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UNDERSTANDING THE NEXUS BETWEEN INFORMATION ASYMMETRY, INTERNAL FINANCE, AND INVESTMENT EFFICIENCY: INSIGHTS FROM LISTED FIRMS IN VIETNAM

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ABSTRACT

To explore the influence of information asymmetry on the link between internal finance and investment efficiency with a specific focus on innovation implications, this study analyses data from 507 non-financial listed firms in Vietnam from 2006 to 2019. The results indicate a proclivity among Vietnamese firms to engage in overinvestment as opposed to underinvestment. Notably, free cash flow significantly influences investment in both positive and negative cash flow scenarios. Furthermore, this investigation identifies that internal financing, represented explicitly by free cash flow, plays a pivotal role in both under- and overinvestment scenarios. Asymmetric information factors such as financial constraints and agency costs intricately shape the relationship between internal finance and investment efficiency. Firms experiencing high financial constraints tend to underinvest when facing an internal finance deficit. Conversely, firms with elevated agency costs show increased investment fuelled by their free cash flows, leading to overinvestment. The insights gained from this research can provide strategic measures for Vietnamese firms to foster innovation and optimise internal finance utilisation.

1. INTRODUCTION

In recent years, investment has played a fundamental role in the economy by contributing to the success of firms' investment projects. Capital and financial decisions are considered to significantly impact a firm's investments. Tobin (1969) documented that investment choices are essential for firms' decisions and have implications for firm growth and market value. A high-efficiency investment decision is conducive to obtaining market opportunities, improving competitiveness, and increasing capital use efficiency. Inefficient investment decisions mainly manifest themselves in two forms: underinvestment owing to financial constraints or overinvestment owing to agency costs (Jensen, 1986). Consequently, ill-considered investment decisions may harm a firm's long-term development, weaken its competitiveness, and lead to a decline in future performance (Nguyen et al., 2020).

Since the East Asian financial crisis of 1997, investors, managers, and scholars have focused on the transparency of information in firms' annual reports. This emphasis arises from the recognition of its crucial significance, which plays a vital role in providing stakeholders with essential information that serves various purposes (Kim et al., 2013). Nevertheless, information discrepancies frequently arise because of information asymmetry and interference effects, which ultimately impact business performance and investor decision-making (Clor-Proell et al., 2014; Müller et al., 2015). As a result, the issue of information asymmetry between firm insiders and outsiders and agency conflicts between managers and shareholders have been widely

acknowledged to have a substantial influence on a firm's investment decisions (Jensen, 1986; Abhyankar et al., 2005).

Empirical evidence of transparency is considered from a variety of perspectives, such as the link between transparent disclosure and cost of capital, indicators of non-financial performance (Barth et al., 2013), transparency and firm social responsibility, sustainable development (Dagiliene et al., 2014), and determinants of information transparency (Behn et al., 2010). However, scientific evidence on the role of information transparency in firms' investment decisions in emerging markets is still inadequate. This perspective is critical because emerging markets are often characterised by weak governance, shareholder protection mechanisms, and efficiency in the weak form (Luo et al., 2017; Guariglia & Yang, 2016). Chen et al. (2016) argue that major shareholders with close ties to company insiders act as minor investors without opportunity costs in emerging markets. Consequently, firm managers are not obligated to return them to shareholders. Additionally, the weak protection of minority shareholders does not place sufficient pressure on managers to improve attainable information. In other words, the effect of information transparency can vary for different performance characteristics based on a firm's value and profits (Kim et al., 2013). Thus, the transparency of firm information is one of the critical factors driving stakeholder trust in a company, and a comprehensive view of information assessment is required when considering investments.

This study addresses several gaps in the literature. First, previous studies have been unable to determine the point at which financial constraints and agency costs significantly impact the relationship between internal financing and investment efficiency. This study aims to shed light on this turning point by examining the threshold effect of information asymmetry on the relationship between internal finance and investment efficiency in Vietnam. Second, this study utilises the dynamic investment expectation model proposed by Kaplan and Zingales (1997) and Lamont et al. (2001) as an alternative to conventional approaches, such as the Q model of investment or simple investment levels. By estimating the optimal level of investment expenditure and calculating investment efficiency by comparing the actual and optimal investments, this study provides a more comprehensive measure of investment efficiency. Finally, this study explores the turning point of information asymmetry in the relationship between internal finance and investment efficiency. The focus is specifically on non-financial firms listed on Vietnamese stock exchanges using a sample of 6,348 observations derived from data spanning from 2005 to 2020 obtained from the Ho Chi Minh Stock Exchange (HOSE) and Hanoi Stock Exchange (HNX) databases. The remainder of this paper is structured as follows: Section 2 provides an overview of relevant literature and presents hypotheses to be tested, Section 3 describes the sample data and methodology employed, Section 4 presents the analysis results and discussion, and the Conclusion summarises the main findings, limitations, and recommendations for future research.

2. LITERATURE REVIEW

2.1. Firm free cash flow and investment

Following Modigliani and Miller (1958), no financing frictions such as agency costs, information asymmetry, access to capital markets, or a country's tax system exist in a perfect capital market. Under these assumptions, financial policy and capital structure are unrelated to investment value, implying that financing decisions do not influence a firm's investment decisions in a perfect capital market. Firms with high financial flexibility adjust their capital structures at a low cost to finance future investment projects. Hence, a firm's investment level can be affected by its expected future returns. It is unaffected by internal funds (cash flows) or external capital (debt and equity) (Modigliani & Miller, 1958).

