Research Article

Working Capital Management, Firm Performance: A Case Study of Listed Firms on MAI

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Abstract

This study investigates the relationship between working capital management and firm performance within the Market for Alternative Investment (MAI) in Thailand. By utilizing panel data analysis, the study examines how different working capital policies and the efficiency of working capital management affect the firm performance of listed companies. The population for this study comprises 210 companies listed on the Market for Alternative Investment, spanning across eight industry sectors. Using a purposive sampling method, a sample of 199 companies was selected, resulting in 2,295 observations covering 14 years from 2009 to 2022.

The findings reveal that working capital policy significantly affects firm performance. Specifically, an aggressive working capital investment policy enhances performance by minimizing excess inventory and associated costs, while a conservative working capital financing policy improves performance by mitigating liquidity issues. The efficiency of working capital management, as measured by the cash conversion cycle, is negatively related to firm performance, although its impact is minor compared to the cash ratio. The performance index shows no significant impact on firm performance. These insights underscore the importance of strategic WCM in enhancing firm value and operational efficiency.

Keywords: *Working Capital Management, Firm Performance, Working Capital Policy, Working Capital Investment Policy, Working Capital Financing Policy*

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Introduction

Working capital management (WCM) is a critical decision in the financial management of businesses (Lateh, 2019). It encompasses the formulation of working capital policies (WCP) and the assessment of working capital management efficiency (WCME) (Pestonji & Wichitsatian, 2019). WCP involves determining the amount of working capital required and its funding source. The primary components of working capital utilized in business operations include cash, trade receivables, and inventory (Brigham & Houston, 1998). Evaluating the efficiency of working capital management entails measuring the capability to effectively use current assets and procure current liabilities to facilitate smooth daily operations (Russo, 2013). The investment policy concerning working capital explains the impact of maintaining a certain level of working capital relative to sales on a business's overall financial health. Businesses that maintain a low level of working capital can allocate surplus funds to invest in non-current assets, thereby generating additional revenue (Kasiran, Mohamad, & Chin, 2016). This strategy can increase overall business income, and reinvesting these funds in revenue-generating assets can enhance profitability, signaling improved performance to investors (Myers & Majluf, 1984). Consequently, the market price of common stock may rise, leading to an increase in firm value (Berk, DeMarzo, & Harford, 2009). Conversely, businesses that adopt a policy of maintaining a high level of working capital, such as substantial inventory reserves, ensure sufficient product availability for sale (Baños-Caballero, García-Teruel, & Martínez-Solano, 2020) thereby preventing lost sales opportunities (Mansoori & Muhammad, 2012). However, Boonsuk (2016) identified that rapid technological advancements can render products obsolete and introduce lower-priced substitutes (Abuzayed, 2012). If businesses fail to meet sales targets, substantial inventory investments can lead to losses (Song, Liu, & Chen, 2012), adversely affecting operational performance and diminishing firm value (Kasiran et al., 2016). Based on the mention above “How does working capital management affect firm performance or firm value?”.

In the context of Thailand, businesses and investors seeking capital for operations can access funds through both internal and external sources. According to the external source, the financial market consists of two main markets: the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (MAI). As of now, 206 SMEs are listed on the MAI, raising over 10.3 billion THB (SET, 2023). These SMEs include both established firms that have

successfully increased their firm performance and new enterprises, illustrating the critical role of the private sector in driving Thailand's economic growth. The involvement of SMEs helps address fundamental economic issues, support employment, and foster direct and indirect investments, thereby propelling domestic economic activities.

A review of the literature on factors affecting the performance of companies in the MAI reveals a broad range of studied issues. These include long-term business survival (Wanitchakorn, 2019), information asymmetry (Thongnoon, 2016), bankruptcy prediction (Lertpatsanawat, 2012), and failures or improper in WCM (Phromsuwansiri, Chutimagul, & Promnurakkij, 2022). Especially, improper WCM has led to financial liquidity crises for some businesses in the MAI, ultimately resulting in their closure (Wanitchakorn, 2019).

Based on a review of studies on WCM and FP, most research utilizes the Working Capital Investment Policy (WCIP) and Working Capital Financing Policy (WCFP), along with Working Capital Management Efficiency (WCME), to explain firm performance or firm value. These policies are typically categorized into three types: aggressive, moderate, and conservative (Brigham & Daves, 2007), with a tendency to use a single financial ratio to assess the risk level of Working Capital Policies (WCP), although multiple ratios may be more appropriate. In measuring WCME, the Cash Conversion Cycle (CCC) is widely used but presents conflicting findings: CCC has been found to have both negative (Padachi, 2006; García-Teruel & Martínez-Solano, 2007; Akoto, Awunyo-Vitor, & Angmor, 2013) and positive correlations with firm performance (Rozari, Sudarma, Indiastuti, & Febrian, 2015; Shan, Onn, Yee, & Chuan, 2015; Ng, Ye, Ong, & Teh, 2017; Al-Mawsheki, Ahmad, & Nordin, 2019). These contradictory relationships suggest that relying solely on CCC may not comprehensively assess WCME. Other studies use the Performance Index (PI) to measure WCME, indicating efficiency in terms of profitability by comparing changes in sales to changes in working capital investment (Kaur & Singh, 2013; Marie & Azhagaiah, 2017; Goker, 2020). However, PI has limitations, as it does not account for liquidity risk or the ability to repay short-term debt.

