# Determinants of Corporate Investment Decisions: The Case of Vietnam

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**Abstract**

*The purpose of this study is to examine determinants of corporate investment decisions. By adopting a static approach, the findings show that cash-flow, fixed capital intensity, business risk, leverage, and firm size are the key elements in making investment activities. Additionally, by using a dynamic approach, the results reveal that past investment also affects investment decisions at the firm level.*

**Keywords:** Corporate investment, Tobin's q, cash-flow, financial constraint.

## 1. Introduction

What are the determinants of investment decisions at firm level? This question has been raised since the Modigliani and Miller theorem (1958) postulated that there has been no relation between the financial structure and financial policy for real investment decisions under certain conditions; and extended this to neoclassical models of investment; for instance, Jorgenson (1963); Hall and Jorgenson (1967). According to the $q$-theory of Tobin (1969) and extended into a proposed model by Hayashi (1982), investment demand could be predicted by the ratio of the market value of a firm's capital stock to its replacement cost under perfect market assumptions (symmetric information, no transaction costs, no default risk, and no taxation); and its market value could also explain further investment opportunities. However, Akerlof (1970) indicated that this theorem will only be correct in a world of perfect capital markets. It cannot interpret investment decisions at the micro level if there is asymmetric information in the market. Concretely, imperfect markets exist in developing countries, firms have more information about the profitability and risks of investment projects than the suppliers of funds have. Besides, corporate finance theory also suggests that market imperfections may repress the capacity of the firms to fund investments and would perpetually influence the investment decisions of firms. Furthermore, he proved how markets fail when buyers have less information than sellers, which leads to an adverse selection, moral hazard or both. There are other corollaries of informational asymmetry. If there is adverse selection and moral haz-

ard, the ratio of 'lemon' in the applicant pool and the probability of default will increase.

Additionally, Fazzari et al. (1988) investigated the effect of financing constraints on the investment-to-cash-flow sensitivity. After controlling for investment opportunities with Tobin's q, they employed the dividend rate so as to distinguish firms that were facing financial constraints from those that were not. They found that cash-flow could affect investment because of imperfections of the capital market, the asymmetric information and the lemon problem. Alternatively, the effect of investment on cash flow is considered as a policy problem of welfare reduction, a capital market failure or an inefficient fund that is similar to problems mentioned in previous studies. Moreover, they also observed that internal finance is cheaper than external finance.

Furthermore, there are two further issues – agency costs and transaction costs that can explain fluctuations in the investment. Firstly, agency costs theory developed by Jensen and Meckling (1976) can answer the problem as to why a firm that is confronting the costs of higher interest rate does not try to get money from other sources (i.e., debt, equity market). Agency problems arise when there is a conflict of interests between managers, creditors, and sharesholders because of differing goals. Secondly, the costs of a transaction combined with the issue of debt and equity might increase the cost of external financing. It is supposed that debt is the only channel of external funds available to the firm. Debt financing allows the creditors to be entitled to interest payments, and to have their principals at the expiry date. If scheduled payments are not

being made, then the payment assets of firm will be sold to raise funds. This depends on the firm's ability and the degree to which it can redeploy its assets. There are usually non-redeployable durable assets in a highly specified investment project; thus, it is quite difficult to recover funds from liquidation. In this circumstance, in order to protect the creditors' interests, they will create disadvantages for the debtors with higher interest payments, restricting the size of loans and so forth.

Added to this, a large level of empirical literatures followed, namely Hall et al. (1998) who used the Panel Data version of the VAR methodology to examine the determinants of investment in scientific firms for the U.S., France, and Japan during the period 1979-1989. They found that there were tighter relations between investments on the one hand, and profits, sales, and cash-flow on the other hand and these differ from country to country. Hubbard (1998) analyzed various factors (e.g., inventory investment, research and development, employment, business formation and survival, pricing, and corporate risk management) which determine the link between cash flow and investment decisions by using the U.S. data. Hubbard's results strongly support that there was a significant relationship between investment and changes in net worth.

Moreover, Carpenter and Guariglia (2008) also analyzed financial factors affect investment decisions with supportive findings. Particularly, they estimated investment regressions distinguishing the firms' abilities to face financial constrain in the UK firms over the period 1983 – 2000. They observed that cash flow could not explain the sensitive nature of investment decisions for large firms; however, its explanatory power was still the same for small firms. It implies that the significance of a cash-flow variable in the investment equation could be caused by information asymmetries in the capital market.

