CORPORATE INVESTMENT AND FINANCIAL CONSTRAINTS: A CASE OF THAI CORPORATIONS

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CORPORATE INVESTMENT AND FINANCIAL CONSTRAINTS:
A CASE OF THAI CORPORATIONS

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ABSTRACT

This paper studied the effect of financial constraints on corporate investment in Thailand. The financial constraints were divided between internal and external constraints. We selected some factors to represent the internal and external financial constraints. For the sample companies, we selected those from SET100 index members, which are considered large Thai corporations. Empirical results showed that most factors were not significant while some significant factors were contrary to our expectations. In general, the selected factors were more significant in explaining operating investments than non-operating investments.

KEY WORDS: CORPORATE / INVESTMENT / FINANCIAL CONSTRAINTS /
THAI CORPPORATIONS / INTERNAL CONSTRAINTS /
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บธ.ม. สาขาวิชาการวิเคราะห์และการสร้างตัวแบบธุรกิจ

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บทคัดย่อ

งานวิจัยนี้เป็นการศึกษาผลกระทบของข้อจำกัดทางการเงินที่มีต่อการลงทุนของบริษัทในกรณีประเทศไทย ข้อจำกัดทางการเงินแบ่งออกเป็นข้อจำกัดทางการเงินภายในและภายนอก เราเลือกตัวแปรบางตัวมาเป็นตัวแทนของข้อจำกัดทางการเงินภายในและภายนอก กลุ่มตัวอย่างที่ศึกษาเลือกมาจากสมาชิกของดัชนี SET100 ซึ่งถือได้ว่าเป็นบริษัทขนาดใหญ่ของประเทศไทย ผลการศึกษาพบว่าตัวแปรส่วนใหญ่ไม่ได้มีผลกระทบอย่างมีนัยสำคัญและตัวแปรบางส่วนมีผลกระทบในทิศทางที่แตกต่างจากการคาดการณ์ของเรา ตัวแปรที่มีผลกระทบอย่างมีนับสำคัญกับการลงทุนที่เกี่ยวข้องกับการดำเนินธุรกิจหลักมีจำนวนมากกว่าการลงทุนที่ไม่เกี่ยวข้องกับการดำเนินธุรกิจหลัก

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CHAPTER I
INTRODUCTION

1.1 Introduction

Waking up in the morning and preparing to go to work are common lifestyle to most of the people. Working is one of major activity in everyone's life. Most of which is working in a company as an employee. Thus, we can conclude that corporations play significant role in people's life. What do corporations do in general? Making investment, hiring people, selling products etc. in order to get profit is what they do. The whole process of this cycle starts from corporate investment. Therefore, corporate investment is a very important issue of everyone's life.

In many of developing countries, investment is a large component of the countries' Gross Domestic Product (GDP); however, it is less in developed countries. For example, the investment as a percentage of GDP as of 2009 (estimation) is 24.4% for Thailand, 46.3% for China, 34.5% for Vietnam, 32.4% for India, 31.1% for Indonesia, and 28.7% for Singapore (Central Intelligence Agency, 2010)[1]. This large portion shows the importance of investment in national economic activities.

As a result, together with other reasons, corporate investment topic becomes popular for many researchers. For example, Hoshi, Kashyap, and Scharfstein (1991) studied Japanese companies with and without liquidity constraint; Fazzari et al. (1988) studied relationship between internally generated cash flow and corporate investment; Malmendier and Tate (2005) did research on topic "CEO overconfidence and corporate investment"; Whited (1992) studied about asymmetric information in debt market and ability to get external debt financing; Fazzari, Hubbard, and Petersen (1988) did research on topic "Investment, Financing Decisions, and Tax Policy"; Boyle and Guthirie (2003) did research on topic "Investment, Uncertainty, and

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[1] Data from CIA World Factbook published on www.cia.gov. The website explains that "This entry records total business spending on fixed assets, such as factories, machinery, equipment, dwellings, and inventories of raw materials, which provide the basis for future production. It is measured gross of the depreciation of the assets, i.e., it includes investment that merely replaces worn-out or scrapped capital."

Liquidity"; Carlson, Fisher, and Giammarino (2004) did research on topic "Corporate Investment and Asset Price Dynamics: Implications for the Cross-Section of Returns". From these previous researches, we can see that corporate investment is studied in various aspects and views depending on researcher's interest. In reality, there are many factors affecting corporate investment as seen in different focuses of previous researches.

Generally, previous researches found that investment of firms with external funding constraints tend to rely on internally generated cash flow. For example, Hoshi, Kashyap, and Scharfstein (1991) studied 2 groups of Japanese companies, those who are tied with banks and those who are not. It is assumed that firms tied with banks are not constrained to debt financing. They found that investment of firms, who are not tied with banks, are more sensitive to their internally generated cash flow. Another example is Whited (1992) who shows evidence supporting that asymmetric information problem causes external debt financing constraint to unhealthy firms, and thus, affects their investment. Another example, Fazzari et al. (1988), classified financially constrained firms by their dividend payout ratio and found that investment of firms with more constraint will be more sensitive to their internal cash flow than those who are less constrained. However, Clearly (1999) found contradict result that investment of firm with less financial constraints is more sensitive to internal cash flow. Kaplan and Zingales (1997) found similar result as well. This result seems to be in conflict with our intuition, but further prove is still needed.

Besides from financial constraints, there are many other factors affecting corporate investment. For example, Agrawal and Mandelker (1987) studied the relationship between manager's holding of common stocks and stick options in their company and firm's financing decisions. Malmendier and Tate (2005) studied the relationship between managerial overconfidence and firm's investment. Both researches found significant relationship in some way. However, our focus in this paper will be on the relationship between corporate investment and financial constraints in Thailand only.

There is a finance theory called "Pecking Order" explaining that, with the existence of asymmetric information, firms will employ internal finance, debt, hybrid securities, and equity respectively to finance their investment (Brealey, Myers, and Allen, 2006). This occurs because there is the least agency problem when using internal finance, less when using debt finance, and most when using equity finance as investors will suffer loss from manager's decisions. According to the theory, all firms' investment should, more or less, have positive relationship with internal cash flow because it is the first priority of corporate investment's financing.

This inconclusive matter of corporate investment sensitivity leads to our interest in studying the relationship between corporate investment and financial constraints. As corporate investment is very important issue to people's life, better understanding of the factors affecting it should benefit many parties e.g. management, government, and analyst and ultimately benefit social welfare.

1.2 Research Objective

This research focuses on 2 types of financial constraints, internal and external. We will find sensitivity of corporate investment, which is separated into operating and non-operating investment, to internal and external financial constraint proxies. Our sample is from SET100 Index members.

1.3 Hypothesis

According to "Pecking Order Theory", we expect both types of corporate investments to have negative relationship with internal financial constraint. However, for external financial constraint, we expect the same direction of relationship, but less in magnitude.

1.4 Limitations of Study

There are some limitations in this research as well. Firstly, sample size is only 28 companies, which are concentrated in Thailand. It may not be able to represent global results.

Secondly, data frequency depends upon financial statement release. The most frequent release is quarterly, but some may published semi-annually. This matter leads to less data frequency in which investment and constraints at each data point may not fully represent the actual business operation between each data point.

Thirdly, our Ordinary Least Square (OLS) can capture only linear relationship. It is possible that the relationships are not linear, and we will not see the relationship if that is the case.

1.5 Contribution of Study

The results of this research will lead to better understanding in factors driving Thai corporate investments, both *Operating Investment* and *Non-Operating Investment*. Knowing the factors is useful to many stakeholders. Firstly, management can better take actions to change each factor in order to change firm's investment. Secondly, government can issue policies that affect the factors to stimulate investment. Thirdly, financial analyst can analyze the change in the factors to forecast the change in investment amount. In summary, this understanding leads to better forecast and manipulation of firm's investment.

1.6 Definitions of Key Terms

1. *Operating Investment (OI)*, it is investment in firm's core business, which is determined by change in net working capital plus investment in fixed assets.

2. *Non-Operating Investment (NOI)*, it is investment in securities or other firms, which is determined by investment in marketable securities or short-term investment plus long-term investment or investment in other companies.

3. *Internal Finance Factors (IF)*, it is factors that proxy internally generated funding. In our research, we have selected 4 factors, which are:

   a. *Net Operating Profit After Tax (NOPAT)*
   b. *Account Receivable Turnover (ART)*
   c. *Account Payable Turnover (APT)*
   d. *Inventory Turnover (IVT)*

4. *External Finance Factors (EF)*, it is factors that proxy firm's ability to raise external funding. In our research, we have selected 4 factors, which are:

a. Size, determined by Total Assets (TA)

b. Liquidity Risk, determined by Current Ratio (CR)

c. Growth Opportunities, determined by Price to Earnings Ratio (PE)

d. Industry that firm is operating (ID)

CHAPTER II
LITERATURE REVIEWS

There are previous literatures studying about firm's investment relationship with various factors e.g. financial constraints, managerial ownership, external debt financing, and many other factors.

The first group of researches I want to mention is those who found that financially constraint firms' investment is more sensitive to their internally generated cash flow than those who are less constrained. Hoshi, Kashyap, and Scharfstein (1991) studied 2 groups of Japanese companies, those who are member of a financial group and those who are not, and found that investment of firms, who are not member of a financial group, are more sensitive to their internally generated cash flow. Whited (1992) shows evidence supporting that asymmetric information problem causes external debt financing constraint to unhealthy firms, and thus, affects their investment. Fazzari et al. (1988) found that investment of firms with more constraint will be more sensitive to their internal cash flow than those who are less constrained.

On the other hand, Clearly (1999) found that investment of firm with less financial constraints is more sensitive to internal cash flow. Kaplan and Zingales (1997) indicated that investment-cash flow sensitive firms are not necessarily financially constrained firms. These researches raise argument to general conclusion that financially constrained firms will rely more on internal cash flow financing than those who are not financially constrained. Therefore, general conclusion does not hold as evidenced by some researches mentioned here.

Base on these previous literatures, firm's investment sensitivity to financial constraints has no common conclusion. Thus, it interested us to study Thai firms' relationship between the factors. However, financial constraint is not the only factor explaining corporate investment. There are also some other factors.

Previous researches have different definition of financial constraints and investment. Thus, they may not be comparing absolutely the same thing. Our research also employs different definitions and assumptions to other researches as will be further explained. However, before moving forward, we examine some of the methodologies used by previous literatures.

Hovakimian and Titman (2003) studied relationship between corporate investment and financial constraints in US manufacturing firms. They use proceed from voluntary asset sales to proxy internally generated cash flow and found that there is significant relationship between firm's investment and asset sales proceed. This is different from our internal financing proxies, which are mostly operating performance of the firms.

