

KEY DETERMINANTS OF CASH RESERVES IN MANUFACTURING FIRMS DURING COVID-19 IN INDONESIA

Santy Dwi Cempaka*, Muhammad Saiful Hakim, Naila Qanita Zharifa, Ika Safitri,
Muhammad Haris Jauhari, Aang Kunaifi
Institut Teknologi Sepuluh Nopember

Correspondence*: scempaka@its.ac.id

Abstract

This study investigates the effects of the COVID-19 pandemic on cash reserves in Indonesian manufacturing companies. The research assesses cash levels before, during, and after the pandemic, and identifies key factors influencing cash holdings. Data from publicly listed manufacturing companies in Indonesia were analyzed, focusing on financial metrics such as earnings before interest, taxes, depreciation, and amortization (EBITDA), sales volatility, and net working capital. The findings reveal significant differences in cash, EBITDA, and sales volatility between the pre-crisis (2018-2019) and crisis periods horizons I (2020-2021) and II (2022). The primary determinants of cash holdings were found to be sensitivity of cash flow, capital expenditure, cash flow volatility, net working capital, and debt levels. These factors are crucial in understanding the impact of the pandemic on cash management in Indonesian manufacturing companies.

Keywords: Cash Holding, COVID-19, Indonesian Stock Exchange, Manufacturing Firm

A. INTRODUCTION

The COVID-19 pandemic has significantly impacted the world economy, presenting enterprises with unprecedented hurdles. Managing financial holdings was a major concern for businesses during this pandemic. Because of the pandemic's uncertainties and financial frictions, companies must reserve more cash as a preventive measure. Consequently, firms' financial and investment practices have shifted, with many firms raising their cash holdings to ensure survival throughout the pandemic (Al-Najjar, 2013).

Cash holdings are crucial to business policies. Keeping cash on hand is the most typical approach for businesses to ensure liquidity (Almeida et al., 2021). Businesses can respond to unforeseen fluctuations in cash flows, support ongoing operations, finance long-term investments, and manage risk by keeping cash reserves (Almeida et al., 2021). The ramification of the pandemic on financial holdings has two opposing consequences. The cautious motive for cash keeping suggests that when enterprises are exposed to the epidemic, they will likely raise their cash holdings. Companies may increase their cash reserves to mitigate cash flow volatility (Zheng, 2022). On the other hand, stockmarket volatility brought on by the epidemic and deteriorating economic climate may exacerbate uncertainty and financial frictions for company management. Corporations become more cautious when investing because of uncertainty, which increases the actual option valuation of investment (Bloom et al., 2007). Consequently, corporations may reserve less capital for investment. Firms anticipate higher external financing costs in the future, which will result in ineffective investment due to a lack of cash. Since it is difficult to theoretically predict how exposure to the pandemic will affect businesses' overall cash

holdings due to cautious factors, uncertainty, and financial frictions, this issue is investigated empirically (He et al., 2022).

Previous research has demonstrated how publicly traded corporations in Japan managed their financial assets in response to the COVID-19 epidemic. The data indicates that corporate cash holdings have experienced a growth rather than a decline since the beginning of the pandemic (Honda & Uesugi, 2021).

In addition, a separate study investigates the effect of the COVID-19 epidemic on modifications made to dividends and share repurchases by publicly traded companies in G-7 nations (Ntantamis & Zhou, 2022). The analysis revealed that corporate cash reserves played a role in reducing the adverse effects of COVID-19 on payout adjustments. However, this effect was less pronounced for European companies. Meanwhile, the examination of the repercussions of the financial crisis on SMEs investigates how the robust governmental support provided to companies in the early phases of the COVID-19 pandemic has averted a liquidity crisis for UK-based small and medium-sized enterprises (SMEs) (Cowling et al., 2020). Additional research has also investigated the variables that influence the amount of money that companies keep in reserve during times of crisis. For example, Joshi (2022) found that firms require precautionary cash reserves throughout the COVID-19 pandemic. Moreover, financial crises impact the cash policy of companies, aligning with the cautious nature of cash (Duchin et al., 2010). During a financial crisis, firms deplete their cash reserves when external financing is scarce, and they replenish their cash reserves after the crisis.

