Determinants of corporate cash holdings: evidence from Vietnamese materials firms

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Abstract

This paper investigates factors affecting cash holdings of materials firms listed on Vietnamese stock exchanges. The study shows that leverage, profitability, cash conversion cycle, cash flows, and growth opportunities significantly affect the level of cash holdings of Vietnamese materials companies by analyzing data collected from 51 companies over seven years (2013-2019) and using FGLS procedure on fixed effect estimation. This study adds more insights in the field of liquidity management in general and cash management in particular by determining factors influencing cash holdings. Outcomes from this research would help managers, investors, and consultants make corporate governance decisions.

Keywords: Cash holdings issues, Corporate governance

1. Introduction

Holding cash and other liquid assets have always been important for the strategic decisions of companies. Accordingly, an effective financial management policy would be an indispensable part of contributing to a company's sustainable growth and performance. According to several reports of cash held by corporations conducted in many different markets, since the 2008 financial crisis, cash holdings level has become one of the biggest concerns of corporate governance. Cash availability is closely related to companies' operations and a core requirement to ensure continued operations. The term of cash holdings in this study refers to the amount of cash and cash equivalent items available for a company to meet its short-term and emergency needs. Shah (2011) argues that cash is one of the least productive assets of a company because cash does not create any accounting income. However, firms assert that it is essential to keep

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a certain amount of cash in their assets. According to Acharya *et al.* (2007), Almeida *et al.* (2004), Bates *et al.* (2009), and Cruz *et al.* (2019), company's managers see that cash reserves allow businesses to be ready for any unanticipated fluctuations in cash flows, to fund day-to-day operations, to finance long-term investment and to prepare for risk. Additionally, this capital for investment opportunities will be included in the firm's balance sheet as a type of bridge financing, signaling its financial strength. In the current challenging situation of the new COVID-19 outbreak, cash availability even plays an unequivocal role when firms suffer from difficulties in their business. The adequate level of cash reserves within the firms will protect them from insolvency by helping to cover all expenses payment incurred in daily operations.

Because each industry and sector has its characteristics, it leads to different demand and requirements for the optimal level of cash holdings of firms operating within each industry and sector. As a result, each industry's understanding of the corporate cash holdings pattern and the factors influencing the level of cash holdings should be investigated separately. To the best of the authors' knowledge, there has been no research considering this matter in the materials industry. The materials industry development is now an urgent and fundamental goal for the sustainable economic development of Vietnam, especially in the current global economic integration. This sector produces input materials for various commodity production markets; hence it has a strong impact on actively promoting the growth of other industries in the economy, founding the development basis for new sectors and occupations, enhancing competitive position, and preparing for globalization. According to the report of Mordor Intelligence Inc, Vietnam's materials industry is the best performing in the Asia-Pacific area. Despite the tremendous economic volatility in 2021, Vietnam's materials industry is expected to recover at the same rate as before the pandemic because Vietnamese authorities have responded by outlining a plan for materials manufacturing development in the coming years and investing more resources in this sector to improve the manufacturing quality of domestic enterprises and the capacity of laborers.

Previous studies have identified incentives for materials firms to hold cash, including theoretical motives and industrial characteristic motives. Theoretically, the theories including trade-off, pecking order and free cash flow can be used to explain the cash holdings behavior of firms. Theoretical frameworks are used in many studies regarding this topic, such as Opler *et al.* (1999) and Ferreira and Vilela (2004). In terms of transaction motives, it is suggested that an appropriate level of cash reserves is fundamental for a smooth operation of firms. Firms can reduce transaction costs associated with external fundings by using cash to make payments. Brokerage fees incentivize corporations to maintain more liquid assets, according to Miller and Orr (1966). It is more expensive to raise external funds than it is to use internal funds in the presence of asymmetric knowledge, according to Myers and Majluf (1984); thus enterprises should keep a specific amount of cash to meet their investment needs. Another incentive for businesses to maintain cash on hand is to protect themselves against unexpected financial shortages, known as the precautionary motive. According to Almeida *et al.* (2004), financially constrained businesses demand more cash

reserves than financially unconstrained companies, supporting this hedging argument and the pecking order theory.

