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The Impact of COVID-19 on Cash Flow and Access to External Financing Amid Financial Constraints

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Abstract

This article explores how cash flow affects the demand for external funding among listed companies in Vietnam during the COVID-19 pandemic, particularly under financial constraints. The study develops hypotheses grounded in the self-ranking match theory and relevant literature. Using a dataset of 5,894 observations from 2010 to 2020 and employing a Generalized Least Squares (GLS) regression model, the hypotheses are tested. Findings reveal that cash flow plays a significant role in shaping businesses' external financing needs. Notably, the effect of cash flow on increased external funding demand is more pronounced during financial constraints and the COVID-19 crisis. The results also indicate that financially constrained firms tended to seek additional funding when experiencing cash flow shortages amid the pandemic. Moreover, a high financial leverage ratio in the preceding year acts as a barrier to accessing diverse external financing sources. This research contributes to understanding the challenges faced by listed companies and suggests avenues for future studies focusing on firms in the financial sector and other macroeconomic factors influencing corporate capital structure.

Keywords: Cash flow, External financing, Financial constraints, COVID-19 pandemic

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Introduction

Securing external capital to finance business operations is a critical activity. According to Modigliani and Miller (1958), in a perfect capital market without transaction costs, a firm's investment decisions are unaffected by its financial condition since external funds perfectly substitute internal capital at equal costs[1]. However, in reality, firms often encounter significant obstacles in obtaining external financing. Thus, the ability to raise capital externally is influenced by various factors such as cash flow and financial constraints [2].

The COVID-19 pandemic has exacerbated difficulties for companies in accessing external funding [3]. The pandemic has led to a rise in business bankruptcies alongside declining financial performance. Internal funds have become insufficient to sustain business activities, prompting firms to seek alternative financing sources.

This study investigates how cash flow affects firms' increasing reliance on external funding, particularly in the context of the COVID-19 pandemic and financial limitations. The analysis is conducted using models applied to disaggregated samples categorized by firm size and financial constraints. The dataset comprises 5,894 observations of companies listed on the Vietnamese stock exchange from 2010 to 2020.

The findings reveal that the COVID-19 crisis has significantly influenced corporate financing behaviors. When retained earnings from cash flows are inadequate to support investment decisions, Vietnamese firms tend to increase their external

borrowing. This substitution effect between cash flow and external financing is especially pronounced in financially constrained companies. Moreover, the interaction between cash flow and COVID-related factors indicates that financially constrained firms have raised their reliance on external funds during the pandemic.

This research makes two main contributions to the literature on external financing. First, it is the initial study to analyze the impact of COVID-19 on listed Vietnamese firms in relation to external capital needs, offering practical models to help businesses assess and adapt their financing strategies amid the pandemic. Second, it simultaneously evaluates financial constraints under the pandemic's influence, providing valuable insights for firms to better manage cash flow and mitigate financial risks while securing capital for sustainable business operations.

Literature review and hypotheses

Contemporary corporate finance theories recognize that internal funds influence a firm's access to and preference for external financing [4, 5]. According to the trade-off theory of capital structure, firms with ample cash flows tend to adopt higher leverage to benefit from the tax shield on interest payments.

From the perspective of pecking order theory, scholars such as Almeida and Campello (2010) and Kanathila *et al*. (2021) have proposed a negative relationship between internal and external financing, driven by market imperfections like information asymmetry and moral hazard[6, 7]. Information asymmetry—where managers possess more detailed knowledge about the firm's performance and investment opportunities than external investors and creditors—is a key source of financial constraints [8]. Pecking order theory thus predicts a negative correlation between cash flow and external financing, as firms prioritize funding sources in the order of internal funds first, then debt, and finally equity issuance [9].

Moreover, numerous studies have highlighted the critical role of financial constraints in determining a firm's ability to obtain and choose external financing [2]. Most researchers agree that financial constraints contribute to the differential costs between internal and external funds, thereby influencing corporate financing decisions [4, 6, 10, 11]. Consequently, firms facing financial constraints have more limited financing options and face higher external financing costs compared to unconstrained firms [6, 12].

