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Firm Characteristics and Cash Holdings Speed of Adjustment: Evidence from Vietnam

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Abstract

The study investigates the existence of an optimal level of cash and the firm characteristics influencing the decision to hold cash, and the adjusting speed of the cash holdings to the target level. It highlights the heterogeneity of cash adjustment speed in the Vietnam market. The research employs the 417 samples of Vietnamese non – financial listed firms in the period of 2010 to 2019. The study uses the Pool OLS model, Fixed effect model (FEM), Random effect model (REM), and GMM model. According to the research findings, there is an optimal amount of cash at which the firm's value is maximized in Vietnamese listed firms, and the majority of the firms in the sample retain cash over the target level. Furthermore, the study demonstrates that firms actively modify their cash holdings to the optimal level with an adjustment speed of less than one owing to adjustment cost constraints. This speed varies between groupings of enterprises with different characteristics, underlining the heterogeneity of the adjustment speed even more. Small deviation firms adjust more rapidly than large deviation firms. Large free cash flow (FCF) firms adjust more readily than small FCF firms, and fiscal deficit firms modify more rapidly than firms with a financial surplus.

Keywords: Cash Holdings Speed of Adjustment (CH–SOA), Vietnamese Listed Firms, Optimal Cash Level, Firm Characteristics

JEL Classification Code: M4, M41, G32

1. Introduction

Cash and cash equivalents are shown on the balance sheet for a reason. Abundant cash resources allow the firm to meet obligations in the short term and prevent risk in the long term, and allow companies to actively cover the costs of business operation and flexibility in investing and financing. However, excess cash also allows a firm to incur significant costs, including opportunity costs and agency costs. As a result, cash and cash management is still a concern for both managers and investors. (Bates et al., 2009). The recent financial crisis and the credit downturn have reinforced the importance of holding liquid assets, including cash. Firms in particular and the economy, in general, have to face many difficulties caused by the COVID-19 pandemic, as result, the role of cash is more important than ever.

Despite the crucial role of cash, previous studies only focus on an optimal (target) holding cash level and the determinants that explain the holding level, which covers only an aspect of cash management. Cash has an important role in the asset structure of the Vietnamese firm. Nevertheless, the cash holding speed of adjustment (CH–SOA) issue is quite new, and the number of studies is still small. Therefore, the author recognizes the need to research the topic of cash holding and its speed adjustment in Vietnamese firms with the expectation that new findings will contribute to this research and provide useful implications for cash management in listed firms in the Vietnam Stock Exchange. The paper explains the effect of firm characteristics on CH–SOA toward the optimal cash holding of firms listed on the Ho Chi Minh Stock Exchange and Hanoi Stock Exchange (HOSE and HNX) in the period 2011–2019.

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2. Literature Review

2.1. Adjustment Speed of Cash Holdings

With several different testing approaches, most of the previous articles have concluded that companies adjust cash according to their goals. Opler et al. (1999) developed a partial modification approach for cash holding, with CH–SOA as large as 26%. Dittmar and Duchin (2011) also found evidence that firms positively adjust cash to the target level, but CH–SOA is imperfect, and there is a significant dispersion between firms (22%–43%). They also investigated whether the firm proactively manages cash through financial activities, investments, and payments. They found that low CH–SOA is due to adjustment costs that disrupt adjustment processes.

Bagh et al. (2021) investigated the determinants of corporate cash holdings (CCH) among emerging and frontier markets (Bangladesh, China, India, Pakistan), The result showed that the firm's size positively enhances CCH in emerging and frontier markets. Growth opportunity is negatively influenced by CCH in the case of Bangladeshi firms while a positive driver in emerging markets. The business cycle has a negative bearing on CCH across Pakistan, India, and Bangladeshi firms while positive and significant in Chinese firms. Financial leverage and dividend payout were positive determinants of CCH in Chinese firms, while they appear negative for Pakistan, India, and Bangladeshi firms. Finally, profitability has a positive and significant impact on CCH in frontier and emerging markets.

Gao et al. (2013) provided one of the first large-sample comparisons of cash policies in public and private U.S. firms. They first showed that despite higher financing frictions, private firms hold, on average, about half as much cash as public firms do. By examining the drivers of cash policies for each group, they were able to attribute the difference to the much higher agency costs in public firms. By combining evidence from public and private firms as well as within public firms across different qualities of governance, they were able to reconcile existing mixed evidence on the effects of agency problems on cash policies. Specifically, agency problems affect not only the target level of cash but also how managers react to cash in excess of the target.

Bates et al. (2018) provide a new perspective on CH–SOA according to the time. They documented a secular decrease in the speed of adjustment (SOA) in cash holdings, particularly for financially constrained firms with cash deficits, suggesting that capital market frictions can account for the trend in the value of cash holdings. On US non-financial firm data, from 1980 to 2000, research shows that the value of corporate cash holdings had increased significantly in recent decades. On average, $1 of cash is valued at $0.61 in the 1980s, $1.04 in the 1990s, and $1.12 in the 2000s. This increase is predominantly driven by the investment opportunity set and cash-flow volatility, as well as secular trends in product market competition, credit market risk, and within-firm diversification.

Orlova and Sun (2018) investigated whether institutional determinants, especially corporate governance and investors' rights protection, affect cash holdings deviation from target and adjustment speed. Using a large, international sample of firms, they found that institutional determinants, including corporate governance, influence the amount of excess cash (deviation from target) and the speed with which firms in different countries adjust their cash holdings. The findings are robust after the inclusion of a wide range of firm-level characteristics and economic and financial development variables.

Orlova and Rao (2018) examined the speed of adjustment of cash holdings and extends the recent work that highlights the importance of accounting for the heterogeneity of the speed of adjustment of cash holdings. The results indicated that firms with cash deficits, rated firms, and firms with financial surpluses have a slower speed of adjustment, while firms with excess cash, non-rated firms, and firms that have financial deficits adjust towards the target faster. Overall, the results supported the idea that firms have a target level of cash holdings, however, costs of adjustment, as well as costs of non-adjustment, affect the speed with which firms adjust towards the target.