However, financial friction makes capital markets imperfect (Denis, 2011). Most researchers agree that financial decisions influence investment decisions (D'Espallier & Guariglia, 2013; Khramov, 2012). Notably, as expected from the pecking order theory, firms may prefer to first use retained earnings followed by external capital to finance their projects. This theory explains that external financing is more expensive than internal funding because of imperfect capital markets. Therefore, a firm's investment level is sensitive to internal financing, such as free cash flow (FCF). Thus, internal financing has a positive effect on investment levels. It has been established that flaws in capital markets restrict firms' ability to secure external funds (Francis et al., 2013; Ben Mohamed et al., 2014; Ellouze & Cherif , 2020). This limitation pushes firms to use internally generated cash flow to finance investment projects. Thus, this study proposes the following hypothesis:

Hypothesis 1. A firm's free cash flow has a positive relationship with the level of investment.

2.2. Agency problem and investment

Information asymmetry between managers and capital providers in the capital market causes moral hazard and adverse selection (Darrough & Stoughton, 1986). Jensen (1986) suggests that shareholders prefer payouts to reduce managers' resources and that managers' goals are related to developing firms and raising their value. To achieve these goals, managers increase the resources under their control and receive more compensation and executive power; consequently, managers and shareholders may not agree on the allocation of a firm's resources. Managers may maximise their own interests instead of following their shareholders' interests. Managers of firms with surplus cash flows tend to use firm resources to build their empires (Shleifer & Vishny, 1997), meaning they are willing to implement negative net present value (NPV)

investments rather than pay dividends to shareholders. Hence, managers of firms with higher moral hazard may distort investments for the following reasons: empire-building, prerequisite consumption, career concerns, quiet life, and overconfidence (Bertrand & Mullainathan, 2003; Malmendier & Tate, 2008), leading to managers' overinvestment. As a result, FCF in firms with higher agency costs boosts their investment levels, leading to overinvestment. Thus, this study proposes the following moral hazard hypothesis:

Hypothesis 2. Firms facing more pronounced agency problems exhibit increased sensitivities of overinvestment to free cash flow.

2.3. Financial constraint and investment

Adverse selection refers to situations in which insiders act in the best interests of shareholders and have more information as potential capital providers than that of outsiders. This information includes capital expenditure, expected cash flows, and forecast risk (Darrough & Stoughton, 1986). Therefore, if shareholders choose to divest themselves from stocks with inflated valuations, investors are likely to assess the situation judiciously and hesitate to offer capital at an inflated price. To reduce this problem, investors require a high return rate as compensation (Easley & O'hara, 2004). This leads to an increase in equity costs (Cheng et al., 2013). These findings can be extended to debt financing. Banks that act as lenders often operate with limited information compared to firms. Consequently, they impose higher interest rates on risky loans, potentially deterring "good borrowers" (Stiglitz & Weiss, 1981). Firms have private information about the risks of their projects, while banks may not easily distinguish "good" from "bad" borrowers. Therefore, banks' higher loan interest rates may drive firms away from promising projects. Finally, internal financing arises from debt and equity.

However, cash holdings may help firms protect themselves against future shocks by forcing them to forgo valuable investment opportunities owing to costly external financing (Nguyen & Wong, 2021). In particular, a financially constrained firm with a lower internal financing level may reject a valuable investment opportunity to prevent the high costs related to external financing and lead to underinvestment (Al-Najjar & Clark, 2017). Numerous studies argue that firms with high external financial constraints prefer to hold cash to undertake investments to mitigate adverse cash flow shocks (Allayannis & Mozumdar, 2004; Jankensgård & Moursli, 2020). Moreover, according to the pecking order theory, firms follow a hierarchical approach when it comes to sourcing funds and prioritising internal financing whenever feasible. If external financing becomes necessary, debt is favoured over equity as the preferred option (Halov & Heider, 2011). This priority level is derived from the costs related to financial decisions. Hence, external financing costs may seem higher in firms with

higher financial constraints than that in financially unconstrained firms. Consequently, a low FCF is likely to reduce investment levels and make the underinvestment problem more serious in financially constrained firms. This study proposes the following hypothesis regarding financial constraints:

Hypothesis 3. Firms facing greater financial constraints display increased sensitivity to underinvestment in response to free cash flow.

3. MEASUREMENT, MODEL, AND METHOD

3.1. Financial constraints measurement

First, this study used the KZI index constructed by Kaplan and Zingales (1997) and Lamont et al. (2001) to evaluate the level of financial constraints. The five categories of accounting variables are cash flow, investment opportunities, debt, dividends, and cash. However, stock mispricing may occur owing to Tobin's Q. Thus, following Baker et al. (2003) and Schauer et al. (2019), this study calculated this index by linearizing the data as

$$KZI_{it} = -1.002 * {}^{CF_{it}}/_{K_{it-1}} + 3.139 * {}^{DEBT_{it}}/_{K_{it-1}} - 39.368 * {}^{DIV_{it}}/_{K_{it-1}} - 1.315 * {}^{CASH_{it}}/_{K_{it-1}} \quad (1)$$

where CF_{it}/K_{it-1} represents the ratio of cash flow to total assets from the previous year; $DEBT_{it}/K_{it-1}$ is the ratio of total debt to lagged total assets, DIV_{it}/K_{it-1} is the cash dividends normalised by the prior year's total assets, and $CASH_{it}/K_{it-1}$ is the proportion of cash and cash equivalent assets to lagged total assets. As suggested by previous research, firms with higher KZI_{it} index values face greater financial constraints.