The COVID-19 epidemic has had a substantial impact on Indonesia. The COVID-19 epidemic has resulted in a substantial economic upheaval throughout all industrial sectors in Indonesia, particularly the manufacturing industry in the Indonesian Capital Market. The company's business operations were disrupted and hindered, raising risk and uncertainty.

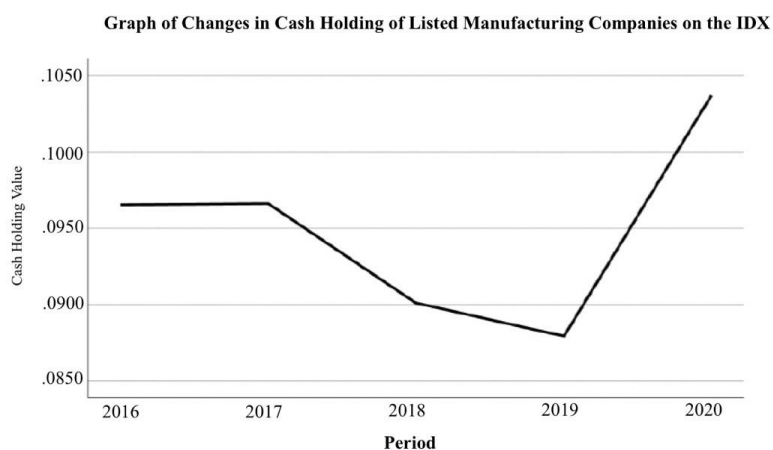


Figure 1 Graphic of Listed Manufacturing Firm Cash Holding Changes

Figure 1 (one) reveals a decline in the cash reserves of manufacturing businesses listed on the Indonesia Stock Exchange (IDX) from 2016 to 2019, before the onset of the COVID-19 pandemic. Subsequently, in the year 2020, the advent of COVID-19 prompted companies to increase their cash reserves as a precaution against future uncertainties. As a result, the Indonesian manufacturing industry is one of the sectors affected by the

pandemic. With growing cash holdings, the corporation must be able to retain its liquidity as a step towards ensuring operational sustainability.

A study on the financial liquidity of Indonesian manufacturing enterprises before and after the COVID-19 epidemic found significant changes in cash holdings between the two periods: before and during the pandemic (Sari & Wijaya, 2022). This reinforces Almeida et al. (2021) view that cash is the most liquid asset and that companies maintain cash as a precautionary measure to protect against unpredictable future conditions.

The study revealed that enterprises with higher cash reserves experienced significant negative consequences due to the occurrence of positive COVID-19 cases (Mujiyanto & Prijadi, 2022). A separate study revealed significant fluctuations in cash-based resilience during the pre-pandemic era, as well as during the COVID-19 pandemic (Troj & Imelda, 2023). While there have been studies examining the impact of the COVID-19 crisis on company payment procedures and financial reserves (Falato et al., 2020), additional research is required to examine the cash retention strategies employed by firms in Indonesia during this crisis.

The manufacturing sector contributed around 27% to Indonesia's Gross Domestic Product (GDP) in 2016. The manufacturing sector in Indonesia experienced significant structural changes over the years, with its rapid diversification being the primary driver of industrial transformation from the 1970s to the 1990s (Setyawan, 2020). Hence, it can be inferred that the manufacturing sector is a significant contributor to Indonesia's economy, playing a crucial part in its growth and development.

Given the circumstances, this study investigates the impact of the COVID-19 epidemic on the financial reserves of publicly listed corporations in Indonesia, in addition to identifying the determinants that impacted these reserves throughout the period in question. The primary objective is to examine the influence of the COVID-19 crisis on the cash reserves of publicly traded companies in Indonesia. This will be achieved by analyzing the fluctuations in cash reserves before and during the pandemic, together with the heterogeneity in cash holdings. The next goal is to determine the factors that impact the cash holdings of companies that listed in Indonesia Stock Exchange during the pandemic (Zhou et al., 2022). This is achieved by analyzing the correlation between cash reserves and other factors, including EBITDA, volatility of sales, net working capital, capital expenditure, size, debt, and Q.

