

## The Moderating Effect of Goodwill and Goodwill Impairment on Global Energy Crisis and Corporate Cash Holding

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### Abstract

*The global energy crisis caused the price spike of various operational inputs for the company, sufficient cash is required to ensure the company's operations continue. This study aims to analyse the casual effect of the energy crisis on corporate cash-holdings in Indonesia and the role of goodwill and impairment of goodwill in moderating this effect. Goodwill and goodwill impairment are indicators of corporate risk related to the synergy of business combinations. This study use differences in differences method. There are 564 companies listed on the Indonesia Stock Exchange include as the sample of this study with a quarterly research period from the 4th quarter of 2020 until the 2nd quarter of 2022. The hypotheses were tested using the linier regression analysis and robustness test. This study found that the global energy crisis has a positive effect on corporate cash holdings for the impacted sub-industry. However, goodwill and goodwill impairment are not moderate that influence. We describe our study's limitations. For further research, we are expected to add more control variables, use another robustness test and increase the observed period until the global energy crisis is over.*

**Keywords:** *global energy crisis, cash holding, goodwill, goodwill impairment, difference in differences.*

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## INTRODUCTION

The global energy crisis, which began in the fourth quarter of 2021, was sparked by significant shifts in the supply and demand for energy commodities. Several nations' decisions to reduce their production of fossil fuels and a disruption in the oil and natural gas supply chain as a result of the invasion of Ukraine by Russia contributed to the decrease in the supply of energy commodities.

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The implementation of a global agreement in France regarding the net zero emission policy has resulted in a decrease in the supply of oil and fossil fuels. This has caused several nations to gradually begin switching to renewable energy and reducing their production of non-renewable energy; however, renewable energy is insufficient to meet the global demand for energy by households and businesses (Ozili & Ozen, 2022).

At the same time, there is an increase in energy demand caused by the post-pandemic economic recovery. The pandemic caused energy consumption to decrease by 4.5 percent in 2020, but it suddenly increased to 4.6 percent in 2021 (IEA, 2021). Additionally, when extreme weather occurs as a result of global warming, heating and cooling equipment consume more energy. The mechanism that causes demand to rise when supply decreases have led to an increase in global energy prices. The global energy index's price will rise by 63.37 percent as a result in 2022. According to Singh (2021), the expansion of fossil fuels is a significant driver of economic growth, industrialization, and human health management. As a consequence of this, it is anticipated that inflation will continue to be high in 2022, reaching an average of 3.9% in developed countries and 5.9% in developing countries (IMF, 2022).

This motivates a variety of businesses to maintain and enhance their financial performance, particularly in terms of liquidity. One of the most crucial aspects of surviving a crisis is controlling the company's liquidity. Planning and analysis of liquidity will enable the company to survive the crisis (Alao et al., 2020). The most liquid asset is cash, so the company needs it to complete daily operations, pay suppliers, compensate employees, and fund projects (Faque, 2022). Thus in times of crisis, management tends to hold more cash under the precautionary motives to anticipate unexpected events.

Previous research in the field of cash has demonstrated a positive correlation between the level of the company's cash holdings and a crisis (Qin et al., 2020; Tran, 2019; Lozano & Yaman, 2020; Zhang et al., 2020; Shiau et al., 2018). These studies were carried out with various kinds of crises, such as financial crises (Tran, 2019; Lozano & Yaman, 2020; Shiau et al., 2018), COVID-19 (Qin et al., 2020), and the volatility of the oil price (Wu et al., 2021; Zhang et al., 2020). However, there is still a lack of research on how the global energy crisis affects cash holdings. Although, the global energy crisis has occurred numerous times in history. In addition, Lozano & Yaman (2020) stated is important to understand whether firms will react similarly (increase their cash holding) during other crisis periods. Thus, this study tends to focus on how the global energy crisis affects corporate cash holdings.

The majority of these studies were carried out in Industrial countries. According to Sriram (1999), only a few studies have been conducted on cash holdings in developing nations, with the majority of those studies focusing on the industrialized country. Meanwhile, the characteristics of companies in industrialized countries and developing countries are very different. Unlike prior studies, this study is carried out in a developing nation like Indonesia. In Indonesia generally, empirical research on corporate cash holdings is limited to specific stock indexes or sectors. Therefore, this research was conducted to add to the literature on cash holdings policies in times of crisis caused by economic conditions, especially in developing countries such as Indonesia. In addition, this research contributes to the Indonesian government in making crisis-related financial

policies. Additionally, for investors, this study provides direction in making investment decisions in times of crisis.

The phenomenon of the global energy crisis has positive or negative impacts on Indonesia. The positive impact of this energy crisis in Indonesia is a trade balance surplus due to the increase in the value of Indonesia's non-oil and gas energy commodities exported such as coal, crude palm oil, and others. Meanwhile, the negative impact of the global energy crisis in Indonesia was the rise in oil and gas commodity prices such as cooking oil due to high global demand which directly boosted prices. As a result, inflation for cooking oil in Indonesia is around 7% in 2021 (Bank Indonesia, 2022). The increased demand caused by a high demand for crude palm oil from various countries that previously consumed sunflower and canola seed oils has returned to consume palm oil due to the crisis. The increase in demand indirectly pushed up the price of cooking oil in Indonesia due to limited supply.



