



Does working capital management strategy affect profitability? Evidence of Indonesian manufacturing companies during the COVID-19 pandemic

¿Afecta la estrategia de gestión del capital circulante a la rentabilidad? Evidencia de empresas manufactureras indonesias durante la pandemia de COVID-19

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Abstract

This study investigates whether various components of working capital policy impact profitability. Furthermore, this study considers whether the COVID-19 outbreak can intervene in this relationship. Using a sample of 126 listed manufacturing companies in Indonesia from 2017 to 2020, we employ a comparison of two general equations (before and during the COVID-19 outbreak) of a linear model involving several working capital policies on profitability. The study shows an anomaly that occurred during COVID-19. Companies tended to carry out aggressive working capital behavior during the COVID-19 pandemic compared to before COVID-19. The reason behind this is that the company gets incentives to defer debt payments or get additional debt facilities which are used to increase receivables and inventory. This study also shows that there is a negative influence of the financial flow cycle on profitability, both before and during the COVID-19 period. Empirical findings indicating inconsistencies

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in working capital behavior prove that the practice of working capital implemented by manufacturing companies in Indonesia is currently not offended to be more.

JEL Code: D22, G11, G30, Q50

Keywords: working capital policy; the COVID-19 outbreak; cash conversion cycle; profitability

Resumen

Este estudio investiga si varios componentes de la política de capital de trabajo impactan la rentabilidad. Además, este estudio considera si el brote de COVID-19 puede intervenir en esta relación. Utilizando una muestra de 126 empresas manufactureras que cotizan en bolsa en Indonesia de 2017 a 2020, empleamos una comparación de dos ecuaciones generales (antes y durante el brote de COVID-19) de un modelo lineal que involucra varias políticas de capital de trabajo sobre la rentabilidad. El estudio muestra una anomalía que ocurrió durante el COVID-19. Las empresas tendieron a llevar a cabo un comportamiento agresivo en materia de capital de trabajo durante la pandemia de COVID-19 en comparación con antes de la pandemia. La razón detrás de esto es que la empresa recibe incentivos para aplazar los pagos de la deuda u obtener líneas de crédito adicionales que se utilizan para aumentar las cuentas por cobrar y el inventario. Este estudio también muestra que existe una influencia negativa del ciclo de los flujos financieros sobre la rentabilidad, tanto antes como durante el período COVID-19. Los hallazgos empíricos que indican inconsistencias en el comportamiento del capital de trabajo demuestran que la práctica de capital de trabajo implementada por las empresas manufactureras en Indonesia actualmente no se ofende por ser mayor.

Código JEL: D22, G11, G30, Q50

Palabras clave: política de capital de trabajo; el brote de COVID-19; ciclo de conversión de efectivo; rentabilidad

Introduction

The outbreak of a respiratory infection caused by the coronavirus began at the beginning of 2020 in the city of Wuhan, China, called COVID-19. This incident impacted the economic downturn in most of the countries experiencing the global financial crisis (Bhar & Malliaris, 2021; Shehzad et al., 2020). Besides, COVID-19 has affected many industries, such as the pharmaceutical, hotel, tourism, and aviation industries, the real estate and housing sectors, sports, information technology, media, research and development, and food (Nicola et al., 2020; Wang et al., 2021). Several recent studies have shown that the effects of the pandemic have affected most manufacturing industries in various countries (Belhadi et al., 2021; Cai & Luo, 2020; Deshmukh & Haleem, 2020; Okorie et al., 2020). The phenomenon had a major impact on the development of the manufacturing industry in Indonesia. This is indicated by the decrease in Purchasing Managers Index (PMI) manufacturing by 45.3 percent in March. The same thing happened in America, with a decrease in PMI by 49.2 (Cai & Luo, 2020). Another case is the manufacturing industry in China, where the PMI fell to 35.7 percent, and in Germany, it fell to 45.7 percent.

The manufacturing industry significantly contributes to Indonesia's GDP, accounting for 19.87% in 2020. However, it experienced a negative growth trend of 6.99% that year, while the overall industry saw a 2.7% decline (Sudiyatno et al., 2021). This downturn was largely due to Large-Scale Social Restrictions (PSBB) implemented across Indonesia to curb the COVID-19 pandemic. The pandemic drastically altered the business cycle, with global economic activity and liquidity, particularly from China, becoming dominant external factors (Harahap et al., 2020).

The COVID-19 crisis severely impacted the manufacturing sector's value chain, disrupting transportation and distribution networks between suppliers, production facilities, and customers. These supply chain disruptions, in turn, affected production systems across various business sectors (Cai & Luo, 2020; Nandi et al., 2021; Veselovská, 2020). Changes in the production system have an impact on financial decisions, including investment decisions and funding decisions (Shakespeare, C., 2020; Shanmuganathan, 2020), as well as working capital turnover (Mursalini et al., 2017; Pirttilä et al., 2020; Wichitsathian & Pestonji, 2019). Several previous studies have shown the impact of COVID-19 on working capital caused by disruptions in the supply chain (Peng & Zhou, 2019; Qin et al., 2020; Zimon & Tarighi, 2021). The COVID-19 pandemic presents new challenges for working capital management in various industries (Demiraj et al., 2022b; Karabay et al., 2022; Rey-Ares et al., 2021; Tarkom, 2022).