According to Greenwood and Hanson (2015), faced with the intense problem of information asymmetry, materials firms shall have a high level of cash flow risk due to the coverage nature. The evidence was also found by Drobetz *et al.* (2016b) and Ahrends *et al.* (2018), among others. Furthermore, the materials industries tend to depend heavily on external financing through capital markets, influencing the firms' cash holdings decision (Ahrends *et al.*, 2018). Additionally, the characteristics of high degree of asset tangibility and a high level of fixed cost of the materials industry are also major motives for firms to preserve cash. Industrial machinery and production lines are highly industry-specific assets, which affects the ability of materials firms to access external funding. Because of the liquidity situation, this would impact investment opportunities (Drobetz *et al.*, 2016a). As a result, the importance of excess cash holdings was emphasized. Even though post-crisis investment declines were severe in the materials sector, cash holdings can still offer financial flexibility and mitigate the adverse effects of the global economy. Despite this importance, many organizations in Vietnam are losing significant capital by failing to effectively manage their cash flows, according to the report of PwC in 2018. This research also pointed out that Vietnam's cash performance lagged behind most regional and global peers, primarily engineering and materials sectors' responsibility. Therefore, the question is: *What are the factors significantly attributing to firms' behaviour of maintaining cash?* By understanding these factors, managers can develop appropriate policies related to improving the effectiveness of cash holdings. Although plenty of studies investigated the determinants of cash holdings across different nations and different sectors, only some have been carried out on factors influencing the decisions of cash holdings in emerging markets in general and in Vietnam in particular. In some ways, this paper contributes to the literature on cash holdings in emerging markets in some respects by: (i) using financial data from materials firms in Vietnam; and (ii) investigating other factors that were not frequently examined in previous studies, such as cash conversion cycle and dividend payout. Following that, financial managers, investors, and corporate governance experts can use the findings to gain a clear understanding of the patterns of cash holdings.

The study employs a quantitative research method to analyze 51 materials firms listed on the Ho Chi Minh Stock Exchange (HOSE) and Hanoi Stock Exchange (HNX). The results of this study are mostly in line with the pecking theory's expectations, which anticipates that leverage, cash conversion cycle, and dividend payout ratio negatively affect the level of cash holdings. In contrast, the other variables show positive influences.

The paper will first present the theoretical framework applied in this study. A review of the previous research on cash holdings behavior, which enables the development of the various hypotheses, will be discussed next. After that, the methods used to test these hypotheses will be presented. The data will then be analyzed, followed by a discussion of the findings. The conclusion section will close this study.

2. Theoretical framework

Different theories explain why firms want to hold cash instead of other liquid assets or transform to other forms of long-term investment. Money is required for various reasons, including preventing financial distress, financing investment, and asset control. The following are summaries of these theories.

2.1 Trade-off theory

According to trade-off theory, there is an optimal amount of cash holdings with a given level of debt. Corporations can determine this optimal level by weighing the marginal costs and advantages of keeping cash on hand (Opler *et al.*, 1999). Holding cash would bear the "cost-of-carry", assuming that managers seek to optimize shareholder capital. The main cost of holding cash is often associated with the opportunity cost of the capital invested in liquid assets (Ferreira and Vilela, 2004). The prime benefit of holding cash is to minimize the external capital raising costs and to avoid missing growth opportunities because of the shortage of liquid assets (Dittmar *et al.*, 2003; Faulkender and Wang, 2006). In addition, Ferreia and Vilela (2004) stated that cash holdings can protect firms from the likelihood of financial distress. In Vietnam, the bankruptcy related costs are high, making the trade-off theory more supportive of cash holdings decisions (Al-Najjar, 2013). However, cash reserve is not always beneficial for businesses. Firms that stockpile cash levels more than the optimal balance might obtain the low rate of return on cash or liquid assets. The agency cost of managerial discretion also increases the cost of cash holdings if managers maintain cash to keep more assets under their control for their interests rather than acting on shareholders' wealth, according to Saddour (2006).

Several studies used financial determinants of cash holdings to investigate the trade-off theory on cash holding behavior. For example, Al-Najjar and Belghitar (2011), Ferreira and Vilela (2004), and Opler *et al.* (1999) employed leverage, liquidity, dividend payout, firm size, and growth to empirically examine this theory.

2.2 Pecking order theory

Pecking order (or financial hierarchy) theory was first introduced by Donaldson (1961) and extended by Myers and Majluf (1984). This theory upholds the concept of funds priority order when firms decide which funds to use for financing investments. The theory states that firms prefer to finance their projects by internal resources which can be accessed easily. After that, they will adjust their dividend levels to exploit retained earnings (available liquid assets), even if the firms follow a sticky dividend policy (Tahir *et al.*, 2016). If retained earnings ratio can no longer be adjusted, firms would tend to sell liquid assets, and external capital raising is only their last resort. This theory focuses on using internal resources as the least expensive resource for firms financing; thereby firms can reduce capital costs. Pecking order theory comes from asymmetric information and agency problem theories to minimize costs related to equity issuing. The theory supports the idea that if a firm is profitable enough to finance its investments, there should be no or less external funding.