**Figure 1. Cooking oil price spike in Indonesia**

Source: Bank Indonesia 2021

Since the impact of the global energy crisis in Indonesia varies across industries. It makes various optimal levels of cash holdings for each industry's characteristics. Holding cash protects the company from threats related to liquidity, but spending cash allows the company to take advantage of new opportunities (Nason & Patel, 2016). This study takes the advantage of various optimal cash holdings by different sector industries who seriously impacted and were not seriously impacted caused by the crisis to navigate the casual effects of the global energy crisis on corporate cash holding in Indonesia.

However, goodwill may impede the expansion of cash reserves. A company with a high goodwill value faces a significant risk, necessitating restrictions on external financing. After a business combination, goodwill impairment as a result of bad synergy performance will send a negative message to stakeholders and the market. Thus, banks or other creditors will use various information to control and limit financing for companies (Qin et al., 2020). Based on the previous explanation, this paper aims to fill the existing gap by analyzing whether Indonesia's listed

companies' cash holdings are affected by the global energy crisis and the role of goodwill and impairment of goodwill in moderating those effects.

A previous study investigated the effect of cash holdings on controlling the negative risk posed by oil price uncertainty in China-based businesses by all non-state-owned manufacturing companies on the China Stock Exchange from 2008 to 2018 (Wu et al., 2021). According to the findings of this study, the uncertain price of oil positively impacts cash holdings. The company increases its cash holdings to control the negative effects of oil price uncertainty by avoiding funding costs when the cost of funding from outside the company is higher than the cost of funding from within the company due to the crisis.

**H1: Ceteris paribus, the global energy crisis has a positive effect on the corporate cash holdings in Indonesia.**

Qin et al. (2020), conducted research on the Shanghai and Shenzhen stock exchanges in the first quarter of 2014 to 2020 regarding the pandemic's influence on cash holdings level within the company and the role of goodwill in moderating this effect. This study uses the difference in differences (did) method. The results of this study indicate that goodwill reduces COVID-19's impact on increasing cash holdings. Where high goodwill identifies high business integration risks, this makes creditors limit their finance. Due to limitations imposed by debt and scale, businesses cannot increase their cash ownership beyond a certain point.

**H2: Ceteris paribus, goodwill weakens the positive effects of the global energy crisis on the cash holdings of Indonesian corporations.**

According to Li et al. (2011), goodwill impairment can serve as the main indicator of reduced profitability in the future. Because goodwill impairment indicates that the benefits expected from the previous acquisition are overstated on the balance sheet. Also, this could happen if the synergies from previous acquisitions didn't work out. Economic or industry factors that have an impact on the business as a whole, a segment, or a reporting unit can also cause impairment.

Fu & Shen (2020), conducted research on Chinese companies from 2014 to 2020 regarding the effect of a pandemic on company performance with goodwill impairment as a moderating variable. This study uses the difference in differences (did) model. This study demonstrates that the covid negatively impacted a company's performance and that businesses with goodwill impairments perform worse.

Thus, compared to other companies, companies with impaired goodwill have a higher unique risk, and their performance will fluctuate more during a crisis. Qin et al. (2020), found that goodwill impairment was able to diminish the pandemic covid impact on the increase of cash holdings.

**H3: Ceteris paribus, goodwill impairment weakens the positive effects of the global energy crisis on the cash holdings of Indonesian corporations.**

## RESEARCH METHOD

This study employs a quasi-experimental research design in a quantitative research methodology. The difference in differences (DID) method is used to analyze the data. The DID method is a strategy for modeling the role of pre-treatment outcomes. Since the crisis effects are generally distinctive, it is challenging to ensure that the sample distribution between the groups with high and low impacts is completely random. Qin et al. (2020), make inquiries about the effects of the Pandemic Covid-19 outbreak on listed companies in the Shanghai and Shenzhen stock exchanges using the DID model. The results from the natural experiment serve as the exact foundation for the DID model. The DID model can successfully isolate the true impact of the crisis and successfully regulate the ex-ante differences between research subjects (i.e., treated and control groups).

### Sampling Method

All of the companies listed on the Indonesia Stock Exchange (IDX) between 2020 and 2022 were the subjects of this study. There are 564 sample companies obtained through the purposive sampling technique.