Furthermore, some studies assess WCME from a risk perspective using the Cash Ratio (CASHR) (Tarek & Rafik, 2020; Lefebvre, 2022) to indicate the adequacy of cash in covering short-term liabilities.

To prevent businesses from improper WCM which leads to shut-down and to gain a deep understanding of the relationship between WCM and FP, this study adopts a clustering

technique to categorize WCP risk levels, employs a panel data analysis to explain their relationship, uses PI as the profitability dimension and fulfills the risk dimension with cash ratio (CASHR) for liquidity adequacy, addressing limitations in using only CCC.

Objective

To test the relationship between WCM and FP of listed companies in MAI.

Literature Reviews

Firm Performance

Performance is a key indicator of a firm's management effectiveness in achieving business goals and creating wealth for shareholders (Le, 2019; Prasertsak, Kanjanawong, & Jantarungsri, 2022). Business performance can be assessed through various criteria, including business continuity and financial metrics (Pestonji, 2023). The survival of a business, as a measure of continuity, indicates successful performance if the business can sustain its operations over time (Lindenberg & Ross, 1981). Financial performance, on the other hand, is typically evaluated using a range of financial ratios that provide insights into different aspects of business efficiency.

Key financial ratios identified in the literature include 1) Gross Operating Profit (GOP), this ratio, calculated as gross profit divided by sales, reflects a firm's ability to manage costs relative to competitors (Shin & Soenen, 1998; Deloof, 2003). 2) Net Operating Profit (NOP), NOP compares net profit with sales to measure overall business performance (Raheman & Nasr, 2007; Ramchandran & Janakiraman, 2009). Return on Assets (ROA), defined as net profit divided by assets, indicates how effectively a firm utilizes its assets to generate profits. A higher ROA signifies better asset management (Deloof, 2003; García-Teruel & Martínez-Solano, 2007; Le, 2019; Puriboriboon, 2021) 3) Return on Equity (ROE), calculated as net profit divided by equity, measures the efficiency of management in using shareholder equity. A higher ROE suggests more effective management (Akoto et al., 2013; Akgün & Şamiloğlu, 2016). 4) Tobin's Q is a performance measurement method that integrates both accounting values and market values to assess a firm's worth (Mohamad & Saad, 2010; Altaf & Shah, 2017). It is calculated by dividing the market value of a firm by its replacement cost. The market value is derived from the total market value of the firm's equity and debt (Lindenberg & Ross, 1981).

In this study, Tobin's Q (TOBINQ) is considered an appropriate measure because it reflects market-based values, such as stock prices, which incorporate historical data and investors' expectations of future growth (Lewellen & Badrinath, 1997). The replacement cost represents the value of resources or assets that a firm can use for optimal investment in other projects. If Tobin's Q is less than 1, it indicates that the firm is not using its assets to generate market value exceeding its replacement cost, suggesting that the firm should consider reallocating its assets to other investments to increase its value.

Working Capital Investment Policy (WCIP) and Firm Performance (FP)

The Working Capital Investment Policy (WCIP) manages working capital to balance risk and return. An aggressive policy, with low working capital, allows for more investment in other projects, enhancing firm performance and value (Berk et al., 2009). However, the liquidity preference theory suggests that insufficient working capital can lead to liquidity issues, operational disruptions, and increased borrowing costs, negatively affecting performance (Pestonji & Wichitsatian, 2019). Conversely, a conservative policy, maintaining higher working capital levels, ensures liquidity for routine operations and unforeseen expenses, preventing liquidity problems and ensuring smooth operations, though potentially lowering profitability due to idle funds (García-Teruel & Martínez-Solano, 2007). Studies indicate that conservative policies enhance performance by maintaining operational efficiency and meeting customer demand (Nazir & Afza, 2009; Mohamad & Saad, 2010; Kaddumi & Ramadan, 2012; Rozari et al., 2015; Ng et al., 2017). In a rapidly changing business environment, a conservative WCIP is posited to increase firm value.