Hoshi, Kashyap, and Scharfstein (1991) separate Japanese firms into 2 groups by ownership structure, those who are subsidiaries or related companies of financial institutions and those who are not. This method focuses on relationship unlike many other researchers, who usually use accounting data. However, this method makes sense in term of intuition and underlying logic.

Clearly (1999) is the most interesting method to us. The research constructs index to proxy firm's financial constraint call Z_{FC}, which is similar to Altman's Z-score (Altman, 1968). He first divided firms into 2 groups, dividend increasing and decreasing firms. Dividend increasing firms are assumed to be non-constrained firms while dividend decreasing firms are assumed to be financially constrained. The index constructed is function of some financial ratios and accounting data e.g. current ratio, fixed cost coverage. The paper uses linear regression to find appropriate coefficient that best fit the index to the 2 groups. After that, he obtained financial constraint index.

For studies in Thailand, Chensavasdijai (1999) studied 155 Thai listed manufacturing firms over 1987-1995 and found that financial constraints have no influence to firm's investment. He also found that firm's investment is sensitive to market valuation of firm's assets. However, the structure of economic environment is different during his study period and ours, so we are not surprised if there is any difference.

What we do in our research is using proxies for both internal and external financing constraint. Even though not all the same variables as Cleary (1999), the concept is quite similar except that we do not construct an index and do not divide firms into groups at beginning. We directly regress firm's investment to those factors.

Our purpose is to see the relationship, in term of both direction and magnitude, among each type of investment and factors.

As we study relationship among investment and firm's cash flow, we are aware that there is argument about this as well. Kaplan and Zingales (1997), and Kaplan and Zingales (2000) provides theoretical argument that firms who finance their investment mainly from their internal cash flow are not necessary to be financial constrained firms. The papers also give some empirical evidence. However, Fazzari, Hubbard, and Petersen (2000) argued on Kaplan and Zingales' theretical approach that it does not provide effective critique. Therefore, we do not have solid conclusion whether investment-cashflow sensitivity can proxy financial constraint or not.

CHAPTER III
RESEARCH FRAMEWORK

3.1 Theoretical Framework

In our introduction part, we mentioned "Pecking Order Theory", which conclude that, with the existence of asymmetric information, firms will employ internal finance, debt, hybrid securities, and equity respectively to finance their investment (Brealey, Myers, and Allen, 2006). From the conclusion, we expect that firm's investment should have relationship with both internal cash flow and ability to raise external debt as they are first priority before hybrid securities or equity financing.

We pick some factors to represent internal and external financing as follows:

1. *Internal Finance Factors (IF)*, it is factors that proxy internally generated funding. In our research, we have selected 4 factors, which are:

1.1. Net Operating Profit After Tax (NOPAT)

NOPAT is firm's operating profit to be distributed to all firm's investor, which are creditors and stockholders, including other firm's securities holders if any. NOPAT is calculate from

$$NOPAT = EBIT(1-t)$$

Where:

EBIT = earning before interest and tax, or operating profit before tax

t = corporate tax rate

This NOPAT is a direct source of internally generated cash flow as firm can finance investments from their profit. Therefore, the higher NOPAT leads to the lower internal financing constraint.

1.2. Account Receivable Turnover (ART)

ART is a financial ratio that represents how quick firm can collect cash from credit sales. ART is calculate from

$$ART = \frac{NetCreditSales}{AverageNetAccount\,\mathrm{Re}\,ceivables}$$

Where:

Net Credit Sales = Total net credit sales in the period

Average Net Account Receivables = Net Account Receivables average from ending value of the period and the prior period

This ART is also another source of internal cash flow as firm get cash when collecting cash from clients, not when goods are sold. The higher number indicates the quicker firm can collect cash. Therefore, the higher ART leads to the lower internal financing constraint.

1.3. Account Payable Turnover (APT)

APT is a financial ratio that represents how quick firm pays cash to credit purchase. APT is calculate from

$$APT = \frac{NetCreditPurchase}{AverageNetAccountPayables}$$

Where:

Net Credit Purchase = Total credit purchase from supplier in the period

Average Net Account Payables = Net Account Payables average from ending value of the period and the prior period

This APT is a use of internal cash flow as firm pay cash when supplier collects cash from the firm. The higher number indicates the quicker firm pays cash. Therefore, the higher APT leads to the higher internal financing constraint.

1.4. Inventory Turnover (IVT)

IVT is a financial ratio that represents how quick firm convert inventory into sales. In other words, how quick firm can sell their products. However, sales can be either cash or credit sales. IVT is calculate from

$$IVT = \frac{COGS}{AverageInventory}$$

Where:

COGS = cost of goods sold in the period

Average Inventory = inventory average from ending value of the period and the prior period

This IVT tends to increase sales, which is a source of internal cash flow, when cash is collected. The higher number indicates the quicker firm can sell their products. Therefore, the higher IVT leads to the lower internal financing constraint. However, the sales need to be collected for cash, which is represented by ART.

2. *External Finance Factors (EF)*, it is factors that proxy firm's ability to raise external funding. In our research, we have selected 4 factors, which are:

2.1. Size, determined by Total Assets (TA)

When firm wants to borrow money, the bigger firm’s asset size should help to get more dollar value borrowing. Also firms with more assets tend to have more collateral to pledge for debt. As a result, higher TA leads to lower external financing constraint.

2.2. Liquidity Risk, determined by Current Ratio (CR)

CR is a financial ration that represents firm’s liquidity. Greater number means higher liquidity. Therefore, when firm has high CR, creditors tend to be more comfortable to lend. As a result, higher CR leads to lower external financing constraint. CR is calculate from

$$CR = \frac{AverageCurrentAssets}{AverageCurrentLiabilities}$$

Where:

Average Current Assets = current assets average from ending value of the period and the prior period

Average Current Liabilities = current liabilities average from ending value of the period and the prior period

2.3. Growth Opportunities, determined by Price to Earning Ratio (PE)

PE is a financial ration that represents market expectation of firm's future earning. The greater number means that market is willing to pay high price for firm's stock, which represents expectation that future earning will be higher. Therefore, when firm has high PE, it is easier to raise external financing either via debt or equity issuance. As a result, higher PE leads to lower external financing constraint. PE is calculate from

$$PE = \frac{Stock\,\mathrm{Pr}ice}{EPS}$$

Where:

Stock Price = Market price of common stock in the interesting period

EPS = earning per share of the firm

2.4. Industry that firm is operating (ID)

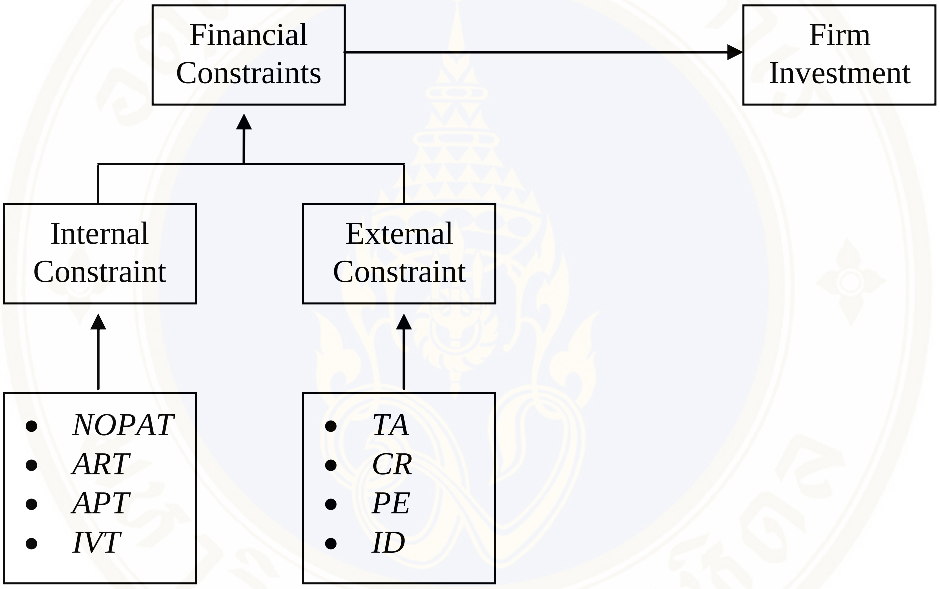
Different industries contain different industry risk. For example, construction firms are usually more sensitive to economic cycle than food industry. Therefore, firms in each industry may face different treatment from investors, both creditors and stock holders. We do not have expectation about which industry faces more external financing constraint.

3.2 Conceptual Framework

Generally, firm finances investment from either internal or external source. Therefore, we set up 2 groups of financial constraints, internal and external constraint factors. In each group, we select some factors to be proxies for each constraint group as further explained in the next section. These factors will be used as independent variables to represent internal and external financial constraints.

In our research, firm's investment is classified into 2 types, *Operating Investment (OI)* and *Non-Operating Investment (NOI)*. We will further explained in the next section as well.

These 2 types of investment are different. *OI* is in core business while *NOI* maybe investment in other companies for strategic or diversification purpose, or could be short-term investment for liquidity purpose. Thus, it is justified to separate firm's investment into 2 types.



CHAPTER IV
METHODOLOGY & DATA

4.1 Methodology

Corporate investment is our dependent variables. We separate the investment into 2 types as follow:

1. *Operating Investment (OI)*, it is investment in firm's core business, which is determined by change in net working capital plus investment in fixed assets.
2. *Non-Operating Investment (NOI)*, it is investment in securities or other firms, which is determined by investment in marketable securities or short-term investment plus long-term investment or investment in other companies.

We have 2 groups of independent variables as follows:

1. *Internal Finance Factors (IF)*, it is factors that proxy internally generated funding. In our research, we have selected 4 factors, which are:
   1.1. Net Operating Profit After Tax (NOPAT)
   1.2. Account Receivable Turnover (ART)
   1.3. Account Payable Turnover (APT)
   1.4. Inventory Turnover (IVT)
2. *External Finance Factors (EF)*, it is factors that proxy firm's ability to raise external funding. In our research, we have selected 4 factors, which are:
   2.1. Size, determined by Total Assets (TA)
   2.2. Liquidity Risk, determined by Current Ratio (CR)
   2.3. Growth Opportunities, determined by Price to Earnings Ratio (PE)
   2.4. *Industry that firm is operating (ID)*, in our study, we divide sample corporations into 4 industries as follows:
      2.4.1. Manufacturing & Industrial (M)
      2.4.2. Agriculture (A)

2.4.3. Service (S)

2.4.4. Construction & Real Estate (R)

For industry difference, we do not put industry dummy into the regression model, but we run regression for all sample and for each industry sample.