Nevertheless, Kaplan and Zingales (1997) disclaimed the results of Fazzari et al. (1988). They investigated that accustomed use of the sensitivity of investment to cash flow as a management of financial constraint. They then implied that the less the financial constraints a firm faces in corporate investment decisions, the more sensitive to the availability of cash-flow they are. In addition, Gomes (2001) showed that the presence or the absence of financial frictions is neither sufficient for significant cash flow effects nor necessary to obtain these cash flow effects. The results strongly supported the controversy that the success of the investment-to-cash-flow sensitivity is possibly due to the existence of a measurement error in $q$.

These empirical studies are somewhat controversial as they relate to what probably caused the observed relationship between investment opportunities, cash flow and investment decisions at a firm level. Nonetheless, this research will not resolve this issue as it will be limited to the first conclusions of Fazzari et al. (1988). Confirming such a relationship would reject the purely neoclassical theory and cannot, but hint at the existence of the imperfect capital market (Saquido, 2003).

Furthermore, there are certain micro level factors (i.e., past investment, firm size, profitability, cash flow and growth opportunities)

which are available to firms and all are significant in forecasting investment decisions (Bokpin and Onumah, 2009). Ruiz-Porras and Lopez-Mateo (2011) documented that the effects of firm size, cash-flow, and investment opportunities are mostly positively significant on investment decisions. Nonetheless, Saquido (2003) concluded that liquidity and firm size are insignificantly related to investment; but there remains a significant relationship between investment and revenue growth and fixed capital intensity. Aviazian et al. (2005) showed that the link between leverage and investment is negative, and that effect is significantly stronger for firm with low growth opportunities than those with high growth opportunities. Nevertheless, the findings of Li et al. (2010) mixed significantly the relationship between debt financing and corporate investment decisions, by using the method of the multiple linear regression on the data from 2006-2008 of 60 Chinese real estate listed companies.

These researchers however have only focused on developed economies and some emerging countries, namely the US, the UK, Canada, India, China, etc. To the best of our best knowledge, only one group of researchers has attempted to address this issue as it relates to the scenario in Vietnam, while investment decision of firms as become a big issue in recent years. Concretely, Ninh L.K. et al. (2007) analyzed some factors involved with the impact on investment decisions of private enterprises in the Mekong River Delta. Nonetheless, in this research other variables such as investment opportunities, region, or business risk, and macroeconomic factors which might have an influence on investment decisions at the firm level have not been analyzed. This study, therefore, proposes to investigate this situation as it relates to a larger scale to overcome the concerning issues.

## 2. Data and research methodolody

### 2.1. Data sources

The research employs data of firms that are listed on the Vietnamese stock market (including HOSE and HNX). As of 2010, there were 644 firms listed on Vietnam's stock market. However, the study only analyzes non-financial firms because the determinants of their investment decisions are different from that of financial companies. In particular, enterprises which operate in the financial sector have different Balance Sheets from those of the non-financial firms. Besides that, this paper excludes enterprises are no longer listed or companies about which there is not enough information on Financial Statements.

Therefore, the sample creates an unbalanced panel data which cover a 5-year period from 2006 to 2010 with 1,538 observations of 500 listed firms. The information about these firms is mainly obtained from VNDIRECT and Cophieu68 websites; others are from companies' websites.

### 2.2. Econometric model

Based on the Tobin's q model, and a further modification on the research of Erickson & Whited (2000), Gomes (2001), Saquido (2003), Ninh L.K. et al (2007), Carpenter and Guariglia (2008), Bokpin and Onumah (2009), Li et al. (2010), Ruiz-Porras and Lopez-Mateo (2011), and Nair (2011), this study proposes the following model to estimate the determi-

nants of investment decision at the firm level.

$$Y_{it} = \alpha_0 + \sum_{k=1}^{k} \beta_k X_{kit} + u_{it} \qquad (1)$$

where Y is a predicted variable, the firm's investment rate; X includes cash-flow of firms, Tobin's $q$, fixed capital intensity, sales growth, firm size, business risk, leverage of firms, interaction between leverage and ownership concentration; and $u_{it}$ is the error term. The subscript $i, t, k$ indicates firms, time (years) and the number of explanatory variables respectively.