H_1: Conservative working capital investment policy (CWCIP) is positively related to firm performance (FP)

Working Capital Financing Policy (WCFP) and Firm Performance (FP)

The Working Capital Financing Policy (WCFP) addresses strategies for financing working capital needs. Three approaches are outlined: 1) Moderate Approach: aligns short-term financing with short-term assets and long-term financing with permanent current asset and fixed assets. Though theoretically sound, perfect matching is challenging in practice. 2) Aggressive Approach: finances long-term assets with short-term funds, assuming short-term

financing is cheaper (Berk et al., 2009). This reduces financial costs, increasing profits and firm performance (Pestonji & Wichitsatian, 2019). 3) Conservative Approach: prioritizes safety and liquidity, using long-term financing to avoid operational disruptions from liquidity shortages, despite higher financial costs (Deloof, 2003; Brigham & Daves, 2007). According to the pecking order theory, businesses should prioritize the funds raised from internal to external sources to minimize costs (Wasiuzzaman, 2015). Short-term trade credit and accrued expenses are low-cost funding sources, reducing financial costs and improving performance. However, long-term financing can maintain adequate inventory levels, enhancing profitability despite higher costs (Nazir & Afza, 2009; Mohamad & Saad, 2010; Kaddumi & Ramadan, 2012). Given the dynamic business environment, a conservative WCFP enhances firm value by ensuring liquidity and operational stability.

H_2: Conservative working capital financing policy (CWCFP) is positively related to Firm Performance (FP)

Cash Conversion Cycle (CCC) and Firm Performance (FP)

The Cash Conversion Cycle (CCC) is a crucial liquidity measure and indicator of working capital management efficiency, combining various financial ratios to assess liquidity over time (Raheman & Nasr, 2007; Mehmet & Eda, 2009; Mohamad & Saad, 2010). According to Brigham and Daves (2007), firm value is derived from discounted future cash flows (FCF), which include Net Operating Profit After Taxes (NOPAT), changes in Net Operating Working Capital (ΔNOWC), and changes in fixed assets. An efficient CCC, ideally minimized, indicates effective working capital management, consisting of Days Inventory (DI), Days Receivables (DR), and Days Payables (DP). Efficient CCC management reduces investments in receivables and inventory, allowing firms to reinvest freed-up capital in other projects, enhancing overall performance (Deloof, 2003; Dong & Su, 2010; Charitou, Elfani, & Lois, 2010; Gill, Bigger & Mathur, 2020). Increased FCF leads to higher firm value (Aktas, Croci, & Petmezas, 2015; Wasiuzzaman, 2015; Le, 2019). However, some studies suggest that higher working capital investment can positively impact future sales and firm value by preventing stockouts and ensuring customer satisfaction (Ramchandran & Janakiraman, 2009; Sharma & Kumar, 2011; Abuzayed, 2012). Overall, an efficient minimized CCC positively impacts firm performance by optimizing short-term liquidity and operational efficiency.

H_3: CCC is negatively related to firm performance

The Performance Index of Working Capital Management (PI)

The Performance Index (PI) evaluates the efficiency of working capital management (WCM). Traditionally, WCM efficiency is assessed using the Cash Conversion Cycle (CCC) and its components (Deloof, 2003; Lazaridis & Tryfonidis, 2006; Padachi, 2006; Shah & Sana, 2006; García-Teruel & Martínez-Solano, 2007). However, PI, as proposed by Kaur and Singh (2013), offers an alternative by comparing sales growth to changes in working capital investment. The formula for PI is:

$$PI_{WCM} = \frac{I_S}{N}\sum_{t=1}^{n}\frac{W_{i(t-1)}}{W_{i(t)}}$$

The sales index (I_S) is defined as the ratio of sales in the current year (S_t) to the sales in the previous year (S_{t-1}), expressed as: $I_S = S_t / S_{t-1}$. $W_{i(t-1)}$ represents groups of current assets, N is the number of asset groups. A PI greater than 1 indicates efficient WCM, where reductions in working capital do not negatively impact sales (Kaur & Singh, 2013). Studies have shown varying PI outcomes: some firms show decreased efficiency due to sustainability constraints (Goker, 2020), while others, like those in India's Nifty CNX FMCG Index, demonstrate high efficiency (Marie & Azhagaiah, 2017). Effective WCM, indicated by a high PI, enhances firm value by contributing positively to sales growth and performance.