Our objective is to test the relationship between each investment, IF and EF, and the selected independent variables. Thus, our regression model will be

$$OI = \beta_0 + \beta_1 NOPAT + \beta_2 ART + \beta_3 APT + \beta_4 IVT + \beta_5 TA + \beta_6 CR + \beta_7 PE + u$$

And

$$NOI = \alpha_0 + \alpha_1 NOPAT + \alpha_2 ART + \alpha_3 APT + \alpha_4 IVT + \alpha_5 TA + \alpha_6 CR + \alpha_7 PE + u$$

Our data is panel data where we have all variables for each firm for 22 observations (quarters). We will use quarter dummy as control variables to ensure that effect of events in each quarter are captured and do not affect other coefficients.

The fixed effect in firm may occur from the difference in firm’s characters. For example, firms related to financial group may have advantage in obtaining external debt financing compare to those who are not related firms. This kind of fixed effect is firm specific; thus, will exist for the firm in all periods.

As we have not concluded that which fixed effect or random effect is the most appropriate, after getting results, we will use Hausman test to determine whether fixed effect on which dimension or random effect is more appropriate to our data.

However, we have adjusted some variables and eventually have 4 models. We have to modify the model because if we only use the THB unit, there is high correlation among investment, NOPAT, and TA. It is common to have higher investment and NOPAT in THB amount for bigger firm, larger TA in THB amount. This natural correlation causes positive coefficients and high t-statistic in our regression model. Thus, it can mislead about the relationship between corporate investment and those correlated independent variables. Therefore, we modify the model into percentage terms, in which we can see better meaningful relationship.

Each model is different in unit of corporate investment, the dependent variable, and unit of NOPAT only. The unit difference is summarized as follows:

Table 4.1 Model Summary

Model	Unit of Investment	Unit of NOPAT
1	THB Billion	THB Billion
2	% of TA	THB Billion
3	% of TA	% of TA
4	% of TA	% of Operating Capital[2]

For model 2-4, the percentage of total assets is calculate as

$$\frac{Investment\ in\ THB}{Total\ Assets\ in\ THB} x100$$

Thus, the unit is not in decimal place. In other words, value of 55% is represented by value of 55 not 0.55. We do this to make the scale of variables in similar amount. Besides, TA unit is in THB billion.

Then, we use STATA to conduct simple regression, fixed effect regression, random effect regression, and Hausman test. The results and findings are presented in the next chapter. The variables in the model are summarize in table 4.2

[2] Operating Capital = Net Operating Working Capital + Operating Fixed Assets
Net Operating Working Capital = Operating Current Assets – Operating Current Liabilities

Table 4.2 Variables Summary

Variable Code	Variable Name
NOPAT	Net Operating Profit After Tax
AR_TURN	Account Receivable Turnover
AP_TURN	Account Payable Turnover
INV_TURN	Inventory Turnover
TA	Total Assets
CUR_RATIO	Current Ratio
PE_RATIO	Price to Earning Ratio

4.2 Data

Our sample set is Thai corporations listed in The Stock Exchange of Thailand. We started from pick up member of SET100 Index to represent Thai large corporations. However, we exclude financial firms out of our sample because they have different business model and financing decisions. It is not appropriate to include financial firms in the same sample group as other corporations. We also exclude firms with unavailable data, which are mainly in service, transportation, and electricity generating industries, and some newly listed firms as they do not have all factors used in our model. We also exclude those with negative earning in our study period as we cannot compute Price to Earnings ratio. The final sample is:

Table 4.3 Sample Firms

No.	Code	Name	Industry
1	ADVANC	Advance Info Service	S
2	AMATA	Amata Corp	R
3	BANPU	Banpu	M
4	BEC	BEC World	S
5	BIGC	Big C Supercenter	S
6	BH	Bumrungrad Hospital	S
7	CPF	Charoen Pokphand Foods	A
8	CPALL	CP ALL	S
9	DELTA	Delta Electronics Thai	M
10	AP	Asian Property	R
11	HMPRO	Home Product Center	S
12	KH	Bangkok Chain Hospital	S
13	CCET	CalComp Electronics Thailand	M
14	MINT	Minor International	S
15	PTT	PTT PCL.	M
16	SCC	Siam Cement	R
17	MAKRO	Siam Makro	S
18	TUF	Thai Union Frozen Products	M
19	DCC	Dynasty Ceramic	M
20	HEMRAJ	Hemaraj Land and Development	R
21	LPN	LPN Development	R
22	ROBINS	Robinson Department Store	S
23	SAMART	Samart Corp	S
24	SAMTEL	Samart Telecoms	S
25	SC	SC Asset Corp	R
26	SPALI	Supalai	R
27	SVI	SVI	M
28	TVO	Thai Vegetable Oil	A

Source: Bloomberg

We will study the period from June 2005 – September 2010 using quarterly data of financial statements and ratios retrieved from Bloomberg.

The sample categorized by industry is:

Table 4.4 Number of Sample by Industry

Industry	Number
Manufacturing & Industrial	7
Agriculture	2
Service	12
Construction & Real Estate	7

Tax rate used in calculating NOPAT is effective tax rate, which is calculated from tax expense divided by earning before tax in each period. In the period that firm makes loss, effective tax rate is zero as there is no tax expense. Using the effective tax rate allows us to capture firm’s variation in tax rate as firms may pose some tax benefit in some period. Therefore, this tax rate is more appropriate than simply use Thai corporate income tax of 30% because it reflects actual tax expense rate in each specific period.

In our regression, we add quarter dummy variables, Q1 – Q22, as control variables in all of our models. This will separate period specific effect, e.g boom or bust, from relationship among our variables.

CHAPTER V
RESULTS

We have 4 different models for 2 dependent variables, Operating Investment and Non-Operating Investment. That makes total of 8 regression results. However, we also run regression with 3 methods, which are simple regression, fixed effect, and random effect. That makes 24 results. Last, we repeat the regression process for each industry, which consists of Manufacturing & Industrial, Agriculture, Construction & Real Estate, and Service. Therefore, total regression results obtained in our study is 120 results, not including Hausman test results. The suggested model from Hausman test is presented in bold numbers in each table. However, to avoid excessive information, we will only present some key numbers from our results in each model.

In this chapter, we separate result presentation by sample group, which are All Sample, Manufacturing & Industrial, Agriculture, Construction & Real Estate, and Service.

5.1 All Sample

Table 5.1: Operating Investment Model 1

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.566116	0.0480	-0.063494	0.8270	**0.535257**	**0.0380**
AR_TURN	-0.000121	0.7580	0.000009	0.9810	**0.000026**	**0.9470**
AP_TURN	0.026093	0.2030	0.026003	0.4600	**0.024194**	**0.4480**
INV_TURN	-0.000233	0.5640	0.000113	0.8280	**0.000057**	**0.9080**
TA	0.533758	0.0000	0.478081	0.0000	**0.514256**	**0.0000**
CUR_RATIO	0.539218	0.3210	0.081853	0.9300	**0.135252**	**0.8690**
PE_RATIO	-0.063518	0.3860	0.030738	0.7020	**0.009924**	**0.8990**
CONSTANT	3.669614	0.1780	6.800062	0.0140	**4.537883**	**0.1320**
R^2	0.984300					
Adjusted R^2	0.983600					
R^2 within			0.795200		**0.793500**	
R^2 between			0.994400		**0.994300**	
R^2 overall			0.984000		**0.984200**	

From results shown in table 5.1, the suggested model is Random Effect model. We found that, in this model, corporate operating investment in THB amount is highly explained by the size of NOPAT and TA. Overall R-square is very high at 0.98, which indicates that the independent variables can explain the variation in corporate operating investment, the dependent variable, very well. Both NOPAT and total assets have positive coefficients, which are statistically significant at 5% significant level. The other variables are not significantly different from zero. Thus, the model suggests that there is no effect from the other variables except NOPAT and TA.

Results from simple regression and fixed effect also support the conclusion about relationship between corporate operating investment and TA. TA is statistically significant at 5% significant level and has positive coefficient in both models. Adjusted R-square for simple regression and overall R-square for fixed effect are also high at 0.98, which also indicates that the independent variables can explain the variation in corporate operating investment, the dependent variable, very well like the random effect model. Therefore, from the same direction of results in 3 models, we conclude that TA has positive effect on corporate operating investment.

Results from simple regression also support the conclusion about relationship between corporate operating investment and NOPAT. NOPAT is statistically significant at 5% significant level and has positive coefficient in simple regression models, but not in fixed effect model. Therefore, the same direction of results in simple regression support results from random effect models, we conclude that NOPAT also has positive effect on corporate operating investment.

Table 5.2: Non-Operating Investment Model 1

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.058928	0.5600	-0.057904	0.6250	**-0.018106**	**0.8550**
AR_TURN	-0.000142	0.3080	-0.000059	0.7140	**-0.000080**	**0.5960**
AP_TURN	0.010744	0.1390	0.002378	0.8680	**0.006489**	**0.5570**
INV_TURN	-0.000018	0.8990	-0.000056	0.7900	**-0.000035**	**0.8460**
TA	0.023627	0.0000	0.019080	0.0000	**0.022191**	**0.0000**
CUR_RATIO	-0.034389	0.8580	-0.087612	0.8170	**-0.080236**	**0.7750**
PE_RATIO	-0.014523	0.5760	-0.023954	0.4640	**-0.021207**	**0.4760**
CONSTANT	0.573291	0.5530	1.115520	0.3230	**0.808899**	**0.4440**
R^2	0.470200					
Adjusted R^2	0.444900					
R^2 within			0.068900		**0.068200**	
R^2 between			0.826500		**0.828100**	
R^2 overall			0.467300		**0.469400**	

From the results shown in table 5.2, all independent variables except TA are not statistically significant in all models, which are simple regression, fixed effect, and random effect. On the other hand, TA has significant positive in all models. Therefore, we conclude that non-operating investment in THB unit is explained by TA in THB unit. The higher TA leads to higher non-operating investment amount, which is intuitively logical.

Table 5.3: Operating Investment Model 2

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.295828	0.3550	-0.113795	0.6030	**-0.182850**	**0.3750**
AR_TURN	0.000039	0.9290	-0.000094	0.7520	**-0.000076**	**0.7970**
AP_TURN	0.171012	0.0000	0.048111	0.0700	**0.056815**	**0.0280**
INV_TURN	-0.001259	0.0060	0.001158	0.0030	**0.001054**	**0.0060**
TA	-0.007322	0.3210	0.003629	0.6590	**-0.000035**	**0.9960**
CUR_RATIO	5.899958	0.0000	3.748336	0.0000	**3.897893**	**0.0000**
PE_RATIO	-0.198007	0.0160	-0.120901	0.0460	**-0.129476**	**0.0310**
CONSTANT	59.646080	0.0000	64.053760	0.0000	**63.983270**	**0.0000**
R^2	0.291200					
Adjusted R^2	0.257400					
R^2 within			0.159200		**0.158500**	
R^2 between			0.197400		**0.239400**	
R^2 overall			0.183600		**0.213500**	

In this model 2, we modify the unit of investment from THB unit to percentage of total assets instead. Hausman suggests using random effect model. From suggested model, A/P turnover, Inventory turnover, Current ratio, and P/E ratio are significant at 5% significant level. NOPAT and TA are not statistically significant in this model. The same variables are significant in simple regression and fixed effect model as well although A/P turnover is significant at 10% in fixed effect model only. However, the directions of relationship are not the same across all models for Inventory turnover. We see negative coefficient in simple regression, but positive in both fixed effect and random effect models. Therefore, we belief that Inventory turnover has positive relationship between operating investment, as percentage of total assets.