Building on the self-ranking match theory framework and previous research, this study proposes the following hypotheses:

- **Hypothesis 1:** Cash flow has a significant impact on a firm's need for external financing.
- **Hypothesis 2:** The influence of cash flow on external financing needs is stronger for firms experiencing financial constraints.

The COVID-19 pandemic has disrupted profits from production and business activities, particularly affecting financially constrained firms that are more vulnerable to cash flow shocks. This situation forces such firms to seek additional external financing to compensate for shortfalls and support investment activities. Since 2020, many companies in Vietnam and worldwide have struggled with operational disruptions due to the pandemic, making retained earnings insufficient to fund investments and necessitating increased external capital. This effect is expected to be especially significant for financially constrained companies facing heightened pandemic-related risks.

The COVID-19 pandemic is widely regarded as an unprecedented risk event. Baker *et al*. [3] note that no infectious disease, including the Spanish flu, has influenced stock markets as profoundly as COVID-19. Yan *et al*. [13] analyze COVID-19's potential impact on stock markets and suggest strategies for investors to capitalize on pandemic-driven market shifts. Additionally, studies such as Dang Ngoc *et al*. (2021) document the pandemic's negative effects on business performance, leading to deteriorated cash flow and increased capital funding challenges[14].

Therefore, we further hypothesize:

- **Hypothesis 3:** During the COVID-19 pandemic, cash flow significantly influences the need for increased external financing.
- **Hypothesis 4:** Under the combined conditions of the COVID-19 pandemic and financial constraints, the impact of cash flow on external financing needs becomes even more pronounced.

Materials and Methods

Building on the methodologies of Almeida and Campello [6] and López-Gracia and Sogorb-Mira [4], this study employs two models to test the proposed hypotheses. These models analyze the additional financing needs of firms as a function of cash flow, cash holdings, firm size, and liquid assets.

Model 1 examines the influence of cash flow on firms' external financing needs, specified as:

$$\mathbf{EXTFIN_{it}} = \beta_0 + \boldsymbol{\beta_1 CF_{it}} + \lambda_1 CASH_{i(t-1)} + \lambda_2 LEV_{i(t-1)} + \lambda_3 SIZE_{it} + \lambda_4 COLLAT_{i(t-1)} + \varepsilon_{it} \quad (1)$$

EXTFINit is the dependent variable representing the additional external financing needs of a company i at year t, CFit is the independent variable representing the cash flow of company i at year t. Control variables SIZEit firm size, CASH i(t-1) representing the previous year's cash and cash equivalents, LEVi(t-1) representing the previous year's financial leverage, and assets convertible into cash prior to year COLLAT i(t-1)).

Model 2 extends Model 1 by incorporating the impact of COVID-19 and its interaction with cash flow on external financing needs, expressed as:

$$EXTFIN_{it} = \beta_0 + \beta_1 CF_{it} + \beta_2 COVID_{it} + \beta_3 COVID\_CF_{it} + \lambda_1 CASH_{i(t-1)} + \lambda_2 LEV_{i(t-1)} + \lambda_3 SIZE_{it} + \lambda_4 COLLAT_{i(t-1)} + \varepsilon_{it} \quad (2)$$

Here, COVIDit_{it}it is a dummy variable indicating observations from the year 2020, the period affected by the pandemic, and COVID × CFit_{it}it represents the interaction between the COVID dummy and cash flow.

Both models consider the role of financial constraints and how cash flow influences external financing across different firms. To examine the moderating effect of financial constraints on the cash flow-external financing relationship for listed Vietnamese firms, all models are estimated on subsamples stratified by firm size. Following Park's [11] approach, companies are ranked by size into quintiles, with firms below the 1st percentile classified as severely financially constrained, while those above the 4th percentile are treated as essentially unconstrained. Firm size is measured by the book value of total assets, a standard proxy for financial constraints as suggested by Fama and French [15].