H_4: PI is positively related to firm performance

Cash Ratio (CASHR) and Firm Performance (FP)

The efficiency of working capital management (WCM) is vital for operational performance. Effective WCM involves allocating funds for daily operations and short-term reserves for potential price fluctuations (Bhattacharya, 2007; Russo, 2013; Al-Mawsheki et al., 2019; Pestonji & Wichitsatian, 2019). High cash levels can lead to opportunity costs, while low cash levels might necessitate accelerated collections, negatively impacting debt recovery (Emery, 1984; Long, Malitz, & Ravid, 1993; Petersen & Rajan, 1997). Research shows varied relationships between liquidity and performance, with some studies indicating lower liquidity leads to higher performance (Mohamad & Saad, 2010; Marobhe, 2014; Eya, 2016),

while others suggest higher liquidity improves performance (Eljelly, 2004; Akoto et al., 2013). The Cash Ratio (CASHR), measuring liquidity, excludes volatile sales and low liquidity assets. Studies in Germany and Egypt found high liquidity enhances performance (Tarek & Rafik, 2020; Lefebvre, 2022). In the context of MAI, Thailand's study proposes that high liquidity is crucial due to limited capital access compared to the SET.

H_5: The Cash Ratio (CASHR) is positively related to firm performance

Factor Affecting the Firm Performance (Control Variables)

Previous studies about factor affecting the firm performance, firm size, sale growth, capital structure and industry competition CEO duality has been used. This study uses five controls consisting of Sales Growth (SG) or Growth Opportunity (GO), Pandemic-Crisis (COVID), Intensity of Industry Competition (INDUSTYPE), Financial Structure (FS), Firm's Size (FZ).

Sales Growth (SG) or Growth Opportunity (GO)

Sales growth indicates a firm's growth, with high SG or GO reflecting strong demand. Proper working capital management can drive sales growth and profitability (Samiloglu & Demirgunes, 2008). Research shows both positive correlation between SG or GO and performance (Puriboriboon, 2021) and negative correlations between SG or GO and performance depending on how firms manage inventory and trade credit (Baños-Caballero, García-Teruel, & Martínez-Solano, 2009).

Pandemic-Crisis (COVID)

Pandemic crises, such as COVID-19, significantly impact economic growth (Lounkaew & Pratheuangrattana, 2022), particularly in developing countries with limited resources. The pandemic disrupted production and consumption (Chen, Chaiboonsri, & Wannapan, 2021; Klinsrisuk & Pechdin, 2022), challenging firms to manage working capital effectively to maintain liquidity and profitability during the crisis.

Intensity of Industry Competition (INDUSTYPE)

The intensity of industry competition is crucial for business success in a rapidly changing business environment (Curry & George, 1983; Zhao & Zou, 2002; Namdar, Pant, & Blackhurst, 2023). Firms in highly competitive industries must adapt strategies, including working capital management, to ensure survival. The intensity of competition can be measured through market structure (Sleuwaegen & Dehandschutter, 1986; Brezina, Pekár, Čičková, & Reiff, 2014), competitive behavior (Houston & Weiss, 1974), and financial analyses (Milana, 1988; Szymanski, Bharadwaj, & Varadarajan, 1993; Brezina et al., 2014). This research uses market structure analysis by using industry concentration to assess competition levels.

Financial Structure (FS)

According to the pecking order theory, firms prioritize internal financing to minimize costs associated with agency and issuing new securities (Nyeadi, Sare, & Aawaar, 2018). High leverage increases a firm's risk and the cost of issuing new securities (risk premium), which can reduce investment in working capital (Russo, 2013) Low returns on working capital investments might lead to missed growth opportunities, making leverage inversely related to working capital levels (Mathuva, 2010; Abbadi & Abbadi, 2013).

Firm's Size (FZ)

Firm size impacts working capital management, particularly in accessing financial resources. Larger firms have better access to capital markets and can offer more trade credit (Petersen & Rajan, 1997), while smaller firms often face financial constraints potentially leading to liquidity issues (Whited, 1992), Firm size is typically measured by the natural logarithm of total assets (Chancharat & Kumpamool, 2020; Afrifa, Tingbani, & Adesina, 2022) or sales (Abbadi & Abbadi, 2013; Al-Mawsheki et al., 2019).