2.3 Free cash flow theory

Free cash flow theory, which usually explains the pattern of cash holdings, was first developed by Jensen (1986). According to Jensen (1986), managers prefer to keep a high level of cash for their assets controlling. Free cash flow theory on this agency problem analysis is a significant part of the modern financial literature. Agency problems are also caused by the firm's optimal level of cash holding. Excess cash can facilitate management to pursue investment projects and financing decisions. For example, if the capital market is not willing to finance new projects, managers need to use available cash within the firm as a risk-free investment. A risk-averse manager would maintain a high cash retention ratio to minimize the company's risk exposure and abandon investments with positive risky NPV (Tong, 2006). Besides the conflict in making financial decisions, the conflict over payout policy are especially severe when free cash flow is substantially available (Jensen, 1986). It seems that management accumulates cash by lowering the payout ratio to keep funds within the firm.

3. Literature review

Many relevant articles have extensively discussed the motivations to hold firms cash, together with empirical evidence. The following section explores and reviews essential papers and their findings in order to develop research hypotheses based on important found determinants and research gaps.

3.1 Determinants of cash holdings

Many studies have been conducted across different markets based on theories associated with cash holdings decisions of firms' managers. Firms hold cash to ensure optimal investment timing and to avoid financial distress events. On the other side, excess of cash would lessen the firm value due to lower investment activities (Easterbrook, 1984; Dittmar *et al.*, 2003).

Regarding this topic, the cash holding behavior of U.S. firms has gained much attention from the literature (Chang-Soo *et al.*, 1998; Opler *et al.*, 1999; Faulkender and Wang, 2006; Bates *et al.*, 2009; Gao *et al.*, 2013; Tahir *et al.*, 2016). The model used in Opler *et al.* (1999) is widely employed to examine determinants of cash holding decisions in other empirical studies. Opler *et al.* (1999) implemented this model on the U.S. data, while Gill and Shah (2012) investigated the cash holdings determinants on a sample of 166 Canadian firms. The U.K. context studied by Ozkan and Ozkan (2004), and Al-Najjar and Belghitar (2011) also applied the same model. Besides some firm-specific characteristics such as leverage, liquidity, investment opportunities, and cash flow that were inherited from previous works, Ozkan and Ozkan (2004) also assessed the role of the ownership structure in the U.K. context. In addition to these variables, Khuong *et al.* (2020) examined actual activities management as an important determinants of cash holdings. Ferreira and Vilela (2004) chose the EMU market for their cash holdings investigation. Garcia-Teruel and Martinez-Salona (2008) analyzed cash holdings determinants of 860 Spanish SMEs, showing a positive association between leverage and cash holdings. In the Vietnamese market, the research of determinants of cash holding in manufacturing firms was conducted by Thieu (2013). This study used data of listed

manufacturing firms between 2006 and 2011, applying three most popular theories as his theoretical framework. This paper only focused partly on the impact of firm characteristics of manufacturing firms in Vietnam and did not mention cash holdings target.

Because of poor market condition, especially in an emerging market like Vietnam, cash holdings level is relevant when assessing financial decisions and firm value (Opler *et al.*, 1999). This section reviews the extant literature to develop hypotheses regarding the determinants of cash holdings in case of materials manufacturing firms listed on Vietnamese stock exchanges.

Leverage

Leverage, which means the proportion of debt in the capital structure, is one of the most critical determinants of cash holdings. It is argued that as a precautionary motive, firms with a high leverage ratio tend to hold a high level of cash so that they can reduce the default risk (Khalil, 2017; Masood *et al.*, 2018). Jebran *et al.* (2019) concluded that, after crisis period, firms choose to issue more debts to enhance their cash level. The pecking order theory, on the other hand, predicts that leverage and cash holding have an inverse relation (Diamond, 1991; Ozkan and Ozkan, 2004; Sheikh *et al.*, 2018), implying that companies capable of borrowing through bonds would hold less cash, and tend to focus on investment activities. Empirically, the negative relation between leverage and cash holding is found in several studies such as Ferreira and Vilela (2004), Afza and Adnan (2007), Shah (2011), Ogundipe *et al.* (2012), Ahmed *et al.* (2018), Das and Goel (2019), and Yudaruddin (2019). In Vietnam, most Vietnamese firms rely on short-term borrowings (Nguyen, 2006), and Vietnamese companies tend to borrow in the short run to substitute for the need of cash (John, 1993). The reason of accumulating a certain level of cash for these firms is to minimize the risk of insolvency in a market with high bankruptcy related costs like Vietnam (Al-Najjar, 2013). The negative association between leverage and cash holdings in the Vietnamese market was also showed in Phung and Nguyen (2018) with the explanation that a high interest expense on a high leverage would lead to a low ability to hold cash. Based on previous findings, the following hypothesis is presented:

H1: There is a negative relationship between leverage and cash holdings of Vietnamese materials firms.

