to eliminate autocorrelation is organized around the time gathering procedure. In that case, the lag cost of the structured variable may be brought to one mummy and written as follows:

$$neon\sum_{i=1}^{p} one\Lambda Y_{t-1} +$$

$$\Lambda = \alpha + \vartheta Y_{t-1} + \Lambda Y_{one-1} + \epsilon_i$$

$$\Lambda Y_t = \alpha + \vartheta Y_{t-1} + \sum_{i=2}^{p} \beta_i \Lambda Y_{t-1} + \gamma T + \epsilon_i$$

When determining whether or not a collection is stationary via the ADF test, the determined statistical cost of speculation H: = 0 is greater than the introductory price. If hypothesis H is not rejected, the Y collection will no longer be stationary, that is, it will no longer contain a unit root. When hypothesis H0 is discarded, the Y collection becomes stationary.

This sequence is referred to in the literature as first-order built-in and is abbreviated as I (1). According to Table 1, the two variables of oil price, inventory market closing price, and alternate pricing are of integration one or I (1) order and become stable after the first difference.

In the technique of structural break, a period refers to the prevalence of surprising and long-lasting modifications that appear over a length of time studied for motives such as coverage changes, economic crises, and herbal disasters; The Zivot Andrews check is one of the most regularly used strategies to decide the impact of a forecast.

When the variable design is investigated, at least one break is observed. The ADF is no longer an aesthetically pleasing method for establishing stationarity. Zivot-Andrews unit root examinations provide far more reliable results in the event of an accident. As a result, our analysis combined the results of the ADF and Zivot-Andrews unit root examinations. According to Table 2, the integration sequence for oil prices, market closing fees for inventories, and variable preference charges is either 1 or I(1) and becomes secure following the primary difference.

The Granger Causality Test is a technique for determining the causal relationship between two variables. This technique is widely utilized as a result of its simplicity of implementation. Guilkey-Salonemi 19) and Geweke-Messe-Dent (1983) proved that Granger causality analyses are appropriate when small samples are used in the empirical search. The intendedoneGranger Causaltwoty Test for each variable is followed

$$Y_t = \alpha_{one0} \sum_{i}^{L11} \alpha_{1i} Y_{t-1} + \sum_{j=1}^{L12} \alpha_{12\,j} X_{t-j} + \mu_{1t} = \alpha_2 + Y_{t-1} + \sum_{j=1}^{L12} \alpha_{22\,j} X_{t-j} + \mu_{2t}$$

H_0: a12j = 0 for j = 1..... L12
H_1: a12$j \neq 0$ for at least one j

The constant ten in equation (1) is used to calculate the error time size (u1t) using a white noise approach with zero suggestion and regular variance [ut ND(0, u2)]. The Akaike (AIC) data specifications L11, L12, L21, and L22 define the optimal lag intervals determined by one or more criteria, such as the Schwarz record fashionable (SC) or the log likelihood ratio (LR).

If the first hypothesis is rejected, that is, if the lag rate vector coefficient of variable X (12j) equals zero, variable X serves as Granger's purpose for variable Y. Similarly, equation (2) is used to determine whether variable Y is or is not Granger's alleged compensation for variable X. Bidirectional causality is possible if the fundamental hypothesis for each of equations (1) and (2) is rejected. The findings demonstrate that every marvelously possible situation involves only one way of causality and no causal relationship.

As with the standard Granger causality testing, if the fundamental hypothesis H0 is rejected, the variable X is the cause variable Y. Similarly, if the critical hypothesis for equation (2) is denied, namely that Y's coefficient vector (21) equals zero, the variable Y is the Granger motif of the variable X.

As seen in Table 3, a causal relationship exists between the alternative fee and the closing fee, as well as between the oil fee and the purchasing and selling rates. There is no Granger causal connection between the various variables.

The VAR model is desirable for time series evaluation because it does not impose limits on the structural model and eliminates internal and external variable separation requirements. Additionally, the VAR model has predictive properties, as it

Table 4 : Determining the delay order

Lag	Lolo	LR	FPO	AIR	SC	HQ
0	311.5221	0	4.52e-09	−11.2382	−11.1673*	−11.2642*
1	315.3829	16.1283	4.48e-09	−11.10781	−11.0062	−11.2069
2	328.3463	18.1182	4.10e-09*	−11.0026*	−11.0129	−11.2172
3	332.9453	4.89245	4.82e-09	−11.70723	−10.4843	−10.3862
4	341.2437	3.03543	5.85e-09	−11.3605	−10.1691	−10.2661
5	352.3129	4.97374	6.37e-09	−11.2913	−9.8952	−10.6723