Conceptual Framework

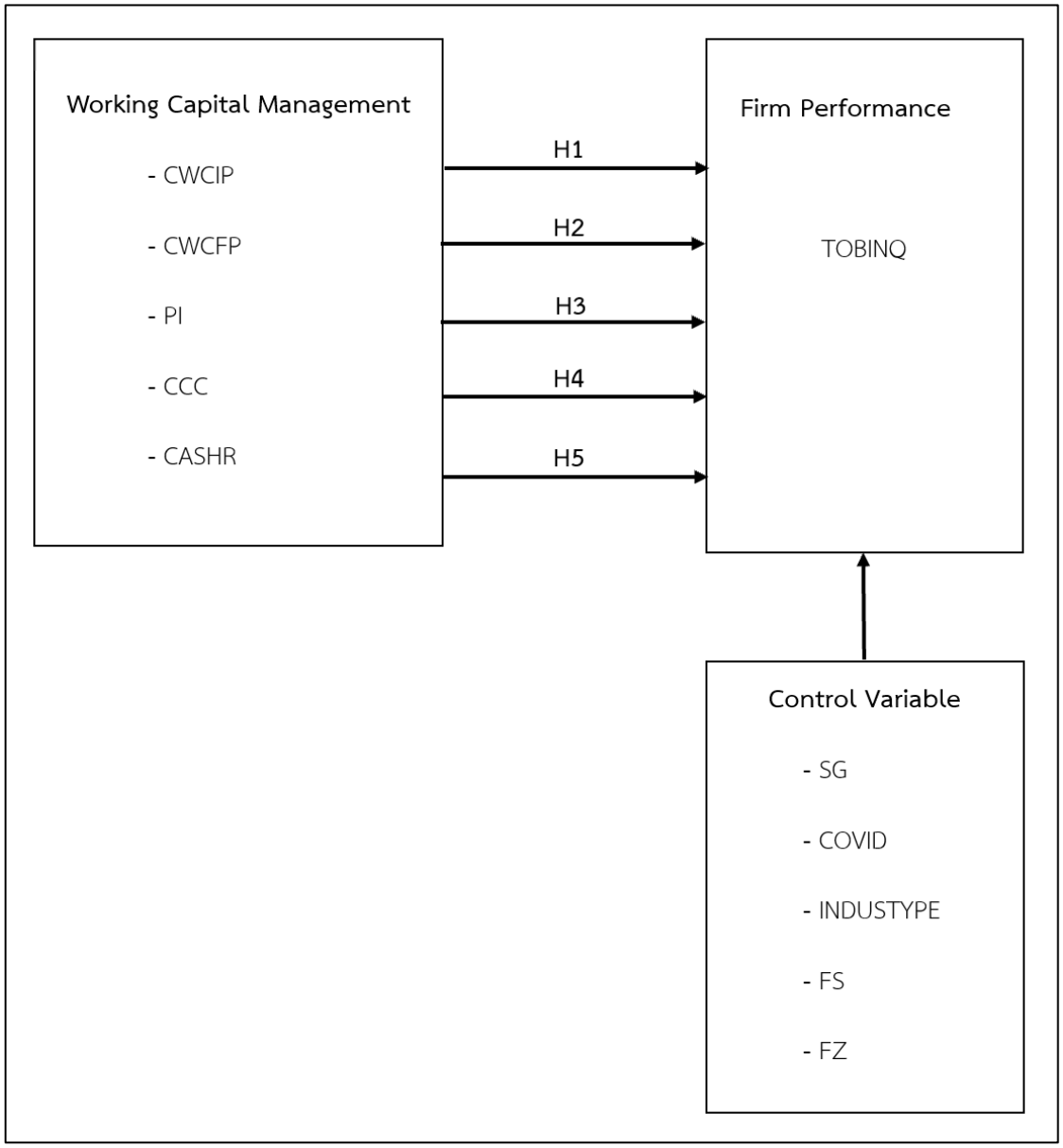

Figure 1 Conceptual Framework

Source: The Researcher's Synthesis

Methodology

Population and Samples

The population for this study consists of 210 companies listed on the MAI, spanning eight sectors: 1) Agriculture and Food Industry, 2) Resources, 3) Technology,

4) Services, 5) Industrial Products, 6) Consumer Products, 7) Property and Construction, and 8) Financial Business.

Sample selection was selected by purposive sampling which selects all companies in the MAI that are operational and not subject to delisting except companies in the Financial Business sector (Due to the difference in the business operation) total of 199 companies with 2,295 observations over a fourteen (2009 - 2022). Financial ratios were collected from financial statements in the STATA database and Price data was collected from the SETSMART database of the Stock Exchange of Thailand.

Variable and Measurements

Table 1 Variables and Measurements

Variables	Measurements
CWCIP	CWCIP is a dummy variable for the working capital investment policy measured using a clustering technique, with a value of '1' for a conservative working capital investment policy and '0' for other types of working capital investment policies.
AWCIP	AWCIP is a dummy variable for the working capital investment policy measured using a clustering technique, with a value of "1" when it is a risky working capital investment policy and "0" for other types of working capital investment policies.
CWCFP	CWCFP is a dummy variable for the working capital financing policy measured using a clustering technique, with a value of '1' for a conservative working capital financing policy and '0' for other types of working capital financing policies.
AWCFP	AWCFP is a dummy variable for the working capital financing policy measured using a clustering technique, with a value of '1' for an aggressive working capital financing policy and '0' for other types of working capital financing policies.
PI	$$PI = \frac{I_S}{N}\sum_{i=1}^{n}\frac{W_{i(t-1)}}{W_{it}}$$ where sales index (I_S) is defined as the ratio of sales in the current year (S_t) to the sales in the previous year (S_{t-1}), expressed as $I_S = S_t / S_{t-1}$. $W_{i(t-1)}$ represents groups of current assets, and N is the number of asset groups (Ahmed, Sehrish, Saleem, Yasir, & Shehzad, 2012; Kaur & Singh, 2013).
CCC	The formula for calculating the CCC is to sum up the days inventory outstanding (DI) and days sales outstanding (DR), and then subtracts the days payable outstanding (DP) as equation CCC = DI + DR – DP (Mehmet & Eda, 2009).