**Table 1. Research Sampling Criteria**

No.	Criteria	Total
1	Companies on Indonesia Stock Exchange 2020-2022	773
2	Companies delisting from Indonesia Stock Exchange 2020-2022	(65)
3	Companies that do not present financial balance sheets in Rupiah	(90)
4	Companies that present incomplete financial statement information	(54)
Total Sample		564
Total Sample data for 7 periods (564 x 7)		3.948

Source: Secondary data processed (2022)

We consider there is a different impact received by every industry depending on their unique characteristic. By several theories, we identified 8 industries as seriously impacted industry. That is the oil, gas & coal industry, food & beverage industry, cigarettes industry, clothing & luxury goods industry, retail trade industry, pharmaceutical & health research industry, banks industry, holding & investment industry. We classify those 8 industries as a treatment group. Other industries are classified as a control group. Also, there is a different performance before and after the global energy crisis, thus we classified the periods quarterly as before and after the global energy crisis which is the fourth quarter of 2020 until the fourth quarter of 2021—referred to as the "before" period—and the fourth quarter of 2021 until the second quarter of 2022—referred to as the "after" period.

### Measurement

The variables in this study are measured by a ratio and dummy scale. This study's dependent variable is the cash holding level. The independent variables are time variables and group

variables. This study's control (explanatory) variables are size, leverage, growth, return on assets, cash flow returns on assets, and net working capital. And the moderating variables in this study are goodwill and goodwill impairment. Table 2 shows the definition and measurement of each variable.

**Table 2. Variables Measurement**

<b>Variables</b>	<b>Equation</b>	<b>Sources</b>
<b>Dependent Variables</b>		
Cash Holding	The corporate cash holdings level, measured by cash/operating income	Zhang et al. (2020) Ranajee & Pathak, (2019)
<b>Independent Variables</b>		
Treated	The dummy variable "global energy crisis impacted industries degree". If the company is in a serious impact industry, is set to 1, otherwise, it is set to 0.	
Period	The "global energy crisis time" dummy variable. If the global energy crisis occurs after the fourth quarter of 2021, the value is 1, otherwise, it is 0.	
<b>Control Variables</b>		
Size	The log of total assets	Hartono (2012:14)
Leverage	The debt ratio is calculated as the ratio of total assets to total liabilities.	Sudana (2015:23)
Grow	The difference between the company's current and previous operating incomes is used to calculate the operating income growth rate, which is then divided by the previous operating income.	Fu & Shen (2020)
Return on Asset	The company's profitability is determined by dividing net income by average total assets.	Sudana (2015:25)
Cash return on Asset	Cash from operating activities is divided by total assets.	Bhandari & Iyer (2013)
Net Working Capital	Also known as the company's liquidity level. Net working capital is determined by assets minus liabilities divided by total assets	Weidemann (2018)
<b>Moderating Variables</b>		
GW	Company goodwill, existence is 1, otherwise is 0.	
GWIM	Company of goodwill impairment, existence is 1, otherwise is 0.	

## Hypothesis Testing Method

Since there is a different impact degree in various industries caused by global energy. We proposed the difference-in-differences model to obtain the casual effect between the global energy crisis and corporate cash holding. The did model was used to estimate certain treatments by comparing changes in outcomes over time between populations enrolled in a program (treatment group) and populations who are not (control group). Thereby, using did effectively measure the global energy crisis effect on corporate cash holding because it's not ignored the role of outcome pre-treatment and it used a control group as a counterfactual to measure the impact precisely.

There are two main assumption tests before applying the difference-in-differences model. First, unit rooting test. In the method proposed by Levin, Lin, and Chu unit root is conducted to make sure that data are stationer. Three criteria of stationer data: The variance (covariance) between two-time series data only depends on the lag between the two time periods; the mean (average) and its variance are constant over time. Second, parallel trend test. It assumes that the treated and control groups before treatment had identical trends in the dependent variable over time.

We used the Z statistical test as a hypothesis test. The tests were carried out with two multiple linear regression models, it is without and with moderation. The following are the models used in this study:

$$Cashholdings_{it} = \beta_0 + \beta_1 Treated_{it}.Period_{it} + \beta_2 Treated_{it} + \beta_3 Period_{it} + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 GROWTH_{it} + \beta_7 ROA_{it} + \beta_8 CFTA_{it} + \beta_9 NWC_{it} + \varepsilon_{it} \dots \dots \dots (1)$$

$$Cashholdings_{it} = \beta_0 + \beta_1 GW.Treated_{it}.Period_{it} + \beta_2 Treated_{it}.Period_{it} + \beta_3 Treated_{it} + \beta_4 Period_{it} + \beta_5 GW_{it} + \beta_6 SIZE_{it} + \beta_7 LEV_{it} + \beta_8 GROW_{it} + \beta_9 ROA_{it} + \beta_{10} CFTA_{it} + \beta_{11} NWC_{it} + \varepsilon_{it} \dots \dots \dots (2)$$

$$Cashholdings_{it} = \beta_0 + \beta_1 GWIM.Treated_{it}.Period_{it} + \beta_2 Treated_{it}.Period_{it} + \beta_3 Treated_{it} + \beta_4 Period_{it} + \beta_5 GWIM_{it} + \beta_6 SIZE_{it} + \beta_7 LEV_{it} + \beta_8 GROW_{it} + \beta_9 ROA_{it} + \beta_{10} CFTA_{it} + \beta_{11} NWC_{it} + \varepsilon_{it} \dots \dots \dots (3)$$