Profitability

Cash is an outcome of profitable financing and investment activities (Dittmar *et al.*, 2003). Firms with significant profitability could have resources for dividend payments, debt payback, and accumulation purposes. Opler *et al.* (2009) concluded that firms with high performance would accumulate cash. Profitable companies have easier and cheaper access to the capital market; they have more resources to pay their shareholders dividends and repay their debt (Ferreira and Vilela, 2004; Almeida *et al.*, 2004). Thus, they tend to accumulate more cash to minimize the possibility of short-term liquidity for those payments or future earnings unpredictability. This positive linkage is also found in Yudaruddin (2019). In addition, the pecking order theory also implies that profitable firms, especially small ones in Vietnam, prefer to hold cash for refinancing their operations and reinvesting their projects due to high

information asymmetry, which makes equity issue too costly. Based on previous findings and the pecking order theory, the following hypothesis is presented:

H2: There is a positive relationship between profitability and cash holdings of Vietnamese materials firms.

Cash conversion cycle

As cash conversion cycle ensures abilities of companies to meet their short-term obligations, it would save the reputation of a company. According to Shah (2011), a short cash cycle improves a company's capacity to replenish funds fast. As a result, businesses with a short cash cycle are less likely to face cash shortages. However, Junli (2011) and Mahjabeen and Rizwan (2018) showed that the cash conversion cycle positively impacts the level of cash holdings. Based on previous findings, the authors predict a negative relationship between cash conversion cycle and cash holdings:

H3: There is a negative relationship between cash conversion cycle and cash holdings of Vietnamese materials firms.

Cash flow

According to pecking order and free cash flow theories, firms prefer internal over external finance (Myers and Majluf, 1984). Firms with high free cash flow can quickly pursue their projects when cash is available. Opler *et al.* (1999) found that companies with high growth potential and cash flows tend to have a larger quantity of cash. Drobetz and Grüninger (2007) also showed that cash balance is positively correlated to operating cash flows. Many studies have been conducted using the cash flow sensitivity to cash holdings to examine the relationship between OCF and cash holdings. Hung *et al.* (2020) and Quoc (2019) recognized the positive linear relation between cash flow and cash holdings. Based on previous research and existing theories, the following hypothesis is developed:

H4: There is a positive relationship between free cash flow and cash holdings of Vietnamese materials firms.

Growth opportunities

One of the most significant determinants of cash retained by companies is the availability of growth/investment opportunities. Saleem *et al.* (2021) argued that growth opportunities are negatively associated with the cash holdings level, which implied that firms with a high level of cash holdings might avoid investing in projects due to agency conflicts. This result was also supported by the finding of Sheikh *et al.* (2018). In contrast, besides studies supporting the negative linkage between growth opportunities and cash holdings, the positive association is found in some others. Firms with high growth typically have low information asymmetry, according to asymmetric information theory. Firms may have troubles finding places to distribute their investments, resulting in a higher cash balance (Phung and Nguyen, 2018). According to Shabbir *et al.* (2016), companies with more growth prospects will need to increase their capital. The positive association is found in some empirical studies such as Opler *et al.* (1999),

Kim *et al.* (2011), Ferreira and Vilela (2004), and Ahmed *et al.* (2018). In the context of Vietnam, Nguyen *et al.* (2013) also found a positive association between the market-to-book ratio, which is used as measurement proxy for growth opportunities and cash holdings. Based on theoretical framework and previous empirical results, the following hypothesis is developed:

H5: There is a positive relationship between growth opportunities and cash holdings of Vietnamese materials firms.

Dividend payout

According to Drobetz and Grüninger (2007), cash reserves are positively correlated with dividend payments. Guizani (2017), Chirecka and Fakoya (2017), and Ahmed *et al.* (2018) all reached the same conclusion. It is explained that to prepare for the possibility of insufficient cash when paying a dividend, firms paying a dividend would keep the excess cash to maintain their dividend payment reputation (Guizani, 2017). However, according to trade-off theory, dividend payout should be inversely related to firms' cash holdings. According to Kim *et al.* (2011), businesses that pay dividends keep less cash. It is proposed that firms that pay dividends have another option for holding cash by reducing dividend payout when a cash shortfall occurs. According to Opler *et al.* (1999), dividend payments significantly reduce the level of cash holdings. Previous studies such as Sheikh *et al.* (2018) and Saleem *et al.* (2021) also suggested this significantly negative association between dividend payments and cash holdings of firms. Based on previous findings, the following hypothesis is developed:

H6: There is a negative relationship between dividend payout and cash holdings of Vietnamese materials firms.

3.2 Research gap

The literature suggests that leverage, liquidity, profitability, growth opportunities, free cash flows, net working capital, firm size, and dividends impact the level of corporate cash holdings. However, the results are mixed across countries and across sectors. In addition, to the best of our knowledge, among existing literature on cash holdings in the Vietnamese context, none have studied cash holding determinants for firms in materials industry. Therefore, this study aims to fill in this research gap by empirically analyzing which factors describe cash holdings behavior of the Vietnamese materials firms.