LITERATURE REVIEW

1. Cash Holding

The amount of cash that a firm has on hand is an important financial indicator of its capacity to pay short-term debt and retain liquidity. To pay its financial responsibilities and invest in growth possibilities, a company must maintain an amount of money and easily convertible assets, known as cash holding, at a specific level. The term "cash and short-term investments" often refers to a company's holdings as a percentage of its overall assets, albeit there are some variances in its definition across empirical studies. A corporation's cash holdings can be defined as its percentage of total assets held by the company, less cash, and short-term investments (Javadi et al., 2021). The ratio of total assets to cash and cash equivalents is another way to define cash holdings (Haj-Salem & Hussainey, 2021).

2. COVID-19 Crisis

The COVID-19 outbreak has significantly hindered businesses' ability to obtain capital

for their operations because of the noticeable decrease in economic activity. The pandemic's disruption of supply chains, loss in demand, and lowering of expectations have led to a decline in investment. Consequently, the private sector is grappling with several challenges, including reduced investment, dampened expectations, disrupted supply chains, and diminished demand. Governments worldwide have endeavored to provide support to companies and alleviate financial distress in response. The private sector, on the other hand, persists in encountering numerous challenges (Zhou et al., 2022).

The pandemic has negatively impacted the leverage of enterprises, leading to a decrease in both total and short-term leverage, as well as long-term leverage (Prakash et al., 2023). COVID-19 is expected to have a substantial effect on the amount of cash that companies hold. (He et al., 2022) predicted a forthcoming decrease in the average amount of money held in reserve. Furthermore, the relationship between capital expenditures and cash flows has weakened, and enterprises in affected countries demonstrate decreased responsiveness to cash flows when deciding on investments.

3. Indonesian Stock Exchange (IDX)

The Indonesia Stock Exchange (IDX) is situated in Jakarta, Indonesia and serves as a marketplace for trading stocks. A crucial role in the Indonesian economy the Indonesian Stock Exchange (IDX) plays by facilitating and overseeing capital markets, enhancing investor participation, listing companies, promoting sustainable business practices, contributing to economic growth, and regulating initial public offering (IPO) criteria. The IDX has significantly increased the number of investors and their level of involvement in the Indonesian capital market, and it presently functions as a platform for enterprises to procure cash and expand their operations. In general, the IDX significantly contributes to the Indonesian economy and continues to have a crucial impact on the expansion and advancement of the country's capital market.

4. Trade-off Theory

Based on the trade-off principle, companies maintain a specific amount of cash reserves by considering the incremental advantages and disadvantages of having such funds. Companies consider the incremental advantages when managing their desired cash reserves. According to the Trade-Off Theory, it is essential to find a balance between the incremental costs and advantages of cash to reach the most advantageous level. Effective utilization of cash reserves can help organizations prevent financial troubles. Nevertheless, there is a trade-off involved, specifically in terms of the immediate financial gain from investing, which is forfeited due to the choice to hold onto funds. Cash is utilized to ascertain the optimal investment strategy to execute.

5. Previous Literature and Hypotheses

Several previous studies have analyzed the impact of the COVID-19 epidemic on the financial reserves of corporations. In 2022, a study was done to analyze the cash reserves of publicly traded firms in Japan and determine the factors that influenced these reserves over that period (Honda & Uesugi, 2022). Evidence from research suggests that businesses' cash reserves have grown rather than diminished. A recent investigation has examined the impact of the COVID-19 epidemic on company payment policy, specifically on dividends and share repurchases, across the G-7 countries (Ntantamis & Zhou, 2022). The study sought to analyze the degree of modifications implemented