H1: *Firms proactively adjust their current cash holdings to the optimal cash level*.

2.2. Size and Sign of Deviation of The Optimal Impact on CH–SOA

Jiang and Lie (2016) found that, on average, firms close 31% of their gap between target and actual cash ratio each year. The adjustment speed is generally swifter if the actual cash ratio exceeds the target ratio, possibly because it is cheaper to disgorge cash than it is to raise it. But as firms become more insulated from the threat of takeovers, they decelerate their cash adjustment at high cash ratios. This evidence suggested that self-interested managers are reluctant to disburse excess cash, and they will allow cash levels to remain high unless the firms are subject to external pressure.

However, when considering the cost of adjustment, Jiang and Lie (2016) argued that reducing the amount of cash holdings by debt payments and share repurchases is easier and cheaper than using external financing to implement cash holdings. In addition, if firms supplement cash by borrowing debt, they increase the risk of financial distress. As a result, it can be assumed that a firm holding cash less than the target level will have a higher adjustment cost than the firm holding

cash above the target level. Therefore, it will take more time to adjust the optimal cash ratio. Although according to the principle of FCF, the manager needs to accumulate cash above the goal level. However, at the same time, the author will still use the cash surplus. Orlova and Rao (2018) showed that the CH–SOA of cash surplus firms is 0.65, while the CH–SOA of cash deficit is only 0.17.

H2: *Firms holding cash less than the target level will have a low CH–SOA compared to firms holding cash more than their target level.*

Orlova and Rao (2018) showed that the firms with the minor deviation have CH–SOA of 0.41 and firms with significant deviations have CH–SOA of 0.64. The author argued that the non-adjustment cost simultaneously increases the size of the deviation, regardless of the sign. Specifically, for a firm with larger cash holdings than the target level, the opportunity cost of holding surplus cash increases when cash holding keeps increasing above the target level. Conversely, for a firm with smaller cash holdings than its target cash level, going below the target increases concerns of low liquidity that could lead to bankruptcy.

H3: *The firms with a higher deviation from the target cash level will have the higher CH–SOA.*

2.3. The Effect of External Finance Availability on CH–SOA

According to Faulkender et al. (2012), a firm's cash flow affect not only the leverage target but also the speed of adjustment toward that target. Heterogeneity in adjustment speeds is driven by an economically meaningful concept: adjustment costs. They also analyze how both financial constraints and market timing variables affect adjustments toward a leverage target. Hadjaat et al. (2021) argued that financially constraint firms would have more difficulty attracting external capital or will have to mobilize at very high costs. Hence, deviation from the optimum cash level carries more risks. In other words, non-adjustment costs for financially constrained companies are very high. This knowledge will encourage managers to make more strategic adjustments, such as investing a portion of their accumulated cash flow in cash (Hadjaat et al., 2021). According to the findings of Orlova and Rao (2018), financially constrained firms have a higher CH–SOA. Specifically, large firms have a CH–SOA of 0.57, while small firms have a CH–SOA of 0.6. Moreover, ranked firms' CH–SOAs is 0.14, whereas unranked firms have a CH–SOA of 0.51.

H4: *The financially constrained companies' CH–SOA is greater than the CH–SOA of unconstrained companies.*

2.4. The Effect of Internal Finance Availability on CH–SOA

Research by Almeida et al. (2004) and Bao et al. (2012) suggested that FCF significantly affects cash holdings. In addition, the study of Byoun (2008) and Faulkender et al. (2012) found that FCF has an impact on capital structure and the speed of capital structure adjustment. At the same time, they emphasize that financial surplus and financial deficit, and the position of the firm in relation to the target leverage, have a substantial impact on the speed of adjustment. Hence, it can be proposed that the FCF impacts CH–SOA. Orlova and Rao (2018) investigated the impact of FCF on CH–SOA through the sign and size of the FCF and the firm's position relative to the cash level. When FCFs are positive, companies will replenish their cash holdings from their financial surplus if their cash holdings are less than optimal level. At that point, the low adjustment cost would hasten the process of changing the cash holdings to the optimal level. In other words, the greater the FCF, the higher the CH–SOA.

Nonetheless, a firm with adverse FCFs may use its cash fund to cover its financial deficit, as argued in the pecking order theory. It may require external financing, mainly if the deficiency is high. For a firm with negative FCFs, the CH–SOA is higher (Kwan & Lau, 2020). Consequently, it is difficult to determine whether financial surplus would result in a higher CH–SOA, especially in a company with a cash surplus and financial surplus or a financial deficit and cash deficit. The research results of Orlova and Rao (2018) showed that the firms with economic surplus have CH–SOA of 0.34. In contrast, financial deficit firms' have a CH–SOA of 0.53. This contrasts with the observations of Faulkender et al. (2012), who investigated the speed of leverage adjustment and found a lower speed of adjustment for financial deficit firms. The study can only assume that the CH–SOA of financial surplus and deficit firms would differ significantly. Orlova and Rao (2018) have demonstrated that CH–SOA increases as FCF increases (absolute value), which is consistent with findings of Oztekin et al. (2012) on the issue of leverage. As a result, the paper anticipates that companies with high FCF (absolute value) could have a high CH–SOA.

H5: *CH–SOA differs among firms with positive and negative FCF and is higher for enterprises with high FCF (absolute value).*

The sign and size of the deviance compared to its FCF would impact CH–SOA. According to research, using surplus cash to offset a financial deficit will allow firms to modify toward an optimal level better than if they had a financial surplus. Orlova and Rao (2018) showed that CH–SOA is

highest for excess cash holdings and financial deficit firms which equals 0.68, and CH–SOA of financial surplus and cash surplus firms equals 0.48.