Table 1 (cont.)

Variables	Measurements
CASHR	Cash ratio (CASHR) = CAEQ/CL, where CAEQ represents the cash and equivalent and CL is the current liability (Lefebvre, 2020; Tarek & Rafik, 2020).
TOBINQ	TOBINQ is Tobin's Q ratio calculated as (MVE+MVD)/BVA where MVE is the market value of equity, MVD is the market value of debt and BVA is the book value of asset (Le, 2019; Pestonji & Wichitsatian, 2019).
SG	Sales Growth Rate (SG) = $Sale_t/Sale_{t-1}$, $Sale_t$ is sales in year t and $Sale_{t-1}$ is sales in the previous year (Intara & Wanganusorn, 2022).
COVID	The duration of the COVID-19 outbreak is in the epidemic period (2019-2022) with a value of "1". It is not in the epidemic period "0" (Hfocus, 2022).
INDUSTYPE	The intensity of competition in an industry is measured by the concentration of the industry. If the concentration index is greater than 67 percent, it is described as highly concentrated or monopoly. If the index is less than 33 percent, it indicates that the industry is fragmented or the industry is highly competitive (Koch, 1980).
FS	Financial Structure (FS) = Debt/Equity ratio (Intara & Wanganusorn, 2022).
FZ	FZ = LN (Size) (Chancharat & Kumpamool, 2020).

Data analysis

Data analysis follows a structured three-step process. First, descriptive analysis examines data distribution using skewness and kurtosis (Byrne, 2010; Hair, Black, Babin, & Anderson, 2010). Second, hypothesis testing addresses multicollinearity (Correlation Test), heteroscedasticity (Breusch-Pagan or White tests), endogeneity (Instrumental Variable Test), and autocorrelation (Durbin-Watson or Breusch-Godfrey test). Lastly, the relationship between Working Capital Management (WCM) and Firm Performance (FP) is analyzed using Pooled OLS, Fixed Effect Model (FEM), or Random Effect Model (REM).

To determine the appropriate between the Pooled OLS Model and the Panel Model, the Lagrange Multiplier Test is applied if the Panel is selected, and then the Hausman Test is required to test the appropriate of FEM or REM by hypothesis testing (H_0: REM is appropriate) (Piriyakul, 2021). This ensures the model accurately captures cross-sectional and time-specific effects, providing robust insights into WCM efficiency and firm performance.

Results

Normality Test

This study on the relationship between WCM and FP assessed the data distribution using descriptive statistics, focusing on skewness and kurtosis. According to George and Mallery (2010), the appropriate range for skewness and kurtosis is between -2 and +2. Byrne (2010); Hair et al. (2010) extend the acceptable range for kurtosis to -7 to +7. The study found three variables with non-normal distributions: CCC (Skewness = 3.16185, Kurtosis = 37.96692), SG (Skewness = 33.1346, Kurtosis = 1269), and FS (Skewness = 5.433904, Kurtosis = 53.24456). These were addressed using the Winsorization technique (Ruppert, 2014; Leone, Minutti-Meza, & Wasley, 2019), which trims extreme values. Descriptive statistics for Tobin's Q (TOBINQ), the dependent variable, showed normal distribution with a mean of 1.2405 and skewness and kurtosis within acceptable ranges. Independent variables (AWCIP, CWCIP) and financing policies (AWCFP, CWCFP) also exhibited normal distributions. The data revealed that aggressive working capital investment policies (AWCIP) were most common, followed by conservative policies (CWCIP). Similarly, conservative financing policies (CWCFP) predominated. Control variables, including Covid, SG, Industype, and FS, showed normal distributions, ensuring the reliability of subsequent analyses.

Multicollinearity Test

The multicollinearity test assesses the relationship between independent variables to ensure that the model does not suffer from multicollinearity. Multicollinearity can inflate the standard errors of the coefficients, making hypothesis testing for the beta coefficients unreliable. This study uses two methods to test for multicollinearity: the Variance Inflation Factor (VIF) and the correlation coefficient (r). A VIF value exceeding 10 or a correlation coefficient (r) above 0.8 indicates severe multicollinearity (Rangkakulnuwat, 2013). The results of the VIF show that the highest VIF value is 3.074 for the variable AWCIP, which is well below the threshold of 10. This indicates that there is no severe linear relationship between any pairs of independent variables. Similarly, the highest correlation coefficient is found between AWCFP and CWCFP, with an r-value of -0.337472 which is below the threshold of 0.8. This further confirms that multicollinearity is not a concern among the independent variables in this model.