Second, Whited and Wu (2006) constructed the WWI index to measure the level of financial constraints. The six categories of accounting variables are cash flow, leverage, dividends, firm size, industry sales growth, and sales growth. Thus, this index can be calculated by linearizing the data as

$$WWI_{it} = -0.091 * {}^{CF_{it}}/_{K_{it-1}} - 0.062 * DIVPOS_{it} + 0.021 * {}^{LD_{it}}/_{TL_{it-1}} - 0.044 * SIZE_{it} - 0.035 * SGR_{it} + 0.102 * ISGR_{it} \quad (2)$$

where the dummy variable $DIVPOS_{it}$ equals one for firms that pay cash dividends and zero otherwise. LD_{it}/TL_{it-1} is approximated as the ratio of long-term debt to lagged total liabilities, $SIZE_{it}$ is the natural logarithm of total assets, SGR_{it} is firm sales growth, and $ISGR_{it}$ is industrial sales growth. As previous research suggests, firms with higher WWI values face greater financial constraints.

Third, Mulier et al. (2016) proposed an index of financial constraints; namely, the age–size–cash flow–leverage (ASCL) index. According to the authors, a firm's age, size, cash flow, and leverage are the primary financial metrics that influence the elasticity of the external capital supply curve. Moreover, older firms have established reputations and are likely to have closer relationships with banks (McVanel & Perevalov, 2008), whereas outside investors may gather sufficient information on larger firms (Bernanke et al., 1996). Higher indicator levels may reduce the degree of information asymmetry between firms and their capital providers, while lower indicators decrease the level of financial constraint (Hadlock & Pierce, 2010).

Fourth, Hadlock and Pierce (2010) corrected the approach of Kaplan and Zingales (1997) by collecting data on 356 listed firms in the US and found that size and age are valuable factors in predicting financial constraints. Thus, following Hadlock and Pierce (2010) and Schauer et al. (2019), this study calculated the SA index as

$$SA_{it} = -0.737 * SIZE_{it} + 0.043 * SIZE_{it}^2 - 0.040 * AGE_{it} \quad (3)$$

where AGE_{it} is computed as the number of years (plus one) that have passed since a firm's initial public offering (IPO) year. As suggested by previous research, firms with higher SA_{it} index values face greater financial constraints.

To measure firms' investment efficiency, this study used the dynamic investment expectation model suggested by Richardson (2006) to determine the optimal level of investment expenditure, which may be interpreted as the fitted value as

$$\mathrm{NEW\_INV_{it}} = \alpha_0 + \alpha_1 * \mathrm{NEW\_INV_{it-1}} + \alpha_2 * \mathrm{CASH_{it-1}} + \alpha_3 * \mathrm{TBQ_{it-1}} + \alpha_4 * \mathrm{SIZE_{it-1}} + \alpha_5 * \mathrm{AGE_{it-1}} + \alpha_6 * \mathrm{ROA_{it-1}} + \alpha_7 * \mathrm{LEV_{it-1}} + \varepsilon_{it} \quad (4)$$

This study may calculate unexpected investments based on these fitted values using the difference between the actual and fitted investments. Unexpected investment can manifest as either positive or negative, aligning with over- or underinvestment, respectively. Thus, the absolute value of unexpected investments reflects a firm's investment efficiency. A higher absolute unexpected investment represents a higher level of investment inefficiency. All variables studied are summarised in Table 1.

Table 1. Summary of studied variables

Definition	Variable	Measurement
Total investment	TOTAL_INV	Capital expenditure is reduced by receipts from the sale of property, plant, and equipment
Maintenance investment	MAIN_INV	Firm's depreciation
New investment	NEW_INV	The difference between total investment expenditure and maintenance investment

Unexpected investment	NEW_IU	the difference between the actual investment and the fitted values from Eq. (4)
Investment inefficiency	IEFF	The absolute of unexpected investment
Cash holding	CASH	The proportion of cash and cash equivalents relative to the total assets
Investment opportunities	TBQ	The market-to-book ratio of total assets
Firms' size	SIZE	The natural logarithm of total assets
Firms' age	AGE	The number of years since the IPO year
Profit	ROA	The ratio of net profit to total assets
Leverage	LEV	The ratio of total debt to total assets

Source: Authors' proposal.

3.2. Econometric models

To further test Hypothesis 1 related to the relationship between internal financing and the investment efficiency of non-financial listed firms in Vietnam, this study regressed Eq. (5):

$$IEFF_{it} = \beta_0 + \beta_1 * D_{NEG_{it}} + \beta_2 * D_{NEG_{it}} * FCF_{it} + \beta_3 * (1 - D_{NEG_{it}}) * FCF_{it} + \varepsilon_{it} \quad (5)$$

A firm's FCF is computed as the difference between net cash flow from operating activities (CFO) and the optimal cash flow level. DNEG is a dummy variable that equals 1 if the firm has a negative FCF in year t and is 0 for surplus FCFs. Following previous studies, to test the information asymmetry hypothesis, this study extended the model as

$$IEFF_{it} = \beta_0 + \beta_1 * FCF_{it} + \beta_2 * IA._{it} + \beta_3 * IA._{it} * FCF_{it} + \varepsilon_{it} \quad (6)$$