Table 1. Overview of Research Model Variables

Variables	Symbols and Measurements	Pre-research References	Expected Impact
Dependent Variable			
External Financing	EXTFINit = EXTFIN_Dit + EXTFIN_Eit	[4, 6, 8 ,11]	
External Financing (Debt)	EXTFIN_Dit = (Liabilitiesit – Liabilitiesi(t-1)) / Total Assetsit		
External Financing (Equity)	EXTFIN_Eit = (Equityit – Equityi(t-1)) / Total Assetsit		
Independent Variable			
Cash Flow	CFit = (Net Profitit + Depreciationit) / Total Assetsit	[6, 8]	None
Control Variables			
Cash and Cash Equivalents	CASHit = (Cash and Cash Equivalentsi(t-1)) / Total Assetsi(t-1)	[4, 6]	Positive (+)
Debt Ratio	LEVit = Total Liabilitiesi(t-1) / Total Assetsi(t-1)	[6, 8]	Negative (-)
Company Size	Ln(Total Assetsit)	[4, 6, 16]	Positive (+)
Assets Convertible to Cash	COLLATit = (Inventoryi(t-1) + Accounts Receivablei(t-1) + Fixed Assetsi(t-1)) / Total Assetsi(t-1)	[4, 6]	Positive (+)

Earlier studies often applied fixed effects (FEM) and random effects models (REM) [4, 11], as well as the Generalized Method of Moments (GMM) approach [6, 10]to explore how cash flow influences firms' reliance on external financing. In this study, however, we chose to utilize the Generalized Least Squares (GLS) technique because it better suits the characteristics of our data and research aims. GLS helps mitigate issues related to autocorrelation and heteroscedasticity among variables, improving estimation reliability.

Our dataset comprises 5,894 observations from Vietnamese publicly listed companies spanning 2010 to 2020. The data were extracted from audited financial reports—including balance sheets, income statements, and cash flow statements—and organized into tabular form for analysis.

Findings and analysis

Figure 1 illustrates that corporate funding sources generally expanded between 2010 and 2019. Specifically, funding increased by 22% in 2010, with 13.6% attributed to external financing and 8.4% to equity. Growth slowed to 2.6% by 2019. However, the COVID-19 pandemic caused a dramatic contraction in 2020, with overall funding falling by 243.8%. Within this decline, external debt funding dropped by 192%, and equity financing declined by 51.8%. These data underscore the significant adverse effects of the pandemic on business financing activities.