**Dependent variable:**

*Investment rate:*

Investment rate reflects corporate investment decisions. This variable is the ratio of investment expenditure to capital stock; and, described by following formula:

$I_{i,t} / K_{i, t-1}$ = (Capital Expenditure$_{ending}$ − Capital Expenditure$_{beginning}$) / $K_{i, t-1}$

in which capital stock equals fixed assets. This variable is taken from Balance Sheets of firms.

**Independent variables:**

*Cash-flow:*

Cash-flow is used as a proxy for the internal net worth of a company. It is generated by the sum of net income after tax and depreciation and amortization. This variable is taken from Balance Sheets, and Income Statements of firms. Cash-flow is an important determinant for investment decisions of firms because if firms have enough cash inflows, it can be utilized in investment activities. In other words, firms already know about potential investment opportunities; However, they cannot invest

because access to external funds is limited. When cash-flow is improved, they can participate in attractive opportunities that might be otherwise unavailable. The expectation of the link between investment rate and cash-flow is a positive sign.

*Hypothesis 1: Higher cash-flow of firms will be associated with higher investment.*

*Tobin's q:*

Tobin's q is used as a proxy for investment opportunities of enterprises. The measurement of $q$ is the ratio of market value of total assets to book value of total assets. Based on the proposal of Li et al. (2010). The market value of total assets is employed by the following formula:

*Market value of total assets = (Liability + stock price * number of tradable share + net asset per share * number of untradeable share)*

Information of this variable is taken from the Balance Sheets and Annual Reports of firms, as well as the website of Cophieu68 for stock prices. It can be stated that investment opportunities are involved in the investment decisions. Higher investment opportunities would cause higher investment in a world where enterprises attempt to maximize the value of firm through net present value positive projects. The study expects that investment decisions are positively influenced by investment opportunities.

*Hypothesis 2: There will be a positive relationship between investment opportunities and investment rate of enterprises.*

*Leverage:*

Leverage is the ratio of total liabilities to

total assets. This variable is calculated from the Balance Sheets of each firm. Leverage might have a negative impact on corporate investment decisions through two channels. First of all, an increase in leverage might strengthen bankruptcy risks; managers may be afraid that shareholders would be move to decline borrowings and/or reduce investment. Secondly, higher levels of debt result in the reduction of funds in hand; therefore leverage has an inverse effect on investment decisions at the firm level. The relationship between investment decisions and leverage is expected to be negative or positive.

*Hypothesis 3: There will be positive or negative connection between leverage and investment.*

*Fixed capital intensity:*

This is measured by fixed assets divided by total assets that are taken from the Balance Sheets of firms. It is clear that when fixed capital increases, it means firms invest more in machinery to satisfy demand for production. Hence, this variable is expected to have a positive relationship with investment.

*Hypothesis 4: Higher fixed capital intensity of companies will be positively correlated with investment activities.*

*Sales growth:*

This is used as a proxy for a firm's growth that may affect investment decisions. This variable is calculated from the Income Statements of firms. It is normally stated in terms of a percentage growth from the prior year. Sales growth's values are calculated from Income Statements of firms. It can be stated that if demand for consumer goods goes up, it leads to an increase in demand for production, or sales growth. Thus, the demand for capital and machinery will increase as well. The expectation of the connection between sales growth and investment decision is positive.

*Hypothesis 5: There will be a positive link between growth of sales and investment activities of firms.*

*Business risk:*

According to Robert S.Pindyck (1986), investment decisions should be affected by changes in risk levels. This paper, therefore, also employs this variable in analysis of investment decisions. It is generated by variation of revenue with the following formula:

*Business risk = standard deviation $(Revenue_t - Revenue_{t-1})$ / mean (Revenue)*

In order to calculate the value of business risk, the research takes information from Income Statements of firms. Because of the different types of risk attitudes, the expected sign of this business risk variable will be alternatively correlated with investment.

*Hypothesis 6: Higher business risk will be negatively or positively associated with investment rate of firms.*

*Firm size:*

From previous research, there are three measurements of firm size, such as log value of total assets, total revenue, and total number of employees. Some information is not complete because the Annual Reports of some firms contain information about the number of employees, while others do not. Additionally, since total asset is used for measuring Tobin's q, leverage and fixed capital intensity, the paper therefore employs the total revenue

measurements to analyze. The information of this variable is obtained from Income Statements.