and the selection of payment channels across various countries. The study also found that corporate cash buffers helped to alleviate the negative impact of COVID-19 on payment adjustments. However, European companies experienced a less significant effect compared to their North American and Japanese counterparts. A recent study conducted by Cowling et al. (2020) has examined the correlation between cash reserves, unpredictability in cash flow, and financial limitations in small enterprises. The aim was to examine the utilization of cash reserves by small enterprises as a defensive measure against unforeseen and adverse circumstances. The study indicates that effective internal financial management and comprehending the magnitude of potential consequences of the crisis are essential measures in assisting small and medium-sized enterprises (SMEs). Based on a thorough examination of other studies, this particular study developed an empirical hypothesis on the financial reserves of companies during the COVID-19 pandemic. In typical circumstances, a company's cash flow is considered essential in evaluating its cash reserves since it necessitates a precautionary financial buffer for its daily operations. However, because to the COVID-19 pandemic, corporations have demonstrated an increased inclination to hold elevated amounts of precautionary cash reserves. Based on this information, the study proposed the empirical hypothesis that is presented below:

H1: There is an increased positive relationship between cash flow sensitivity and manufacturing firm cash holding during the COVID-19 crisis.

Investigation into the second study topic focuses on the predictability of an organization's precautionary cash reserves by evaluating the volatility of its cash flows. (Opler et al., 1999) discovered that companies facing greater uncertainty regarding their cash flow tend to maintain larger cash reserves compared to those with lower levels of uncertainty. Similarly, (Han & Qiu, 2007) provide evidence that enterprises facing financial constraints and experiencing greater volatility in their cash flow tend to maintain higher levels of cash reserves as a precautionary strategy. The findings of a study that was carried out by (Bates et al., n.d.), those with substantial cash reserves during the COVID-19 pandemic are inclined to participate in fewer capital investments. This finding aligns with the concept of an investment's genuine option value. (Bates et al., n.d.) provide evidence that American corporations maintained a higher average cash reserve between 1980 and 2006. Our hypothesis posits that the ongoing pandemic crisis has increased the significance of this factor and that the variability of the corporation's cash flow functions as a critical signal of its financial reserves. Therefore, we present our second theory regarding the cash reserves of the company:

H2: There is an increased positive relationship between cash flow volatility and manufacturing firm cash holding during the COVID-19 crisis.

CONCEPTUAL FRAMEWORK / RESEARCH METHODOLOGY

The sequential process undertaken during the research are shown in the figure below:

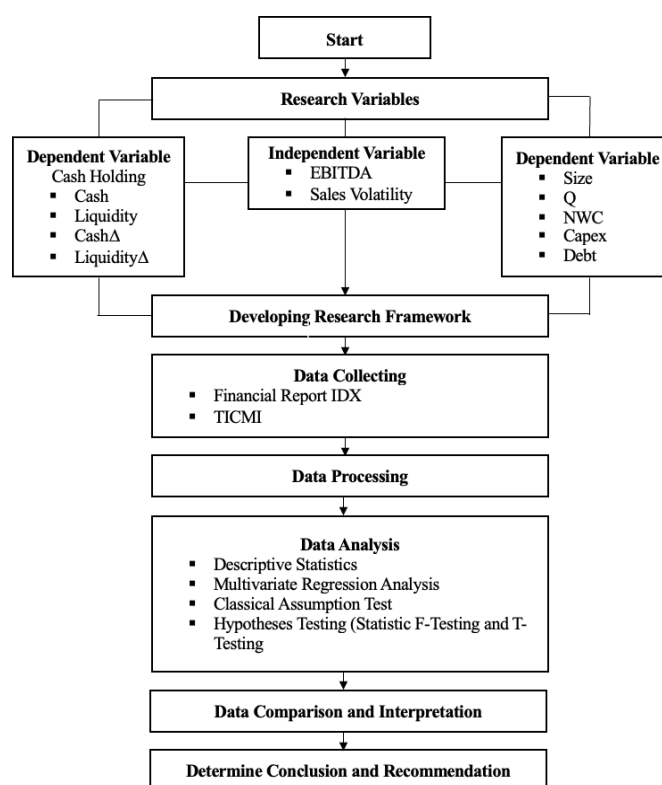


Figure 2 Research Flow Diagram

The cash holding is considered as a dependent variable in this study, which is influenced by various other factors. Cash holding, as defined in a study published in the PMC journal (Zhou et al., 2022), pertains to the proportion of monetary funds and trade financial assets concerning net assets. The four variables are utilized to analyze cash holdings, specifically, Cash is determined by dividing the total of cash and outstanding deposits by book assets. The liquidity statistic is measured by dividing the total value of cash and its equivalent such as deposits and marketable securities by the total value of book assets.