Autocorrelation and Heteroscedasticity Test

Autocorrelation Test

The autocorrelation examines the correlation of error terms in a regression model, which can bias statistical hypothesis testing for beta coefficients. This study used three methods to detect autocorrelation: the Durbin-Watson statistic, correlogram analysis with Q-statistics, and the Wooldridge test (Wooldridge, 2002). The Durbin-Watson statistic yielded a value of approximately 0.997, indicating a high level of positive autocorrelation. The correlogram showed significant declines in autocorrelation values, and the Q-statistics were significant. The Wooldridge test, with an LM value of 591.7226 and a P-value of 1.06×10^{-130}, confirmed the presence of autocorrelation, as the null hypothesis of no autocorrelation was rejected.

Heteroscedasticity

Heteroscedasticity is characterized by a non-constant variance of error terms and can be observed through the varying spread of residuals at different levels of independent variables. This study identified heteroscedasticity via residual plots, which showed non-uniform dispersion, undermining parameter estimate accuracy. To address both autocorrelation and heteroscedasticity, for removing heteroscedasticity and autocorrelation, the Newey-West standard error correction method was applied (Newey & West, 1986). This adjustment ensures more reliable and robust statistical inferences by correcting the standard errors to account for these issues.

Endogeneity

Testing for endogeneity in panel data is crucial for model reliability, as endogeneity can bias results due to omitted variables (Arellano & Bond, 1991; Bajaj, Kashiramka, & Singh, 2018; Piriyakul, 2021). This study employs the Instrumental Variable method using a two-stage least squares (2SLS) approach (Angrist & Pischke, 2009). Residuals from the first stage parameter estimation are used in the second stage to re-estimate the main model parameters, addressing endogeneity in variables such as CASHR, CCC, CWCFP, AWCIP, CWCIP, COVID, and FZ. Various methods, including Fixed Effect (FE), Random Effect (RE), 2SLS, and Generalized Method of Moments (GMM), can address endogeneity (Bender, Bloom, Card, Reenen, & Wolter, 2018).

This study uses the Fixed Effect method to control for unobserved heterogeneity, ensuring an accurate reflection of variable relationships.

Model Specification

$TOBINQ_{it}$ = $\beta_0 + \beta_1 CASHR_{it} + \beta_2 CCC_{it} + \beta_3 PI_{it} + \beta_4 AWCIP_{it} + \beta_5 CWCIP_{it} +$
(Based Model) $\beta_6 AWCFP_{it} + \beta_7 CWCFP_{it} + \beta_8 COVID_{it} + \beta_9 FS_{it} + \beta_{10} FZ_{it} +$
$\beta_{11} INDUSTYPE_{it} + \beta_{12} SG_{it} + U_{it}$ .....(1)

$TOBINQ_{it}$ = $1.1145^{**} + 0.0020 CASHR_{it} - 0.0006^{**} CCC_{it} - 0.0345 PI_{it} +$
(POLS Model) $0.7338^{**} AWCIP_{it} + 0.6882^{**} CWCIP_{it} + 0.0383^{**} AWCFP_{it} +$
$0.3223^{**} CWCFP_{it} - 0.0841^{**} COVID_{it} - 0.1197^{*} FS_{it} - 0.0285^{**} FZ_{it} -$
$0.1107 INDUSTYPE_{it} + 0.0510 SG_{it} + e_{it}$ .....(2)
Adjusted R^2 = 0.297558, Prob(F-statistic) = 0.0000

$TOBINQ_{it}$ = $-0.1441 + 0.0869^{**} CASHR_{it} - 0.0003^{*} CCC_{it} + 0.0325 PI_{it} +$
(FE Model) $0.7410^{**} AWCIP_{it} + 0.6552^{**} CWCIP_{it} + 0.1296^{**} AWCFP_{it} +$
$0.2903^{**} CWCFP_{it} - 0.1274^{**} COVID_{it} + 0.0171 FS_{it} + 0.0633^{**} FZ_{it}$
$- 0.2171^{**} INDUSTYPE_{it} + 0.0361 SG_{it} + e_{it}$ .....(3)
Adjusted R^2 = 0.519745, Prob(F-statistic) = 0.0000

$TOBINQ_{it}$ = $0.4468^{**} + 0.0688^{**} CASHR_{it} - 0.0004^{**} CCC_{it} - 0.0330 PI_{it} +$
(RE Model) $0.7457^{**} AWCIP_{it} + 0.6724^{**} CWCIP_{it} + 0.1000^{**} AWCFP_{it} +$
$0.2995^{**} CWCFP_{it} - 0.1069^{**} COVID_{it} - 0.0289 FS_{it} + 0.0189 FZ_{it} -$
$0.1921^{**} INDUSTYPE_{it} + 0.0399 SG_{it} + e_{it}$ .....(4)
Adjusted R^2 = 0.323444, Prob(F-statistic) = 0.0000