Working capital management is very important when companies face problems of market instability, trade fluctuations, economic growth, and macroeconomic uncertainty (Othuon et al., 2021; Tsuruta, 2019). Cash flow is an essential factor during the COVID-19 pandemic. The cash conversion cycle (CCC) hurts profitability (Abuhommos et al., 2022; Ahmad et al., 2022). In line with Tarkom (2022), companies exposed to COVID-19 were operating with a high level of CCC in the US. Conversely, companies that get government incentives with credit and tax deferrals operate with a lower CCC. The CCC is closely related to cash flow. A high CCC is a sign that working capital management (WC) is inefficient and can significantly reduce financial security.

During the COVID-19 pandemic, industrial companies, as observed by Tarkom (2022), typically managed their working capital conservatively. This period generated conflicting global research on the link between working capital management and profitability. For example, studies in Europe and the U.S. found that longer cash conversion cycles (CCC) hindered companies' ability to boost exports and manage crises, particularly as COVID-19 reduced international trade. In contrast, Omani manufacturing firms on the Muscat Stock Exchange showed a positive correlation between CCC and return on assets (ROA), while more days in working capital negatively affected ROA. For MSMEs, COVID-19-induced credit restrictions influenced working capital investment, displaying a convex relationship between investment behavior and profitability (Rey-Ares et al., 2021). In Turkey there is a difference between large and small companies which proves that many large companies with weak liquidity levels have to

cover their short-term debt and a decrease in the leverage ratio increases profitability. Meanwhile, small companies do not show an increase in leverage (Karabay et al., 2022). In Indonesia, the COVID-19 incident has had a significant impact on decreasing income. Other research conducted in several developing countries in Asia shows that CCC has a positive effect on ROA and Net Working Capital only has a significant and positive effect on ROA (Ahmad et al., 2022). Meanwhile, automotive companies in Europe show that the receivables collection period, inventory conversion period, accounts payable period, and cash conversion cycle have a significant negative impact on ROA in both cases. pre-pandemic and pandemic periods (Demiraj et al., 2022). The same incident in Nigeria at the time of COVID-19 which had an impact on working capital policy, proves that there is a positive impact of CCC and working capital investment policy on ROA in companies non-financial.

Existing research on the impact of working capital management on profitability during COVID-19 shows inconsistent findings across various countries. This study contributes to the literature by specifically examining this relationship within Indonesia's manufacturing industry, both before and during the pandemic. We aim to identify which elements of working capital significantly predict profitability. These elements encompass gross working capital components like the cash conversion cycle, receivables cycle, inventory cycle, and accounts payable cycle, as well as net working capital elements such as changes in working capital, other current liabilities, other current assets, the financial flow cycle, and changes in liabilities. By comprehensively analyzing these variables, this research seeks to provide valuable insights for Indonesian manufacturing companies to address working capital challenges and formulate effective recovery strategies. Understanding the precise impact of working capital and operational financing on profitability will enable companies to focus on critical factors that may have been overlooked during the pandemic. Further analysis of the manufacturing sector in developing countries like Indonesia is crucial.

Literature review

The operating cycle theory

In theory, working capital management functions to manage cash generated from business processes, control inventory, accounts receivable and payables, determine liquidity positions, measure working capital ratios as a financial manager analysis tool, analyze cash budgets and measure the efficiency of working capital use (Ajike et al., 2022; Chauhan, 2021; and Seth, Chadha & Sharma, 2020). Operating cycle theory initially explained the relationship between credit sales to customers and the investment

needed to supply these needs. Too significant an investment in inventory can cause illiquid in the inventory turnover cycle.

Control over the company by showing how often the company changes the total stock of raw materials, processing to finished goods for product sales Aminu & Zainudin (2015). Finally, the effectiveness of the company's operational cycle is also essential to measure, starting from obtaining raw materials and processing finished materials to distribution to final consumers. In conclusion, cash liquidity is an essential factor in managing working capital. Liquidity is a component of working capital management (Bintara, 2020; Seth, Chadha, & Sharma, 2020). Liquidity is also defined as "cash position", which can be measured by the current or quick ratio (Boisjoly et al., 2020). Classified working capital report accounts, namely operational financing and operational working capital (Aduda & Ongoro, 2020).

This study aims to elucidate the significant impact of liquidity and operating cash flow on profitability. Operational financing, derived from current liabilities like trade payables and bank loans, directly influences operations through transactions with consumers and suppliers. This is termed the financial flow cycle (FFC), representing a financing function of total assets. Similarly, current assets such as cash, bank balances, and short-term financial investments indicate excess cash. In contrast, other current assets like inventories and accounts receivable, directly linked to the operating cycle, constitute operating working capital.

The portfolio theory

The operating cycle reflects the health of a company's operations with a measure of the net operating cycle (NOC) or the cash conversion cycle (Choubey, 2021). The NOC is a metric for utilizing a company's assets. In practice, working capital performance measures are also associated with credit ratings (Abuhommous et al., 2022); financial distress (Habib & Kayani, 2022; Moch et al., 2019; Sardo & Serrasqueiro, 2022); and risks (Al-Rawi et al., 2021). The relationship between working capital and risk and profit will be explained by portfolio theory. Portfolio theory, which focuses on uncertainty, can be used to explain the relationship between working capital and profitability Aminu, Y. and Zainudin, N. (2015). In essence, the financial statements are shown by the balance sheet, on the left side describes the allocation of funds or investment, and the right side describes the sources of use of funds. The combination of the structure of the use of funds and funding sources can be explained by portfolio theory.