The third variable is Cash Δ . It is defined as the difference in Cash between consecutive quarters. The fourth indicator, Liquidity Δ , measures the quarterly fluctuation in Liquidity.

The study incorporates independent variables such as EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization) and Sales Volatility. EBITDA is commonly used in valuation ratios, especially when paired with earnings (Chen & Chen, 2012). It is calculated by subtracting operating expenses from revenue. EBITDA is commonly used in valuation ratios, especially when paired with earnings (Chen & Chen, 2012). Sales volatility, conversely, pertains to the extent of fluctuation in a company's sales throughout a specific timeframe (John Bae et al., 2020). It quantifies the extent to which a company's sales deviate from its typical sales level.

In this study, we employ control variables including size, Q, Capex, NWC, and Debt. Size is a financial metric that quantifies a company's overall assets or market capitalization. It is frequently used as a replacement for a company's resources and ability to, Tobin's Q ratio evaluates the correlation between the book value (or total asset value)

and the market value in a quantitative manner of a firm that is listed on the stock market.

Capex is a financial metric that denotes a company's expenditure on durable assets, such as real estate, infrastructure, and machinery (John Bae et al., 2020). Net Working Capital (NWC) is a financial parameter utilized to evaluate the present liquidity position of a company. The computation involves deducting current assets from current liabilities (Chen & Chen, 2012). Debt is a financial concept that quantifies the monetary obligations of a firm to its creditors.

The sample for this study was selected using a purposeful or judgmental selection approach, which means it was selected based on defined criteria. Sample selection criteria:

- a. The companies chosen are in the manufacturing sector and are listed on the Indonesian Stock Exchange (IDX).
- b. The company's fiscal year is the 2018-2022 quarterly period.

The research model consists of four equations, which are shown below:

Equation 1:

$$Y1(\text{Cash}_{i,t}) = \alpha + \beta1(\text{EBITDA}_{i,t}) + \beta2(\text{EBITDA}_{i,t} * \text{Crisist}) + \beta3(\text{SalesVolatility}_{i,t}) + \beta4(\text{SalesVolatility}_{i,t} * \text{Crisist}) + \beta5(\text{Crisist}) + \beta6(\text{Size}) + \beta7(\text{Q}) + \beta8(\text{Capex}) + \beta9(\text{NWC}) + \beta10(\text{Debt}) + \beta X + \delta_i + \epsilon_{i,t}$$

H0 :Independent variables do not affect cash holding

H1 :Independent variables affect cash holding

Equation 2:

$$Y1(\text{Liquidity}_{i,t}) = \alpha + \beta1(\text{EBITDA}_{i,t}) + \beta2(\text{EBITDA}_{i,t} * \text{Crisist}) + \beta3(\text{SalesVolatility}_{i,t}) + \beta4(\text{SalesVolatility}_{i,t} * \text{Crisist}) + \beta5(\text{Crisist}) + \beta6(\text{Size}) + \beta7(\text{Q}) + \beta8(\text{Capex}) + \beta9(\text{NWC}) + \beta10(\text{Debt}) + \beta X + \delta_i + \epsilon_{i,t}$$

H0 :Independent variables do not affect cash holding

H1 :Independent variables affect cash holding

Equation 3:

$$Y1(\text{Liquidity Change}_{i,t}) = \alpha + \beta1(\text{EBITDA}_{i,t}) + \beta2(\text{EBITDA}_{i,t} * \text{Crisist}) + \beta3(\text{SalesVolatility}_{i,t}) + \beta4(\text{SalesVolatility}_{i,t} * \text{Crisist}) + \beta5(\text{Crisist}) + \beta6(\text{Size}) + \beta7(\text{Q}) + \beta8(\text{Capex}) + \beta9(\text{NWC}) + \beta10(\text{Debt}) + \beta X + \delta_i + \epsilon_{i,t}$$