H6: *The cash surplus firms have higher CH–SOA with the financial deficit firms than the surplus financial ones.*

3. Methodology

3.1. Research Model – Variable Description

This model is based on a standard partial adjustment model that allows for an imperfect adjustment model from the actual cash level to the optimal cash level. The partial adjustment model used is based on the research of Dittmar and Duchin (2011): this standard adjustment model is applied to the study of cash adjustment speed. The proposed adjustment model is as follows:

$$\text{Cash}_{i,t+1} - \text{Cash}_{i,t} = \lambda(\text{Cash}_{i,t+1} - \text{Cash}_{i,t}) + \delta_{i,t+1} \quad (1)$$

The above model was modified and rewritten as follows:

$$\text{Cash}_{i,t+1} = \lambda\,\text{Cash}^{*}_{i,t+1} + (1-\lambda)\,\text{Cash}_{i,t} + \delta_{i,t+1} \quad (2)$$

Where,

λ is the adjustment speed of the level of cash holding towards the target level of cash holdings, mean CH–SOA ($-1 \le \lambda \le 1$). The model's estimated coefficient is stated as $1 - \lambda$. The CH–SOA (λ) estimate, also known as a "half-live"[1], is the time taken by the company to reach half of its optimal cash level.

$\text{Cash}_{i,t+1}$ and $\text{Cash}_{i,t}$ are the ratio of current cash holdings of firm i in year $t + 1$ and year t, determined by the ratio of Cash and Cash Equivalents to Net Assets (Total Assets minus Cash).

$\text{Cash}^{*}_{i,t+1}$ is the target (optimal) cash holding ratio of the company.

$\text{Cash}^{*}_{i,t+1} - \text{Cash}_{i,t}$ is the deviation between the ratio of cash holdings in year t and the target cash holdings in year $t + 1$. The deviation is estimated as follows:

$$\widehat{\text{DEV}_{i,t+1}} = \widehat{\text{Cash}}^{*}_{i,t+1} - \text{Cash}_{i,t} \quad (3)$$

$\delta_{i,t+1}$ is standard error (SE).

The first step in implementing model (1) is to evaluate the value of the variable Cash*. Cash* is measured in three ways, according to Orlova and Rao (2018).

Option 1 is the most popular method. Cash* denotes the approximate value of the dependent variable in the following equation:

$$\text{Cash}^{*}_{i,t+1} = \beta X_{i,t} \quad (4)$$

Whereas,

$X_{i,t}$ (specific and observable variables' vector) determines the optimal amount of cash holding of the firm and β is a coefficients vector. According to Bates et al. (2009), Opler et al. (2001), and Orlova and Rao (2018), the following factors influence the target cash holding level: size (SIZE), cash flow (CF), R&D costs (RD), capital expenditure (CAPEX), leverage (LEV), dividends (DIV), net working capital (NWC), industry cash flow volatility (INDUSTRY VOLATILITY) and fixed effects (FE_i).

However, the author cannot get the value of the variable Cash* to regress model (4) and find the coefficient β, so the author combines model (4) with model (2) to form the following model (Venkiteshwaran, 2011; Orlova and Rao, 2018).

$$\text{Cash}_{i,t+1} = (\lambda_{\beta})X_{i,t} + (1-\lambda)\,\text{Cash}_{i,t} + \delta_{i,t+1} \quad (5)$$

The optimal cash holding (or leverage) is unobservable, and capital structure theories and cash holdings demonstrate that determining a solid proxy for goal leverage or optimal cash holding ratio is complex. Therefore, Orlova and Rao (2018) used various proxies for optimal cash holding. Besides the multivariate model stated above, the study uses the median value of cash holdings of firms in the same industry in the year of observation as a second proxy (the second estimation) to calculate the value of Cash*. The 5 - year moving average of the firms' cash holding ratio is the third proxy (the third estimation) to calculate the value of Cash*. Then, using the values of the two recently found variables, compute the value $\widehat{\text{DEV}}_{i,t+1}$ for each firm by year. Finally, run the following model regression to get the coefficient. This model is created by combining equation (3) with equation (1):

$$\text{Cash}_{i,t+1} - \text{Cash}_{i,t} = \lambda_{i,t+1}(\widehat{\text{DEV}}_{i,t+1}) + \delta_{i,t+1} \quad (6)$$

Chang and Dasgupta, (2009) and Chen and Zhao, (2007) have questioned the validity of the methodology based on the partial adjustment model. The adjustment speed calculated in model (4) is the mean speed, which is an issue with most empirical research. Under some circumstances, the adjustment cost may be so significant that some firms cannot make any additional modifications, mainly when the deviation is close to the target level. Orlova and Rao (2018)

improved the dynamic adjustment model by eliminating the assumption of homogeneous adjustment speed, where CH–SOA depends on company-particular features as well as circumstances. is defined as follows:

$$\lambda_{i,t+1} = \gamma_0 + \gamma_{i,t+1} \times Z_{i,t} \quad (7)$$

Substitute model (7) into model (6), resulting in the following model:

$$\text{Cash}_{i,t+1} - \text{Cash}_{i,t} = (\gamma_0 + \gamma_{i,t+1} Z_{i,t}) \times (\widehat{\text{DEV}}_{i,t+1}) + \delta_{i,t+1} \quad (8)$$

The above model can be modified and represented as follows:

$$\text{Cash}_{i,t+1} - \text{Cash}_{i,t} = \gamma_0 (\widehat{\text{DEV}}_{i,t+1}) + \gamma_{i,t+1} Z_{i,t} \times (\widehat{\text{DEV}}_{i,t+1}) + \delta_{i,t+1} \quad (9)$$

Where,

$\widehat{\text{DEV}}_{i,t+1} = \widehat{\text{Cash}}^{*}_{i,t+1} - \text{Cash}_{i,t}$ và $\text{Cash}^{*}_{i,t+1}$ is the level of optimal cash holding. $\widehat{\text{DEV}}_{i,t+1}$ is calculated in three ways, corresponding to the three ways of determining Cash* that was discussed previously.