In Eq. (6), IA represents information asymmetry proxying the degree of financial constraints or agency costs faced by a firm. This study employed four indices to gauge firm-specific financial constraints described in Section 3.1. Elevated values for each proxy signify increased levels of financial constraint. Concerning the agency costs faced by firms, this study focused on two principal metrics: asset turnover (AC1), which denotes the ratio of total sales to total assets, and (AC2), which represents the ratio of selling, general, and administrative expenses to total sales. The asset turnover metrics provide insights into the efficient utilisation of a company's assets and reflect

how effectively management deploys its resources. Therefore, firms with lower asset turnover may face higher agency costs between managers and shareholders, and a high expense ratio reflects management's excessive pay and perquisite consumption. Thus, the expense ratio may indicate managerial discretion regarding the spending of company resources. In other words, the higher the AC2 ratio of a firm, the higher its agency conflicts.

Based on Eq. (5), to investigate whether information asymmetry affects the relationship between internal financing and investment efficiency, this study uses the derivative (d) of investment efficiency (IEFF) as the information asymmetry variable

$$dIEFF/dFCF = \beta_1 + \beta_3 * IA \tag{7}$$

From Eq. (7), this study detects that the FCF variable's total effect on investment efficiency depends on the level of IA. Furthermore, firms are more likely to underinvest if they face financial constraints. At the same time, agency problems may cause firms to overinvest. Hence, this study split Eq. (5) into two equations based on the a priori likelihood of financial constraints or agency problems as

$$IEFF_{it} = \beta_0 + \beta_1 * FCF_{it} + \beta_2 * FC_{it} + \beta_3 * FC_{it} * FCF_{it} + \varepsilon_{it} \text{ if } NEW\_IU < 0 \tag{8}$$

or

$$IEFF_{it} = \beta_0 + \beta_1 * FCF_{it} + \beta_2 * AC_{it} + \beta_3 * AC_{it} * FCF_{it} + \varepsilon_{it} \text{ if } NEW\_IU > 0 \tag{9}$$

FC represents the degree of financial constraints proxied by the KZ, WW, SA, and ASCL indices. AC represents agency costs. This study uses AC1 and AC2 to investigate the impact of agency costs on the relationship between internal finance and investment efficiency.

3.3. *Method*

This study applied the generalised method of moments (GMM) to estimate the parameters in dynamic econometric models. Developed from the theory of Hansen (1982), GMM is a statistical technique that utilises observed data along with conditions based on population moments to estimate unknown parameters and is suitable for dynamic panel data with a small T and large N. The presence of lagged dependent variables in dynamic equations may create correlations with the error term ($\varepsilon_{i,t}$) at different levels, which may lead to endogeneity that distorts the estimated parameters according to ordinary least squares, fixed effects, or random effects methods. Considering a dynamic model such as $Y_{it}=\alpha y_{it-1}+\beta X_{it}+\varepsilon_{i,t}$, there are two approaches to GMM estimation: diff-GMM (Arellano & Bond, 1991) and system-GMM (Arellano & Bover, 1995; Blundell et al., 2001). Diff-GMM uses the first differences themselves (ΔX_{it}) and their lags as instrumental variables to eliminate unobserved effects and create orthogonality conditions between and the explanatory variables to solve the endogeneity problem. However, its limitations include eliminating

previous observations and erasing time-constant variables. Blundell et al. (2001) further note that the first-difference estimation could suffer from significant bias and low precision owing to the persistence of the series, even with large sample sizes. Thus, the system-GMM procedure is generally more efficient than the one-step method because it utilises a suboptimal weighting matrix. It corrects endogeneity by introducing additional instruments to dramatically improve the estimation efficiency and transforms instruments (Z_{it}) instead of (X_{it}) by differentiating them to expand the fixed effects. It also uses orthogonal deviations by subtracting the average of future observations from the current value.

However, this can introduce bias into the standard errors when a large number of instruments are used. Roodman (2009) recommended that the number of instrumental variables should not exceed the number of groups (N) to avoid overestimation. For the GMM methods to be considered valid, two key conditions must be satisfied: (1) the validity of the instruments must be confirmed through Hansen or Sargan tests, where higher p-values suggest that their null hypothesis about robustness is likely to be accepted, and (2) there must be no second-order autocorrelation in the error terms as indicated by the AR2 test.

4. EMPIRICAL FINDINGS

4.1. Descriptive statistics

This study collected financial data from 507 non-financial firms in Vietnam listed on the HOSE and HNX stock markets from 2006 to 2019. This study excluded data for 2020–2022, as this is the period of the COVID-19 crisis which significantly impacted firm investments and cash flows and potentially skewed the general investment trend of the 2000–2019 period. Table 2 displays the means, standard deviations, and minimum and maximum values of the variables in the sample. The mean value of NEW_INV was 0.0142, and its standard deviation was 0.0787. In this sample, the min and the max of NEW_INV were -0.8787 (Lilama 10 Joint Stock Company in 2013) and 0.8533 (Sao Thang Long Investment JSC in 2015), respectively. Statistical descriptions of independent variables include FCF (mean 0.0148 with SD 0.1365), SIZE (mean 27.02509 with SD 1.5133), ROA (mean 0.0603 with SD 0.0836), CASH (mean 0.1674 with SD 0.1734), LEV (mean 0.2315 with SD 0.1912), TBQ (mean 1.0372 with SD 0.5155), and AGE (mean 6.9298 with SD 3.3568) as detailed in Table 2.