Table 1. Previous studies on determinants of cash holding level

Variables	Positive relationship (+)	Negative relationship (-)	Hypotheses development
Leverage	Ferreira and Vilela (2004); Khalil (2017); Masood *et al.* (2018); Jebran *et al.* (2019)	Hardin *et al.* (2009); Ahmed *et al.* (2018); Das and Goel (2019); Yudaruddin (2019)	H1 - Negative
Profitability	Nguyen (2006); Yudaruddin (2019)	Drobetz and Grüninger (2007)	H2 - Positive

Table 1. Previous studies on determinants of cash holding level (*continued*)

Variables	Positive relationship (+)	Negative relationship (-)	Hypotheses development
Cash conversion cycle	Junli (2011); Mahjabeen and Rizwan (2018)	Shah (2011)	H3 - Negative/ Positive
Cash flow	Opler *et al.* (1999); Pinkowitz and Williamson (2001)	Kim *et al.* (1998); Ferreira and Vilela (2004)	H4 - Positive
Growth opportunities	Ferreira and Vilela (2004); Kim *et al.* (2011); Ahmed *et al.* (2018)	Sheikh *et al.* (2018); Saleem *et al.* (2021)	H5 - Positive
Dividend payout	Drobetz and Grüninger (2007); Guizani (2017); Ahmed *et al.* (2018)	Al-Najjar (2013); Sheikh *et al.* (2018); Saleem *et al.* (2021)	H6 - Negative

Source: The authors' compilation

4. Data and methodology

4.1 Data collection

In this study, a quantitative method is employed using secondary data from annual audited financial statements of targeted companies. Targeting a sample of materials companies listed on the Vietnamese stock exchange, the authors collected data from FiinTrade Platform. Due to some constraints during the data collection process such as non-availability of data or non-working companies in a year, the research sample includes 51 companies for over a period of years. Thus, the research has 357 observations in total.

4.2 Methodology

The following regression model is used:

$$CHR_{i,t} = \beta_0 + \beta_1 LEV_{i,t} + \beta_2 ROE_{i,t} + \beta_3 CCC_{i,t} + \beta_4 GRTH_{i,t} + \beta_5 CFLOW_{i,t} + \beta_6 DPR_{i,t} + \mu_{i,t}$$

where CHR represents cash and cash equivalents ratio; LEV is leverage ratio; ROE means return on equity; CCC is cash conversion cycle; GRTH denotes growth opportunities; CFLOW is free cash flow ratio; DPR means dividend payout ratio; μ represents random error term/ residuals.

Table 2. Measurement of variables

Variables	Model input	Measurement	References
Cash holdings level	CHR	$\dfrac{Cash\ and\ cash\ equivalents}{Total\ assets}$	Opler *et al.* (1999); Afza and Adnan (2007)
Leverage	LEV	$\dfrac{Total\ debts}{Total\ assets}$	Ferreira and Vilela (2004); Afza and Adnan (2007)

Table 2. Measurement of variables (*continued*)

Variables	Model input	Measurement	References
Profitability	ROE	$\dfrac{Net\ income}{Total\ equity}$	Nguyen (2006); Al-Najjar (2013)
Cash conversion cycle	CCC	CCC = RCP + ICP - APP	Shah (2011)
Cash flow ratio	CFlow	$\dfrac{Free\ cash\ flow}{Total\ assets}$	Cap (2014)
Growth opportunities	GRWTH	$\dfrac{Price\ per\ share}{Book\ value\ per\ share}$	Nguyen (2006); Kim *et al.* (2011)
Dividend payout ratio	DPR	$\dfrac{Dividend\ per\ share}{Earnings\ per\ share}$	Nguyen (2006); Saddour (2006)

Source: The authors' compilation

4.3 Descriptive Statistics

Descriptive statistics of the research sample are presented in Table 3.

Table 3. Descriptive Statistics

Variables	Observation	Mean	Std. Dev.	Min	Max
CHR	357	0.0834134	0.0861461	0.0001157	0.5211058
LEV	357	0.4546902	0.2006204	0.0589278	0.8707558
ROE	357	0.1386917	0.134545	-0.41113	0.6344157
CCC	357	105.037	105.1224	-198.8168	774.9073
CFlow	357	0.0502254	0.1471334	- 0.58062	0.6241435
GRWTH	357	1.36096	1.100218	0.1387799	8.986499
DPR	357	0.0918227	0.0988234	0	0.9325

Source: The authors' calculation

The results indicate that the average level of cash holdings is 8.34% of total assets, and its standard deviation is 8.61%. The standard deviation of cash ratio observations is relatively high, with the maximum and minimum values of cash holdings ratio being 52% and 0.01%, respectively. This shows that cash holdings have fluctuated among a wide range. The average leverage ratio used as a proxy to measure a company's financial health is 45.5% with a standard deviation of 20%, which indicates a wide variance across firms. The average return on equity (ROE) is 13.87%, implying that this industry can be profitable. The mean of cash conversion cycle is 105 days with a standard deviation is 105 days. The cash flow ratio has the mean value of 5%, indicating that firms in this industry have low efficiency in cash availability. The growth opportunities ratio is represented by the price-to-book ratio (P/B). The average of P/B at 1.36 reveals that the current capital market is overvaluing the materials firms. The mean value for dividend payout is 9.2%.