H0 :Independent variables do not affect cash holding

H1 :Independent variables affect cash holding

Equation 4:

$$Y1(\text{Cash Change}_{i,t}) = \alpha + \beta1(\text{EBITDA}_{i,t}) + \beta2(\text{EBITDA}_{i,t} * \text{Crisist}) + \beta3(\text{SalesVolatility}_{i,t}) + \beta4(\text{SalesVolatility}_{i,t} * \text{Crisist}) + \beta5(\text{Crisist}) + \beta6(\text{Size}) + \beta7(\text{Q}) + \beta8(\text{Capex}) + \beta9(\text{NWC}) + \beta10(\text{Debt}) + \beta X + \delta_i + \epsilon_{i,t}$$

H0 :Independent variables do not affect cash holding

H1 :Independent variables affect cash holding

Description:

- $Y_{i,t}$ (Cash Holding): Cash or cash equivalent on hand.
- EBITDA, t: Earnings Before Interest, Taxes, Depreciation, and Amortization is a metric that assesses a company's whole financial performance
- Crisis: A binary variable is assigned a value of 1 if the observation occurs during a

- crisistime, and 0 if it does not
- SalesVolatility i, t : A predictor variable that represents the volatility of the sales of a corporation
 - Size: The scale of a firm and its operations as quantified by the aggregate revenue earned by the company
 - Q: Calculated as the book value of debt divided by the market value of equity in relation to the replacement cost of assets
 - Capex: Measured as capital expenditures divided by total assets.
 - NWC: Measured as the ratio of net working capital to total assets.
 - Debt: Measured as the amount of money a company owes to creditors.
 - $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}$: The regression coefficients quantify the impact of each independent variable on the dependent variable.
 - α : The intercept or constant term in the regression equation.
 - β_X : Other predictor variables that are not explicitly mentioned in the equation but are included in the model.
 - δ_i : The random effect or individual-specific effect that captures the unobserved heterogeneity across individuals.
 - $\epsilon_{i, t}$: The error term or residual that represents the residual variation in the dependent variable that remains unexplained by the independent variables.

To generate a multi-regression equation, the sample will undergo processing utilizing the Stata tool. To determine the most accurate variable model for the dependent variable, we conduct traditional assumption tests, which encompass multicollinearity, heteroscedasticity, autocorrelation, and normality testing.

To evaluate the proposed hypothesis, we employ regression analysis using t-tests and F-tests. The objective of utilizing regression analysis is to ascertain the impact that independent variables have on the variable that is known to be dependent, both individually and collectively, and to quantify the magnitude of the impact that independent factors exert on the dependent variable.

D. RESULT AND DISCUSSION

The descriptive statistics are employed to get a comprehensive depiction of the values of the research variables by the analysis of the central tendencies and variation, which shown below:

Table 1 Descriptive Statistics

Variable	N	Mean	SD	Min	Max
Cash	2881	0,1526	0,6856	0,0001	9,0335
Liquidity	2881	2,3013	2,2629	0,0007	38,7678
Cash Change	2879	-0,0001	0,2172	-6,5874	8,9942
Liquidity ~e	2876	0,000	1,1297	-17,9233	20,017
EBITDA	2893	0,0505	0,0973	-0,8907	1,2607
Sales Vol	2884	0,0488	0,0968	0,0000	1,7399
Size	2893	28,5357	1,6383	25,1478	33,6552
Q	2893	3,2866	4,8323	0,0097	59,1909
Capex	2893	0,3997	0,193	0,0027	0,9069
NWC	2890	0,1370	0,4708	-4,4737	0,8332
Debt	2893	0,5710	0,5686	0,0429	5,3405

Source: Processed Data (2023)

Panel regression analysis encompasses three distinct regression model approaches:

the Common Effect Model (also known as Pooled Least Square), the Fixed Effect Model (FE), and the Random Effect Model (RE). To determine the most suitable regression model method for the study data, several tests consist of the Chow, Hausman, and Lagrang Multiplier tests were conducted.