Table 2. Data statistics summary

Variable	Mean	Std. Dev.	Min	Max
NEW_INV	0.0142	0.0787	-0.8787	0.8533
FCF	0.0148	0.1365	-0.8810	1.7878
CASH	0.1674	0.1735	0.0001	0.9913
TBQ	1.0372	0.5155	0.0943	8.9017
SIZE	27.0509	1.5133	23.2399	33.4628
LEV	0.2315	0.1912	0.0000	1.7648
ROA	0.0603	0.0836	-1.6933	0.7837
AGE	6.9298	3.3568	2	15

Source: Authors' calculation.

4.2. Investment efficiency

Table 3 displays the determinants of new investment decisions in Vietnam between 2006 and 2019 using the GMM system. The Hansen tests rejected the null hypothesis (p-value is 0.3143), and the robustness of the GMM test was confirmed. The p-value of AR1 was statistically significant; thus, the null hypothesis was rejected. Second-order autocorrelation was more critical, and the moment conditions of the model were satisfied. The instruments were exogenous and the number of groups (No. Group) exceeded the number of instruments (No. Instruments). Therefore, this study concludes that the results satisfied the diagnostic criteria.

Table 3. Determinants of new investment decisions

Investment decisions	Expected sign	Coef
L1.NEW_INV	+	0.2292*** (70.70)
L1.CASH	+	-0.0046*** (-2.86)
L1.TBQ	+	0.0061*** (10.73)
L1.SIZE	+	0.0017*** (3.98)
L1.AGE	+	-0.0013*** (-12.06)
L1.ROA	+	0.1366*** (23.01)

L1.LEV	-	0.0208*** (5.92)
Constant		-0.0500*** (-4.35)
Observations		5240
No. Groups		507
No. Instruments		345
AR1 (p-value)		0.0000
AR2 (p-value)		0.1358
Hansen (p-value)		0.3143

Note: ***, **, and * report statistical significance level at 1%, 5%, and 10%, respectively, ( ) is the z-statistic value.
Source: Authors' estimations.

Investment opportunities had a positive relationship with new investments at the 1% level. This indicates that firms with more investment opportunities are likely to undertake more new investment projects. This finding is consistent with prior evidence from Guariglia and Yang (2016) and Khan et al. (2017). This relationship may explain why firms with high growth opportunities have enough internal capital to finance their projects; they may prioritise using internal capital over debt and equity capital as indicated in the pecking order theory. Therefore, firms with many growth opportunities attempt to implement investment projects to expand their development policies. In other words, growth opportunities incentivise firms to undertake investment projects.

4.3. Relationship between internal finance and investment efficiency

Regarding Hypothesis 1, this study investigated the relationship between internal financing and investment efficiency by regressing Eq. (5). Table 4 presents the estimation results for the effect of FCF on the investment efficiency of under/overinvesting firms obtained using the GMM method. The FCF coefficient was significantly positive at the 1% level for underinvesting firms facing negative FCF. This result indicates that external financing is more expensive than internal funding owing to financial constraints. Consequently, firms with a negative FCF may consider using external funding sources to finance investment projects. Consequently, firms can forgo investment projects, even those with positive NPVs, to avoid funding costs. The underinvestment of firms with negative FCFs became more severe. In other words, the FCFs of underinvesting firms may increase their investment levels.

Table 4. The relationship between internal finance and investment efficiency

Investment efficiency	Under-investment	Over-investment
D_NEG	0.0372***	0.0140*
	(10.41)	(1.81)
D_NEG*FCF	0.0900***	0.0046
	(6.80)	(0.11)
D_POS_FCF	0.0324***	0.0676***
	(3.02)	(2.76)
Constant	0.0144***	0.0363***
	(6.30)	(8.58)
Observations	3189	2051
No. Groups	506	481
No. Instruments	145	109
AR1 (p-value)	0.0000	0.0000
AR2 (p-value)	0.8674	0.5562
Hansen (p-value)	0.3851	0.1587

Note: ***, **, and * report statistical significance level at 1%, 5%, and 10%, respectively, ( ) is the z-statistic value.
Source: Authors' estimations.

Moreover, this study finds that the FCF coefficient is significantly positive at the 1% level for overinvesting firms with positive FCFs because, under agency theory, the discrepancy of interest between shareholders and managers may lead to management trying to maximise their personal interests. Therefore, managers can carry out activities aimed at building an "empire" for private objectives instead of for shareholders' benefit by investing in unprofitable investment projects or even an investment project with a negative NPV, particularly when the firm's FCF is a surplus. In other words, managers overinvest in pursuit of self-interest instead of distributing cash to shareholders. Thus, the overinvestment of firms with positive FCFs becomes more severe. In summary, in all cases, a firm's FCF increases its investment level, which confirms Hypothesis 1, but reduces their investment efficiency.

4.4. Does information asymmetry explain the relationship between internal finance and investment efficiency?

From Eq. (5), this study finds that internal finance, proxied by FCF, is the leading cause of over- and underinvestment problems. Thus, this section examines the influence of asymmetric information on the relationship between internal financing and

investment efficiency in listed Vietnamese firms. The effects of financial constraints and agency costs are presented in Table 5 and Table 6, respectively.