On one hand, Ninh L.K. et al. (2007), Bokpin and Onumah (2009) proved that firm size is a negatively significant determinant of investment decisions. The reason is that the management capabilities or human resource cannot control all things or meet requirements in a large firms; thus, they tend to have less investment. One the other hand, Adele an and Ariyo (2008), Jangili and Kumar (2010), Li et al. (2010), Ruiz-Porras and Lopez-Mateo (2011) have made opposite findings. The reason is that large firms should have better access to external capital sources, more stable cash flows and be more diversified than small ones. Hence, this leads to incentive investment activities. Therefore, this variable is expected to be a mix associated with investment.

*Hypothesis 7: There will be positive or negative relationship between firm size and investment decisions.*

*Ownership concentration:*

In terms of investment decisions, state-owner enterprises might be different from other types of enterprises. Specifically, these firms are strongly influenced by the government; and even are tools for the implementation of government policies. For that reason, the government expects that state-owner firms will be more active in investment than non-state owned enterprises. Therefore, the research employs ownership concentration as a dummy variable to express characteristics of listed firms -taking 1 for firms whose state stock holding equals or is more than 50%; taking 0 for others.

## 2.3. Methods of estimation

Normally, methods of estimation for panel data are Ordinary Least Squared (OLS), Fixed Effects Model (FEM), and Random Effects Model (REM). Particularly, the researchers assumed the unobservable individual effect is zero and employ pooled OLS regression to estimate the investment equation. This assumption leads to the problem of heterogeneity across industries and across firms within the same industries. Hence, FEM and REM are used to cope with this problem. Nonetheless, it is difficult to choose which one is the most appropriate.

Therefore, by using the statistics program STATA11, the paper firstly performs a Breusch-Pagan Lagrange Multiplier (1980) test to decide between OLS and REM; and a Hausman (1978) test to choose between FEM and REM. In addition, the robust standard errors also perform to cope with the heteroskedasticity problem if it is present. Furthermore, if having the presence of an endogeneity problem, it can lead to biased and inconsistent parameter estimates. In order to identify this problem, the study uses the Durbin-Wu Hausman test. The best way to overcome this concern is therefore through IV-GMM (Instrument Variables – Generalized Method of Moment). The specification tests are carried out as below:

**Breusch-Pagan Lagrange Multiplier (LM) test:**

In order to find out whether OLS or REM would be more proper, the research performs the LM test in which OLS is the null hypothesis or variances across firms is zero. The Chi-squared statistics (15.65) is recorded in Table

3; the null hypothesis is rejected at the 1 percent level of significance. This result implies that there is evidence of a cohort effect that is different from zero; and thus, the OLS is not suitable.

**Hausman test:**

To decide between FEM and REM, the research runs the Hausman test where the null hypothesis is that the coefficients estimated by the efficient RE estimator are the same as the ones estimated by the consistent FE estimator. After that, based on the Chi-squared statistic (146.49) as displayed in Table 3, the null hypothesis is rejected at the 10 percent level of significance. This result suggests that FEM is more appropriate.

Nonetheless, there are econometric issues which may affect the FE estimator. First of all, there can be a high correlation between the different predictor variables that might influence the efficiency of the estimated coefficients. However, the results of Table 2 is basically smaller than 0.40; therefore, the problem of multi-collinearity is not serious.

**Robust Standard Errors correction:**

Secondly, if the error terms do not have constant variance, they are said to be heteroskedastic (HET). In the presence of HET, the standard errors are biased. It thus causes bias in test statistics and confidence intervals. In order to detect any linear model of HET, a modified Wald test is designed. If HET is present, the study employs the Robust Standard Errors to resolve the problem.

**Durbin-Wu Hausman test:**

To identify the endogeneity problem, the Durbin-Wu Hausman test is applied. The research conducts an exogeneity test on all the predictor variables used in the regression models. The null hypothesis of the considered predictor variable is exogeneity. Otherwise, the alternative hypothesis is the endogenous variable at a specific significance level.

**Instrumental Variables Techniques:**

The GMM regression can deal with not only endogeneity and autocorrelation issues but also the panel dataset, which has a short time dimension (T=5) and a larger firm dimension (N= 500). The study, therefore, uses the GMM estimator to analyze. Specifically, the GMM estimator is explained based on the dynamic panel model as below:

$$Y_{it} = \alpha_0 + \sum_{s=1}^{s} Y_{it-s} + \sum_{k=1}^{k} X_{itk} + \varepsilon_{it} \qquad (2)$$

Where Y is the outcome variable, the firm's investment rate; $Y_{it-s}$ represents lagged predicted variable; X represents explanatory variables; $\delta_i$ represents firm specific effects; $\varepsilon_{it}$ represents the disturbance term having the properties, $E(\varepsilon_{it}) = 0$ and $Var(\varepsilon_{it}) = \sigma^2$. The subscript i, t, k, s indicates firms, time (year), the number of explanatory variables and the number of lags respectively.