In addition to that, Panel regression analysis involves testing assumptions on autocorrelation, heteroscedasticity, and multicollinearity. If the OLS model, specifically the fixed effect or common effect regression model selection, is employed to estimate the panel regression model, it is necessary to satisfy the classical assumptions. Conversely, if the GLS model is utilized (specifically the selected random effect when choosing the regression model), it is possible to circumvent or not fulfill the classical assumptions (Gujarati & Porter, 2009). Below are the summary of the regression analysis result:

Table 2 Regression Analysis Result

	Eq.(1) Cash	Eq.(2) Liquidity	Eq.(3) Liquidity Δ	Eq.(4) Cash Δ
EBITDA	1.403 (0.0573)	-1.079 (0.390)	0.353 (0.123)	0,0299** (0.0121)
EBITDA XCrisis1	-0,832 (0.0642)	-0.174 (0.422)	0.209 (0.158)	0.00635 (0.0148)
EBITDA XCrisis2	0.798 (0.106)	0.513 (0.452)	-0.193 (0.181)	-0.0221 (0.0181)
Sales_ Volatility	-0.415 (0.0646)	-1.988 (0.390)	0.150 (0.149)	0.00369 (0.0150)
Sales_Vol X Crisis1	-0.421 (0.0795)	1.000 (0.642)	-0.0353 (0.202)	0.0195 (0.0201)
Sales_Vol X Crisis2	-0.184 (0.0947)	-1.544 (1.000)	0.184 (0.247)	-0.0104 (0.0276)
Crisis1	0.0311 (0.00423)	-0.0361 (0.0303)	-0,0231** (0.0109)	-0,00287 (0.000922)
Crisis2	-0.00275 (0.00623)	0.00437 (0.0367)	0,0259** (0.0131)	0,00263** (0.00110)
Size	0,0103 (0.000583)	-0,0149 (0.00291)	-0.00225 (0.00240)	-0.000152 (0.000232)
Q	-0,0160 (0.000515)	0,0389 (0.00449)	0.000231 (0.00126)	0.0000110 (0.000124)
Capex	0,437 (0.00633)	0,704 (0.0507)	0,0809 (0.0207)	-0.00227 (0.00155)
NWC	0,358 (0.00796)	5.067 (0.0648)	0,147 (0.0293)	0.00133 (0.00188)
Debt	-0,149 (0.00901)	-1.176 (0.0696)	0.0262 (0.0238)	-0.000231 (0.00162)
_cons	-0.0494 (0.0175)	1.860 (0.101)	-0.0139 (0.0763)	0.00505 (0.00654)
N	2881	2881	2876	2879
R2	0.386	0.773	0.381	0.121

Source: Processed Data (2023)

EBITDA and cash holdings indicate a strong positive correlation, with cash, liquidity change, and cash change serving as dependent variables. This discovery implies that, under typical circumstances, there is a direct correlation between the amount of cash a company has and how much its cash flow is affected by external factors. This finding suggests that firms may be assessing the benefits and drawbacks of retaining cash in consideration of the Trade-off Theory. Conversely, The Liquidity variable exhibits a strong negative correlation with EBITDA. This might occur as a result of client payments being delayed, a decrease in credit availability, the withdrawal of trade credit insurance, an increase in fixed overheads and machinery maintenance expenses, and the management

of inventory turnover. This is inconsistent with the studies of (Honda & Uesugi, 2022).

In contrast, the correlation between EBITDA and Crisis 1 adversely affects the liquidity variables, whereas the correlation between Liquidity Change and Cash Change is positive. Nevertheless, none of them hold any significance.