$Z_{i,t}$ is a set of variables concerning various firm characteristics. The research hypothesizes the impact of CH–SOA, such as the size and sign of the deviation of actual cash level from target cash level, access to external capital markets, and capacity to generate funds internally. This paper estimates equation (9) using the OLS regression method, according to Oztekin and Flannery, (2012). In Faulkender et al. (2012), firm-level clustering is used to evaluate the speed of leverage adjustment across different subsamples of firms. This approach generates heteroscedasticity and reduces the population independence assumption in clusters. As a result, as indicated by Orlova and Rao (2018), this study involves the below factors to relate to deviation.

NegDev is a dummy variable that represents the difference between the amount of cash holding and the optimal level of cash. NegDev is 1 if the firm holds the level of cash below its target, and is NegDev is 0 if the firm holds the level of cash above its target.

DevLarge is a dummy variable that represents the difference between the amount of cash held and the optimal level of cash. DevLarge equals 1 if the deviation from the optimal firm's cash holding is larger than the median, and DevLarge equals 0 if the deviation from the optimal firm's cash holding is smaller than the median.

SizeLarge is a dummy variable, representing the financial constraints of the firm. The smaller the firm size, the more likely its financial constraints. The SizeLarge is 1 if the size of a firm is greater than the median and 0 if the size of a firm is smaller than the median. A firm with a SizeLarge 1 is non-financially constrained, whereas a firm with a SizeLarge 0 is financially constrained. Large firms may easily borrow from outside sources since they often have a constant cash flow, a large number of collaterals, a solid reputation, and a great relationship with banks.

Rated is a dummy variable, similar to SizeLarge. Rated represents the financial constraints. Previous research has also demonstrated that firms with credit ratings had better access to external capital, with lower costs and higher credit lines at banks than firms without credit ratings (Denis & Mihov, 2003; Faulkender & Wang, 2006). If a firm has a credit rating, it is rated 1; otherwise, it is 0. A firm with Rated 1 is financially unconstrained, whereas a firm with Rated 0 is financially limited. Since there is no official credit rating agency in Vietnam for all enterprises, the research will apply Altman's Z-score bankruptcy risk measurement index (Altman, 1968):

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 0.999X_5$$

Where:

$$X_1 = \frac{\text{Working capital} - \text{Cash and Cash equivalents}}{\text{Total assets}}$$

$$X_2 = \frac{\text{Retained earnings}}{\text{Total assets}}$$

$$X_3 = \frac{\text{Earnings before interests and taxes}}{\text{Total assets}}$$

$$X_4 = \frac{\text{Market value of equity}}{\text{Total liabilities}}$$

$$X_5 = \frac{\text{Net sales}}{\text{Total assets}}$$

$2.99 < Z$: The company's finances are in great condition, and it is not at risk of falling bankrupt.

$1.81 < 2.99$: The company should not have any troubles in the short term, but it is essential to examine its financial situation thoroughly.

$Z \leq 1.81$: The business has serious financial problems and is in danger of bankruptcy.

AbsFCF is FCF's absolute worth by Faulkender et al., (2012) as follows:

$$\text{Free CF}_{i,t} = \frac{\text{OIBD}_{i,t} - \text{T}_{i,t} - \text{Int}_{i,t}}{A_{i,t-1}} - \text{Ind\_CapEx}_t$$

Whereas,

$OIBD_{i,t}$ is Earnings before Depreciation and Amortization, $T_{i,t}$ is taxes, $Int_{i,t}$ is interest payable, Ind_CapEx_t stands for the average value of capital expenditure of the industry in year t divided by Average assets in the previous year (t – 1) for the whole industry. $A_{i,t-1}$ is total assets of the end of financial year t–1. The current capital expenditure of the firms is substituted by the capital expenditure of industry, Ind CapExt. Because corporate capital expenditure reflects both the investment opportunity and the firm's capacity to access financial markets, this substitution means correcting endogeneity.

NegFCF is a dummy variable, representing the sign of FCF. NegFCF is 1 if the FCF of the firm is negative and the NegFCF is 0 the FCF of the firm is positive.

AbsFCFLarge is a dummy variable, representing the size of the FCF (considered as absolute value). AbsFCFLarge is 1 if the size of the firm's FCFs is greater than the median value and the AbsFCFLarge is 0 if the size of the firm's FCFs is smaller than the median value.

3.2. Data

Research data is listed companies on the Ho Chi Minh City Stock Exchange (HOSE) and the Hanoi Stock Exchange (HNX) in various industries in Vietnam from 2010 to 2019. The information is derived from the audited annual consolidated financial statements, which include the balance sheet, income statement, and cash flow statement. To prevent the scenario where the study findings are inaccurate due to structural differences, the author excludes financial firms such as banks, insurance companies, and brokerage firms from the study. Furthermore, companies that do not properly publish or discontinue financial statements (for 2010 to 2019), and enterprises with omitted or negative owner's equity, total assets, and net revenues, are eliminated/removed. After the elimination of firms under the conditions, the research data included 417 firms, (for the period 2010–2019), with 4170 observations and in 9 sectors.

3.3. Methodology

The author uses the OLS estimation method to perform regression on panel data. Since the OLS method does not account for each characteristic of each subject in the analysis, the authors use the FEM method (derived from the OLS model, with additional variables monitoring each feature that varies between subjects but having a correlation between the independent variables and the model's residuals) and REM method (derived from the OLS model, with additional variables monitoring each feature that varies between subjects but not having a correlation between the independent variables and the model's residuals). Then, using F-test and Hausman test, we choose the most suitable model among the three models - OLS, FEM, REM. At the same time, we perform Multicollinearity and Heteroscedasticity tests.

4. Results and Discussion

4.1. Descriptive Statistics

Table 1 summarizes the minimum value and standard deviation of the data. In column 1, the descriptive statistics of the entire sample of 417 non-financial enterprises with 4170 observations from 2010 to 2019 are presented. In the following sections, the author presents the descriptive statistics data separated from large sample by criteria: cash surplus firms (NegDev = 0), cash deficit firms (NegDev = 1), financially constrained firms (Rated = 0), financially non-constrained firms (Rated = 1), financial surplus firms (NegFCF = 0), and financial deficit firms (NegFCF = 1).