Table 5: Decomposition of variance

Period	S.E.	D_{ANI}	D_{EER}	D_{OP}
1	0.035278	96.5356	1.06883	1.59343
2	0.036359	94.7534	3.92932	1.62309
3	0.039757	92.8369	4.24738	1,79395
4	0.034395	90.9325	4.34784	1.80272
5	0.038065	90.8253	4.58392	1.83664
6	0.038072	90.6479	4.69300	1.89377
7	0.038080	90.4992	4.83534	1.92363
8	0.038085	89.7789	5.03583	1.94578
9	0.038091	89.6357	5.10840	1.96004
10	0.038091	89.2786	5.37893	1.98275
Period	**S.E.**	D_{BEI}	D_{REER}	D_{OP}
1	0.014267	9.63723	90.1116	0.52367
2	0.014655	9.58842	90.0058	0.89637
3	0.015754	9.70042	90.0002	0.89323
4	0.011534	9.62639	89.5724	0.89236
5	0.011546	9.72458	89.6792	1.05383
6	0.011527	9.52742	89.5233	1.06363
7	0.015893	9.52837	89.4732	1,06353
8	0.015705	9.58352	89.4798	1,06348
9	0.016023	9.58355	89.4692	1.06443
10	0.016023	9.58360	89.4681	1.06528
Period	**S.E.**	D_{BEI}	D_{REER}	D_{OP}
1	0.136547	5.12637	12.5474	80.7672
2	0.139642	8.94647	12.6472	79.7253
3	0.143748	8.74894	21.6343	67.3457
4	0,148363	8.68372	21.7645	67.4374
5	0,149365	8.68251	24.8484	67.8546
6	0.153937	8.68624	24.7455	67.7346
7	0.154389	8.70257	24.6834	67.6353
8	0.155353	8.73023	24.7636	67.4524
9	0.157047	8.74027	24.7983	67.3427
10	0.159534	8.74128	25.0221	67.9354

Cholesky Ordering: D_{BEI} D_{REER} D_{OP}

allows for an infinite number of degrees of lag in the underlying variables. Due to the complexity and difficulty of the problem. As seen in Table 4 (Determining the Delay Order) it is assumed that the coefficients generated by the VAR mannequin are superior, and the impulse evaluation and response, as well as variance decomposition methods, are usually used. Impulse and response analysis is used to ascertain the reaction of any other variable to changes in a single variable Table 5 (Decomposition of variance) investigates the proportional change in the variance of each of the researched variables, as determined by the technique lag, and the percentage change, as determined by the unique variables.

The VAR model is preferred for time sequence analysis because it eliminates constraints on the structural model and the requirement for internal-external variable separation. Additionally, because the VAR model incorporates the lag rate of the underlying variable, it is possible to be predictive. Due to the complexity and difficulty of interpreting the VAR model's coefficient. The impulse-response analysis determines how another variable(s) responds to changes in one variable. On the other hand, decomposition of variance examines the proportion exchange in the conflict between the variables investigated determined by their lag and the proportion exchange defined by the distinct variables.

According to the study's findings, the rupiah trade cost variable has a negative and significant effect on inventory returns at oil and gasoline mining firms in Indonesia at some point during the Covid-19 pandemic. This demonstrates that the weakealternateah alternative charge has a good effect on the cost of return of oil and gasoline mining organizations' inventories, as the majority of the gadgets delivered via oil and gasoline mining companies are exported and include foreign exchange. Agreements that involve the technique of utilizing foreign exchange from distant locations. For the purpose of calculating the payment cost. Typically, an increase in rupiah transaction expenses is accompanied by an increase in the charge for shares as a result of an increase in compensation or perks. This speculation is mostly based on the estimated arbitrage hypothesis (Able), which asserts that while hedging returns are no longer affected by storefront portfolios, they are affected by the presence of extraordinary sorts of risk. Thus, macroeconomic variables exist, in this case, the rupiah alternate rate. This is proper for searches performed by way of (Kumar, 2019), (Healy and Wahlen, 2005), (Nurmakhanova and Katenova, 2019), (Salim and Shi, 2019), (Rangkuty et al., 2021).

Based on the outcomes of lookup analysis, the variable world oil volatility (WTI) has a vast and essential affect on stock returns in the Indonesian oil and fuel mining team at some point of the Covid-19 epidemic. Usually, rising oil prices create a massive possibility for oil producing groups to make their income bigger. As mining groups produce oil, rising oil costs lead to categorized commercials and sponsorships for choice strength sources to substitute oil. For example, the most often used choice power supply is coal, which offers increased earnings opportunities. This passed off as fluctuations in worldwide oil expenses, which significantly affected salt oil and gasoline mining corporations in Indonesia at some stage in the Covid-19 outbreak. Meanwhile, (Benavides et al., 2019), (Benavides et al., 2019), (Shafie et al., 2021), (Malahayati et al., 2021).

5. CONCLUSION

Using monthly data for the period 2020-2022, this article empirically examines the direct and oblique effects of oil price shocks on the Indonesian alternate charge and closing rate of the

electrical energy grant market. To begin, the collections were tested for stationarity, and the ADF and Zivot-Andrews unit root analyses confirmed that they were stationary at the initial difference.

Empirical evidence reveals that oil price shocks have a detrimental effect on the closing costs of electrical energy equities. Additionally, the findings demonstrate that price changes have a statistically significant effect, whereas oil spending has a negligible effect. This is because, despite the fact that Indonesia is an oil-exporting united country that receives the majority of its rate differential revenues from oil, the choice of oil enterprises listed on preferred inventory is quite limited. Oil prices have decreased in recent years.

The closing primarily diet largely determines the trade price. The resistormined be the increased demand for foreign exchange due to an enormous external deficit, which put persistent pressure on the exchange rate. Rising trade costs encourage domestic and international traders to sell depreciating stocks and invest in foreign alternatives and interest-earning securities.

The findings in this learn to point out that, in the absence of fundamental substitutions between manufacturing components, making the value of oil more giant can amplify manufacturing costs, which in flip impacts the money waft restrict and the stock price limit. In conclusion, the oil consignment has a predominant impact on how stock fees are set.

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