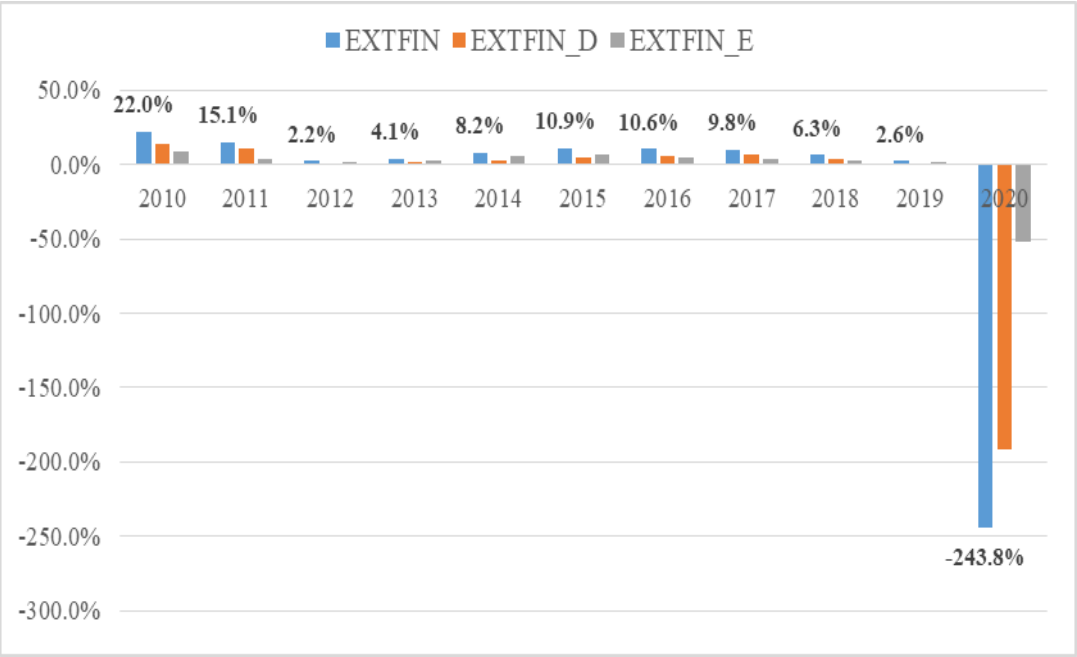

Figure 1. External financing variation

The author conducted a descriptive statistical analysis to better understand the data characteristics. Since outliers can significantly affect model accuracy, data cleaning was performed by eliminating outliers at the 1% level from both ends of the distribution for all variables. The statistical summary presents key details of the independent and dependent variables. The following two tables provide an overview of the control variables, including the number of observations, mean, median, standard deviation, as well as the minimum and maximum values.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
EXTFIN	5.984	-0.014	3.307	-198.766	1.904
EXTFIN_D	5.984	-0.033	2.555	-153.424	1.898
EXTFIN_E	5.984	0.019	0.768	-45.341	0.969
CF	5.984	0.088	0.130	-1.748	5.085
CASH	5.984	0.099	0.112	0.000	0.961
LEV	5.984	0.495	0.222	0.001	0.993
SIZE	5.984	27.181	1.545	23.330	33.677
COLLAT	5.984	0.652	0.219	0.001	1.000

The descriptive statistics presented in **Table 2** cover an 11-year period from 2010 to 2020 and include 5,984 observations of firms without financial constraints. The mean values indicate that, on average, debt financing is -0.033, while funding through equity issuance averages 0.019. For companies utilizing both debt and equity financing simultaneously, the mean external financing value is -0.014. These figures suggest that Vietnamese firms tend to rely more on equity issuance than debt, consistent with findings from the Spanish market reported by López-Gracia and Sogorb-Mira [4]. Regarding cash flow (CF), the average value among the unlisted firms is 0.088.

The explanatory variable CF and the dependent variable EXTFIN demonstrate a significant negative correlation. This implies that when cash flow decreases, firms compensate by increasing external financing, whereas an increase in cash flow reduces the need for such funding. The variable CASH, representing the previous year's cash and cash equivalents, shows a positive but statistically insignificant correlation with EXTFIN. This suggests that companies with larger cash reserves are less inclined to seek additional external debt financing for capital needs, though the correlation is not strong. Financial leverage (LEV) exhibits a negative relationship with EXTFIN, indicating that higher leverage corresponds to less external financing. Conversely, firm size (SIZE) has a positive and significant correlation with all three EXTFIN variables, implying that larger firms obtain more external funding compared to smaller firms. Lastly, no significant relationship is observed between collateral (COLLAT) and EXTFIN.

Table 3. Correlation Matrix

	EXTFIN	CF	CASH	LEV	SIZE	COLLAT
EXTFIN	1					
CF	-0.4137*	1				
CASH	0.0154	0.1860*	1			
LEV	-0.0314*	-0.1878*	-0.2566*	1		
SIZE	0.0630*	-0.0544*	-0.1089*	0.3025*	1	
COLLAT	-0.0125	-0.0299*	-0.3773*	0.3794*	-0.0644*	1

t statistics in brackets * p<0.05

Table 3 shows that all three coefficients are negative and statistically significant at the 1% level, indicating that the majority of Vietnamese firms tend to increase their external financing when needed. The observed negative correlation between the explanatory variable (CF) and the dependent variable (EXTFIN) aligns with findings from previous studies by Almeida & Campello (2010), Chen & Hsiao (2014), López-Gracia & Sogorb-Mira (2014), and Park (2019)[6, 8, 10, 11].

Overall, the regression results from both Model 1 and Model 2 reinforce the robustness of the baseline findings, even after incorporating control variables. These results consistently demonstrate the significant influence of cash flow on the external financing behavior of listed Vietnamese companies.