Amidst the COVID-19 pandemic recovery phase, there exists a direct correlation between EBITDA (earnings before interest, taxes, depreciation, and amortization) and the variables of cash and liquidity. As a result, manufacturing enterprises have a simultaneous increase in their cash reserves during the COVID-19 recovery phase, due to the expansion of their EBITDA (earnings before interest, taxes, depreciation, and amortization). The link observed with Crisis 2 indicates that this association may be altered by the crisis scenario. The findings of Honda & Uesugi (2022) contradict this claim. Conversely, the relationship between EBITDA and Crisis 2 has a detrimental effect on the variables of cash change and inverses liquidity change, but this effect is not statistically significant. Conversely, manufacturing enterprises exhibit a negative relationship between their sales volatility and their cash reserves. Consequently, a rise in sales volatility leads to a decrease in their cash reserves.

At the turning point of the epidemic, there exists an inverse correlation between the fluctuation in sales and the amount of cash a company holds, as determined by the variables of Cash and Liquidity Change. There exists a detrimental correlation between the amount of cash a company has and the level of fluctuation in its sales, however, this correlation lacks statistical significance.

The recovery phase of the epidemic reduces the negative correlation between cash reserves and sales fluctuations. A negative coefficient signifies an inverse correlation between sales volatility and the quantity of cash held. As sales volatility increases, the cash reserves decrease. This result is in line to the trade-off theory states that businesses assess the benefits and drawbacks of maintaining cash reserves.

During the acute epidemic phase, there is an inverse relationship between cash holding and crisis I. However, the variables of Cash and Liquidity do not exhibit statistical significance. The presence of a negative coefficient signifies a decrease in the quantity of cash being stored as the intensity of the outbreak escalated. This result is consistent owing to the trade-off theory asserts that businesses assess the benefits and drawbacks of maintaining cash reserves. On the other hand, there exists a direct correlation between the variables of cash holding (namely cash change and liquidity change) and the duration of recovery from a pandemic. The positive coefficient signifies that as the epidemic's recovery phase progresses, there is an escalation in the level of cash holding. This result follows the trade-off theory, which proposes that companies should weigh the benefits and drawbacks of maintaining cash reserves. Firms maintain cash reserves to alleviate the costs associated with financial hardships, as per the assumption.

E. CONCLUSION

The economic upheaval due to COVID-19 has greatly affected the financial decision-making of manufacturing organizations, namely their approaches to preserving capital and handling liquidity. The investigation uncovers significant differences in the average cash, EBITDA (indicating cash flow fluctuations), and sales volatility (indicating cash flow volatility) in the midst of the pre-crisis period (2018-2019) and the crisis period I (2020-2021). Furthermore, the second t-test reveals a discrepancy in the average values of cash and EBITDA between the pre-crisis period (2018-2019) and the crisis II period (2022).

The main factors influencing cash reserves in manufacturing companies between 2018 and 2022 are sensitivity of cash flow, defined by EBITDA, volatility of cash flow, evaluated by Sales Volatility, net working capital, capital expenditure, and debt level. The cash flow sensitivity shows a positive correlation with the cash variable in normal periods, but during the COVID-19 era, it indicates a counterintuitive negative association, which contradicts the initial hypothesis.

The pandemic has impacted the way firms handle their cash reserves, as seen by the significant negative relationship between cash reserves (Cash Variable) and sensitivity of cash flow. Amidst the crisis, corporations likely aimed to hold more amount of cash, as evidenced by the cash flow sensitivity and its inverse connection of great significance and the amount of cash held during this period.

The discovery of an inverse correlation between the cash flow volatility and the gauge of cash held, both in regular situations and during the COVID-19 crisis, indicates that organizations with higher cash flow sensitivity tend to keep small amounts of cash reserves. The inverse correlation between the volatility of cash flow and the quantity of cash held (Liquidity Variable) can be explained by the balancing act of deploying money to other ventures against maintaining it. The equilibrium between liquidity and profitability is crucial, especially amidst economic disturbance such as the COVID-19 epidemic, where businesses must consider the significance of having easily accessible capital versus the potential benefits from investments.

This finding contradicts the theory. Nevertheless, the statistical research fails to demonstrate any significant associations between Sales Volatility and the COVID-19 period, indicating that any apparent correlation may be coincidental. This research has limitations, thus it is advised that additional researchers interested in the topic of variables that affect cash holdings add more years of research and utilize different calculation variants from this research to increase the level of accuracy and confidence.

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