To summarize the findings of results in this table, A/P turnover, Inventory turnover, and Current ratio has positive relationship while P/E ratio has negative relationship with operating investment, in percentage of total assets. It is in line with our expectation that higher Inventory turnover, which lead to higher internal cash flow, will lead to higher investment. The high value of current ratio indicates that firms have high current assets, and lead to more availability of cash for investment.

However, positive relationship between operating investment and A/P turnover is contradicted to our expectation.

R-square in this model 2 is not high as the previous model 1. It is around 20% only. Thus, large part of operating investment in this case is explained by factors outside of our model.

Table 5.4: Non-Operating Investment Model 2

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.069796	0.5820	-0.094148	0.3630	**-0.039007**	**0.6820**
AR_TURN	-0.000390	0.0260	0.000148	0.2910	**0.000145**	**0.2990**
AP_TURN	0.002495	0.7840	0.002783	0.8240	**0.002358**	**0.8440**
INV_TURN	0.000056	0.7560	-0.000062	0.7370	**-0.000034**	**0.8490**
TA	0.000281	0.9230	-0.009744	0.0120	**-0.006036**	**0.0510**
CUR_RATIO	0.614622	0.0110	-1.250635	0.0000	**-1.017623**	**0.0010**
PE_RATIO	0.006658	0.8380	0.011960	0.6760	**0.008852**	**0.7540**
CONSTANT	1.336934	0.2700	5.052566	0.0000	**4.437135**	**0.0000**
R^2	0.032600					
Adjusted R^2	-0.013500					
R^2 within			0.067800		**0.065900**	
R^2 between			0.006500		**0.014100**	
R^2 overall			0.000000		**0.000000**	

In non-operating investment as percentage of total assets, even though some variables are significant at 5% or 10%, the R-square in this model is approximately zero. Therefore, we conclude that non-operating investment has no relationship with independent variables in our models.

Table 5.5: Operating Investment Model 3

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.557715	0.0330	-0.098344	0.5510	**-0.093875**	**0.5680**
AR_TURN	0.000046	0.9160	-0.000097	0.7450	**-0.000076**	**0.7970**
AP_TURN	0.168670	0.0000	0.047024	0.0780	**0.057360**	**0.0270**
INV_TURN	-0.001627	0.0010	0.001178	0.0030	**0.001059**	**0.0060**
TA	-0.013232	0.0000	0.003725	0.6500	**-0.001207**	**0.8630**
CUR_RATIO	5.818536	0.0000	3.774440	0.0000	**3.936174**	**0.0000**
PE_RATIO	-0.178228	0.0290	-0.121117	0.0450	**-0.126978**	**0.0340**
CONSTANT	58.151080	0.0000	64.112710	0.0000	**63.918310**	**0.0000**
R^2	0.295700					
Adjusted R^2	0.262100					
R^2 within			0.159300		**0.158400**	
R^2 between			0.175100		**0.225600**	
R^2 overall			0.168100		**0.203300**	

In model 3, we modify both units of investment and NOPAT from THB unit to percentage of total assets. Table 5.5 shows result of operating investment. We still found the same conclusion as in model 2 for operating investment, which is A/P and Inventory turnover, and Current ration have positive relationship while P/E ratio has negative relationship with operating investment.

Table 5.6: Non-Operating Investment Model 3

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.279884	0.0070	-0.014921	0.8480	**-0.023014**	**0.7670**
AR_TURN	-0.000394	0.0240	0.000148	0.2920	**0.000144**	**0.3030**
AP_TURN	0.003931	0.6640	0.002714	0.8290	**0.002188**	**0.8550**
INV_TURN	0.000219	0.2470	-0.000059	0.7500	**-0.000028**	**0.8780**
TA	-0.001278	0.3150	-0.009404	0.0160	**-0.006201**	**0.0400**
CUR_RATIO	0.663992	0.0060	-1.256158	0.0000	**-0.999280**	**0.0010**
PE_RATIO	0.003177	0.9210	0.014703	0.6070	**0.009340**	**0.7400**
CONSTANT	1.915897	0.1170	4.930960	0.0000	**4.413960**	**0.0000**
R^2	0.044100					
Adjusted R^2	-0.001500					
R^2 within			0.066500		**0.065100**	
R^2 between			0.011200		**0.015900**	
R^2 overall			0.000000		**0.000000**	

In this model 3 for non-operating investment, we found the same conclusion as model 2 that is R-square is about zero. It means that non-operating investment is not explained by independent variables in our model.

Table 5.7: Operating Investment Model 4

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.564271	0.0000	-0.320520	0.0000	**-0.328882**	**0.0000**
AR_TURN	-0.000018	0.9670	-0.000107	0.7110	**-0.000090**	**0.7550**
AP_TURN	0.176345	0.0000	0.046248	0.0740	**0.055808**	**0.0260**
INV_TURN	-0.000691	0.1260	0.001223	0.0010	**0.001127**	**0.0030**
TA	-0.013281	0.0000	0.000650	0.9350	**-0.003234**	**0.6380**
CUR_RATIO	5.878834	0.0000	3.811627	0.0000	**3.959449**	**0.0000**
PE_RATIO	-0.202136	0.0110	-0.141418	0.0160	**-0.147314**	**0.0110**
CONSTANT	61.990710	0.0000	65.588100	0.0000	**65.432650**	**0.0000**
R^2	0.330600					
Adjusted R^2	0.298700					
R^2 within			0.204500		**0.203900**	
R^2 between			0.259200		**0.295900**	
R^2 overall			0.234100		**0.259800**	

In this model 4, we modify investment unit from THB unit to percentage of total assets and modify unit of NOPAT from THB unit to percentage of operating capital.

Most of the relationship remains the same except for NOPAT. Table 5.7 shows that operating investment is significantly explained by NOPAT. However, the coefficient is negative, which is contradicted to our expectation since higher NOPAT leads to higher cash for investment. Hausman suggests random effect model. The suggested random effect model has higher R-square than in model 2 and 3 for operating investment. Thus, we belief that model 4 is most appropriate. In other words, NOPAT as percentage of operating capital and investment as percentage of total assets is appropriate.

Table 5.8: Non-Operating Investment Model 4

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.225752	0.0000	0.148891	0.0000	**0.152887**	**0.0000**
AR_TURN	-0.000368	0.0300	0.000155	0.2570	**0.000152**	**0.2630**
AP_TURN	0.000586	0.9470	0.003831	0.7540	**0.003193**	**0.7840**
INV_TURN	-0.000190	0.2870	-0.000093	0.6050	**-0.000076**	**0.6650**
TA	-0.001236	0.3200	-0.007738	0.0410	**-0.005107**	**0.0800**
CUR_RATIO	0.630409	0.0070	-1.298169	0.0000	**-1.028559**	**0.0010**
PE_RATIO	0.013866	0.6590	0.026799	0.3330	**0.021454**	**0.4310**
CONSTANT	0.251242	0.8320	4.090196	0.0000	**3.541100**	**0.0030**
R^2	0.088300					
Adjusted R^2	0.044800					
R^2 within			0.115400		**0.113700**	
R^2 between			0.003100		**0.002100**	
R^2 overall			0.008100		**0.014300**	

In model 4 for non-operating investment, R-square improves a little, but still very closed to zero. Thus, we conclude the same way that non-operating investment is not explained by independent variables in our model.

To summarize findings in all sample part, we belief that investment as percentage term is more appropriate than in THB unit. Therefore, model 1 is not appropriate in our view.

Regarding operating investment, Model 2-4 give almost the same conclusion that higher A/P turnover, Inventory turnover, and Current ratio lead to higher operating investment, and higher P/E ratio leads to lower operating investment. However, only model 4 gives result that NOPAT, as percentage of operating capital, has negative relationship with operating investment.

Regarding non-operating investment, model 2-4 give that same conclusion that independent variables in our model cannot explained non-operating investment. It may come from the fact that the selected independent variables represent operating performance of the firm, thus, they cannot explain non-operating investment.

In the next part, we separately run model for each industry. The results may differ according to industrial specific characters.

5.2 Manufacturing & Industrial

Table 5.9: Operating Investment Model 1 – Manufacturing & Industrial

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.926767	0.0580	**-1.860341**	**0.0010**	0.926767	0.0560
AR_TURN	0.107842	0.6600	**-0.078166**	**0.8230**	0.107842	0.6590
AP_TURN	0.000688	0.9960	**0.384622**	**0.1860**	0.000688	0.9960
INV_TURN	-1.099470	0.0000	**-2.335896**	**0.0000**	-1.099470	0.0000
TA	0.585041	0.0000	**0.519778**	**0.0000**	0.585041	0.0000
CUR_RATIO	1.997055	0.4700	**2.109351**	**0.6470**	1.997055	0.4690
PE_RATIO	-0.351947	0.3660	**-0.475650**	**0.1640**	-0.351947	0.3640
CONSTANT	11.944430	0.2340	**39.370480**	**0.0010**	11.944430	0.2320
R^2	0.992400					
Adjusted R^2	0.990700					
R^2 within			**0.909600**		0.875600	
R^2 between			**0.998600**		0.999700	
R^2 overall			**0.978400**		0.992400	

Table 5.10: Non-Operating Investment Model 1 – Manufacturing & Industrial

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.113919	0.6320	-0.241061	0.4550	**-0.113919**	**0.6310**
AR_TURN	0.048082	0.6880	-0.005011	0.9810	**0.048082**	**0.6870**
AP_TURN	0.228942	0.0000	0.021943	0.9000	**0.228942**	**0.0000**
INV_TURN	0.059874	0.6370	-0.052993	0.7520	**0.059874**	**0.6360**
TA	0.021064	0.0270	0.027313	0.0130	**0.021064**	**0.0250**
CUR_RATIO	-0.023720	0.9860	1.586761	0.5670	**-0.023720**	**0.9860**
PE_RATIO	-0.267819	0.1600	-0.313805	0.1270	**-0.267819**	**0.1570**
CONSTANT	0.885674	0.8560	2.988126	0.6740	**0.885674**	**0.8560**
R^2	0.542300					
Adjusted R^2	0.439800					
R^2 within			0.190900		**0.171300**	
R^2 between			0.726500		**0.953600**	
R^2 overall			0.443300		**0.542300**	