The financial measures emphasize the size of cash flow and its relationship to profitability. For example, cash flow returns on investments as a measure of company performance by adjusting to the inflation rate and the market's demand cost for using capital, internal rate of return in several business life cycles and future life cycle conditions (Wichitsathian & Pestonji, 2019). The CCC is related to the

receivable cycle, inventory cycle, payable cycle, purchase cycle, and work-in-process cycle (Rajaguru & Khan, 2021). One approach that might be used is the CCC approach as operating working capital (Marttonen et al., 2013; Sagner, 2011; Talonpoika et al., 2016). From this description, it can be stated that assets in working capital are risky investments that can be measured in the turnover of working capital elements. In short, the higher the CCC, the lower the profitability.

The working capital behavior

The company's working capital behaviour can be seen from changes in net non-cash operating working capital called non-cash operating working capital (Damodaran, 2014). Suppose a company has positive non-cash operating working capital as an indication of the need for additional funds for non-cash working capital. In that case, these funds can be sourced from internal or external funds. If financed internally, it reduces free cash flow and, if funded externally, increases short-term or long-term debt, which in turn creates a cost of debt. Meanwhile, if the company has negative non-cash working capital, it can increase cash flow, which will have an impact on reducing short-term debt in stable sales conditions. However, increasing sales can impact opportunity costs because investments in long-term assets are financed by debt (Imbierowicz & Rauch, 2014; Li et al., 2021).

The companies with internal sources of financing for investment in working capital tend to behave conservatively. On the contrary, companies with external funding tend to adopt aggressive strategies in their working capital management (Hill et al., 2010). Working capital is highly dependent on efforts to optimize working capital between sources of financing and the need for working capital investment. It is supported by Akbar et al. (2022); Chauhan & Banerjee (2018). Heuristic behaviour on working capital can also be influenced by the behaviour of corporate treasurers involved in making decisions on cash flow, inventory, receivables, debt, and risk management processes in the face of financial crises (Ramiah et al., 2014).

The relationship between working capital and profitability

Efforts to find out the relationship between working capital and profitability are in order to measure the company's efficiency in generating profits (Prasad et al., 2019; Seth et al., 2021b; Seth, Chadha, & Sharma, 2020a). Several studies have shown the influence of positive working capital on profitability. Study by Akbar et al. (2022); Amponsah-Kwatiah & Asiamah (2021) show a negative effect of working capital on profitability, while Altaf & Shah (2018) show a relationship between working capital to profitability in the form of a "U" shape. Furthermore, study by Jaworski & Czerwonka (2021); Yilmaz &

Acar (2022) show the relationship between working capital and profitability in a non-linear form and show the negative effect of CCC on profitability. The CCC is a financial index that is increasingly important because it can monitor the cash conversion cycle every day and can be relied upon to make decisions regarding the company's cash flow strategy (Jaworski & Czerwonka, 2021; Provasi et al., 2019; Yilmaz & Acar, 2022). However, several studies also show that profitability decreases when working capital and liquidity increase (Zimon & Tarighi, 2021). Moreover, study by Dbouk et al. (2020) show the relationship between working capital management and profitability from a different perspective that credit financing under competitive conditions and the perspective of the business cycle stages influence financial distress. On the other hand, study by Wichitsathian & Pestonji (2019) show a negative effect of working capital management on profitability. It is in line with Peng and Zhou, (2019), which shows a negative effect of working capital management on the profitability of companies in India (Zimon & Tarighi, 2021). The case in Poland shows that the impact of working capital management on profitability differs at each stage of the business cycle.

Research method

Data

This study was conducted on large-scale manufacturing companies in Indonesia that listed in Indonesia Stock Exchange. The sample comprises of 131 manufacturing companies. The before COVID-19 data are the year 2018, and the after COVID-19 data are the year 2020 from the financial report. The list of the companies are as follows:

Table 1
The list of companies studied

	Companies			Companies	
1	ALTO	Tri Banyan Tirta Tbk	66	GJTL	Gajah Tunggal Tbk PT
2	COCO	PT Wahana Interfood Nusantara	67 68	MYTX	Asia Pacific Investama Tbk
3	AISA	FKS Food Sejahtera Tbk	69	PBRX	Pan Brothers Tbk
4	ENZO	Moreno Abadi Perkasa Tbk	70	ARGO	Argo Pantas Tbk PT
5	IIKP	Inti Agri Resources Tbk	71	ERTX	Eratex Djaja Tbk
6	IKAN	Era Mandiri Cemerlang	72	TRIS	Trisula International Tbk PT
7	ADES	Akasha Wira International	73	UCID	Uni-charm Indonesia PT
8	BUDI	Budi Starch & Sweetener	74	ZONE	Mega Perintis Tbk PT
			PT	RICY	Ricky Putra Globalindo Tbk
9	CAMP	Campina Ice Cream Industry Tbk	75	SBAT	Sejahtera Bintang Abadi Tbk
			Textile		