After taking the first-difference equation (2) to eliminate the specific effects, the GMM estimator is utilized to estimate:

$$\Delta Y_{it} = \Delta \alpha_0 + \sum_{s=1}^{s} \Delta Y_{it-s} + \sum_{k=1}^{k} \Delta X_{itk} + \Delta \varepsilon_{it} \quad (3)$$

## 3. Empirical results and discussion

### 3.1. Descriptive statistics

Table 1 reports the overall observations, mean, standard deviation, minimum, and maximum values. Information from this table

**Table 1: Basic statistics of the key variables**

| Variables | Obs. | Mean | Std. | Min | Max |
|---|---|---|---|---|---|
| Investment rate | 1538 | 0.82 | 1.69 | -4.79 | 32.87 |
| Cash flow | 1538 | 1.62 | 1.85 | -6.94 | 40.10 |
| Tobin's q | 1538 | 1.15 | 0.72 | 0.23 | 14.05 |
| FCI | 1538 | 0.31 | 0.21 | 0.01 | 0.98 |
| Leverage | 1537 | 0.60 | 1.73 | 0.00 | 57.15 |
| Sales growth | 1538 | 0.29 | 0.65 | -0.84 | 9.67 |
| Firm size | 1538 | 12.66 | 1.36 | 7.78 | 16.88 |
| Business risk | 1538 | 0.71 | 0.22 | 0.00 | 1.46 |

reflects a high variation of investment among the listed firms on the Vietnamese stock market. The mean of investment rate is 0.82, while its standard deviation is 1.69, which is two times the mean. This situation also occurs in the debt ratio with the sample average of 0.60 but the standard deviation of 1.73, which is almost three times the mean. This suggests that there is a significant reliance on debt by Vietnamese listed firms.

**Table 2: Correlation coefficients of the explanatory variables**

| | CF | Q | LEV | FCI | GROWTH | SIZE | RISK |
|---|---|---|---|---|---|---|---|
| Cash flow | 1.0000 | | | | | | |
| Tobin's q | 0.1010 | 1.0000 | | | | | |
| Leverage | 0.0122 | -0.0267 | 1.0000 | | | | |
| FCI | -0.3458 | 0.0034 | -0.0059 | 1.0000 | | | |
| Sales growth | 0.0053 | 0.0685 | -0.0037 | -0.0208 | 1.0000 | | |
| Firm size | -0.0839 | -0.0030 | 0.0486 | -0.0991 | 0.0732 | 1.0000 | |
| Business risk | -0.0566 | - 0.0861 | -0.0319 | 0.0049 | 0.0205 | -0.0397 | 1.0000 |

Additionally, the sample mean of Tobin's q of 1.15 implies that investment opportunities for listed firms are strong over the period considered. Besides, the mean for business risk is 0.71 and this also shows variations over the sample period across the sample firms. It is reasonable with the mean of growth (0.29). Finally, cash-flow records the mean of 1.62 and a standard deviation of 1.85, suggesting that the internal funds of firms are high.

### 3.2. Correlation analysis

Table 2 reports the correlations among the independent variables. Specifically, the research uses the pairwise correlation analysis to assess collinearity problems. Furthermore, there are some inverse relationships among these variables (i.e., cash-flow and fixed capital intensity, firm size, business risk has negative connections). Meanwhile, there are also some direct relationships among these variables (e.g., firm size and Tobin's q, leverage, fixed capital intensity, sales growth has positive links). Overall, these variables are less than 0.4. This suggests that multi-collinearity is not a serious issue.

### 3.3. Results

Table 3 summarizes the results of regressions on determinants of corporate investment decisions from panel data for the period from 2006 to 2010. From the result of the Breusch-Pagan Lagrange Multiplier test (Chi-squared statistics of 15.65), it implies that there is evidence of a cohort effect that is different from zero; and thus, the OLS is not suitable. Based on the result of the Hausman test (Chi-squared statistics of 146.49), it suggests that FEM is more appropriate.