Table 5.11: Operating Investment Model 2 – Manufacturing & Industrial

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.078320	0.8050	**-0.276777**	**0.1350**	-0.078320	0.8040
AR_TURN	0.775699	0.0000	**-0.388505**	**0.0020**	0.775699	0.0000
AP_TURN	-0.410992	0.0000	**0.056087**	**0.5750**	-0.410992	0.0000
INV_TURN	-0.936289	0.0000	**-0.329102**	**0.0010**	-0.936289	0.0000
TA	0.044701	0.0010	**-0.002233**	**0.7200**	0.044701	0.0000
CUR_RATIO	3.288767	0.0700	**4.186476**	**0.0090**	3.288767	0.0670
PE_RATIO	-0.102436	0.6860	**-0.110647**	**0.3460**	-0.102436	0.6850
CONSTANT	66.471290	0.0000	**65.186010**	**0.0000**	66.471290	0.0000
R^2	0.513500					
Adjusted R^2	0.404500					
R^2 within			0.295900		0.042600	
R^2 between			0.091800		0.762100	
R^2 overall			0.103700		0.513500	

Table 5.12: Non-Operating Investment Model 2 – Manufacturing & Industrial

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.083162	0.5910	-0.113273	0.4780	-0.083162	0.5900
AR_TURN	-0.049111	0.5290	0.222332	0.0340	-0.049111	0.5280
AP_TURN	0.405355	0.0000	0.279274	0.0020	0.405355	0.0000
INV_TURN	0.139418	0.0930	-0.079647	0.3390	0.139418	0.0900
TA	-0.007248	0.2380	0.000227	0.9660	-0.007248	0.2360
CUR_RATIO	-0.064976	0.9410	-3.928173	0.0050	-0.064976	0.9410
PE_RATIO	-0.261555	0.0360	-0.222357	0.0300	-0.261555	0.0340
CONSTANT	2.490578	0.4350	10.793830	0.0030	2.490578	0.4330
R^2	0.528400					
Adjusted R^2	0.422800					
R^2 within			0.238800		0.147400	
R^2 between			0.368000		0.731200	
R^2 overall			0.320300		0.528400	

Table 5.13: Operating Investment Model 3 – Manufacturing & Industrial

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.480130	0.5980	**-1.405682**	**0.0020**	0.480130	0.5970
AR_TURN	0.683169	0.0030	**-0.289554**	**0.0170**	0.683169	0.0030
AP_TURN	-0.391179	0.0000	**0.070641**	**0.4640**	-0.391179	0.0000
INV_TURN	-0.928523	0.0000	**-0.301791**	**0.0010**	-0.928523	0.0000
TA	0.042990	0.0000	**-0.007191**	**0.2440**	0.042990	0.0000
CUR_RATIO	3.214367	0.0760	**5.209520**	**0.0010**	3.214367	0.0740
PE_RATIO	-0.059550	0.8060	**-0.122618**	**0.2710**	-0.059550	0.8060
CONSTANT	65.049200	0.0000	**65.851950**	**0.0000**	65.049200	0.0000
R^2	0.514300					
Adjusted R^2	0.405500					
R^2 within			**0.337600**		0.042700	
R^2 between			**0.046200**		0.759300	
R^2 overall			**0.062200**		0.514300	

Table 5.14: Non-Operating Investment Model 3 – Manufacturing & Industrial

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.168435	0.7050	-0.064680	0.8720	0.168435	0.7040
AR_TURN	-0.086008	0.4390	0.230172	0.0330	-0.086008	0.4370
AP_TURN	0.411976	0.0000	0.285988	0.0010	0.411976	0.0000
INV_TURN	0.142866	0.0860	-0.057423	0.4550	0.142866	0.0840
TA	-0.009086	0.0750	-0.000304	0.9560	-0.009086	0.0720
CUR_RATIO	-0.107671	0.9030	-3.948556	0.0060	-0.107671	0.9020
PE_RATIO	-0.231811	0.0520	-0.205740	0.0400	-0.231811	0.0500
CONSTANT	1.839801	0.5830	10.111250	0.0040	1.839801	0.5820
R^2	0.527900					
Adjusted R^2	0.422100					
R^2 within			0.235700		0.139400	
R^2 between			0.404600		0.736600	
R^2 overall			0.345500		0.527900	

Table 5.15: Operating Investment Model 4 – Manufacturing & Industrial

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.969443	0.0000	-0.261208	0.0080	**-0.969443**	**0.0000**
AR_TURN	1.052606	0.0000	-0.271339	0.0310	**1.052606**	**0.0000**
AP_TURN	-0.286045	0.0000	0.072235	0.4580	**-0.286045**	**0.0000**
INV_TURN	-0.918429	0.0000	-0.295998	0.0010	**-0.918429**	**0.0000**
TA	0.041248	0.0000	-0.001924	0.7520	**0.041248**	**0.0000**
CUR_RATIO	2.959092	0.0730	3.626820	0.0210	**2.959092**	**0.0710**
PE_RATIO	-0.365250	0.1070	-0.151136	0.1920	**-0.365250**	**0.1040**
CONSTANT	73.773390	0.0000	66.330360	0.0000	**73.773390**	**0.0000**
R^2	0.595300					
Adjusted R^2	0.504700					
R^2 within			0.323400		**0.091700**	
R^2 between			0.119700		**0.867200**	
R^2 overall			0.138500		**0.595300**	

Table 5.16: Non-Operating Investment Model 4 – Manufacturing & Industrial

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.677825	0.0000	0.455659	0.0000	0.677825	0.0000
AR_TURN	-0.253708	0.0000	0.037432	0.6970	-0.253708	0.0000
AP_TURN	0.317176	0.0000	0.286944	0.0000	0.317176	0.0000
INV_TURN	0.128722	0.0560	-0.013081	0.8450	0.128722	0.0540
TA	-0.007900	0.0560	-0.002109	0.6540	-0.007900	0.0540
CUR_RATIO	0.124427	0.8610	-3.351842	0.0060	0.124427	0.8610
PE_RATIO	-0.041391	0.6710	-0.049941	0.5760	-0.041391	0.6710
CONSTANT	-2.991181	0.2580	4.568902	0.1370	-2.991181	0.2560
R^2	0.690800					
Adjusted R^2	0.621600					
R^2 within			0.415300		0.347800	
R^2 between			0.606600		0.886200	
R^2 overall			0.541400		0.690800	

Regarding operating investment as percentage of total assets, NOPAT in THB unit does not have significant relationship, but NOPAT as percentage of total assets and operating capital does have significant relationship. Table 5.13 shows that NOPAT as percentage of total assets have negative relationship with operating investment in fixed effect model, the Hausman suggested model. However, the result is not consistent with the other two models, simple regression and random effect models. In table 5.15, NOPAT as percentage of operating capital has significant negative relationship with operating investment as well. The negative sign is consistent among all three models. The relationship in table 5.15 is consistent with all sample case.

A/R turnover has significant relationship with operating investment as percentage of total assets. However, fixed effect model shows negative coefficient in model 2-4 while random effect model shows positive coefficient in model 2-4. In model 2-3, Hausman suggests fixed effect model while it suggests random effect model. Therefore, we cannot conclude the sign of relationship. In all sample case, A/R turnover is not significant in all models

Inventory turnover shows significant negative relationship with operating in all models, both investment in THB unit and as percentage of total assets. This is contradicted to our expectation that higher Inventory turnover should lead to higher operating investment. In all sample case, we belief that Inventory turnover has positive relationship with operating investment. Thus, this industry shows contradict result to all sample case.

Current ratio shows significant positive relationship with operating as percentage of total assets in all models 2-4. This is consistent with results n all sample case and our expectation.

In model 4 only, we found that A/P turnover and TA have significant relationship as shown in table 5.15. In Hausman suggested model, random effect model, A/P turnover has negative while TA has positive coefficient. This is consistent with our expectation. Overall R-square of this model is about 0.60, which is quite high.

Regarding non-operating investment, A/P turnover has significant positive coefficient in model 1-4. In all sample case, there is extremely low R-square in many results, but this industry has acceptable R-square n all results.

P/E ratio has significant negative coefficient in model 2-3, and is not significant in model 4. In addition, model 4 shows 2 more significant independent variables, NOPAT and A/P turnover. NOPAT as percentage of operating capital and A/P turnover have positive coefficient in model 4.

5.3 Agriculture

Table 5.17: Operating Investment Model 1 – Agriculture

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.772124	0.2720	**-0.543948**	**0.4250**	-0.772124	0.2550
AR_TURN	-0.052200	0.7870	**-0.045113**	**0.8070**	-0.052200	0.7830
AP_TURN	-0.006706	0.6380	**0.004472**	**0.7710**	-0.006706	0.6310
INV_TURN	-0.651669	0.5510	**-0.808707**	**0.4420**	-0.651669	0.5420
TA	0.755317	0.0000	**0.639889**	**0.0000**	0.755317	0.0000
CUR_RATIO	1.197508	0.6050	**-0.583054**	**0.8140**	1.197508	0.5970
PE_RATIO	0.022095	0.6750	**0.014332**	**0.7760**	0.022095	0.6690
CONSTANT	5.249675	0.3710	**12.252400**	**0.1010**	5.249675	0.3570
R^2	0.999100					
Adjusted R^2	0.997500					
R^2 within			**0.963800**		0.958800	
R^2 between			**1.000000**		1.000000	
R^2 overall			**0.998600**		0.999100	

Table 5.18: Non-Operating Investment Model 1 – Agriculture

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-1.036115	0.2300	-1.271793	0.1470	**-1.036115**	**0.2110**
AR_TURN	0.047352	0.8410	0.040032	0.8620	**0.047352**	**0.8380**
AP_TURN	-0.027741	0.1250	-0.039287	0.0560	**-0.027741**	**0.1040**
INV_TURN	1.709528	0.2100	1.871730	0.1660	**1.709528**	**0.1910**
TA	0.027261	0.3930	0.146484	0.1490	**0.027261**	**0.3790**
CUR_RATIO	-2.962740	0.3010	-1.123633	0.7180	**-2.962740**	**0.2840**
PE_RATIO	-0.031505	0.6250	-0.023488	0.7100	**-0.031505**	**0.6180**
CONSTANT	-2.857635	0.6870	-10.090610	0.2680	**-2.857635**	**0.6810**
R^2	0.779100					
Adjusted R^2	0.366800					
R^2 within			0.706600		**0.671000**	
R^2 between			1.000000		**1.000000**	
R^2 overall			0.525100		**0.779100**	