## Robustness Test Method

In this study, kernel propensity score matching was used as a model for the robust regression model. There is two main assumption tests before applying propensity score matching regression. First, selection on observables means that the treatment group characteristic determines entirely by observable characteristics. Second, common support means that there are control individuals with similar characteristics as the treatment individuals. Then a weighting scheme is carried out in which estimates for each covariate (control variable) are formed using a parametric model, probit, or logit. The probit or logit regression result is a propensity score for each treatment and control individual. Later, the treatment and control individuals are matched based on their propensity scores. Those improve the quality of the matches used to obtain the average treatment effect (ATE). Furthermore, the significance of the ATE results can be determined by the Z test, which is significant if the p-value is < 1%, 5%, or 10%.

## RESULT AND DISCUSSION

### Result

Table 3 shows the descriptive statistical analysis test result. The Variable of cash holding has an average of 0.089 and a standard deviation value of 0.118. This shows that the variation/distribution of the variable data on the level of cash ownership is diverse from the average. Meanwhile, the average (standard deviation) for size is 28.455 (1.961), this shows that the variation/distribution of the variable data is diverse from the average. The average (standard deviation) for leverage is 0.489927 (0.329262), this shows that the variation/distribution of the variable data is diverse from the average.

The average (standard deviation) for growth is 0.603711 (8.377061), this shows that the variation/distribution of the variable data is diverse from the average. The average (standard deviation) for return on asset is 0.011211 (0.080511), this shows that the variation/distribution of the variable data is diverse from the average. The average (standard deviation) for cash flow return on asset is 0.026575 (0.096778), this shows that the variation/distribution of the variable data is diverse from the average. The average (standard deviation) for net working capital is 0.310939 (0.37746), This shows that the variation/distribution of the variable data is diverse from the average.

Based on table 3, The cash holdings level has a minimum value of 0.0000000108 and a maximum value of 0.968216. This minimum value shows that less than 1% of some company assets are in the form of cash, which shows a high level of liquidity risk. And the maximum value shows that 96% of some company assets are in the form of cash. It shows the high level of company liquidity.

**Table 3. Descriptive Statistic Tests**

Variable	N	Mean	Std. Deviation	Minimum	Maximum
<i>Cash holding</i>	3,948	0.089249	0.118994	1.08E-07	0.968216
<i>Size</i>	3,948	28.45518	1.961241	22.57565	35.11859
<i>Leverage</i>	3,948	0.489927	0.329262	8.00E-06	3.138601
<i>Growth</i>	3,948	0.603711	8.377061	-22.2462	298.1355
<i>Return on Asset</i>	3,948	0.011211	0.080511	-1.04252	1.932827
<i>Cash return on asset</i>	3,948	0.026575	0.096778	-0.66639	1.928885
<i>Net Working Capital</i>	3,948	0.310939	0.37746	-2.86442	0.994987
<i>Goodwill</i>	3,948	0.247214	0.431447	0	1
<i>Goodwill Impairment</i>	3,948	0.018744	0.135636	0	1

Source: Secondary data processed (2022)



### Assumption Test

The unit rooting test results using the Levin, Lin, and Chu model are presented in Table 4. It demonstrates that research variables remain stable below 1%. As a result, every variable is stationary. This indicates that the data already has a constant variance and mean (average) value over time and that the covariance between two-time series only depends on the time lag between the two periods.

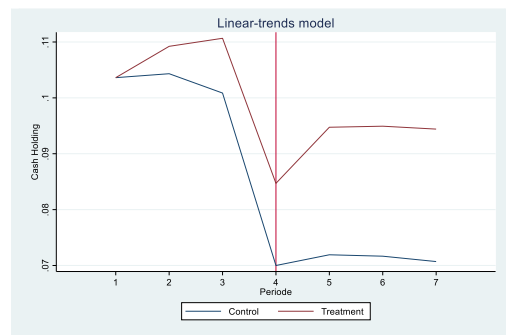
**Table 4. Levin, Lin & Chu Unit Rooting Test**

Variable	Levin, Lin & Chu	Stationary
Cash holding	-82,3975***	Stable
Size	-61,8254***	Stable
Leverage	-8,1e+02***	Stable
Growth	-67,7755***	Stable
Return on Asset	-46,8779***	Stable
Cf return on asset	-53,1195***	Stable
Net Working Capital	-53,2395***	Stable

\*  $p < 10\%$ , \*\*  $p < 5\%$ , dan \*\*\*  $p < 1\%$ .