		Companies		Companies	
10	CEKA	Wilmar Cahaya Indonesia	76	SRIL	Sri Rejeki Isman Tbk
Tbk			77	SSTM	Sunson Textile Manufacturer Tbk
11	CLEO	Sariguna Primatirta Tbk			
12	DLTA	Delta Jakarta Tbk	78	BATA	Sepatu Bata Tbk PT
13	DMND	Diamond Food Indonesia PT	79	CCSI	Communication Cable
14	FOOD	Sentra Food Indonesia Tbk			
15	GOOD	Garudafood Putra Putri Jaya			Indonesia Tbk
Tbk			80	SCCO	Supreme Cable
16	HOKI	Buyung Poetra Sembada Tbk			Manufacturing &
17	ICBP	Indofood Cbp Sukses			Commerce Tbk
Makmur		Tbk	81	SCNP	Sat Nusapersada Tbk
			82	SCNP	Selaras Citra Nusantara
18	INDF	Indofood Sukses Makmur	Perkasa		PT Tbk
Tbk					
19	MLBI	Multi Bintang Indonesia Tbk	83	SLIS	Gaya Abadi Sempurna Tbk
20	MYOR	Mulia Boga Raya	84	WSBP	Waskita Beton Precast Tbk
21	PANI	Pratama Abadi Nusa Industri Tbk	85	WTON	Wijaya Karya Beton Tbk
			86	SMBR	Semen Baturaja (Persero)
22	MYOR	Mayora Indah Tbk PT	Tbk		
23	PCAR	Prima Cakrawala Abadi Tbk	87	SMCB	Solusi Bangun Indonesia Tbk
24	PSDN	Prasidha Aneka Niaga Tbk			
25	ROTI	Nippon Indosari Corpindo	88	SMGR	Semen Indonesia (Persero)
Tbk			Tbk		
26	SKBM	Sekar Bumi Tbk PT	89	ARNA	Arwana Citramulia Tbk
27	SKLT	Sekar Laut Tbk PT	90	IKAI	Intikeramik Alamasri
28	STTP	Siantar Top Tbk	Industri		Tbk
29	ULTJ	PT Ultrajaya Milk Industry			
Tbk			91	CAKK	Cahayaputra Asa Keramik
30	GGRM	GUDANG GARAM TBK	Tbk		
PT			92	ALMI	Alumindo Light Metal
31	HMSP	Hanjaya Mandala Sampoerna Tbk	Industry		Tbk
32	RMBA	Bentoel International	93	CTBN	Citra Tubindo Tbk PT
Investama		Tbk	94	GDST	Gunawan Dianjaya Steel Tbk
33	WIIM	Wismilak Inti Makmur Tbk	95	PURE	Trinitan Metals and Minerals
34	DVLA	Darya-Varia Laboratoria Tbk	PT		
35	INAF	Indofarma Tbk	96	GGRP	Gunung Raja Paksi Tbk
36	KLBF	Kalbe Farma Tbk	97	PICO	Pelangi Indah Canindo Tbk
37	MERK	Merck Tbk PT	98	LION	Lion Metal Works Tbk PT
38	PEHA	Phapros Tbk PT	99	ALKA	Alakasa Industrindo Tbk
39	SOHO	SOHO Global Health	100	BAJA	Saranacentral Bajatama Tbk
40	SCPI	Organon Pharma Indonesia	101	BTON	Betonjaya Manunggal Tbk
41	PYFA	Pyridam Farma Tbk	PT		
42	SIDO	Industri Jamu dan Farmasi	102	NIKL	Pelat Timah Nusantara
Sido		Muncul Tbk	103	BRPT	Barito Pacific Tbk
			104	TBMS	Tembaga Mulia Semanan
43	TSPC	Tempo Scan Pacific Tbk	Tbk		
44	KINO	Kino Indonesia Tbk	105	AGIII	Aneka Gas Industri Tbk
45	KPAS	Cottonindo Ariesta Tbk	106	DPNS	Duta Pertiwi Nusantara Tbk

Companies			Companies		
46	MBTO	Martina Berto Tbk	107	EKAD	Ekadharna International Tbk
47	MRAT	Mustika Ratu Tbk	108	ETWA	Eterindo Wahanatama Tbk
48	TCID	Mandom Indonesia Tbk	109	AMFG	Asahimas Flat Glass Tbk PT
49	WOOD	Integra Indocabinet Tbk	110	SAMF	Saraswanti Anugerah
50	CBMF	Cahaya Bintang Medan Tbk			Makmur
51	UNVR	UNILEVER INDONESIA	111	AKPI	Argha Karya Prima Industry
52	CINT	Chitose Internasional Tbk			Tbk
53	KICI	Kedaung Indah Can Tbk	112	EPAC	Megalestari Epack
54	LMPI	Langgeng Makmur Industri			Sentosaraya
55	TOYS	Sunindo Adipersada Tbk	113	IPOL	Indopoly Swakarsa Industry
56	HRTA	Hartadinata Abadi Tbk	114	APLI	Asiaplast Industries Tbk PT
57	AMIN	Ateliers Mecaniques	115	BINA	Berlina Tbk PT
		D'Indonesie	116	PBID	Panca Budi Idaman Tbk
		Tbk	117	TALF	Tunas Alfin Tbk PT
58	GDYR	Goodyear Indonesia Tbk	118	SMKL	Satyamitra Kemas Lestari
59	ASII	Astra International Tbk PT			Tbk
60	AUTO	Astra Otoparts Tbk	119	TRST	Trias Sentosa Tbk
61	BOLT	Garuda Metalindo Tbk PT	120	IFII	Indonesia Fibreboard
62	LPIN	Multi Prima Sejahtera Tbk			Industry
63	BRAM	Indo Kordsa Tbk	121	SINI	Singaraja Putra Tbk
64	PRAS	Prima Alloy Steel Universal	122	SULI	SLJ Global Tbk PT
		Tbk	123	TIRT	Tirta Mahakam Resources
65	SMSM	Selamat Sempurna			Tbk
			124	INRU	Toba Pulp Lestari Tbk
			125	TKIM	Pabrik Kertas Tjiwi Kimia
					Tbk
			126	INKP	Indah Kiat Pulp & Paper Tbk
			127	ALDO	Alkindo Naratama Tbk PT
			128	SPMA	Suparma Tbk
			129	SWAT	Sriwahana Adityakarta Tbk
					PT
			130	INCF	Indo Komoditi Korpora
			131	INOV	Inocycle Technology Group
					Tbk