Table 4. Regression results of model 1 & model 2

	Model 1			Model 2		
	EXTFIN	EXTFIN_D	EXTFIN_E	EXTFIN	EXTFIN_D	EXTFIN_E
CF	-11.49***	-9.139***	-2.354***			
	[-37.83]	[-39.24]	[-32.49]			
COVID				0.647***	0.458***	0.189***
				[3.54]	[3.25]	[4.35]
COVID_CF				-21.66***	-16.41***	-5.255***
				[-40.05]	[-39.44]	[-40.87]
CASH	2.958***	2.324***	0.634***	0.49	0.451*	0.0391
	[7.81]	[8.00]	[7.01]	[1.45]	[1.73]	[0.49]
LEV	-2.224***	-1.794***	-0.430***	-0.746***	-0.676***	-0.0699
	[-10.94]	[-11.51]	[-8.86]	[-4.07]	[-4.80]	[-1.60]
SIZE	0.212***	0.170***	0.0429***	0.125***	0.104***	0.0213***
	[7.96]	[8.28]	[6.73]	[5.27]	[5.68]	[3.77]
COLLAT	1.132***	0.915***	0.217***	0.242	0.240*	0.00212
	[5.51]	[5.81]	[4.43]	[1.33]	[1.71]	[0.05]
_cons	-4.704***	-3.773***	-0.931***	-3.144***	-2.601***	-0.543***
	[-6.34]	[-6.63]	[-5.26]	[-4.78]	[-5.14]	[-3.48]
N	5984	5984	5984	5984	5984	5984

t statistics in brackets * p<0.1, ** p<0.05, *** p<0.01

The results for the control variables in **Table 4** indicate that all factors significantly influence financing at the 1% level, with a stronger impact observed on external debt financing compared to equity financing. Specifically, cash and cash equivalents (CASH) from the previous year and convertible assets (COLLAT) from the prior year show a positive relationship with the overall increased demand for financing, including external funding. This suggests that Vietnamese firms continue to seek external financing even when holding substantial cash reserves and convertible assets. The positive effect of previous-year CASH aligns with findings from Chen & Hsiao [11], but contrasts with López-Gracia & Sogorb-Mira [4]. This discrepancy may be due to the interest tax shield benefits in Vietnam sufficiently offsetting the costs of debt financing.

Similarly, the positive association of previous-year COLLAT across all models matches Chen & Hsiao's [10] results but differs from López-Gracia & Sogorb-Mira [4], possibly because Vietnamese firms typically use convertible assets as collateral rather than selling them to raise funds. The financial leverage ratio (LEV) from the previous year is negatively correlated with the need for external financing, indicating that firms with high leverage face greater difficulties in accessing new external funds. This finding is consistent with prior studies by Almeida & Campello [6] and López-Gracia & Sogorb-Mira [4], as high leverage may raise investor concerns about debt repayment capacity.

Examining firms by financial constraint status based on size, most coefficients for cash flow (CF) are negative and statistically significant at 1%, 5%, or 10% levels, reflecting an increasing tendency for Vietnamese companies to turn to external financing when internal funds are insufficient for investment. The magnitude of CF's negative effect is notably stronger among highly financially constrained firms (Group 1) compared to unconstrained firms, indicating a greater reliance on external financing by constrained firms.

Table 4 also presents findings from the second model assessing cash flow's impact on external financing during the COVID-19 pandemic. While the correlation between cash flow (CF) and external and non-debt financing is negative but not statistically significant, cash flow shows an increasingly positive association with external financing when retained earnings fall short of investment needs. The COVID-19 variable is positively and significantly related (at the 1% level) to both debt and retained earnings financing. Moreover, the interaction term COVID_CF exhibits a strong and significant effect, with a greater impact on debt financing compared to retained earnings.

Overall, these regression results reveal a negative relationship between cash flow and the increased demand for both internal and external financing, highlighting a substitution effect. The heightened need for external capital is largely driven by the COVID-19 pandemic's impact, supporting acceptance of the third hypothesis.

Table 5. Regression results of model 1 under financial constraints

	By scale				
	Financial constraints			No Financial constraints	
	Quantile 1	Quantile 2	Quantile 3	Quantile 4	Quantile 5
CF	-19.43***	-0.332*	0.439***	0.01	-0.271**
	[-24.28]	[-1.69]	[3.00]	[0.06]	[-2.11]
CASH	4.872***	0.18	0.08	0.13	-0.03
	[3.33]	[0.98]	[0.45]	[1.11]	[-0.30]
LEV	-3.807***	-0.678***	-0.254***	-0.122**	-0.171***
	[-4.07]	[-6.14]	[-2.98]	[-2.41]	[-3.31]
SIZE	0.808***	0.1	0.11	-0.01	0.01
	[3.03]	[1.00]	[1.60]	[-0.29]	[0.71]
COLLAT	2.015**	0.229**	0.03	-0.07	-0.04
	[2.20]	[2.01]	[0.39]	[-1.35]	[-0.94]
_cons	-19.17***	-2.44	-2.86	0.52	0.1
	[-2.88]	[-0.94]	[-1.52]	[0.51]	[0.35]
N	1197	1197	1197	1197	1196