Source: Secondary data processed (2022)

Figure 2 shows the graphic results of the linear trend test. It can be seen that the treatment and control groups before the treatment period (from the 4<sup>th</sup> quarter of 2020 until the beginning of the global energy crisis-quarter 4<sup>th</sup> of 2021) have the same variation in trends and then the trend changed drastically after receiving treatment (after the 4<sup>th</sup> quarter of 2021). That means, this model passed the linear trend test, hence, the difference in differences estimation model is suitable for our analysis.



**Figure 2. Parallel trend test**

Source: Secondary data processed (2022)

### Hypotheses Tests

After passing all the assumptions, we estimate the difference in the differences model using regression and report the result in table 5. There are 3 columns, and each column shows the result

of the regression models using model 1, 2, and 3 which has been mentioned before in the research method part.

**Table 5. The Regression Result**

	1	2	3
	Base	Goodwill	Goodwill Impairment
<i>Treated*Period</i>	0.0158** 2.39	0.0155** 1.93	0.0159** 2.38
<i>GW*Treated*Period</i>		0.0009 0.09	
<i>GWIM*Treated*Period</i>			-0.0059 -0.55
<i>Goodwill</i>		-0.0012 -0.09	
<i>Goodwill Impairment</i>			0.0004 0.07
<i>Treat</i>	-0.2914** (-2.01)	-0.2909** (-2.02)	-0.2916* (-1.9)
<i>Period</i>	-0.005*** (-3.7)	-0.005*** (-3.68)	-0.005*** (-4.24)
<i>Size</i>	0.0049 (-0.35)	0.005 (0.4)	-0.0313* (-1.88)
<i>Leverage</i>	-0.0313** (-2.2)	-0.0314* (-1.77)	0.0049 (0.31)
<i>Growth</i>	0.0001 (-0.26)	0.0001 (0.24)	-0.0585*** (-5.16)
<i>Return on Asset</i>	0.0105 (-0.82)	0.0105 (0.67)	0.0104 (0.72)
<i>Cash return on asset</i>	0.0924*** (-3.79)	0.0924*** (3.39)	0.0924*** (4.28)
<i>Net Working Capital</i>	-0.0585*** (-4.86)	-0.0585*** (-4.76)	0.0001 (0.2)
<i>Constant</i>	0.2322 (-0.56)	0.2295 (-0.59)	0.2334 (-0.61)
<i>Adjusted - R2</i>	0.8714	0.8714	0.8714

In parentheses, a Z-statistic is mentioned. \*, \*\*, and \*\*\* signify significance levels of 10%, 5%, and 1%, respectively.

Source: Secondary data processed (2022)

Table 5 column 1, reported the global energy crisis effect on corporate cash holding without any moderation. The  $\beta_1$  ( $Treated*Period$ ) coefficient is the value of the difference in differences estimate. The value of  $\beta_1$  is 0.0158 that significant at the 0.05 level. It indicates that every company that belongs to the treatment group has a higher level of cash holdings than companies engaged in the control group after the global energy crisis occurred. This result supports the first research hypothesis.

Table 5 column 2, reported the result of the goodwill on moderating the global energy crisis effect on corporate cash holding. The coefficient  $\beta_1(GW*Treated*Period)$  is the estimated moderating effect of goodwill. The value of the regression coefficient  $\beta_1$  is 0.0009. However, given that the p-value was greater than 10%, this result is insignificant. It suggests that form-level cash holding is not diminished by the global energy crisis because of goodwill. This result does not support the second hypothesis of the study.

Table 5 column 3, reported the result of the impairment of goodwill on moderating the global energy crisis effect on corporate cash holding. The  $\beta_1$  ( $GWIM*Treated*Period$ ) is the value of the estimated moderating effect by the impairment of goodwill. The  $\beta_1$  is -0.0059. However, given that the p-value was greater than 10%, this result is insignificant. It indicates that the effect of the global energy crisis on form-level cash holding is not diminished by goodwill impairment. This result does not support the second hypothesis of the study.

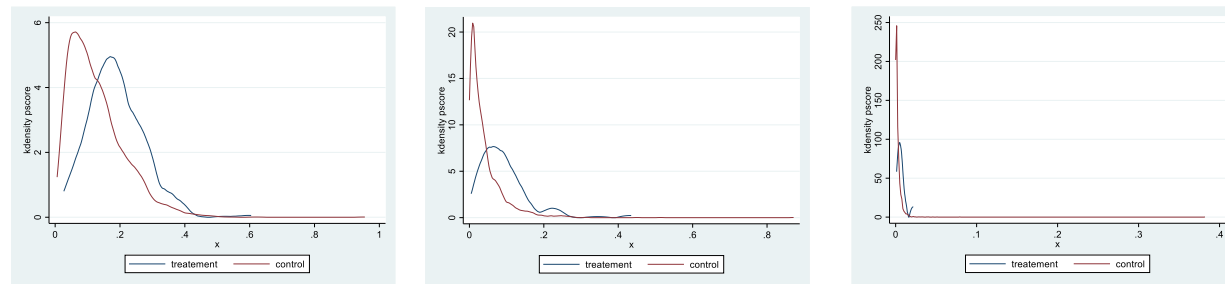
### Robustness Test

Assumption 1, selection on observables. Since the treatment group must be matched with the control group based on the observed covariates (control variables), the control variable that describes the characteristics of the treatment variable must be observable.