Source: PT Bursa Efek Indonesia; <https://www.idx.co.id> › id

To analyze the data two general equations of a linear model involving several independent variables on profitability are compared. Multiple regression analysis as a model that is widely used for prediction is employed. Basically, regression analysis is used because it is a very useful tool in analyzing data and understanding the relationship between different variables with a high level of prediction accuracy. Two regression equations are displayed to see the differences between each component of working capital on profitability before the pandemic and after the pandemic. Table 2 provides a summary of the operational definitions of the research variables.

Table 2
 Operational research parameter

Variables	Indicators	Measurement	Source
PR	Profitability	Earning before interest tax, depreciation, and amortization divided by net sales	(Yilmaz & Acar, 2022)
CASH _{CY}	Total Cash	Total cash divided by net sales multiplied by 365 days	(Yunos et al., 2015)
REC _{CY}	Accounts Receivables Days	Accounts receivables days divided by net sales	(Talonpoika et al., 2016)
INV _{CY}	Days Inventory Held	Days inventory held divided by net sales	(Talonpoika et al., 2016)
AP _{CY}	Account Payable Days	Account payable days divided by net sales	(Talonpoika et al., 2016)
WC _{Change}	Total Current Assets Changes	Changes ratio in total current assets per year	(Yao et al., 2015)
CCC	Cash Conversion Cycle	Total accounts receivables days and days inventory held less account payable days	(Talonpoika et al., 2016)
OCL	Operating Current Liabilities	Current liabilities less accounts payable divided by net sales	(Talonpoika et al., 2016)
OCA	Operating Current Assets	Current Assets less inventories and less accounts receivable divided by net sales multiplied by 365 days	(Talonpoika et al., 2016)
FFC	Financial Flow Cycle	Operating current assets less operating current liabilities	(Talonpoika et al., 2016)
LIAB _{Change}	Total Current Liabilities Changes	Changes ratio in total current liabilities per year	(Leuz et al., 2003)
SIZE	Total Assets	Natural logarithm of total assets per year	(Yunos et al., 2015)

Source: (Yilmaz & Acar, 2022); (Yunos et al., 2015); (Talonpoika et al., 2016)

Model specification

This study we divide it into two equation models, namely conditions before and during the COVID-19 pandemic.

First, equation model for condition before COVID-19:

$$\begin{aligned}
 PR_{i,t} = & \beta_0 + \beta_1 CASH_{CY_{i,t}} + \beta_2 REC_{CY_{i,t}} + \beta_3 INV_{CY_{i,t}} + \beta_4 AP_{CY_{i,t}} + \beta_5 WC_{Change_{i,t}} + \beta_6 CCC_{i,t} \\
 & + \beta_7 OCL_{i,t} + \beta_8 OCA_{i,t} + \beta_9 FFC_{i,t} + \beta_{10} LIAB_{Change_{i,t}} + \beta_{11} SIZE_{i,t} + \epsilon_{1i,t}
 \end{aligned}
 \tag{1}$$

Second, equation model for condition during COVID-19 outbreak:

$$\begin{aligned}
 PR_{i,t} = & \beta_{10} + \beta_{11}CASH_{CY_{i,t}} + \beta_{12}REC_{CY_{i,t}} + \beta_{13}INV_{CY_{i,t}} + \beta_{14}AP_{CY_{i,t}} + \beta_{15}WC_{Change_{i,t}} \\
 & + \beta_{16}CCC_{i,t} + \beta_{17}OCL_{i,t} + \beta_{18}OCA_{i,t} + \beta_{19}FFC_{i,t} + \beta_{20}LIAB_{Change_{i,t}} \\
 & + \beta_{21}SIZE_{i,t} + \epsilon_{2\ i,t}
 \end{aligned}
 \tag{2}$$

From the six multiple regression equations, it will be tested to whether there are structural differences using the Chow-test. The Chow-test for testing differences in the structure of the regression equation for each independent variable will be tested individually to get four possible conditions before and during COVID-19.

- (a) $\beta_0 = \beta_{10}; \beta_1 = \beta_{11}; \dots \beta_n = \beta_n$; two identical regression model is called coincident regression;
- (b) $\beta_0 \neq \beta_{10}; \beta_1 = \beta_{11}; \dots \beta_n = \beta_n$; two regression model with the same slope but different intercept is called parallel regression;
- (c) $\beta_0 =; \beta_1 \neq \beta_{11}; \dots \beta_n \neq \beta_n$; two regression model with the same intercept but different slope is called concurrent regression;
- (d) $\beta_0 \neq \beta_{10}; \beta_1 \neq \beta_{11}; \dots \beta_n \neq \beta_n$; two perfectly different regression models are called dengan dissimilar regression.