Non-financial firms' cash holdings to net assets ratio varied significantly, with a mean of 13.1% and a standard deviation of 0.21. It allows the author to examine the factors contributing to the cash holding ratio difference of the firm. In terms of volatility, SIZE is the variable with a significant variation among firms in the sample, with a standard deviation greater than 1. The average firm size is about VND 575 billion, ln (total assets) = 27,077. When we examine the sub-samples, we notice that the cash to average net assets ratio of the cash surplus companies is similar to the sample's cash to average net assets ratio. It indicates that most Vietnamese companies in the sample have a cash surplus. The average cash holding ratio in firms with financial constraints is relatively low at 7.2%, while for financial non-constraints firms it is 17%. The average cash holding ratio of financial deficit firms is 7.7%, while it is 16.8 percent for firms with a financial surplus. It illustrates that differences in cash holdings across firms might be caused by deviation, financial constraints, and internal capital sources. As a result, it is reasonable to predict that these factors will impact the firm's adjustment costs and CH–SOA.

Table 2 presents the correlation coefficients between the variables in the model that affect the level of cash holding. The results show that firm size, capital expenditure, leverage, working capital, and cash flow volatility negatively correlate with cash holdings. On the contrary, growth opportunity variables, research and development cost, and dividend payments positively correlate with cash holdings.

The variables in the model are all related to one another. Nevertheless, most correlation coefficients (in terms of absolute values) between the variables are relatively low. The correlation between NWC and LEV (–0.426), LEV and SIZE (0.399), and LEV and CASH are the strongest in the model (–0.304). These correlation coefficients are still less

Table 1: Descriptive Statistics

	Full Sample		Cash Surplus Firm		Cash Deficit Firm		Financially Constrained Firm		Financially Non-Constrained Firm		Financial Surplus Firm		Financial Deficit Firm	
Variables	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Cash	0.131	0.21	0.137	0.221	0.068	0.098	0.072	0.119	0.17	0.245	0.168	0.243	0.077	0.134
Size	27.077	1.474	27.166	1.477	26.618	1.391	27.497	1.4	26.808	1.456	27.061	1.497	27.1	1.442
TobinQ	1.026	0.479	1.027	0.485	0.922	0.439	0.864	0.176	1.134	0.576	1.144	0.556	0.859	0.259
CF	0.098	0.09	0.097	0.083	0.085	0.143	0.053	0.082	0.128	0.083	0.14	0.073	0.039	0.079
RD	0.235	0.265	0.232	0.27	0.23	0.245	0.216	0.314	0.247	0.227	0.267	0.22	0.188	0.312
CAPEX	0.049	0.069	0.047	0.067	0.052	0.076	0.044	0.069	0.052	0.068	0.06	0.075	0.033	0.054
LEV	0.235	0.192	0.247	0.193	0.122	0.142	0.318	0.185	0.18	0.175	0.201	0.184	0.282	0.192
DIV	0.764	0.425	0.757	0.429	0.755	0.43	0.664	0.472	0.83	0.375	0.859	0.348	0.628	0.483
NMC	0.106	0.2	0.091	0.193	0.235	0.237	0.031	0.168	0.155	0.204	0.119	0.202	0.087	0.196
Industry Volatility	0.083	0.023	0.083	0.023	0.08	0.023	0.077	0.022	0.086	0.022	0.084	0.023	0.08	0.022

than 0.8, implying that the model will not exhibit significant multicollinearity.

4.2. Empirical Results

4.2.1. Overall CH–SOA

The appropriation of the GMM method is investigated by OLS and FEM approach. If the estimated coefficient of the lagged variable of the dependent variable in the GMM model is within the range of the corresponding estimated coefficient in the OLS and FEM models, the GMM is correct (Lemmon et al., 2008). The findings indicate that OLS generated the lowest CH–SOA (0.37), whereas FEM estimated the highest CH–SOA (0.83).

Regression results of GMM showed that the coefficient of CASH is 0.503, corresponding to CH–SOA of 0.497. It demonstrates a target level of cash holdings that Vietnamese-listed firms should maintain to maximize firm value. It also indicates that businesses must modify their cash holdings toward the optimal level. Specifically, it takes the business 1.01 years to adjust 50% of the current cash to the optimal level. CH–SOA less than one indicates that firms' adjustment costs have slowed the process. This conclusion provides empirical evidence in favor of the dynamic trade-off theory, which is compatible with Orlova and Rao (2018). Dynamic trade-off theory proposes that firms may deviate from their target capital structure but they will exhibit an adjustment behavior towards that target. That is, firms' capital structures may not always coincide with their target leverage ratios. The optimal cash holdings of Vietnamese listed firms in the period 2010–2019 are affected by the following factors.

$$\begin{aligned}\text{Cash}^{*}_{i,t+1} = \beta X_{i,t} &= \frac{-0.00808}{0.497} * \text{TOBINQ}_{i,t} + \frac{0.00969}{4.97} * \text{RD} \\ &+ \frac{0.114}{0.497} * \text{CAPEX}_{i,t} - \frac{-0.103}{0.497} * \text{LEV}_{i,t} + \frac{0.0261}{0.497} \\ &* \text{DIV}_{i,t} + \frac{0.0342}{0.497} * \text{NWC}_{i,t} \\ &= -0.0163 * \text{TOBINQ}_{i,t} + 0.0195 * \text{RD}_{i,t} + 0.2291 \\ &* \text{CAPEX}_{i,t} - 0.2073 * \text{LEV}_{i,t} + 0.0525 * \text{DIV}_{i,t} \\ &+ 0.0688 * \text{NWC}_{i,t}\end{aligned}$$

Table 3 shows that most Vietnamese firms adjust the level of cash holdings toward industry median cash (five-year moving mean of the firm) with CH–SOA of 0.32 (0.74). In other words, Vietnamese firms require 1.8 (0.51) years to modify half of their cash holding toward the target level. Both coefficients have a significant statistic at the1% level. In general, regression results confirm the previous studies that the size of CH–SOA has a huge economic impact.