Table 5. Under-investment firms – The effect of financial constraints on the relationship between internal finance and investment efficiency

Investment efficiency	K.Z.	WW	SA	ASCL
FCF (β1)	-0.0026***	-0.0992**	0.0031**	0.0159***
	(-23.75)	(-2.53)	(2.54)	(5.94)
FC (β2)	0.0068***	0.6213**	0.4827***	-0.1501***
	(3.60)	(2.41)	(2.67)	(-6.49)
FCF* FC (β3)	0.0100***	0.5020**	0.0256***	0.2432***
	(33.36)	(2.33)	(2.61)	(7.06)
Constant	0.0280***	-0.0903*	0.0885***	0.0206***
	(43.37)	(-1.88)	(3.80)	(11.51)
Observations	3189	3189	3189	3189
No. Groups	506	506	506	506
No. Instruments	235	81	132	154
AR1 (p-value)	0.0000	0.0000	0.0000	0.0000
AR2 (p-value)	0.9064	0.9991	0.9892	0.8987
Hansen (p-value)	0.3561	0.1280	0.1283	0.2909
Threshold value	-0.6819	-1.2376	-18.8789	0.6174
P-value	0.0001	0.000	0.000	0.000

Note: ***, **, and * report statistical significance level at 1%, 5%, and 10%, respectively, ( ) is the z-statistic value.
Source: Authors' estimations.

For the financial constraint hypothesis, this study used four indicators as proxies for the degree of financial constraints mentioned in Table 4.1. These indicators are the KZ, WW, SA, and ASCL indices. This study found that the coefficients of the interactive variables were positive and significant at the 5% and 1% levels across all four regressions. This finding suggests that firms with higher financial constraints face more severe underinvestment when their internal finances are a surplus. Moreover, this study calculated the threshold values of the financial constraint variables. The results in Table 5 show that the internal financing effect changes from negative to positive when the values of the KZ, WW, SA, and ASCL indices are -0.6819, -1.2376, -18.8789, and 0.6174, respectively. This implies that underinvestment problems become more serious for firms with a financial constraint level greater than a threshold value. Underinvestment problems become more serious when the FCF is insufficient

to finance investment projects, even projects with a positive NPV. This finding supports our hypothesis that firms likely to face more significant financial constraints exhibit higher sensitivity to underinvestment in FCF.

Table 6. Over-investment firms – The effect of agency cost on the relationship between internal finance and investment efficiency

Investment efficiency	AC1	AC2
FCF (β1)	0.0391*	-0.0180**
	(1.74)	(-2.25)
AC (β2)	-0.0050*	0.0129***
	(-1.71)	(5.54)
FCF*AC (β3)	-0.0374***	0.0339**
	(-3.16)	(2.06)
Constant	0.0519***	0.0469***
	(13.57)	(29.85)
Observations	2051	2051
No. Groups	481	481
No. Instruments	107	98
AR1 (p-value)	0.0000	0.0000
AR2 (p-value)	0.4427	0.4340
Hansen (p-value)	0.4737	0.3271
Threshold value	1.0456	0.5317
P-value	0.0006	0.085

Note: ***, **, and * report statistical significance level at 1%, 5%, and 10%, respectively, ( ) is the z-statistic value.
Source: Authors' estimations.

For the agency costs hypothesis, this study used two indicators as proxies for the degree of agency costs as mentioned in Section 4.3 for AC1 and AC2. For AC1 and AC2, the coefficients of the interactive variables were significantly negative and positive, respectively. This finding suggests that firms with higher agency costs face more severe underinvestment problems when their internal financing is a surplus (the low AC1 and high AC2 are related to the significant agency costs). Furthermore, this study calculated the threshold values of the agency cost variables. The results in Table 6 show that the internal financing effect changes from negative to positive when the values of AC1 and AC2 are 1.0456 and 0.5317, respectively. This means that for firms with an agency cost level greater than a threshold value, overinvestment problems seem more extreme when their FCF is a surplus. This finding supports our hypothesis that

firms likely to face more significant moral hazard problems exhibit higher sensitivity to overinvestment in FCF.

4.5. Robustness check

In this section, this study employs two measurement approaches to assess corporations' investment efficiency in our research sample to enhance the robustness of the findings. According to Ullah et al. (2021), investment efficiency may be measured by the models of Chen et al. (2013) and Chen et al. (2011). The model proposed by Chen et al. (2011) is

$$INV_{it} = \alpha_0 + \alpha_1 * NEG_{it-1} + \alpha_2 * SAGR_{it-1} + \alpha_3 * NEG_{it-1} * SAGR_{it-1} + \varepsilon_{it} \quad (10)$$

where, INV represents a firm's total investment calculated as the ratio of capital expenditure to total assets. SAGR is revenue growth calculated as the percentage change in sales in year t compared to year t–1, and NEG is a dummy variable with a value of 1 if revenue growth is negative and 0 otherwise. The residual model represents investment efficiency, where positive (negative) residuals reflect overinvestment (underinvestment).

Chen et al. (2013) developed a new model by incorporating growth opportunities represented by Tobin's Q into their research model to measure the optimal investment level. They noted that "this approach does not rely on the assumption that cash balance and leverage are exogenous factors predicting the propensity to underinvestment and overinvestment".

$$INV_{it} = \beta_0 + \beta_1 * SAGR_{it-1} + \beta_2 * Q_{it} + \varepsilon_{it} \quad (11)$$

The variables are described in the model of Chen et al. (2011) except for variable Q, which is calculated by a firm's market value divided by the book value. This study re-estimated the parameters using the GMM method and presents them in Tables 7, 8, and 9. Table 7 reveals that the regression coefficients of variables D_NEG*FCF and D_POS*FCF in the cases of under- and overinvestment were positive, with p-values less than 10%. This finding suggests that firms experiencing cash flow deficits and surpluses in under- and overinvestment scenarios exacerbate inefficient investments.