The findings in **Table 5** align with those of Almeida & Campello (2010), Gracia & Mira (2014), and JinPark (2019). When internal cash flows are insufficient to fund investment projects, Vietnamese firms generally increase their reliance on external financing. This substitution effect—where cash flow shortages lead to greater external funding—is particularly pronounced among financially constrained companies.

In **Table 6**, the COVID variable shows a negative correlation with the increased financing needs specifically for financially constrained firms, while for unconstrained firms, no significant or positive correlation is observed. This suggests that only financially constrained firms have tended to boost their external financing during the COVID-19 pandemic. Small-scale businesses, in particular, experienced a marked decline in performance amid the pandemic, forcing them to seek additional external funds to cover cash flow shortfalls. The interaction term COVID_CF is significantly negative for firms within the 1st and 2nd percentiles (the most financially constrained groups), but statistically insignificant for other groups. This indicates that financially constrained firms tend to increase funding when cash flow is tight during the pandemic period.

Similar patterns were found in both debt and equity financing models. Overall, the results from model 2 support the fourth hypothesis, confirming that during the COVID-19 crisis, companies, especially those financially constrained, are more likely to raise external financing.

Table 6. Regression results of model 2 covid effects according to financial constraints

	By scale				
	Financial constraints			No Financial constraints	
	Quantile 1	Quantile 2	Quantile 3	Quantile 4	Quantile 5
CF	-0.29	0.536***	0.434***	0.07	-0.274**
	[-0.17]	[2.61]	[3.01]	[0.53]	[-2.08]
COVID	-10.19***	-1.554***	-0.511***	0.114**	-0.06
	[-7.91]	[-12.00]	[-4.35]	[1.96]	[-1.08]
COVID_CF	-20.42***	-1.939***	-0.71	-0.846*	0.15
	[-10.59]	[-4.76]	[-0.63]	[-1.78]	[0.31]
CASH	1.03	-0.06	0.03	0.13	-0.04
	[0.76]	[-0.37]	[0.16]	[1.09]	[-0.40]
LEV	-1.18	-0.543***	-0.306***	-0.114**	-0.176***
	[-1.36]	[-5.40]	[-3.64]	[-2.23]	[-3.40]

SIZE	0.27	0.07	0.112*	-0.01	0.01
	[1.09]	[0.79]	[1.65]	[-0.26]	[0.87]
COLLAT	0.09	0.14	0.01	-0.08	-0.04
	[0.11]	[1.34]	[0.16]	[-1.44]	[-0.92]
_cons	-6.46	-1.69	-2.81	0.48	0.06
	[-1.04]	[-0.72]	[-1.53]	[0.48]	[0.21]
N	1197	1197	1197	1197	1196

Conclusion

This study investigates the influence of cash flow on external financing among Vietnamese listed companies over the period from 2010 to 2020. Employing a generalized least squares (GLS) regression model, the research tests the proposed hypotheses and reveals that debt financing plays a more significant role than equity financing. Additionally, cash holdings and convertible assets from the previous year show a positive association with the increased demand for both public and external funding. This suggests that Vietnamese firms continue to rely on external financing despite holding substantial cash reserves and liquid assets. Conversely, the financial leverage ratio from the prior year is negatively correlated with financing needs, indicating that high leverage can hinder access to additional external capital. Furthermore, the findings highlight that financially constrained firms are more likely to raise external funds when faced with cash flow shortages during the COVID-19 pandemic. Future research could expand this study by focusing on firms within the financial sector and examining other macroeconomic factors that influence corporate capital structure. Additionally, the development and evaluation of policies aimed at supporting businesses' recovery post-COVID-19 remains an important area for further exploration.

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