Column (2) records the regression result of FEM. This shows that cash-flow, Tobin's q, fixed capital intensity, business risk, and firm size are the main factors which interpret the investment activities of firms. However, the heteroskedasticity problem is presented in this regression through the result of the Wald test (p-value of 0.000). This can lead to bias in test statistics and confidence intervals. Therefore, the study uses robust standard error for FEM to cope with this problem. Column (3) provides the empirical result of FEM with the robust standard errors estimator as follows: cash-flow, fixed capital intensity, business risk, firm size, leverage. The interaction between leverage and ownership are predicators of corporate investment decisions.

In particular, cash-flow is statistically significant and positively associated with investment decisions at the micro level. This result shows that an increase of 1% in cash-flow might lead to an increase of 0.67% in investment whilst other independent variables are constant. In other words, this indicates that cash-flow is an important determinant of corporate investment decisions and can help stimulate investment. This result is also matched with the findings of, Aivazian et al. (2005), Azzoni and Kalatzis (2006), Adelegan and Ariyo (2008), Jangili and Kumar (2010), Li et al. (2010), Nair (2011), Ruiz-Porras and Lopez-Mateo (2011).

Tobin's q is still positively correlated with investment activities but becomes less significant in statistics. Specifically, Tobin's q is slightly statistically significant and positively associated with investment decisions in FEM regression, while it is not significant in FEM

## Table 3: Regression analysis of investment equations

| Variables (1) | FEM (2) | FEM with robust (3) | IV-GMM (4) |
|---|---|---|---|
| Constant | 3.497** | 3.497 | -0.719 |
| | (0.026) | (0.126) | (0.792) |
| Cash-flow | 0.669* | 0.669* | 0.652* |
| | (0.000) | (0.000) | (0.000) |
| Tobin's q | 0.126*** | 0.126 | 0.056 |
| | (0.062) | (0.116) | (0.435) |
| Fixed capital intensity | 3.977* | 3.977* | 4.310* |
| | (0.000) | (0.000) | (0.000) |
| Sales growth | 0.125 | 0.125 | 0.133 |
| | (0.145) | (0.204) | (0.252) |
| Business risk | -0.521** | -0.521** | -0.189 |
| | (0.016) | (0.048) | (0.638) |
| Firm size | -0.381* | -0.381** | -0.320*** |
| | (0.002) | (0.036) | (0.096) |
| Leverage | 0.018 | 0.018* | 7.480* |
| | (0.519) | (0.000) | (0.000) |
| Leverage x ownership | -0.033 | -0.033* | -2.863* |
| | (0.551) | (0.000) | (0.000) |
| 1st lag of investment | | | -0.127* |
| | | | (0.000) |
| LM test | Chi$^2$(1)= 15.65* | | |
| Hausman test | Chi$^2$(8)= 146.49*** | | |
| Wald test for HET | 0.000 (p-value) | | |
| Observations | 1537 | 1537 | 1032 |
| R-squared | 0.3653 | 0.3653 | |
| Sargan test (p-value) | | | 0.925 |
| M1 (p-value) | | | 0.000 |
| M2 (p-value) | | | 0.937 |

*Note: The LM specification test is employed to test OLS versus REM. The Hausman test is utilized to test REM versus FEM. The Wald specification test is used to test heteroskedasticity. The valid of instrument variables is checked by Sargan test. P-values are presented in parenthesis below the coefficient estimates. One, two, and three asterisks indicate significance levels of 1, 5, and 10 percent respectively.*

with robust standard errors. The Tobin's q coefficient of 0.126 reveals that if investment opportunities grow by 1%, the investment rate will go up by 0.13% on the condition that the other independent variables are held constant. This result is the same expected sign and is logical with the following research, Saquido (2003), Aivazian et al. (2005), Baum et al. (2008), Carpenter and Guariglia (2008), Bokpin and Onumah (2009), Li et al. (2010).

In addition, there is definitely a positive statistically significant relationship between fixed

capital intensity and corporate investment decisions at a 1 percent level of significance. The estimated coefficient of 3.977 indicates that an increase of 1% in fixed capital intensity will cause an increase of 3.98% in investment decisions at the firm level. The results of sales growth reveal that investment decisions and growth of sales have a positive relationship (0.125) but are statistically insignificant. This indicates that sales growth does not play an important role for investment decisions of listed firms. During this period, technical improvement to increase productivity and quality is an issue to which firms pay a great deal of attention. Besides, when Vietnam has been participating in WTO, in order to compete with firms of other countries, Vietnamese products must comply with strict standards of international markets, especially in the United States and European markets. Therefore, firms have to change technology and machinery to meet these standards. This means fixed capital intensity contributes to the investment activities.