Table 7. Robustness check – The relationship between internal finance and investment efficiency

	Chen et al. (2011)		Chen et al. (2013)	
Investment efficiency	**Under**	**Over**	**Under**	**Over**
D_NEG	0.0126**	0.0027	0.0230***	0.0253***
	(2.42)	(0.65)	(3.95)	(2.58)
D_NEG*FCF	0.0805***	0.1248***	0.0551*	0.1621**

	(3.04)	(4.95)	(1.75)	(2.55)
D_POS_FCF	-0.0361	0.0229**	0.0795***	0.0661**
	(-1.43)	(2.15)	(2.59)	(2.02)
Constant	0.0323***	0.0583***	0.0290***	0.0581***
	(9.78)	(20.50)	(8.15)	(12.57)
Observations	2819	1914	2931	1802
No. Groups	486	459	493	454
No. Instruments	83	118	94	91
AR1 (p-value)	0.0000	0.0000	0.0000	0.0000
AR2 (p-value)	0.4257	0.6310	0.2385	0.8725
Hansen (p-value)	0.1460	0.5781	0.3174	0.3298

Note: ***, **, and * report statistical significance level at 1%, 5%, and 10%, respectively, ( ) is the z-statistic value.
Source: Authors' estimations.

Furthermore, the results in Table 8 for the regression coefficients of the variable FCF*FC are positive with p-values less than 10%. These values indicate that underinvestment challenges become more severe for firms facing higher financial constraints and intensify when their FCF is insufficient to fund investment projects, even for those with a positive NPV. This result supports our hypothesis that firms facing significant financial constraints demonstrate higher sensitivity to underinvestment in FCF.

Table 8. Robustness check – The effect of financial constraints on the relationship between internal finance and investment efficiency in under-investment firms

	Chen et al. (2011)				**Chen et al. (2013)**			
Financial constraints	**KZ**	**WW**	**SA**	**ASCL**	**KZ**	**WW**	**SA**	**ASCL**
FCF	0.0628***	0.0554*	0.2567***	-0.1286***	0.0865***	0.3386***	1.2377***	-0.2263***
	(4.51)	(1.84)	(5.01)	(-3.60)	(3.95)	(3.12)	(6.41)	(-3.76)
FC	0.0020***	0.0266***	0.0049***	0.0309***	-0.0001	-0.1463***	-0.0101***	0.0488***
	(3.15)	(3.45)	(4.33)	(3.67)	(-0.09)	(-10.24)	(-6.71)	(4.98)
FCF*FC	0.0079**	0.0450*	0.0140***	0.1797***	0.0129**	0.3030***	0.0690***	0.3375***
	(2.04)	(1.83)	(4.99)	(3.19)	(2.18)	(3.29)	(6.55)	(3.56)
Constant	0.0358***	0.0665***	0.1244***	0.0146***	0.0401***	-0.1390***	-0.1468***	0.0107*
	(32.12)	(7.02)	(5.95)	(2.85)	(25.86)	(-7.94)	(-5.26)	(1.79)
Observations	2819	2819	2819	2819	2819	2819	2819	2819
No. Groups	486	486	486	486	493	493	493	493

No. Instruments	70	211	211	85	66	163	151	108
AR1 (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AR2 (p-value)	0.5127	0.3896	0.3745	0.3445	0.7731	0.5877	0.7339	0.6987
Hansen (p-value)	0.5288	0.1400	0.2105	0.1231	0.8781	0.2008	0.2026	0.1243

Note: ***, **, and * report statistical significance level at 1%, 5%, and 10%, respectively, ( ) is the z-statistic value.
Source: Authors' estimations

Table 9 presents the regression results for the impact of agency costs on the relationship between FCF and investment efficiency in overinvesting firms. The regression coefficient of the variable FCF*AC was negative and positive for the AC1 and AC2 proxies, respectively, with p-values less than 10%. This implies that overinvestment challenges are more pronounced for firms with higher agency costs when their FCFs are excessive. This result aligns with our hypothesis that firms likely to encounter substantial moral hazard exhibit heightened sensitivity to overinvestment in FCF.

Table 9. Robustness check – The effect of agency cost on the relationship between internal finance and investment efficiency in over-investment firms

	Chen et al. (2011)		Chen et al. (2013)	
Agency cost	AC1	AC2	AC1	AC2
FCF	0.0528***	-0.0204***	0.0365**	-0.0200***
	(3.58)	(-3.55)	(2.13)	(-4.41)
AC	0.0045***	-0.0039	0.0004	-0.0150***
	(10.30)	(-1.08)	(0.96)	(-5.77)
FCF*AC	-0.0106**	0.0394*	-0.0087*	0.0453***
	(-2.46)	(1.68)	(-1.70)	(7.32)
Constant	0.0543***	0.0633***	0.0695***	0.0664***
	(34.38)	(67.14)	(44.31)	(38.15)
Observations	1914	1914	1914	1914
No. Groups	459	459	454	454
No. Instruments	121	103	121	106
AR1 (p-value)	0.0000	0.0000	0.0000	0.0000
AR2 (p-value)	0.6991	0.8706	0.9854	0.5874
Hansen (p-value)	0.1933	0.1189	0.2926	0.3459

Note: ***, **, and * report statistical significance level at 1%, 5%, and 10%, respectively, ( ) is the z-statistic value.
Source: Authors' estimations.