Table 2: Pairwise Correlation

	Cash	Size	TobinQ	RD	CAPEX	LEV	DIV	NMC	Industry Volatility
Cash	1								
Size	–0.117	1							
TobinQ	0.176	0.118	1						
RD	0.052	0.019	0.143	1					
CAPEX	–0.066	0.104	0.094	0.068	1				
LEV	–0.304	0.399	–0.111	–0.059	0.171	1			
DIV	0.145	124	0.156	0.039	0.113	–0.035	1		
NMC	–0.117	–0.267	0.044	0.065	–0.188	–0.426	–0.017	1	
Industry Volatility	–0.002	0.087	0.105	0.082	0.097	0.123	0.058	–0.083	1

Table 3: Speed of Adjustment Cash Holdings in the Full Sample

	OLS	FEM	REM	GMM	Industry Median	5-Year Moving Average
L.Cash	0.6330***	0.1670***	0.6330***	0.5032***		
L.Size	–0.006*	–0.0328**	–0.00600**	–0.00254		
L.TOBINQ	0.00624	–0.0246*	0.00624	0.00808***		
L.CF	–0.00988	–0.0186	–0.00988	–0.0188		
L.RD	0.0143	–0.000123	0.0143	0.00969**		
L.CAPEX	0.0564	–0.0310	0.0564	0.114***		
L.LEV	–0.0633	–0.0385	–0.0633**	–0.103***		
L.DIV	0.0120	–0.00301	0.01200	0.0261***		
L.NWC	0.0152	–0.0000295	0.0152	0.0342***		
L.Industry Volatility	–0.000375	0.142	–0.000375	–0.0770		
Constant	0.195**	1.022**	0.195**	0.127**		
DEV					0.320***	0.738***
R^2	0.489	0.0391			0.172	0.289
AR(1)				0.00219		
AR(2)				0.916		
Hansen				0.319		

Note: ***, ** and * indicates significant at 1%, 5% and 10% level of significance based on *t*-statistics.

As a result, the study accepts hypothesis H1: Firms proactively adjust the current cash holding to the optimal cash level.

4.2.2. The Effect of Size and Sign of Deviation on CH–SOA

Companies with surplus cash have a CH–SOA of 0.33, whereas cash deficit firms have a CH–SOA of 0.21 (= 0.33 – 0.12), but DEV * NegDev does not have a statistically significant value. The remaining two representations of the optimal level of cash, on the other hand, all result in a negative and statistically significant coefficient at the 1% level, indicating that the surplus firms' CH–SOA is greater than CH–SOA of cash deficit firms (Table 4). It supports the hypothesis that the difference in adjustment costs explains the difference in CH–SOA and is consistent with Orlova and

Table 4: Relationship Between the Sign of Deviation and Size of Deviation to CH–SOA

	Determinants	Industry Median	Five-Year Average
DEV	0.331***	0.338***	1.107***
DEV * NegDev	–0.123	–0.349***	–0.815***
R^2	0.176	0.175	0.354
DEV	0.338***	0.340***	1.103***
DEV * DevLarge	0.042	–0.399***	–0.808***
R^2	0.188	0.176	0.353

Note: ***, ** and * indicates significant at 1%, 5% and 10% level of significance based on *t*-statistics.

Table 5: Relationship Between Firm Size and Credit Ranking of Deviation to CH–SOA

	Determinants	Industry Median	Five-Year Average
DEV	0.318***	0.306***	0.609***
DEV * SizeLarge	0.0480	0.0520	0.359*
R^2	0.177	0.173	0.307
DEV	0.454***	0.443***	0.975***
DEV * Rated	–0.138*	–0.14	–0.280
R^2	0.181	0.176	0.295

Note: ***, ** and * indicates significant at 1%, 5% and 10% level of significance based on *t*-statistics.

Rao (2018). As a result, the analysis accepts hypothesis H2: Firms holding cash less than the target level will have a low CH–SOA compared to firms holding cash more than their target level.

Firms with slight deviations have a CH–SOA of 0.34, whereas firms with large deviations have a CH–SOA of 0.76 (= 0.34 + 0.42). However, the variable DEV * DevLarge is not statistically significant. Furthermore, firms with a slight deviation has a CH–SOA of 0.34 for the second representative of the target level of cash. Firms with a slight deviation from the industry median cash, has CH–SOA at –0.059 (= 0.3 – 0.399). The regression results using the third representative of the target cash amount, that is average cash, confirm that firms with slight deviations adjust faster. This finding contradicts the conclusion of Orlova and Rao (2018) and the this study's hypothesis H3: The firms with a higher deviation from the target cash level will have a higher CH–SOA. According to the author, the greater the deviation from the target level, the greater the adjustment costs in Vietnam. Specifically, the incremental adjustment cost is more than the incremental unadjusted cost for each extra unit of deviation, slowing the adjustment process.

4.2.3. The Effect of External Finance Availability on CH–SOA

The interaction variable's coefficient is not statistically significant in both representing optimal cash holdings, (influencing factors and industry median). The results demonstrate that size has no significant impact on CH–SOA (Table 5). The discrepancy in CH–SOA of huge/small companies is not statistically significant, with CH–SOA 0.32 (0.37 = 0.318 + 0.048) and CH–SOA 0.31 (0.358 = 0.306 + 0.052). Only the 5 - year average model has an interaction variable statistically significant at the 5% level of significance, demonstrating a difference in CH–SOA across enterprises of various sizes. According to the author, firm size does not substantially influence CH–SOA in the Vietnamese market. However, Orlova and Rao (2018) found statistically significant evidence that small enterprises have a higher CH–SOA.