**Table 6. Pseudo R<sup>2</sup> value of co-variate probit regression**

Variable	1 - base	2 - GW	3 - GWIM
Pseudo-R <sup>2</sup>	0,0785	0,1262	0,0938

Source: Secondary data processed (2022)



K-density model graph 1

K-density model graph 2

K-density model graph 3

### Figure 3. Score Matching Graph

Source: Secondary data processed (2022)

The probit regression results are presented in Table 6, which reveals that the pseudo-R2 values of models 1, 2, and 3 were just 7%, 12%, and 9%, respectively. This means that if the control variable is included in the regression model, the impact is only 7%, 12%, and 9% outperform of regression model without a control variable. It indicates that the character of the control variable for the treatment group in this study is not fully observable. Thus, the first assumption was rejected.

Assumption 2, common support. Where the k-density value between the treatment group and the non-treatment group overlaps. The common support area represents the similarity of characteristics between the 2 groups based on the similarity of the distribution of the propensity values so that the model is suitable or matched based on the trend score.

**Table 7. Kernel-Propensity Score Matching Regression Result**

Variable	1 - Base	2 - GW	3 - GWIM
<i>Treated*Period</i>	0,0002257 (0,964)		
<i>GW*Treated*Period</i>		0,0104834 (1,42)	
<i>GWIM*Treated*Period</i>			0,0115181 (0,41)
<i>Size</i>	0,1279*** (9,45)	0,1780*** (9,02)	0,1204*** (2,21)
<i>Leverage</i>	-0,2502** (-2,55)	-0,1951*** (-1,39)	-0,3498 (-0,94)
<i>Growth</i>	0,0013 (0,46)	-0,0074 (-0,41)	0,0008 (-,0,04)
<i>Return on Asset</i>	0,8824*** (2,57)	1,3846*** 3,04	-16,468 (-1,23)
<i>Cash return on asset</i>	-0,4156 (-1,38)	-1.1555 (-2,32)	0,7840 (-0,04)
<i>Net Working Capital</i>	-0,9398*** (-11,08)	-1,035*** (-8,07)	-0,8009*** (-2,83)
<i>Constant</i>	-4,4161*** (-11,59)	-6,5717*** (-11,6)	-5,9782 (-3,82)
R <sup>2</sup>	0,0785	0,1262	0,0938

In parentheses, a Z-statistic is mentioned. \*, \*\*, and \*\*\* signify significance levels of 10%, 5%, and 1%, respectively.

Source: Secondary data processed (2022)

Figure 3, shows there is an overlap between the k-density probability scores for the treatment and control groups. This indicates that there are control individuals with similar characteristics as the

treatment individual for every treatment individual. Thus, assumption 2 is accepted. However, because assumption 1 is rejected, the results of the probability score matching are likely to be biased.

Based on table 7 column 1, the *Treated\*Period* value is 0.000225672 and has a significance value greater than 10% so the results are not significant. This indicates that the global energy crisis does not affect Indonesia's corporate cash holdings. These results are inconsistent with the hypothesis test which states that the energy crisis has a positive effect on cash holding level. However, this result is also biased because during the first assumption test (selection on observables) the pseudo-R<sup>2</sup> value's only 7% which means the first assumption test is rejected. So using the PSM model to robust this model is not effective and we can't trust the result

Based on table 7 column 2, the *GW\*Treated\*Period* value is 0.010483 with a significance value greater than 0.1 so the results are not significant. This indicates that goodwill does not moderate the global energy crisis effect on the increase in sensitive corporate cash holdings. These results are consistent with the model 2 hypothesis test. However, these results are also biased because during the first assumption test (selection on observables) the pseudo-R<sup>2</sup> value's only 12% which means the first assumption test is rejected. Therefore, using the PSM model to robust this model is not effective and we can't trust the result

Based on table 7 column 3, the *GWIM\*Treated\*Period* value is 0.0115 with a significance value greater than 0.1 so the results are not significant. This indicates, that goodwill impairment does not moderate the global energy crisis effect on the increase in sensitive corporate cash holdings. These results are consistent with the model 3 hypothesis test. These results supported the model 3 result. However, these results are also biased because during the first assumption test (selection on observables) the pseudo-R<sup>2</sup> value's only 9% which means the first assumption test is rejected. So, using the PSM model to robust this model is not effective and we can't trust the result.

## Discussion

### *The global energy crisis affects the level of cash holdings*

Based on table 5 column 1, the *Treated\* Period* value is positive at 0.0158. With a significance level of less than 0.05, these findings are significant. This means that the global energy crisis has caused the companies that are classified as the treatment group to have more cash rather than the companies classified as the control group. But these results were not supported by the robustness test that was conducted using the PSM method which showed that the coefficient of the positive treatment effect was 0.000225672 with a significance value greater than 0.1 so the results were not significant. However, we ignore the result of the PSM model to robust this model because it does not pass the first assumption test (selection on observable). Therefore, the study's test results suggest that cash holdings are positively impacted by the global energy crisis. As a result, we agreed with the study's first hypothesis.