Furthermore, there is an inverse statistically significant association between business risk and investment decisions at a significant 5 percent level. It means that business risk will be a disincentive to investment activities of the listed firms. This result indicates that business risk is also an important determinant of corporate investment decisions. The coefficient of -0.521 points out that if business risk rises by 1%, investment will drop by 0.52% on the condition that the remaining predictor variables are unchanged. At present time, the world economy in general and the Vietnamese economy specifically have faced several difficul-

ties, such as financial crisis, debt crisis, etc. Hence, consumers consider spending carefully. This causes enterprises to have difficulties in consuming products and in investing in new products. That is why higher business risks lead to less investment activities.

In terms of firm size, the estimated coefficient of this variable is -0.381, which indicates that firm size is negatively statistically significant when associated with investment decisions at 1% and 5% respectively. This finding suggests that the larger the firm is, the less investment it will make. In addition, it is the same as the expected sign and consistent with previous research such as that of Adelegan and Ariyo (2008), Li et al. (2010), Ruiz-Porras and Lopez-Mateo (2011). Next, leverage is statistically insignificantly correlated with investment decisions in the FEM regression; however, it is definitely statistically significant when associated with investment at the 1% level of significance in the FEM with robust standard errors regression. Besides, the sign of this estimated coefficient is as expected and is logical with the following studies: Azzoni and Kalatzis (2006), Ninh L.K. et al. (2007), Adelegan and Ariyo (2008), Jangili and Kumar (2010), and Nair (2011).

In the FEM regression, the combination between leverage and ownership is not statistically significant and is negatively related to investment activities; nonetheless, it is strongly statistically significant and inversely correlated with investment at a significant 1% level in the FEM with robust standard errors regression. This confirms the hypothesis that state-owned enterprises are less incentive to invest whilst they have easier access loans than other

companies.

After applying Durbin-Wu Hausman, the result shows that there is an endogenous problem (appendix); hence, the research runs IV-GMM regression. Column (4) performs the empirical result of this estimator. Although these variables (e.g., cash-flow, fixed capital intensity, firm size, leverage, and the combination between leverage and ownership) are still the determinants of investment decisions at the micro level as the FEM estimator, there is only one difference in statistical significance, namely business risk. Specifically, the business risk variable becomes less statistically significant associated with the investment activities of firms. The reason could be instrument variables are not enough or the measurement of business risk is variable. This measure requires a large enough period to calculate (for example 5-10 years); however, the analyzing period of this study is short especially in IV-GMM method. These results are consistent with previous studies as well. By employing the Sargan test, p-value of 0.925 reveals that the null hypothesis fails to reject the invalidity of instrumental variables. It means that employed instruments are totally valid. Besides, the M1 and M2 procedure tests directly for, respectively, first- and second-order residual autocorrelation. They have a p-value of 0.000 and 0.937 respectively, which mean that there are no serial correlations in the residual.

Finally, the first lag of investment is an important element in making investment decisions at the micro level. The estimated coefficient of -0.127 portrays that past investment is highly statistically significant and negatively correlated with investment at the 1 percent level. An increase of 1% in past investment can explain the 0.13% fluctuation in investment while other variables are kept unchanged. This result is consistent with previous studies, namely Carpenter and Guariglia (2008), and Bokpin and Onumah (2009).

## 4. Conclusion and policy recommendation

### 4.1. Conclusion

From our research results, some following conclusions should be made. First of all, cash flow is approximately positive and significant in statistics across regressions. This result implies that cash-flow (or internal funds) is the key determinant of investment decisions at the firm level. It also indicates that firms use their own capital to finance their investment activities besides external funds. Second, Tobin's q is mostly positive and statistically insignificant related to investment decision across specifications, namely FEM with robust standard errors and GMM. This result reveals that Tobin's q or investment opportunity does not stimulate the investment activities of listed firms in the Vietnamese stock market. Thirdly, fixed capital intensity is absolutely positive and statistically significant associated with corporate investment decision across all estimators. It indicates that fixed capital intensity helps investment activities to be intensive. The finding also affirms that fixed capital intensity is a major determinant of investment decisions for improving product quality and productivity.