5. Empirical results

5.1 Correlation Analysis

Before regression, Pearson's correlation analysis is conducted to verify the relationship between variables.

Table 4. Correlation matrix

Variables	CHR	LEV	ROE	CCC	CFlow	GRWTH	DPR
CHR	1.0000						
LEV	-0.3642	1.0000					
ROE	0.2311	-0.0563	1.0000				
CCC	-0.1213	-0.1812	- 0.1437	1.0000			
CFlow	0.3540	-0.3120	0.1651	0.0067	1.0000		
GRWTH	0.1478	0.1351	0.5058	- 0.0303	0.1071	1.0000	
DPR	0.2660	- 0.1765	0.4036	- 0.0678	0.2001	0.2454	1.0000

Source: The authors' calculation

Although the highest correlation result between ROE and growth opportunities is relatively high (+0.5058), the correlation coefficient is still within the allowable level (<0.8). Therefore, it can be concluded that there is no perfect multicollinearity in the regression.

5.2 Collinearity diagnosis

Table 5. Collinearity diagnosis result

Variable	VIF	1/VIF
ROE	1.56	0.639600
GRWTH	1.43	0.700331
DPR	1.25	0.797959
LEV	1.24	0.807733
CFflow	1.16	0.864429
CCC	1.07	0.932246
Mean VIF	1.29	

Source: The authors' calculation

Furthermore, the study tests for multicollinearity to see a linear relationship between the variables. Variance inflation factor (VIF) is used for this test.

According to the test result, the mean VIF is 1.29 which is much smaller than 10. Also, each VIF value is consistently smaller than 10 and greater than 1. Therefore, it can be concluded that the model is free from multicollinearity.

5.3 Regression model selection and results

Initially, this research used Pooled OLS, Fixed Effect (FEM) and Random Effect (REM) regression analyses to investigate the impact of each proxy on cash holdings level. The result

is shown in Table 6 with estimated coefficient of each independent variable and its level of significance in explaining effects on cash holdings.

The results of adjusted - R^2 of Pooled OLS, FEM, REM are 25.64%, 13.13%, and 23.93%, respectively (Table 6). This result implies that the independent variables used as determinants in the model can explain 25.64%, 13.13%, and 23.93% of changes in levels of cash reserve of materials firms listed on the Vietnamese stock market. Because the p-value of each estimated model among the three models above is 0.0000, less than the significance level of 0.05, all models are statistically significant.

Table 6. Regression results and robustness tests

Proxy variables	Pooled OLS	FEM	REM
LEV	-0.137*** (-6.29)	0.0104 (0.25)	-0.0718* (-2.34)
ROE	0.0365 (1.00)	0.0838* (2.36)	0.0635 (1.91)
CCC	-0.000133*** (-3.42)	-0.0000508 (-1.14)	-0.0000825* (-2.01)
CFlow	0.125*** (4.33)	0.144*** (5.74)	0.135*** (5.51)
GRWTH	0.00848* (1.98)	0.0140* (2.27)	0.0118* (2.38)
DPR	0.0928* (2.08)	0.0105 (0.25)	0.0299 (0.75)
_cons	0.128*** (9.41)	0.0452* (1.98)	0.0903*** (4.75)
Observations	357	357	357
	F(6,350) = 21.46 Prob > F = 0.0000 Adj R-squared = 0.2564	F(6,300) = 7.85 Prob > F = 0.0000 R-sq: within 0.136	Wald chi2(6) =64.27 Prob > chi^2 = 0.0000 R-sq: within 0.1223

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model
H0: $sigma(i)^2 = sigma^2$ for all I
chi^2 (51) = 6767.55
Prob>chi^2 = 0.0000

Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
F(1, 50) = 25.118
Prob > F = 0.0000

Source: The authors' calculation

The impact of each proxy on cash holdings level is not being fully reflected by the estimation by Pooled OLS model and statistic errors as heteroskedasticity and autocorrelation still exist. The

Modified Wald test presents the result of Prob > chi2 = 0.0000, indicating that the OLS model suffers from heteroskedasticity. Additionally, the Wooldridge test shows that autocorrelation exists in the OLS regression model. Therefore, the Pooled OLS model is not the most appropriate model. The authors then use the Hausman test to check for the appropriation of the FEM and REM. The test result suggested that the FEM is more appropriate for the regression.