The unranked firms have CH–SOA of 0.45, while rated companies have a CH–SOA of 0.32 (= 0.454 – 0.138). The results reveal that not being rated does not affect CH–SOA. This conclusion is contrary to the data presented by Orlova and Rao (2018). When using different representations of cash holdings, the regression findings for both variables for access to capital markets generate varied findings. Since the interaction variable is not statistically significant in most models, the author believes that the CH–SOA of the financially constrained and unconstrained firms is not significantly different. The author wonders if Vietnamese enterprises can use FCF to modify cash rather than rely on external finance. The investigation will next take this conclusion to the test.

4.2.4. The Effect of Internal Finance Availability on CH–SOA

According to the findings, CH–SOA is more remarkable in firms with low FCF (Table 6). However, the interaction variable's coefficient is not statistically significant, and the distinct CH–SOA is very small and does not appear to be economically significant. In particular, a small (large) FCF firm has a CH–SOA of 0.33 (0.33 = 0.336 – 0.00668), whereas a small (large) FCF firm has a CH–SOA of 0.32 (0.32 = 0.321–0.00139). The regression results indicate that the coefficient of interaction is positive, statistically significant at 5%, and has economic relevance, supporting Orlova and Rao (2018) who showed that CH–SOA is greater in the group of firms with large FCF (in absolute terms). A small (large) FCF firm has a CH–SOA of 0.58 (0.79 = 0.575 + 0.216), implying that a small (large) FCF firm

Table 6: Relationship Between the Size of FCF, the Sign of FCF, FCF, and Deviation on CH–SOA

	Determinants	Industry Median	Five-Year Average
DEV	0.336***	0.321***	0.575***
DEV * AbsFCFLarge	–0.00668	–0.00139	0.216*
R^2	0.176	0.172	0.294
DEV	0.301***	0.287***	0.711***
DEV * NegFCF	0.176***	0.186***	0.119
R^2	0.181	0.176	0.295
DEV	0.303***	0.303***	1.100***
DEV * NegFCF	0.179***	0.227***	0.0203
DEV * NegFCF * NegDev	–0.662*	–0.703***	–0.770**
DEV * PosFCF * NegDev	–0.0445	–0.175	–0.821***
R^2	0.188	0.189	0.354

Note: ***, ** and * indicates significant at 1%, 5% and 10% level of significance based on *t*-statistics.

requires 0.80 (0.44) years to adjust half of the cash amount to the optimal level. As a result, the author assumes CH–SOA increases since FCF increases in Vietnam.

The proxy for the optimal level of cash, DEV * NegFCF, is positive and statistically significant, showing that financial deficit firms have a greater CH–SOA than financial surplus firms. A financial surplus (deficit) business, for example, has a CH–SOA of 0.30 (0.48 = 0.301 + 0.176), which corresponds to the time it takes to adjust 50% of its cash holdings to the optimal level of 1.94 (1.06) year. This finding is consistent with the findings of Orlova and Rao (2018).

Besides, the companies with a high FCF and a financial deficit have a higher CH–SOA than companies with a financial surplus. As a result, the author argues that a large surplus FCF will reduce adjustment costs as much as feasible without the need for costly external financing, resulting in a larger CH–SOA. A company with positive FCF, on the other hand, might use surplus cash to cover a financial deficit, especially if the deficiency is considerable, resulting in a greater CH–SOA than a negative FCF firm. To test the above argument, we investigate the CH–SOA's sensitivity to different combinations of cash surplus/deficit and FCF, where NegFCF (PosFCF) = 1 if FCF is negative (positive). Estimated CH–SOA outcomes for four distinct enterprise groups are: The group of firms with the greatest CH–SOA has a excess cash and financial deficit (CH–SOA = 0.48 = 0.303 + 0.179), which is greater than the group of excess cash and financial surplus firms (CH–SOA = 0.30), cash deficit and a financial deficit firms (CH–SOA = –0.18 = 0.303 + 0.179 – 0.662), and cash shortfall and a surplus financial firms (CH–SOA = 0.26 = 0.303–0.0445). It seems that the enterprise used surplus cash to offset the financial deficit resulting in high CH–SOA. It is consistent with the pecking-order theory. This hypothesis, however, also predicts that enterprises will raise cash when they have a financial surplus, which the analysis does not support because the variable DEV * PosFCF * NegDev is not statistically significant. Although financial deficits have generally been analyzed within the context of pecking order theory, they may also be viewed as an "adjusted expense" determinant in trade-off theory's dynamic version. However, the "adjusted costs" approach does not entirely describe why firms only reduce the cash gap partially when there is a positive cash flow.

5. Conclusion

The author conducted a regression of data on 417 non-financial firms listed in Vietnam from 2010 to 2019 to find answers to the study question provided. The regression findings suggest that the CH–SOA of Vietnamese firms in the period 2010–2019 is 40.68 percent, implying an optimal cash holding ratio and the regular adjustment of actual cash holdings to the optimal level by Vietnamese firms. Because CH–SOA is less than one, this investigation supports the dynamic version of the trade-off theory, meaning that adjustment costs have slowed. Next, further research shows that CH–SOA differs widely between organizations, depending on the size and sign of the deviation. Cash deficit firms have a CH–SOA lower than the cash surplus firms because the firm's adjustment costs are higher when it is cash shortage than when it is cash surplus.

Finally, we find no evidence that access to external capital markets results in a substantial difference in CH–SOA because firms use internal financing rather than external financing in addition to cash adjustment. According to the findings, more FCF corresponds to a greater CH–SOA. Furthermore, financial deficit enterprises have a greater CH–SOA than enterprises with financial surpluses. When analyzing deviation, the author discovers that enterprises with cash surpluses and financial deficits have the largest CH–SOA, followed by businesses with financial surpluses and cash surpluses and companies with cash deficits adjust relatively slow. Firms that spend surplus cash to cover financial deficits appear to have high CH–SOA, supporting an assumption t.hat low adju.sted expenses lead to high CH–SOA. It also partially supports the pecking-order theory. With positive FCF, businesses can only partly close cash shortfalls. The rational reason is t.hat th.e ca. sh fl.ow's size i.s insufficient to reduce deviance to zero, and the firm must modify leverage using FCF.