There are two factors in this study, the working capital is an exogenous variable whereas profitability is an endogenous variable. Profitability is a company's ability to generate operating profit from average sales. Profitability is measured by earnings before interest tax, depreciation, and amortization divided by net sales generated from main business activities. Meanwhile, the Cash Conversion Cycle (CCC) is operational working capital as measured by the component cycle time of inventory; the cycle time of receivables; and the cycle time of payables. The components are calculated based on the method used by Talonpoika et al. (2016). Inventories divided by sales and multiplied by 365 days will result in the cycle time of inventories.

Results

This section presents a concise summary and discussion of the statistical test results. To ensure generalizability and model accuracy, given the multiple samples, predictor transformation was employed to achieve normality, assess Cook's distance, and establish a significance level of $p < 0.05$ for parameter testing. The automatic linear modeling statistical process generated insights into model accuracy, predictor variable contribution, and the significance of parameter coefficients, offering both numerical and visual representations for enhanced clarity of findings. This section summarizes the statistical test results, focusing on generalizing findings and ensuring model accuracy. We used predictor transformation for

normality, assessed Cook's distance, and set a significance level of $p < 0.05$. Automatic linear modeling provided insights into model accuracy, predictor contributions, and parameter significance, presented both numerically and visually for clarity.

The level of model accuracy

The level of accuracy is information on the quality level of the model. Table 3 displays the accuracy of the final model, compared to the proposed deductive reference model of 12 predictors. The higher the level of accuracy indicates the "best" model. For continuous data targets, accuracy is 1 minus the ratio of the mean absolute error in prediction (mean absolute value of predicted value minus observed value) to the range of predicted values (maximum predicted value minus minimum predictive value).

Table 3
Model accuracy rate for pooled sample, before and during COVID-19

Sample	Accuracy (%)	Predictor Model	Records
Pooled Sample	41.10	10	262
Before COVID-19	80.70	9	123
During COVID-19	43.40	10	125

Source: Authors calculation from data collected

In statistical testing, the accuracy of the prediction model in the pooled sample model was 41.1 percent to explain changes in PR of 9 predictor variables, which previously proposed 12 predictors. Furthermore, in the pre-sample model, the accuracy rate was 80.7 percent for changes in PR which could be explained by 9 predictors, and during COVID-19 the accuracy rate was 43.4 percent which could be explained by 10 predictors.

The importance predictor and parameter coefficient test

To focus on modeling, it is necessary to determine predictor variables based on their relative importance for further analysis consideration. Because the values are relative, the sum of the values for all predictors in the model is 1.0. The importance of the predictor is not related to the accuracy of the model. This only relates to the importance of each predictor in making predictions, not whether the prediction is accurate. The level of importance of predictors can be shown in Table 4. Before COVID-19, the cash conversion cycle was more important with a relative number of importance, while during the period, the inventory cycle was more important. This shows that during the period, the inventory cycle is a consideration in predicting performance, compared to the cash flow cycle. Fundamental changes occurred in the variable

changes in liabilities and changes in working capital. At the time before COVID-19, changes in liabilities were an important factor and not as predictors during COVID-19, which was replaced by changes in working capital, which were included in the important category.

Some interesting things from the empirical findings in the COVID-19 phenomenon are that almost all variables have changed in relative importance as predictors of profitability before and during the COVID-19 period. In addition to changes in importance, there is also a change in the direction of the slope from positive to negative and vice versa. Changes in direction occur in the CCC variable; REC_{CY}; INV_{CY}; AP_{CY} and predictors that did not change direction were FFC while insignificant predictors were OCL and OCA before COVID-19 and significant after COVID-19; for LIAB Change significant before COVID-19 and not significant during COVID-19, lastly the SIZE predictor is only significant during COVID-19.

Table 4
 The effect of working capital on profitability before and during COVID-19

Predictor	Pooled Sample			Before COVID-19			During COVID-19		
	Import	Coeff.	Prob.	Import	Coeff.	Prob.	Import	Coeff.	Prob.
Intercept		0.063	0.387		0.186	0.015		-1.02	0.664
CCC	0.259	-0.010	0.000	0.318	-0.019	0.000	0.240	0.011	0.000
REC _{CY}	0.217	0.010	0.000	0.276	0.021	0.000	0.222	-0.011	0.000
INV _{CY}	0.152	0.009	0.000	0.214	0.019	0.000	0.270	-0.011	0.000
AP _{CY}	0.150	-0.010	0.000	0.134	-0.017	0.000	0.118	0.008	0.000
WC _{Change}	0.076	0.449	0.000	0.006	0.266	0.021	0.020	0.239	0.057
FFC	0.050	-0.004	0.001	0.022	-0.001	0.000	0.021	-0.002	0.053
OCL	0.009	-0.004	0.039	-	-	Unsig	0.048	-0.003	0.004
OCA	0.031	0.404	0.003	-	-	Unsig	0.032	0.003	0.017
CASH _{CY}	0.027	0.003	0.006	0.024	0.003	0.000	-	-	Unsig
LIAB _{Change}			Unsig	0.003	-0.122	0.110	-	-	Unsig
SIZE			Unsig			Unsig	0.030	0.021	0.022

Source: Authors calculation

The t-test was used to verify the statistical significance with the error probability level significance <0.05. This test is used to determine whether there is an influence between the capital predictor variable, the dynamic working capital predictor element on profitability, which is distinguished before and during the COVID-19 period. To show whether there is a difference in the prediction of the model using the Chow test technique with the F-test. In the pooled sample condition, most of the operational working capital and operational financial variables significantly affect operational performance, except for changes in short-term liabilities and SIZE. Before COVID-19, there were three variables that were not significant, namely OCL, OCA and SIZE, while during COVID-19 the

insignificant ones were $CASH_{CY}$ and $LIAB_{Change}$. However, there is a difference in the direction of the parameter coefficients between before and during the COVID-19 period.