The FEM results show that all remaining factors positively affect cash holdings level except for the cash conversion cycle. However, only the factor ROE, cash flow ratio, and growth opportunities have significant impacts on the dependent variable. Although FEM is the most appropriate models in the three models above, the Modified Wald test suggested that heteroskedasticity still occurs in this model.

5.4 Feasible least squares regression result

Due to the existence of heteroskedasticity and autocorrelation in the FEM, the feasible generalized least squares (FGLS) is conducted hereafter to fix these problems. This estimator with the AR1 level allows estimation in the presence of heteroscedasticity and autocorrelation within the panel. It can be clearly seen from the summary table result that the estimates have changes in their magnitude after running FGLS to fix violations of the model. However, all the impact directions of independent variables on cash holdings level, except the variable of leverage ratio, are still the same as that of the FEM.

Table 7. FEM and FGLS regression result

Proxy variables	FEM	FGLS
LEV	0.0104 (0.25)	-0.0752*** (-3.90)
ROE	0.0838* (2.36)	0.0538* (2.50)
CCC	-0.0000508 (-1.14)	-0.0000673** (-2.89)
CFlow	0.144*** (5.74)	0.112*** (6.97)
GRWTH	0.0140* (2.27)	0.00686** (2.87)
DPR	0.0105 (0.25)	0.0448 (1.67)
_cons	0.0452* (1.98)	0.0811** (6.58)
Observations	357	357
	$F(6,300) = 7.85$ Prob > F = 0.0000 R-sq: within 0.136	Wald chi^2(6) = 126.44 Prob > chi^2 = 0.0000

Notes: t statistics in parentheses; *, **, *** show the level of significance at 10%, 5%, and 1%, respectively.

Source: The authors' calculation

The regression model of level of cash holdings after fixing violations by feasible least squares model is:

$$CHR = 0.0811 - 0.0752 \, LEV_{i,t} + 0.0538 \, ROE_{i,t} - 0.000067 \, CCC_{i,t} +$$
$$0.00686 \, GRWTH_{i,t} + 0.112 \, CFLOW_{i,t} + 0.0448 \, DPR_{i,t} \,.$$

The model's p-value is $0.0000 < 5\%$, which implies that the regression result is statistically significant at 5% level of significance. The empirical results indicate that LEV, CCC, CFlow, and GRWTH are statistically significant at 5% level of significance, as shown in Table 7. On the other hand, DPR has no significant impact on level of cash holdings.

6. Discussion and limitations

6.1 Discussion

It is found that leverage has a significant negative influence on cash holdings of Vietnamese materials firms, at 1% level of significance. This negative correlation supports the precautionary motive and H1. The result is consistent with the prediction of pecking order theory and the findings of Opler *et al.* (1999), Hardin *et al.* (2009), Afza and Adnan (2007), Megginson and Wei (2010), Ogundipe *et al.* (2012), Khalil (2017), and Jebran *et al.* (2019). With a higher level of debt, firms can see debt as a substitute for cash holdings. Although the impact has changed its direction after running the FGLS model, it presents a more significant influence in this final model. At the level of 1% significance, the leverage variable strongly impacts the decision to hold cash. In a materials firm with a high level of debt financing, managers and stakeholders would want to use their cash and cash equivalent to make the most of investment opportunities to avoid wasting money on high interests from the financial market. This tendency then reduces the demand for cash.

The coefficient for ROE is significant and has a value of 0.0538, showing the positive impact of profitability on cash holding level of materials companies. This finding supported H2. This result can be explained by transaction motive and is consistent with expectation of pecking order theory. This relationship is also confirmed by some studies on the developed markets such as Tokyo market (Nguyen, 2006) and U.S. market (Opler *et al.*, 1999). The positive impact is also found in emerging markets by evidence from Nigeria (Ogundipe *et al.*, 2012), China (Megginson and Wei, 2010), and Indonesia (Yudaruddin, 2019). This could imply that profits from businesses could be used as a good source of internal funds in some emerging markets where the agency costs of debts are high. A further possible argument can be concluded from free cash flow theory, which states that conservative managers tend to hold excess cash from cash flow generated from operating profits to pursue their own projects for their own interests.

The regression results indicate a negative impact of the cash conversion cycle on the cash holdings level. However, this effect is at a low magnitude of -0.0000673. This finding accepts the prediction of H3 and is consistent with trade-off theory and pecking order theory. The negative relationship between the cash conversion cycle and cash holdings can be explained

that shortening the cash conversion cycle can increase the cash reserve in a firm's bank account and that the firm would not go with a shortage of cash for long. To be specific, the shorter the cash conversion cycle is, the more cash-free managers can accumulate to prepare for investments and projects. The result of cash conversion cycle effect in this study is also supported by Shah (2011).