References

Altman, E. I. (1968). Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy. *The Journal of Finance,* 23(4*)*, 589–609. https://doi.org/10.2307/2978933

Almeida, H., Campello, M., & Weisbach, M. S. (2004). The cash flow sensitivity of cash holdings. *The Journal of Finance*, *7*(14), 4795–4801. https://doi.org/10.1111/j.1540-6261.2004.00679.x

Bao, D., Chan, K. C., & Zhang, W. (2012). Asymmetric cash flow sensitivity of cash holdings. *Journal of Corporate Finance*, *18*(4), 690–700. https://doi.org/10.1016/j.jcorpfin.2012.05.003

Bagh, T., Khan, M. A., Meyer, N., Sadiq, R., & Kot, S. (2021). Determinants of corporate cash holdings among Asia's emerging and frontier markets: Empirical evidence from the non-financial sector. *The Journal of Asian Finance, Economics, and Business*, *8*(6), 661–670. https://doi.org/10.13106/jafeb.2021.vol8.no6.0661

Bates, T. W., Chang, C., & Chi, J. D. (2018). Why has the value of cash increased over time? *Journal of Financial and Quantitative Analysis (JFQA)*, *53*(2), 749–787. https://doi.org/10.2139/ssrn.1975491

Bates, T. W., Kahle, K. M., & Stulz, R. M. (2009). Why do U. S. firms hold so much than they used to? *Journal of Finance*, *64*(5), 1985–2021. https://doi.org/10.1111/j.1540-6261.2009.01492.x

Byoun, S. (2008). How and when do firms adjust their capital structures toward targets? *Journal of Finance*, *63*(6), 3069–3096. https://doi.org/10.1111/j.1540-6261.2008.01421.x

Chang, X., & Dasgupta, S. (2009). Target behavior and financing: How conclusive is the evidence? *Journal of Finance*, *64*(4), 1767–1796. https://doi.org/10.1111/j.1540-6261.2009.01479.x

Chen, L., & Zhao, X. (2007). Mechanical mean reversion of leverage ratios. *Economics Letters*, *95*(2), 223–229. https://doi.org/10.1016/j.econlet.2006.10.008

Denis, D. J., & Mihov, V. T. (2003). The choice among bank debt, non-bank private debt, and public debt: Evidence from new corporate borrowings. *Journal of Financial Economics*, *70*(1), 3–28. https://doi.org/10.1016/S0304-405X(03)00140-5

Dittmar, A., & Duchin, R. (2011). *The dynamics of cash*. Michigan: Michigan Ross School of Business.

Faulkender, M., Flannery, M. J., Hankins, K. W., & Smith, J. M. (2012). Cash flows and leverage adjustments. *Journal of Financial Economics*, *103*(3), 632–646. https://doi.org/10.1016/j.jfineco.2011.10.013

Faulkender, M., & Wang, R. (2006). Corporate financial policy and the value of cash. *Journal of Finance*, *61*(4), 1957–1990. https://doi.org/10.1111/j.1540-6261.2006.00894.x

Gao, H., Harford, J., & Li, K. (2013). Determinants of corporate cash policy: Insights from private firms. *Journal of Financial Economics*, *109*(3), 623–639. https://doi.org/10.1016/j.jfineco.2013.04.008

Hadjaat, M., Yudaruddin, R., & Riadi, S. S. (2021). The impact of financial distress on cash holdings in Indonesia: Does business group affiliation matter? *The Journal of Asian Finance, Economics, and Business, 8*(3), 373–381. https://doi.org/10.13106/jafeb.2021.vol8.no3.0373

Jiang, Z., & Lie, E. (2016). Cash holding adjustments and managerial entrenchment. *Journal of Corporate Finance*, *36*, 190–205. https://doi.org/10.1016/j.jcorpfin.2015.12.008

Kwan, J. H., & Lau, W. Y. (2020). Do firm characteristics and industry matter in determining corporate cash holdings? Evidence from hospitality firms. *The Journal of Asian Finance, Economics, and Business, 7*(2), 9–20. https://doi.org/10.13106/jafeb.2020.vol7.no2.9

Lemmon, M. L., Roberts, M. R., & Zender, J. F. (2008). Back to the beginning: Persistence and the cross-section of corporate capital structure. *Journal of Finance*, *63*(4), 1575–1608. https://doi.org/10.1111/j.1540-6261.2008.01369.x

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics*, *52*(1), 3–46. https://doi.org/10.1016/S0304-405X(99)00003-3

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (2001). Corporate cash holdings. *Journal of Applied Corporate Finance*, *14*(1), 55–67. https://doi.org/10.1111/j.1745-6622.2001.tb00320.x

Orlova, S. V., & Rao, R. P. (2018). Cash holdings speed of adjustment. *International Review of Economics & Finance*, *54*, 1–14. https://doi.org/10.1016/j.iref.2017.12.011

Orlova, S. V., & Sun, L. (2018). Institutional determinants of cash holdings speed of adjustment. *Global Finance Journal*, *37*, 123–137. https://doi.org/10.1016/j.gfj.2018.05.002

Oztekin, Ö., & Flannery, M. J. (2012). Institutional determinants of capital structure adjustment speeds. *Journal of Financial Economics*, *103*(1), 88–112. https://doi.org/10.1016/j.jfineco.2011.08.014

Venkiteshwaran, V. (2011). Partial adjustment toward optimal cash holding levels. *Review of Financial Economics*, *20*(3), 113–121. https://doi.org/10.1016/j.rfe.2011.06.002

Endnotes

1 For AR (1) process, the half-life is $\frac{\log(0.5)}{\log(1-\lambda)}$, a CH–SOA estimation of 0.5, for example, indicates that a corporation normally covers half of the gap between its actual cash holding and its optimal in a year, and it takes a year to resolve the other half of cash toward the optimal cash holdings level.