Table 5.19: Operating Investment Model 2 – Agriculture

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-1.584170	0.1250	-1.904914	0.0660	**-1.584170**	**0.1040**
AR_TURN	-0.132098	0.6360	-0.142060	0.5960	**-0.132098**	**0.6290**
AP_TURN	0.094662	0.0000	0.078949	0.0030	**0.094662**	**0.0000**
INV_TURN	-1.146819	0.4680	-0.926072	0.5410	**-1.146819**	**0.4560**
TA	-0.014709	0.6930	0.147546	0.2040	**-0.014709**	**0.6870**
CUR_RATIO	0.401177	0.9040	2.904090	0.4220	**0.401177**	**0.9020**
PE_RATIO	-0.044638	0.5570	-0.033727	0.6440	**-0.044638**	**0.5480**
CONSTANT	87.480480	0.0000	77.636840	0.0000	**87.480480**	**0.0000**
R^2	0.947500					
Adjusted R^2	0.849400					
R^2 within			0.871100		**0.849400**	
R^2 between			1.000000		**1.000000**	
R^2 overall			0.001500		**0.947500**	

Table 5.20: Non-Operating Investment Model 2 – Agriculture

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-1.007527	0.2230	-1.239006	0.1390	**-1.007527**	**0.2030**
AR_TURN	0.056864	0.8010	0.049675	0.8220	**0.056864**	**0.7980**
AP_TURN	-0.026478	0.1260	-0.037818	0.0540	**-0.026478**	**0.1050**
INV_TURN	1.703719	0.1930	1.863032	0.1500	**1.703719**	**0.1730**
TA	0.019793	0.5150	0.136892	0.1560	**0.019793**	**0.5050**
CUR_RATIO	-2.845271	0.2990	-1.038928	0.7260	**-2.845271**	**0.2820**
PE_RATIO	-0.032130	0.6020	-0.024255	0.6880	**-0.032130**	**0.5950**
CONSTANT	-2.403112	0.7230	-9.507232	0.2740	**-2.403112**	**0.7180**
R^2	0.733200					
Adjusted R^2	0.235100					
R^2 within			0.693800		**0.654200**	
R^2 between			1.000000		**1.000000**	
R^2 overall			0.412500		**0.733200**	

Table 5.21: Operating Investment Model 3 – Agriculture

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.270469	0.1980	-0.375936	0.0810	**-0.270469**	**0.1780**
AR_TURN	-0.170398	0.5480	-0.184209	0.4940	**-0.170398**	**0.5390**
AP_TURN	0.080361	0.0010	0.059339	0.0170	**0.080361**	**0.0000**
INV_TURN	-1.502104	0.3560	-1.365070	0.3770	**-1.502104**	**0.3410**
TA	-0.059084	0.0460	0.112279	0.3080	**-0.059084**	**0.0300**
CUR_RATIO	0.865712	0.8020	3.932635	0.3060	**0.865712**	**0.7990**
PE_RATIO	0.012241	0.8430	0.034145	0.5700	**0.012241**	**0.8400**
CONSTANT	90.941570	0.0000	80.743830	0.0000	**90.941570**	**0.0000**
R^2	0.944900					
Adjusted R^2	0.842100					
R^2 within			0.867900		**0.842200**	
R^2 between			1.000000		**1.000000**	
R^2 overall			0.035400		**0.944900**	

Table 5.22: Non-Operating Investment Model 3 – Agriculture

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.111186	0.5100	0.067173	0.7090	**0.111186**	**0.5000**
AR_TURN	-0.006476	0.9780	-0.012239	0.9580	**-0.006476**	**0.9770**
AP_TURN	-0.034617	0.0410	-0.043390	0.0400	**-0.034617**	**0.0250**
INV_TURN	1.669945	0.2180	1.727131	0.2100	**1.669945**	**0.1980**
TA	-0.004839	0.8310	0.066674	0.4870	**-0.004839**	**0.8290**
CUR_RATIO	-3.539730	0.2240	-2.259847	0.5000	**-3.539730**	**0.2050**
PE_RATIO	0.024962	0.6230	0.034103	0.5200	**0.024962**	**0.6160**
CONSTANT	-0.572809	0.9330	-4.828513	0.5870	**-0.572809**	**0.9320**
R^2	0.713100					
Adjusted R^2	0.177600					
R^2 within			0.643700		**0.627900**	
R^2 between			1.000000		**1.000000**	
R^2 overall			0.463700		**0.713100**	

Table 5.23: Operating Investment Model 4 – Agriculture

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.269572	0.1430	-0.361286	0.0540	**-0.269572**	**0.1220**
AR_TURN	-0.160533	0.5650	-0.173346	0.5100	**-0.160533**	**0.5560**
AP_TURN	0.079785	0.0010	0.058242	0.0160	**0.079785**	**0.0000**
INV_TURN	-1.494404	0.3500	-1.341887	0.3730	**-1.494404**	**0.3350**
TA	-0.059019	0.0430	0.115631	0.2820	**-0.059019**	**0.0270**
CUR_RATIO	0.968176	0.7760	4.071302	0.2780	**0.968176**	**0.7720**
PE_RATIO	0.007518	0.9020	0.029341	0.6180	**0.007518**	**0.9000**
CONSTANT	90.842540	0.0000	80.408290	0.0000	**90.842540**	**0.0000**
R^2	0.946700					
Adjusted R^2	0.847300					
R^2 within			0.874200		**0.847400**	
R^2 between			1.000000		**1.000000**	
R^2 overall			0.042300		**0.946700**	

Table 5.24: Non-Operating Investment Model 4 – Agriculture

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.075077	0.6160	0.034995	0.8250	**0.075077**	**0.6090**
AR_TURN	-0.004287	0.9850	-0.009887	0.9670	**-0.004287**	**0.9850**
AP_TURN	-0.034577	0.0420	-0.043992	0.0390	**-0.034577**	**0.0260**
INV_TURN	1.643465	0.2270	1.710119	0.2160	**1.643465**	**0.2080**
TA	-0.005312	0.8160	0.071015	0.4600	**-0.005312**	**0.8130**
CUR_RATIO	-3.442923	0.2390	-2.086777	0.5330	**-3.442923**	**0.2200**
PE_RATIO	0.023629	0.6460	0.033166	0.5350	**0.023629**	**0.6390**
CONSTANT	-0.498259	0.9420	-5.058295	0.5710	**-0.498259**	**0.9410**
R^2	0.709500					
Adjusted R^2	0.167200					
R^2 within			0.641300		**0.623300**	
R^2 between			1.000000		**1.000000**	
R^2 overall			0.452400		**0.709500**	

Regarding operating investment, model 2-4, which shows results in case of operating investment as percentage of total assets, show that A/P turnover and TA are significant. A/P turnover is significant in all models 2-4 (table 5.19, 5.21, and 5.23) while TA is significant in almost all models 3-4 except in fixed effect model (table 5.22 and 5.24).

A/P turnover has positive coefficient in all models. This is consistent with result in all sample case, but contradicted to our expectation. TA has negative coefficient in Hausman suggested random effect model in model 3-4, which is not found in all sample case. However, TA's relationship is contradicted to our expectation as well.

Overall R-square of model 2-4 is about 0.94-0.95, which is very high. The model has high explanatory power, so the significant variables are reliable.

Regarding non-operating investment, model 3-4, in table 5.22 and 5.24, show that on A/P turnover is significant with negative coefficient. This is in line with our expectation. In all sample case, R-square is about zero, so we conclude that our independent variables do not explain variation in non-operating investment.

In this industry, R-square of all models regarding non-operating investment is about 0.70-0.71, which is much higher than in all sample case. Thus, relationship found in case of agricultural industry should be reliable.

5.4 Service

Table 5.25: Operating Investment Model 1 – Service

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.237499	0.6920	**0.268898**	**0.6240**	-0.059159	0.9170
AR_TURN	-0.002308	0.2580	**0.000943**	**0.8400**	-0.002753	0.3990
AP_TURN	0.109203	0.5290	**-0.700985**	**0.0080**	-0.481220	0.0330
INV_TURN	0.000145	0.7020	**0.000538**	**0.1660**	0.000444	0.2420
TA	0.557395	0.0000	**1.243906**	**0.0000**	0.609559	0.0000
CUR_RATIO	-0.400735	0.7400	**-0.723300**	**0.6770**	-0.006953	0.9960
PE_RATIO	-0.085862	0.2440	**-0.028105**	**0.7320**	-0.044042	0.5880
CONSTANT	2.210320	0.4580	**-6.265797**	**0.2560**	5.494542	0.1030
R^2	0.865700					
Adjusted R^2	0.849700					
R^2 within			**0.326100**		0.288100	
R^2 between			**0.958400**		0.958000	
R^2 overall			**0.852500**		0.856300	

Table 5.26: Non-Operating Investment Model 1 – Service

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.080856	0.3500	**0.003108**	**0.9630**	0.021223	0.7780
AR_TURN	-0.000688	0.0200	**-0.000067**	**0.9070**	-0.000263	0.5270
AP_TURN	-0.070351	0.0050	**0.021060**	**0.5150**	-0.009920	0.7370
INV_TURN	-0.000077	0.1620	**-0.000089**	**0.0650**	-0.000109	0.0310
TA	0.018182	0.0000	**-0.083378**	**0.0000**	0.010290	0.0250
CUR_RATIO	0.442559	0.0120	**1.083844**	**0.0000**	0.624483	0.0010
PE_RATIO	0.022354	0.0370	**-0.001759**	**0.8620**	0.005292	0.6230
CONSTANT	-0.285122	0.5070	**0.579205**	**0.3940**	-0.730706	0.0970
R^2	0.251600					
Adjusted R^2	0.162400					
R^2 within			**0.284000**		0.167100	
R^2 between			**0.250800**		0.204000	
R^2 overall			**0.067900**		0.182300	

Table 5.27: Operating Investment Model 2 – Service

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.618846	0.5330	0.249523	0.7190	**0.004195**	**0.9950**
AR_TURN	-0.011585	0.0010	-0.001291	0.8280	**-0.004516**	**0.4120**
AP_TURN	1.789626	0.0000	-0.255340	0.4410	**-0.240956**	**0.4460**
INV_TURN	-0.000653	0.2970	0.001262	0.0110	**0.001124**	**0.0220**
TA	-0.187373	0.0000	0.414439	0.0470	**0.014946**	**0.8690**
CUR_RATIO	-3.067972	0.1260	2.150076	0.3290	**1.645196**	**0.4340**
PE_RATIO	-0.261057	0.0330	-0.239005	0.0220	**-0.245362**	**0.0190**
CONSTANT	59.965910	0.0000	57.765130	0.0000	**67.382530**	**0.0000**
R^2	0.333400					
Adjusted R^2	0.254000					
R^2 within			0.181200		**0.165400**	
R^2 between			0.067600		**0.015300**	
R^2 overall			0.018000		**0.064500**	