5. CONCLUSION

This study examined the importance of firms' investment decisions and their impact on firm growth and market value by exploring the threshold effect of information asymmetry on the relationship between internal financing and investment efficiency in Vietnam. Efficient investment decisions can lead to opportunities, improved competitiveness, and efficient capital use, whereas inefficient decisions can harm long-term development and weaken competitiveness. By emphasising the role of obtaining funds for investment projects, with FCF being the preferred choice for firms, this study explored the significance of information transparency in annual reports and its effects on business performance and investor decisions.

Our findings show that Vietnamese firms tend to overinvest. This behaviour, indicated by the spread between over- and underinvestment levels, suggests that firm managers in Vietnam prefer undertaking investments beyond a firm's optimal levels. Reasons for this behaviour include empire building, prerequisite consumption, career concerns, and overconfidence (McVanel & Perevalov, 2008; Nguyen & Wong, 2021). Our findings demonstrate that in both under- and overinvesting firms, FCF increases investment levels, confirming the impact of FCF on investment levels. However, an increase in investment is associated with a reduction in investment efficiency, indicating that FCF can negatively affect the effectiveness of firms' investments. In summary, the findings suggest that internal financing, represented by FCF, is a major contributor to both under- and overinvestment. Additionally, asymmetric information factors such as financial constraints and agency costs influence the relationship between internal finance and investment efficiency. Firms with higher financial constraints or agency costs experience severe under- or overinvestment when they have surplus internal financing. These findings highlight the importance of considering the impact of information asymmetry on the relationship between internal financing and investment efficiency among listed Vietnamese firms.

Based on these findings, this study has implications that may be useful for managers and policymakers. Given the importance of information transparency, firms should focus on enhancing the transparency of their financial information to ensure that it is readily available and understandable by investors and stakeholders. An important solution is that enhanced disclosure standards in annual reports can diminish information gaps and foster more equitable and effective investment opportunities. Moreover, managers must be aware of the risks associated with overinvestment and strive to achieve optimal investment levels that align with the firm's strategic objectives. Thus, independent board oversight, stricter audit requirements, and performance-based incentives for managers can reduce inefficient investment practices and promote optimal capital allocation. Regulatory measures that prioritise transparency in investment decision-making can also help limit managerial discretion over FCF allocation, aligning investment choices more closely with long-term value creation. Moreover, firms should carefully evaluate the effectiveness and

efficiency of investments made using internal financing to maximise returns and develop internal policies to manage FCF efficiently to avoid over- or underinvestment issues. However, firms facing greater financial constraints or agency costs experience severe under- or overinvestment when they have surplus internal financing. Therefore, workshops and training programs targeting corporate managers can be powerful tools for reducing inefficient investment behaviour stemming from overconfidence or overcautiousness. Moreover, regulatory agencies can mandate or encourage firms to track and report investment efficiency metrics, providing regular assessments of how capital is deployed concerning their return on investment. This monitoring process can be particularly beneficial in identifying and mitigating issues associated with over- and underinvestment, giving firms a clear understanding of their investment efficiency and aiding investors in assessing firm performance.

This study focused on Vietnam as an emerging economy facing transparency and firm-governance challenges. The results indicate the impact of information asymmetry and agency conflicts on investment decisions and acknowledge that emerging markets often face weak governance and shareholder protection mechanisms that affect information transparency. This study highlights the need for comprehensive transparency assessments and discusses managers' hesitation in adopting transparency practices. These findings may not directly apply to other countries with different market conditions, governance structures, or regulatory frameworks. However, these findings may be helpful to firms in other countries with similar characteristics, particularly in countries with less stringent transparency standards. In many emerging economies, information asymmetry can create agency conflicts and distort investment decisions as observed in Vietnamese firms. This finding suggests that similar studies in other countries could reveal similar trends in overinvestment. Additionally, this study highlights that FCF can increase investment levels, but often contributes to overinvestment. Indeed, emerging economies with relatively shallow capital markets may see similar patterns, as reliance on FCF owing to limited access to external financing can lead to inefficient investment.

This study has some limitations. First, it analysed internal finances and the impact of information asymmetry on investment efficiency rather than exploring firms' exposure to global risks or external revenue dependencies. Therefore, global risk and revenue dependence on markets also impact investment behaviour (over- and under-investment) and should be considered in future studies. Second, the influence of foreign ownership on dividend-seeking behaviour falls outside the scope of this study because internal financial decisions and the relationship between financial constraints, agency costs, and investment efficiency are the main factors studied. Third, this study focused on the role of internal FCF financing and its impact on investment decisions and efficiency. This study did not thoroughly explore other potential factors or variables that may influence investment behaviour, such as external financing options, macroeconomic conditions, industry-specific factors, or managerial expertise. This study emphasised cash flow management and agency costs

as internal drivers of investment decisions that are distinct from external foreign direct-investment influences. Finally, this study relied on secondary data from annual reports, which may have limitations in terms of observation and completeness. However, this study lays the groundwork for further studies on the role of asymmetric information in investment performance using improved analytical frameworks and adding more evidence to related theories.

DISCLOSURE STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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