Fourth, sales growth and investment have a positive and statistically insignificant relationship across regressions. It reveals that sales growth does not help stimulate investment

activities of firms. This result can be explained as follows: because sales growth is small and potential profitability is not as expected, the firms will be careful in making investment decisions. Fifth, business risk is almost negative and statistically significantly associated with investment decisions across fixed effect models. This result implies that business risk is the main determinant of corporate investment decisions. Nevertheless, in the GMM technique, the business risk variable becomes less significant in statistics. Sixth, the connection between firm size and investment decision is definitely negative and significant in statistics across estimators. It demonstrates that firm size is a key element in making investment decisions at the firm level. Seventhly, the relationship between leverage and investment decision is truly positive but mixed in statistics across estimation methodologies. This helps firms make incentive investment decisions. Next, the combination between leverage and concentration of ownership is absolutely negative and statistically significant correlated with investment activities across estimators except FEM. This interaction is a substitute combination in stimulating investment decisions. Finally, the first lag of investment is also an element which influences investment decisions at the firm level in the GMM technique. This result is consistent with the findings of Carpenter and Guariglia (2008), and Bokpin and Onumah (2009).

### 4.2. Policy recommendation

On the basis of the empirical results, a few suggestions on the improvement of investment decisions at the firm level are given as follows:

Firstly, firms need capital to finance their investments in order to eliminate outdated technology and develop the scale. Capital sources can be from two channels such as internal and external funds. Therefore, for internal funds, enterprises themselves must have transparent information and financial statements and be efficient businesses to create the confidence for shareholders to invest continuously and more. In other words, all kinds of firms (state-controlled or non-state owned enterprises, small or large firms) must be required to publish annual reports audited by independent and reputable accounting firms. From that, firms can mobilize more capital for investment. For external funds, it is necessary to enhance the borrowing capacity of firms, especially in non-state owned enterprises. Despite the fact that the Vietnamese government usually states its commitment to support non-state owned enterprises, in fact the state-controlled firms receive many advantages, especially in capital; whilst the non-state owned firms continue to suffer from the harassment of government officials, especially in the taxation and customs areas. The government must be unbiased and ensure that resources are allocated to those who can utilize them most efficiently. In order to this, the laws, which are related to these firms, need to be established and strengthened to limit the risks to financial and credit system lending to these enterprises. Besides that, banks need to improve processes and procedures to make it easier for businesses to use mortgage assets for loans. Finally, the government, especially in banking, should help the enterprises maintain a proper system of standard books, and to make proper business plans and business strategies. From that, it can improve the exchange of information between enterprises and banks.

# APPENDIX

## The Durbin-Wu Hausman test results

***Test result of Cash-flow:***

Tests of endogeneity of: cf

$H_0$: Regressor is exogenous

    Wu-Hausman F test:               0.00000  F(1,646)    P-value = 0.99999

    Durbin-Wu-Hausman chi-sq test:   0.00000  Chi-sq(1)   P-value = 0.99999

***Test result of Tobin's q:***

Tests of endogeneity of: q

$H_0$: Regressor is exogenous

    Wu-Hausman F test:               0.00000  F(1,646)    P-value = 0.99954

    Durbin-Wu-Hausman chi-sq test:   0.00000  Chi-sq(1)   P-value = 0.99954

***Test result of Fixed capital intensity:***

Tests of endogeneity of: fci

$H_0$: Regressor is exogenous

    Wu-Hausman F test:               51.06396  F(1,646)    P-value = 0.00000

    Durbin-Wu-Hausman chi-sq test:   48.12904  Chi-sq(1)   P-value = 0.00000

***Test result of Sales growth:***

Tests of endogeneity of: gro

$H_0$: Regressor is exogenous

    Wu-Hausman F test:               -0.00000  F(1,646)    P-value = 1.00000

    Durbin-Wu-Hausman chi-sq test:   -0.00000  Chi-sq(1)   P-value = 1.00000

***Test result of Sales growth:***

Tests of endogeneity of: sizer

$H_0$: Regressor is exogenous

    Wu-Hausman F test:               31.87584  F(1,646)    P-value = 0.00000

    Durbin-Wu-Hausman chi-sq test:   30.89419  Chi-sq(1)   P-value = 0.00000

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