Hausman test Chi-square = 33.904716 P-value 0.0007

**Significant level at 5%, *Significant level at 10%

Equations 2, 3 and 4 show the analysis results of the relationship between Working Capital Management (WCM) and Financial Performance (FP) using Pooled OLS (POLS), Fixed Effect (FE), and Random Effect models (RE). All three models effectively explain this relationship, with the fixed effect model providing the most robust explanation, evidenced by the highest adjusted R^2 value (52%). Given the panel nature of the data, model selection is

crucial. The Breusch and Pagan Lagrangian Multiplier (LM) Test indicates the appropriateness of the panel least square model (P-value < 0.05), rejecting the null hypothesis. The results of the hausman test favor the fixed effect model for explaining the WCM-FP relationship (P-value < 0.05), thus rejecting the null hypothesis. Therefore, this study employs a fixed effect model.

The study reveals a significant relationship between working capital investment policies and financial performance (TOBINQ). Specifically, an aggressive working capital investment policy (AWCIP) enhances financial performance, with a beta coefficient of 0.7410, indicating a substantial positive impact compared to a moderate policy. Similarly, a conservative working capital investment policy (CWCIP) positively affects financial performance, with a beta coefficient of 0.6552. In terms of financing policies, an aggressive working capital financing policy (AWCFP) positively impacts financial performance, with a beta coefficient of 0.1296. Moreover, a conservative working capital financing policy (CWCFP) further improves financial performance, with a beta coefficient of 0.2903. These findings underscore the importance of strategic working capital management in enhancing firm performance, with both aggressive and conservative policies showing significant positive effects compared to moderate approaches. The control variables used in this study include the COVID-19 pandemic period (COVID), the debt-to-equity ratio (FS), firm size (FZ), industry competition intensity (INDUSTYPE), and sales growth rate (SG). The results indicate that COVID, FZ, and INDUSTYPE significantly affect firm performance. Specifically, during the COVID-19 pandemic, financial performance (TOBINQ) decreased by 0.1274 compared to normal periods. A 1% increase in firm size results in a 0.0633% increase in TOBINQ. Higher industry competition (INDUSTYPE) negatively impacts financial performance, with a beta coefficient of -0.2171, suggesting that increased competition leads to a decrease in TOBINQ, holding other variables constant.

Discussion

Based on the study of the relationship between WCM and FP within the context of the MAI Thailand, WCM policies significantly impact firm performance. This aligns with Al-Mawsheki et al. (2019); Pestonji and Wichitsatian (2019); Chancharat and Kumpamool (2020); Wichitsathian (2022). Specifically, an Aggressive Working Capital Investment Policy (AWCIP) yields better performance and leads to higher firm value compared to moderate and conservative policies, as excessive inventory can lead to losses and increased management

costs. Conversely, a Conservative Working Capital Financing Policy (CWCFP) results in better performance, mitigating liquidity issues and ensuring smooth operations. The efficiency of WCM, as measured by the Cash Conversion Cycle (CCC), supports previous findings that shorter cycles improve performance (Deloof, 2003; García-Teruel & Martínez-Solano, 2007; Mehmet & Eda, 2009; Russo, 2013; Karadağ, 2018). However, the impact is minor compared to the cash ratio. The Performance Index (PI) showed no significant impact, contrary to Kaur and Singh (2013); Goker (2020); Nhung, Trang, and Phuong (2021).

Recommendations

Recommendations for Applying the Results

1. Adopt Aggressive Investment Policies: listed companies in the MAI should consider adopting AWCIP to optimize inventory levels, reduce management costs, and allocate surplus funds to high-return projects. This approach can enhance profitability and firm value.

2. Implement CWCFP: to ensure liquidity and smooth operations, firms should adopt CWCFP into business operations. This strategy helps prevent liquidity issues and ensures sufficient funds are available for daily operations and unforeseen expenses.

3. Focus on Cash Conversion Cycle Efficiency: companies should aim to minimize their Cash Conversion Cycle (CCC) to improve working capital management efficiency. Shorter cash cycles allow firms to reinvest freed-up capital into other projects, enhancing overall performance.

4. Monitor and Adjust Cash Ratios: maintaining an optimal cash ratio is crucial for balancing liquidity and investment opportunities. Firms should regularly monitor their cash ratios to ensure they have adequate liquidity without incurring high opportunity costs.

Recommendations for Further Research

Further studies should explore the impact of WCM policies across different industries and countries to generalize the findings. Additionally, examining the role of macroeconomic factors and technological advancements on WCM and firm performance would provide deeper insights.

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