Table 5.28: Non-Operating Investment Model 2 – Service

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.338738	0.1550	-0.088796	0.6700	**-0.054366**	**0.7950**
AR_TURN	-0.003104	0.0000	0.000889	0.6180	**-0.000837**	**0.5410**
AP_TURN	-0.262783	0.0000	-0.178301	0.0750	**-0.152243**	**0.0860**
INV_TURN	-0.000041	0.7850	-0.000075	0.6140	**-0.000095**	**0.5100**
TA	0.017744	0.0860	-0.173262	0.0060	**-0.004591**	**0.7750**
CUR_RATIO	1.897542	0.0000	2.595636	0.0000	**2.293063**	**0.0000**
PE_RATIO	0.104252	0.0000	0.041910	0.1810	**0.054986**	**0.0750**
CONSTANT	0.062720	0.9580	2.778933	0.1850	**-0.675425**	**0.6170**
R^2	0.285300					
Adjusted R^2	0.200200					
R^2 within			0.173700		**0.140500**	
R^2 between			0.041900		**0.345500**	
R^2 overall			0.034500		**0.226800**	

Table 5.29: Operating Investment Model 3 – Service

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.108864	0.7570	0.258334	0.3090	**0.210842**	**0.4070**
AR_TURN	-0.011776	0.0010	-0.000728	0.9020	**-0.003296**	**0.5540**
AP_TURN	1.797995	0.0000	-0.260863	0.4300	**-0.291137**	**0.3560**
INV_TURN	-0.000684	0.2870	0.001213	0.0140	**0.001114**	**0.0230**
TA	-0.166925	0.0000	0.424465	0.0410	**0.039987**	**0.6860**
CUR_RATIO	-3.091367	0.1240	2.115203	0.3360	**1.699717**	**0.4220**
PE_RATIO	-0.265283	0.0300	-0.231906	0.0270	**-0.238826**	**0.0220**
CONSTANT	59.668470	0.0000	57.113750	0.0000	**66.584660**	**0.0000**
R^2	0.332600					
Adjusted R^2	0.253100					
R^2 within			0.184500		**0.170700**	
R^2 between			0.068200		**0.000400**	
R^2 overall			0.018100		**0.035900**	

Table 5.30: Non-Operating Investment Model 3 – Service

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.086938	0.3030	-0.052250	0.4940	**-0.048586**	**0.5230**
AR_TURN	-0.003002	0.0000	0.000819	0.6460	**-0.000143**	**0.9260**
AP_TURN	-0.262571	0.0000	-0.178125	0.0750	**-0.128643**	**0.1610**
INV_TURN	-0.000014	0.9290	-0.000065	0.6620	**-0.000080**	**0.5840**
TA	0.006596	0.3190	-0.174593	0.0060	**-0.016668**	**0.4170**
CUR_RATIO	1.923672	0.0000	2.601691	0.0000	**2.451374**	**0.0000**
PE_RATIO	0.106658	0.0000	0.040629	0.1950	**0.047981**	**0.1210**
CONSTANT	0.218113	0.8530	2.877926	0.1710	**-0.737516**	**0.6290**
R^2	0.282400					
Adjusted R^2	0.196900					
R^2 within			0.174800		**0.149400**	
R^2 between			0.041800		**0.249800**	
R^2 overall			0.034700		**0.187100**	

Table 5.31: Operating Investment Model 4 – Service

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.402168	0.0010	-0.204644	0.0170	**-0.237155**	**0.0050**
AR_TURN	-0.011847	0.0000	-0.003075	0.5980	**-0.005461**	**0.3170**
AP_TURN	1.947397	0.0000	-0.173581	0.5970	**-0.151629**	**0.6280**
INV_TURN	-0.000433	0.4820	0.001259	0.0100	**0.001155**	**0.0160**
TA	-0.153402	0.0000	0.330548	0.1120	**0.019116**	**0.8420**
CUR_RATIO	-2.568139	0.1910	2.210384	0.3090	**1.846807**	**0.3750**
PE_RATIO	-0.249197	0.0370	-0.246289	0.0170	**-0.250751**	**0.0140**
CONSTANT	58.639530	0.0000	59.819860	0.0000	**67.162880**	**0.0000**
R^2	0.363000					
Adjusted R^2	0.287200					
R^2 within			0.201400		**0.192100**	
R^2 between			0.052500		**0.058100**	
R^2 overall			0.005900		**0.104000**	

Table 5.32: Non-Operating Investment Model 4 – Service

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.021160	0.4720	0.011674	0.6520	**0.020737**	**0.4180**
AR_TURN	-0.002989	0.0000	0.001076	0.5450	**0.000114**	**0.9410**
AP_TURN	-0.284663	0.0000	-0.184795	0.0660	**-0.142500**	**0.1230**
INV_TURN	-0.000059	0.6990	-0.000075	0.6130	**-0.000091**	**0.5270**
TA	0.005751	0.3910	-0.167122	0.0090	**-0.016896**	**0.4180**
CUR_RATIO	1.856580	0.0000	2.590254	0.0000	**2.427431**	**0.0000**
PE_RATIO	0.105536	0.0000	0.042627	0.1740	**0.049526**	**0.1080**
CONSTANT	0.294273	0.8030	2.598008	0.2160	**-0.789401**	**0.6060**
R^2	0.280700					
Adjusted R^2	0.195000					
R^2 within			0.173800		**0.151100**	
R^2 between			0.042500		**0.237800**	
R^2 overall			0.035800		**0.182100**	

In this industry, models explaining operating investment have low R-square. It ranges between 0.035-0.104 only. We found 2 significant independent variables regarding operating investment, which are P/E ratio and Inventory turnover.

P/E ratio is significant for operating investment in all models 2-4 with negative coefficient. This is consistent in results in all sample case, but contradicted to our expectation. Inventory turnover is significant with positive coefficient in fixed and random effect models in model 2-4, but insignificant in simple regression in model 2-4. We belief that there is significant relationship between Inventory turnover and operating investment as percentage of total assets. The relationship of these 2 variables is consistent with results in all sample case.

Regarding non-operating investment, Current ratio is significant with positive coefficient in all models 2-4. R-square is lower at around 0.18-0.23. This is in line with our expectation.

5.5 Construction & Real Estate

Table 5.33: Operating Investment Model 1 - Construction & Real Estate

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-1.579687	0.0000	**-0.500762**	**0.1490**	-1.579687	0.0000
AR_TURN	0.000057	0.6440	**0.000056**	**0.6580**	0.000057	0.6430
AP_TURN	0.022617	0.3250	**-0.028406**	**0.1960**	0.022617	0.3230
INV_TURN	-1.720522	0.0000	**-0.392921**	**0.3740**	-1.720522	0.0000
TA	0.703083	0.0000	**0.817912**	**0.0000**	0.703083	0.0000
CUR_RATIO	0.362881	0.2140	**0.285474**	**0.4300**	0.362881	0.2120
PE_RATIO	0.087748	0.1550	**0.021007**	**0.7890**	0.087748	0.1530
CONSTANT	2.262694	0.2060	**-4.125750**	**0.0440**	2.262694	0.2030
R^2	0.997300					
Adjusted R^2	0.996700					
R^2 within			**0.956700**		0.944500	
R^2 between			**0.999800**		1.000000	
R^2 overall			**0.996100**		0.997300	

Table 5.34: Non-Operating Investment Model 1 - Construction & Real Estate

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.331052	0.0050	0.334057	0.0060	**0.331052**	**0.0050**
AR_TURN	-0.000041	0.3230	0.000019	0.6590	**-0.000041**	**0.3210**
AP_TURN	-0.019541	0.0120	-0.014777	0.0530	**-0.019541**	**0.0110**
INV_TURN	0.256637	0.0680	0.190178	0.2140	**0.256637**	**0.0660**
TA	0.010755	0.0050	0.007684	0.2640	**0.010755**	**0.0050**
CUR_RATIO	-0.211601	0.0310	-0.482830	0.0000	**-0.211601**	**0.0300**
PE_RATIO	-0.040576	0.0500	-0.037618	0.1670	**-0.040576**	**0.0480**
CONSTANT	2.234637	0.0000	3.186896	0.0000	**2.234637**	**0.0000**
R^2	0.829100					
Adjusted R^2	0.790800					
R^2 within			0.301900		**0.258000**	
R^2 between			0.926500		**0.959000**	
R^2 overall			0.810200		**0.829100**	

Table 5.35: Operating Investment Model 2 - Construction & Real Estate

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.891419	0.3080	-0.838983	0.3330	-0.891419	0.3060
AR_TURN	0.000077	0.8020	-0.000029	0.9270	0.000077	0.8020
AP_TURN	0.113332	0.0490	0.033566	0.5410	0.113332	0.0470
INV_TURN	-6.019923	0.0000	-3.007368	0.0070	-6.019923	0.0000
TA	0.100939	0.0010	0.106827	0.0330	0.100939	0.0000
CUR_RATIO	1.863273	0.0110	3.948294	0.0000	1.863273	0.0100
PE_RATIO	0.327112	0.0340	-0.018388	0.9260	0.327112	0.0320
CONSTANT	77.977720	0.0000	71.443440	0.0000	77.977720	0.0000
R^2	0.526100					
Adjusted R^2	0.420000					
R^2 within			0.409100		0.343200	
R^2 between			0.033200		0.807800	
R^2 overall			0.232900		0.526100	

Table 5.36: Non-Operating Investment Model 2 - Construction & Real Estate

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.267121	0.6840	0.189578	0.6940	-0.267121	0.6830
AR_TURN	-0.000578	0.0140	0.000113	0.5210	-0.000578	0.0120
AP_TURN	-0.039430	0.3590	-0.014836	0.6280	-0.039430	0.3570
INV_TURN	1.252892	0.1100	1.177709	0.0580	1.252892	0.1080
TA	-0.035457	0.0970	-0.030614	0.2710	-0.035457	0.0940
CUR_RATIO	-0.771576	0.1580	-1.812292	0.0000	-0.771576	0.1560
PE_RATIO	-0.298438	0.0100	-0.143290	0.1930	-0.298438	0.0090
CONSTANT	8.202678	0.0150	9.040035	0.0020	8.202678	0.0140
R^2	0.217700					
Adjusted R^2	0.042500					
R^2 within			0.300300		0.184300	
R^2 between			0.001600		0.312400	
R^2 overall			0.086000		0.217700	

Table 5.37: Operating Investment Model 3 - Construction & Real Estate

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.338403	0.5470	-0.795666	0.1590	-0.338403	0.5460
AR_TURN	0.000085	0.7840	-0.000032	0.9190	0.000085	0.7830
AP_TURN	0.116771	0.0430	0.027462	0.6140	0.116771	0.0410
INV_TURN	-6.072763	0.0000	-2.865618	0.0100	-6.072763	0.0000
TA	0.083141	0.0010	0.108469	0.0290	0.083141	0.0000
CUR_RATIO	1.852882	0.0130	4.092682	0.0000	1.852882	0.0110
PE_RATIO	0.326149	0.0370	-0.083929	0.6790	0.326149	0.0350
CONSTANT	78.752210	0.0000	72.576650	0.0000	78.752210	0.0000
R^2	0.523500					
Adjusted R^2	0.416800					
R^2 within			0.414300		0.336300	
R^2 between			0.044100		0.811900	
R^2 overall			0.096300		0.523500	