Table 5
 The effect of working capital on profitability: regression model comparison

Predictors	Before COVID-19			During COVID-19			Differences
	Importance	Coeff.	Prob.	Importance	Coeff.	Prob.	
Intercept		0.186	0.015		-1.02	0.664	Dissimilar regression
CCC	0.318	-0.019	0.000	0.240	0.011	0.000	Dissimilar regression
REC_{CY}	0.276	0.021	0.000	0.222	-0.011	0.000	Dissimilar regression
INV_{CY}	0.214	0.019	0.000	0.270	-0.011	0.000	Dissimilar regression
AP_{CY}	0.134	-0.017	0.000	0.118	0.008	0.000	Dissimilar regression
WC_{Change}	0.006	0.266	0.021	0.020	0.239	0.057	Paralel regression
FFC	0.022	-0.001	0.000	0.021	-0.002	0.053	Paralel regression
OCL	-	-	Unsig	0.048	-0.003	0.004	Dissimilar regression
OCA	-	-	Unsig	0.032	0.003	0.017	Dissimilar regression
$CASH_{CY}$	0.024	0.003	0.000	-	-	Unsig	Dissimilar regression
$LIAB_{Change}$	0.003	-0.122	0.110	-	-	Unsig	Dissimilar regression
SIZE				0.030	0.021	0.022	Dissimilar regression

Source: Authors calculation

Table 5 reports that for comparison of parameters between sample groups before and during COVID-19, it is only interpreted through changes in the direction of the slope as explained in the previous research method. There are 4 possible changes that occur in the two regression equation models. Table 5 reports there are significant differences in several predictors before COVID-19 and during the COVID-19 period. There are differences in the form of the regression equation, mostly in the form of dissimilar regression and only the FFC variable shows parallel regression before and during the COVID period. This finding can be concluded that the occurrence of the COVID pandemic significantly affects the change in direction.

Table 5 also shows (1) that there was a negative influence of the Cash Conversion Cycle on profitability before the pandemic, and there was a positive influence of CCC during the pandemic; (2) there was a positive influence on receivables cycle on profitability before the pandemic and a negative

influence during the pandemic; (3) there is a positive influence of inventory turnover on profitability before the pandemic and a negative influence during the pandemic; (4) there was a negative influence of debt turnover on profitability before the pandemic and a positive influence during the pandemic; (5) there is a positive influence of changes in working capital on profitability before the pandemic and during the pandemic; (6) there is a negative influence of the financial flow cycle (FFC) on profitability before and during the pandemic; (7) the effect of OCL and OCA on profitability was not significant before the pandemic and was significantly negative during the pandemic.

Discussions

Events that occurred in the Indonesian manufacturing sector have shown the influence of COVID-19 on working capital management. This research has added to the treasures in the field of working capital management which strengthens the findings on the dynamics of working capital. In line with previous research (Cai & Luo, 2020; Deshmukh & Haleem, 2020; Okorie et al., 2020; Qin et al., 2020). The reinforcement in the results of this study is the change in the importance of predictors as the reason for the emphasis on attention and locus of working capital elements, namely the cash conversion cycle, account receivable cycle, inventory cycle, and account payable cycle. However, this study does not discuss purchasing and work-in-process cycles that integrate the concept of supply chain management in working capital management (Sagner, 2011).

Before COVID-19; the cash conversion cycle had a negative effect on profitability with a relatively high predictor importance of 0.318. It can be interpreted that the higher the number of days of cash conversion from inventories, receivables, and less days of payment of short-term debt, the lower the profitability. The results of this study are in line with most previous studies (Marttonen et al., 2013; Peng & Zhou, 2019; Talonpoika et al., 2016; Wichitsathian & Pestonji, 2019; Zimon & Tarighi, 2021) and other researchers (Mutua Mathuva, 2014; Nobanee et al., 2011; Tran & Dat Le, 2019; Tripathi & Ahamed, 2016). This is also in line with several studies which show a negative relationship between liquidity and profitability. The same finding as (Nguyen et al., 2020) shows the negative and significant impact of working capital management as measured by the cash conversion cycle. The same thing with study by Pakdel & Ashrafi (2019) shows that there is a significant negative relationship between working capital management and performance, and there is no difference at several stages of the business cycle. However, several studies also show a level of optimization. The effect of liquidity on profitability. In contrast to study by Enqvist et al. (2014) which states that the relationship between the CCC and profitability depends on economic conditions. This shows that the relationship between the CCC and profitability depends on the characteristics of the company (Chauhan & Banerjee, 2018). While study by (Chauhan & Banerjee,

2018) found that the manufacturing industry in India, cannot be proven that working capital behavior follows systematic targets and company-specific characteristics.