The coefficient between cash flow and cash holdings level showed a significant positive impact of cash flow on the level of cash holdings. Notably, cash flow ratio is the most robust proxy influencing the level of cash reserves in firms in this study, as its coefficient is 0.112 and significant at the 1% level. The positive relationship indicates that H4 is accepted, and pecking order and free cash flow theories hold in this case. This result suggests that materials firms in Vietnam with a high cash flow ratio tend to retain more cash to finance their new investments. Cash is kept within firms in order to safeguard the firms against potential losses and sudden unexpected events as a transactional and precautionary move. Pecking order theory reflected through this result can be understood that firms prefer to finance themselves with internal funds before resorting to the market. This positive influence of cash flow ratio on cash holdings is also strongly supported in Kariuki *et al.* (2015) study on Kenya market. In Cap (2014), it is reported that this outcome is seen in the overall sample of the research and remains the same when analyzing the effect on sub-samples classifying by industry. This finding is also confirmed by Mahjabeen and Rizwan (2018) while investigating non-financial Pakistani companies' determinants of cash holdings. Opler *et al.* (1999), Pinkowitz and Williamson (2001) reported the same outcome when examining the effect of cash flow on cash holding behaviors.

Growth opportunities, measured by the market-to-book ratio, have a positive influence on level of cash holdings in firms at the 5% level. H5 is accepted by this empirical result. The finding is also consistent with the result reported by Ozkan and Ozkan (2004), Ferreira and Vilela (2004), Jani *et al.* (2004), D'Mello *et al.* (2008), Bates *et al.* (2009), and Ahmed *et al.* (2018). All three theories can explain the relationship. To avoid financial distress, a growing corporation with significant growth potential tends to accumulate greater cash reserves, corresponding to the precautionary reason for holding cash. This direction of the impact can be explained by the fact that the company would have higher bankruptcy costs as a company has more investment potential (Ferreira and Vilela, 2014). Pecking order theory also predicts the same correlation; high investment opportunities would lead a firm to have more cash to avoid shortage and costly external capital raising.

In contrast to the findings of a significant positive relationship between dividend payment and cash holdings reported by Guizani (2017) and Ahmed *et al.* (2018), there is a positive and insignificant relationship between dividend payout ratio and cash holdings level. Thus, the dividend payout ratio has no significant relationship with companies' cash reserves. Hence, it can be concluded that the dividend payout ratio does not affect the cash holdings of materials firms in Vietnam. According to the free cash flow theory, there are few agency problems in materials companies in Vietnam, although the authors did not detect significant relationships.

Table 8. Summary of research findings

Variables	Trade-off theory	Pecking order theory	Free cash flow theory	Prediction	Final finding
LEV		(-)	(-)	(-)	(-)
ROE	(+)	(+)		(+)	(+)
CCC	(-)	(-)	(+)	(-)	(-)
CFRatio	(-)	(+)	(+)	(+)	(+)
GRWTH	(+)	(+)	(+)	(+)	(+)
DPR	(-)	(-)		(-)	(-)

Source: The authors' compilation

As the outcomes of this study suggested, in general, the incentive for cash holding by Vietnamese materials firms could be explained by pecking order theory, with all of the empirical results consistently fitting the theory mentioned above. There are slight differences between this research's outcomes and other theories, but the final findings are generally consistent with the authors' initial predictions.

6.2 Limitations

This study is limited to the sample of materials firms listed on Vietnamese stock exchanges. Therefore, the whole situation of cash holdings' determinants of the whole materials sector might not be entirely reflected. In addition, another drawback of this study is that only three basic methods of estimation are adapted. Additional methods can be implemented to consider the model's suitability.

For a more accurate evaluation of the materials sector, future research should investigate for all currently active companies. Internal corporate governance considerations such as board structure, audit processes and robust policies, and CEO characteristics should also be considered.

7. Conclusion

This research is conducted to investigate the cash holding decisions in the emerging market of Vietnam. Results from several previous studies indicate that the influence of each factor is diversified across countries and across industries. However, few studies in Vietnam focus on this topic, especially in a specific industry. Therefore, this study aims to understand why companies keep cash from the viewpoint of the Vietnamese materials industry. The study is carried out using secondary data from audited financial reports of 51 materials companies listed on the HNX and HOSE for the period from 2013 to 2019. The authors use the FGLS model as the final regression result to test the hypotheses.

The research outcomes show that free cash flow ratio has the strongest impact on cash holdings among the remaining evaluated variables; leverage ranked second, profitability ranked third, while growth opportunities and cash conversion cycle have the lowest impact

on the cash holdings level of firms. The dividend payout ratio has no significant relationship with companies' cash balances. Under that perspective, it is suggested that Vietnamese materials firms may take these factors as considerations in understanding their cash position influencing factors to make proper decisions. It may also be beneficial to researchers and regulators in providing timely and effective adjustments regarding the cash holdings of these companies.

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