The results of this test are consistent with the cash holding theory of the precautionary motive, Keynes (1936), which stated that the company needs a certain amount of cash to deal with emergencies to ensure the continued operation of the company. The food & beverage, clothing & luxury goods, retail trade, pharmaceutical & health research typically increase their cash holdings in response to the global energy crisis to reduce the risk of rising operating costs and falling

consumer purchasing power due to inflation. The results of this study are supported by Qin et al. (2020), which stated that pandemic has a significant positive effect on the level of cash holdings. Thus, businesses in China typically increase their cash holdings as a precaution to lessen the potential economic effects of the pandemic. Several studies have confirmed that the increases in corporate cash holding are under precautionary motives (Honda & Uesugi, 2022)

The increase in production operational costs in the food and beverage sector due to rising cooking oil prices and rising prices of other foods makes the food and beverage industry increase its cash so that the company's operations could continue. This is supported by Zhang et al. (2020), in their research, which demonstrates that cash holdings rise as oil prices become more uncertain. Also, Wu et al. (2021), demonstrate a positive correlation between cash holdings and exposure to oil price uncertainty, as businesses typically increase cash holdings as a hedge against rising oil prices. Also, a number of recent research have supported the positive effect of oil price uncertainty on company cash holdings. (Bugshan, 2022; Alomran & Alsubaiei, 2022)

The results of this test are also consistent with Keynes' theory of money demand related to transaction motives, Keynes (1936), in which the company's cash holdings are driven by the need for cash for current business and exchange transactions. Thus, in the company's operational process, additional cash is needed to manage or purchase additional raw materials, equipment, and pay wages, and pay for increases in other utility costs due to increased production or increased sales. So, the companies that experience increased sales due to increased market demand due to the energy crisis, such as companies engaged in the energy sector, will increase their level of cash ownership. This finding is in line with Jamil et al. (2016) who state that the drivers of cash holdings for Pakistani companies may be explained by transaction motives.

This result is also consistent with the transaction cost theory proposed by Coase (1937). Where in the concept of transaction cost theory there are non-operational costs needed for the coordination, control, and manage the transaction. This includes costs such as fees for negotiating and renegotiating contracts, as well as costs for contract enforcement. When the global energy crisis occurred, there is also uncertainty about economic policies taken by each country. The global energy crisis triggers global uncertainty which could generate transaction costs outside of operational costs. So, the companies that depend on imports, such as companies engaged in the pharmaceutical & health, and clothing & luxury goods sectors, may experience changes in contracts or negotiations with outside parties that encourage companies in these sectors to increase their cash holdings level.

The finding is in line with the theory of money as an asset approach proposed by Tobin (1958) which explains that money is needed by individuals as an asset for liquidity preference in their wealth portfolio because other investment assets tend to have risks that are dependent on market volatility. So that companies engaged in the banking sector, holding & investment companies will increase their cash holdings as a form of liquidity preference amid global uncertainty. This is supported by Tran (2019) in his research that a culture of avoiding uncertainty positively affects the company's cash holdings.

*The role of goodwill in moderating the global energy crisis effect on corporate cash holdings*

Based on table 5 column 2, the  $GW* Treated* Period$  is positive at 0.0008665. With a significance level greater than 0.05, these findings are not significant. This means that goodwill does not moderate the global energy crisis effect on the level of cash holdings. Using the PSM method, we carry out a robustness test which showed that the coefficient of the treatment effect value was 0.000225672 with a significance value greater than 0.05 so the results were not statistically significant. Therefore, it can be deduced that the global energy crisis's positive effect on corporate cash holdings is not moderated by goodwill. As a result, the study's second hypothesis was rejected.

The acquirer's overpayment of the acquired company's fair value is known as goodwill. According to a lot of literature, a company's goodwill poses a risk. where there is a possibility that mergers and acquisitions will not work out as planned due to a lack of synergies. This has an impact on the assessment of creditors or banks related to financing which can reduce the level of company cash ownership. However, in this study, it was found that goodwill did not affect corporate cash holding because the significance value of the goodwill variable was greater than 0.05.

Based on signaling theory, companies with goodwill tend to show an overvaluation of business combination activities where there is a potential risk of a business combination that can signal to banks or other creditors. However, this study's findings indicate that cash holding is unaffected by the goodwill variable. Thus, the signal theory cannot be supported by this result. This can happen because goodwill may not be seen as something bad for investors or creditors. This statement is in line with Lee (2011) who found that, contrary to the general view based on the opportunistic reporting hypothesis, discretionary reporting caused by SFAS 142 was not used opportunistically.