During the COVID-19 period, the CCC had a positive effect on profitability with relative predictor importance of 0.240. An anomaly occurs, which can be interpreted that the higher the CCC, the higher the profitability. This is possible if the company increases sales by providing incentives to extend the days of collection of receivables and suppliers extend the days of payment of debts, there by extending the CCC days and account profitability will increase. This shows that during the COVID-19 period, manufacturing companies in Indonesia carried out aggressive strategic behavior toward working capital. This is in line with study by Hill et al. (2010) that companies that are faced with financial difficulties, sales uncertainty, and expensive external financing, tend to adopt an aggressive working capital strategy. In addition, the length of the CCC can also be determined by the company's financial constraints and external factors (Chauhan & Banerjee, 2018), such as the financial cycle and regulation of short-term and long-term funding sources and the trade credit system. Therefore, aggressive strategic actions on excessive working capital will have an impact on financial distress. The findings of this study contradict the findings study by Zimon & Tarighi (2021) show that the behavior of working capital management in Poland during the COVID period was conservative. Firms with a larger internal financing capacity tend to be more conservative (Hill et al., 2010). While study by Zheng et al. (2022) indicate that businesses need to adopt a proactive approach to working capital to ensure their chances of success. Bigger and overcome many challenges. In the time of COVID-19, it is necessary to focus on cash availability, extend payment terms, and lower unnecessary inventory levels to get the benefit of fast cash payable payment.

The same thing happens in the receivable cycle (RC). Before COVID-19 it showed a positive impact on profitability, but during COVID-19, it had a negative impact on profitability. The accounts receivable cycle (the number of times accounts receivable rotates from the average sales, the higher the receivable turnover, shows customer credibility and effective receivable management. In theory, the higher the receivable turnover rate, the more effective sales and the higher the profit (Ross et al. , 2017; Van Home, 2002). However, during COVID-19, the opposite occurs, the higher the receivables, the lower the profitability, this is in line with the findings of Demiraj et al., (2022); and Zimon & Tarighi, (2021) which show that COVID-19 does not have a significant impact on changes in working capital.

The influence of INVcy on profitability before COVID-19 showed a positive influence on profitability, but during COVID-19, it had a negative influence on profitability. Several studies show that uncertainty has an impact on inventory policy (Zhao & Chen, 2022; Zeng et al., 2020), this can be analogous to when the COVID-19 incident showed high uncertainty. This research shows that INVcy has an effect positive before COVID-19 and negative during the pandemic, consistent with the findings of Demiraj et al., (2022); and Tarkom, (2022). APcy has a positive effect on profitability before COVID-19

and a positive effect during COVID-19. This is getting stronger as the reason that the company gets incentives in terms of debt repayment which is used to increase sales and increase inventory. A change of direction occurs when COVID-19 on APcy.

Changes from a negative influence on PR to a positive. This can happen, which shows that the longer the days of paying debts, the higher the profitability. This case is proof that the company is more proactive in the pandemic situation. This is in line with the findings of anomalies that occurred during COVID-19, it can be interpreted that there is a potential for suppliers to provide incentives for the debt collection period, which can be used to increase profitability. However, it is different from the incident in the industrial sector in Bangladesh, in that the short-term impact of the pandemic causes product expiration, lack of working capital, and limited distributor operations, which are very severe (Chauhan & Banerjee, 2018). The pandemic incident in Bangladesh had an impact on incentives for additional working capital for the industrial and service sectors in the short term through the banking system and discounting interest rates (Islam et al., 2020). Another finding in this study, there is a statistically significant difference for the OCL, OCA, and SIZE variables before and during COVID-19. OCL has a negative effect on PR; OCA has a positive effect on PR and SIZE has a positive effect on PR.

Conclusions

This study reveals a significant shift in the impact of working capital elements on profitability in Indonesian manufacturing before and during COVID-19. Almost all regression predictors changed direction during the pandemic, except for the Financial Flow Cycle (FFC), indicating an aggressive working capital management approach by these companies. Companies require reliable predictors for short-term investment and funding decisions to mitigate evolving risks. The cash conversion cycle emerges as the primary predictor in working capital management, with the receivables cycle, inventory cycle, and accounts payable cycle also playing crucial roles in early loss detection. This study provides valuable insights for manufacturing companies, aiding their spontaneous financing decisions driven by sales fluctuations, financial planning, and strategic choices in short-term capital structures.

Before COVID-19, our findings indicate that both the Cash Conversion Cycle (CCC) and Financial Flow Cycle (FFC) negatively impacted profitability. This suggests that managers could boost profits by shortening these cycles. Shortening the CCC involves effective working capital management across the value chain, from raw material procurement to product sales and customer credit policies. Reducing the FFC, on the other hand, requires strategic short-term financial resource management to navigate external uncertainties. Maintaining a consistent cash conversion cycle, clear collection rules, and prudent idle cash investment are also crucial.

However, during COVID-19, Indonesian manufacturing companies aggressively delayed debt payments and boosted sales through increased accounts receivable and inventory. This shift in working capital behavior is reflected in the changed regression models and confirms that poor working capital management during the pandemic negatively affected profitability. Specifically, changes in working capital and increased inventory led to decreased profitability, highlighting the potential for financial distress if not carefully managed. In conclusion, working capital management significantly impacts profitability, and Indonesian manufacturing firms demonstrated aggressive behavior during the pandemic.

Based on research findings, several recommendations are suggested as follows: (1) effective receivable management to increase receivable turnover and cash collection, (2) inventory policy to decrease inventory cost, idle and over capacity of inventory, and (3) effective short-term debt management in line with receivable and inventory turnover. This study recommends for future research the development of working capital behavioral theory. Whereas, working capital management will be different in the contingency situation that will lead to the development of various empirical research in working capital management in different setting of environment.

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