According to Aprilia & Budhidharma (2022), the positive impact of the COVID-19 pandemic on corporate cash holdings is not diminished by goodwill, which is consistent with the findings of this study. the positive impact of the COVID-19 pandemic on corporate cash holdings is not diminished by goodwill, which is consistent with the findings of this study. The researcher explained that only a few Indonesian companies have entered into business combinations with goodwill, so the analysis shows that goodwill moderation does not weaken the positive influence of COVID-19 on the level of corporate cash holdings in Indonesia.

However, this study's findings do not align with previous research work by Qin et al., (2020) which asserts that the effect of covid on cash holding level increases within the company will be diminished by goodwill. The researcher explains that high goodwill indicates a high risk of business integration, which will ultimately affect (decrease) corporate cash holdings and cause banks and credit unions to limit finance credit.

*The role of goodwill impairment in moderating the global energy crisis effect on cash holdings*

Based on table 5 column 3, the value of  $GWIM* Treated * Period$  is positive at 0.0058962. With a significance level greater than 0.05, these findings are not significant. This means that goodwill impairment does not moderate the global energy crisis effect on cash holding. This test was also strengthened by a robustness test conducted using the PSM method which showed that the

treatment effect coefficient was 0.0115 with a significance value greater than 0.1 so this result was not statistically significant. It can be deduced that the global energy crisis's positive effect on corporate cash holdings is not moderated by goodwill impairment. As a result, this study's third hypothesis was rejected.

Goodwill impairment is an adjustment to the carrying amount of goodwill by reducing its value due to several reasons, such as the acquisition being overestimated, or because of macroeconomic factors. Based on the signal theory, Spence (1973), there is asymmetry information between internal and external parties and only management (internal party) knows detailed information regarding the condition and prospects of the company. Management hides information about various factors behind the decrease in goodwill to maintain the company value. But the decline in the value of goodwill is the main indicator of a failure of synergy in a business combination that causes investors or creditors to limit their credit. Thus, cash holdings owned by companies that experience goodwill impairment are predicted to decrease due to financing constraints. However, in this study, it was found that goodwill impairment did not affect the company's cash holdings where the significance value of the goodwill variable was greater than 0.05.

This can happen because the information on the value of goodwill impairment is irrelevant to business analysts (investors, banks, or creditors). This assertion is supported by Schatt et al. (2016) in their research results which concluded that the impairment of goodwill is ineffective due to the fact that users cannot rely on accounting figures or additional information provided by management in impairment test notes, but they can adjust their expectations based on public information. Additionally, a number of studies demonstrate that avoiding goodwill impairment has long-lasting effects on a company's future performance and stock price (Han & Tang, 2020). Thereby, Investors and creditors are not forced to limit their credit as a result of goodwill impairment. Thus, the crisis's impact on company cash holdings was not affected by the impairment of goodwill.

However, this study's findings do not align with previous research work by Qin et al., (2020) which asserts that the effect of covid on cash holding level increases within the company will be diminished by the impairment of goodwill. The impairment of goodwill, according to the researcher, is a warning sign that the company's profitability will decline in the future. Consequently, creditors will restrict their credit, and the company's cash holdings will eventually lose value.

## CONCLUSIONS

This paper examines the global energy crisis's casual effect on the cash holding level in Indonesian companies due to the absence of cash-related research that examines the effect of the global energy crisis and research conducted in a developing country. We compare two types of corporate: seriously impacted and not seriously impacted to determine whether cash holdings are affected by the global energy crisis. Our results find that the global energy crisis has a positive effect on



corporate cash holding. However, goodwill and the impairment of goodwill, as indicators of corporate risk related to the synergy of business combinations, were found not moderate this effect.

This paper contributes to cash holding literature by providing information and bridging the gap between various crisis impacts on cash holding. This research makes several implications. First, this study can be used by the government to obtain information about different exposure on seriously and not seriously impacted industries caused by a global energy crisis on cash holding. This is important to make better financing policies and other macroeconomic policies. Second, investors can use this study's findings to decide how to diversify their portfolios in light of the liquidity risk associated with each industry.

This paper limitations include, first, the study's limited use of control variables. We try to focus only on how the global energy crisis affects cash holdings, but since cash holdings are influenced by many other variables (factors), the regression model should include all explanatory variables. However, only a few explanatory variables were included because of the limitations of the existing literature. Second, the model's robustness cannot be assessed using the kernel propensity score matching. Thus, suggestions for further research are expected to add more control variables, use another robustness test and increase the observed period until the global energy crisis is over.

### **List of Abbreviations**

USA: United States of America, GW: Goodwill, GWIM: Goodwill Impairment, PSM: Propensity Score Matching.

### **Authors' Contribution**

GRS developed research conceptual and collect data input on the proposed research, as well as performed data processing and developed article writing. DHS provided direction for the entire project, develop research ideas, supervise data collection, and analyse and contribute to the writing of articles.

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## Availability of Data and Materials

Data are available from the public sources cited in the text.

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