Table 5.38: Non-Operating Investment Model 3 - Construction & Real Estate

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-1.485716	0.0000	0.062093	0.8440	**-1.485716**	**0.0000**
AR_TURN	-0.000497	0.0260	0.000112	0.5260	**-0.000497**	**0.0240**
AP_TURN	-0.035275	0.3870	-0.013681	0.6540	**-0.035275**	**0.3850**
INV_TURN	1.353042	0.0690	1.146855	0.0630	**1.353042**	**0.0670**
TA	-0.046567	0.0060	-0.031870	0.2480	**-0.046567**	**0.0050**
CUR_RATIO	-1.062566	0.0430	-1.826711	0.0000	**-1.062566**	**0.0410**
PE_RATIO	-0.363360	0.0010	-0.139397	0.2210	**-0.363360**	**0.0010**
CONSTANT	13.561590	0.0000	9.171268	0.0020	**13.561590**	**0.0000**
R^2	0.295000					
Adjusted R^2	0.137100					
R^2 within			0.299600		**0.158600**	
R^2 between			0.000100		**0.620000**	
R^2 overall			0.102600		**0.295000**	

Table 5.39: Operating Investment Model 4 - Construction & Real Estate

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	-0.961218	0.0000	-1.017586	0.0000	**-0.961218**	**0.0000**
AR_TURN	0.000012	0.9660	-0.000103	0.7210	**0.000012**	**0.9660**
AP_TURN	0.130167	0.0180	0.046027	0.3620	**0.130167**	**0.0160**
INV_TURN	-5.574434	0.0000	-2.578345	0.0120	**-5.574434**	**0.0000**
TA	0.068715	0.0030	0.081492	0.0760	**0.068715**	**0.0020**
CUR_RATIO	1.316572	0.0630	3.638656	0.0000	**1.316572**	**0.0610**
PE_RATIO	0.179004	0.2360	-0.244485	0.1940	**0.179004**	**0.2330**
CONSTANT	83.666810	0.0000	77.080890	0.0000	**83.666810**	**0.0000**
R^2	0.573900					
Adjusted R^2	0.478500					
R^2 within			0.500200		**0.419500**	
R^2 between			0.009300		**0.811200**	
R^2 overall			0.244300		**0.573900**	

Table 5.40: Non-Operating Investment Model 4 - Construction & Real Estate

Variable	Simple Reg. Coefficient	p-value	Fixed Effect Coefficient	p-value	Random Effect Coefficient	p-value
NOPAT	0.546911	0.0050	0.686510	0.0000	0.546911	0.0040
AR_TURN	-0.000551	0.0150	0.000168	0.2760	-0.000551	0.0140
AP_TURN	-0.046685	0.2630	-0.025300	0.3450	-0.046685	0.2610
INV_TURN	0.928892	0.2230	0.948302	0.0790	0.928892	0.2210
TA	-0.031356	0.0710	-0.010099	0.6770	-0.031356	0.0680
CUR_RATIO	-0.408413	0.4490	-1.593841	0.0000	-0.408413	0.4480
PE_RATIO	-0.201280	0.0830	0.012953	0.8960	-0.201280	0.0810
CONSTANT	4.549811	0.1860	4.570453	0.0690	4.549811	0.1840
R^2	0.265800					
Adjusted R^2	0.101400					
R^2 within			0.465300		0.312700	
R^2 between			0.020300		0.279700	
R^2 overall			0.087400		0.265800	

From results in table 5.35, 5.37, and 5.39, the common independent variables that are significant in most models 2-4 are A/P turnover, Inventory turnover, and TA. A/P turnover has positive coefficient and Inventory turnover has negative coefficient. Both of them are contradicted to our expectation, but A/P turnover is consistent with result in all sample case. TA has positive coefficient, which is in line with our expectation.

From results in table 5.36, 5.38, and 5.40, the common significant independent variable is A/R turnover only. It has negative coefficient, which is contradicted to our expectation.

5.6 Summary of Results

From regression results in all sample case and each industry, we summarize the relationship between each independent variables and operating investment as a percentage of total assets in table 5.41. The relationship between each independent variables and non-operating investment as a percentage of total assets is presented in table 5.42.

The relationship presented in table 5.41 and 5.42 come from our conclusions about each variable explained previously. Since we have 3 models for investment as percentage of total assets, the conclusion about each variable's relationship may differ among the 3 models. Most of the results show consistent relationship across models. However, in the case that they are not consistent, we pick the result from Haussman suggested model.

Table 5.41: Summary of Relationship with Operating Investment

Variable	All Sample	Manufacturing & Industrial	Agriculture	Service	Construction & Real Estate
NOPAT	None	-	None	None	None
AR_TURN	None	Unknown	None	None	None
AP_TURN	+	None	+	None	+
INV_TURN	+	-	None	+	-
TA	None	None	-	None	+
CUR_RATIO	+	+	None	None	+
PE_RATIO	-	None	None	-	None

There is unknown relationship in case of A/R turnover in Manufacturing & Industrial because there is significant relationship, but we have difference in direction. We cannot make conclusion on the direction of relationship, thus, we present the result that there is significant relationship with unknown direction.

Table 5.42: Summary of Relationship with Non-Operating Investment

Variable	All Sample	Manufacturing & Industrial	Agriculture	Service	Construction & Real Estate
NOPAT	None	None	None	None	None
AR_TURN	None	None	None	None	-
AP_TURN	None	+	-	None	None
INV_TURN	None	None	None	None	None
TA	None	None	None	None	None
CUR_RATIO	None	None	None	+	-
PE_RATIO	None	-	None	None	-

Regarding All Sample case, none of the independent variable has significant relationship. This occurs because we have extremely low R-square in all models explaining non-operating investment. Even though some variables show significant p-value, we cannot conclude that they have significant relationship.

CHAPTER VI
CONCLUSION

We have presented all regression results in the previous chapter, Chapter 5 Results. At the end of Chapter 5, we have presented summary tables. In this chapter, we will discuss about the reasons or theory explaining these results.

Regarding operating investment, A/R turnover has significant relationship, but we are unable to make conclusion about the direction. A/P turnover has positive relationship in All Sample, Agriculture, and Construction & Real Estate. Inventory turnover has positive relationship in All Sample and Service while having negative relationship in Manufacturing & Industrial and Construction & Real Estate. Total Assets has positive relationship in Construction & Real Estate while having negative relationship in Agriculture. Current ratio has positive relationship in All Sample and Manufacturing & Industrial. Lastly, Price to Earnings ratio has negative relationship in All Sample and Service.

Regarding non-operating investment, A/R turnover has negative relationship in Construction & Real Estate. A/P turnover has positive relationship in Manufacturing & Industrial while having negative relationship in Agriculture. Current ratio has positive relationship in Service. Lastly, Price to Earnings ratio has negative relationship in Manufacturing & Industrial.

For both operating and non-operating investment, those independent variables not mentioned in the above paragraph do not have significant relationship.

We will be discussing the reasons explaining relationship for each independent variable.

NOPAT does not have significant relationship with both operating and non-operating investment. This is contradicted to our expectation base on pecking order theory that firms use internal cash flow to finance investment first, so higher NOPAT should lead to higher investment. However, since our sample consist of SET100 members, which are Thai large corporations. They can easily access to bank borrowing or debt securities issuance, even stock issuance as well. They do not need to rely heavily on internal cash flow to finance their investment. Therefore, NOPAT does not show significant relationship in all cases.

Regarding A/R turnover, there is unknown significant relationship with operating investment in case of Manufacturing & Industrial. The difference in business models could explain this. As Manufacturing & Industrial sell goods and much of it is credit sales. A/R makes up a significant part of their current assets while other industries e.g. Service may have relatively insignificant A/R compare to Manufacturing & Industrial. Thus, A/R turnover does not have significant impact on other industries' operating investment. For non-operating investment, A/R turnover has negative relationship in Construction & Real Estate. In this industry, operating investment is large, high A/R turnover may signal high demand for their products and the need for more investment. If that is the case, cash invested in non-operating investment may need to be transferred to operating investment. Therefore, it explains negative relationship between A/R turnover and non-operating investment.

A/P turnover mostly illustrates positive relationship with investment. This is contradicted to our expectation. However, that is because we view A/P turnover as a source of funds. In practice, high A/P turnover may signal that firms have active transactions with their suppliers as well. If firms' business is in good condition, they can have high investment along with high A/P turnover. Besides, there is cash discount in common business practice, which encourages firms with good financial condition to pay their account payable before deadline.

Inventory turnover has positive relationship with operating investment in All Sample and Service, but negative for Manufacturing & Industrial and Construction & Real Estate. The positive relationship is in line with our previous expectation because higher Inventory turnover generates more internal cash flow to the firm. According to pecking order theory, firm use their internal cash flow to finance investment first. Therefore, higher internal cash flow should lead to more investment. For the negative relationship, there may be mismatching between measurement period of Inventory turnover and investment because in these 2 industries, investment projects cannot be done quickly. It needs much consideration before making investment. That may cause contradicting results.

Total Assets has significant relationship with operating investment in 2 industries, negative in Agriculture, and positive in Construction & Real Estate. An explanation could be that with Agricultural business has more limited investment opportunities because it involves investing in large piece of farmlands. Therefore, larger TA tends to decrease the investment as a percentage of TA because operating investment cannot grow as fast as Total Assets. For Construction & Real Estate, the positive relationship is in line with our expectation. The reason explaining why we only see this relationship in Construction & Real Estate industry is that when compare to others, this industry has more economies of scale. Because machinery and equipments are used in many construction projects, smaller firms who do not have many projects may choose to rent or outsource those parts instead of buying the equipments themselves.

Current ratio has significant with operating investment in All Sample and Manufacturing & Industrial, and with non-operating investment in Service. This is in line with our expectation that higher Current ratio, which means higher net liquid assets, should lead to higher investment.

Price to Earnings ratio has negative relationship with operating investment in All Sample and Service and with non-operating investment in Manufacturing & Industrial. This is contradict to our expectation that higher P/E ratio should lead to higher investment because firms have opportunity to raise fund through equity issuance at higher price. There are 2 major explanations for this. Firstly, from pecking order theory, firm will use equity financing as a last resort of financing. Secondly, Thai corporations do not usually issue equity. They rely more heavily on debt financing and internal cash flow. Therefore, P/E ratio may not have meaningful implication on Thai corporate investment.

Regarding non-operating investment, the investment decision mainly depends on firm’s strategic policy. For example, when firms want to take control or secure resource, they may take over the targeted firms. As a result, they have more non-operating investment. Therefore, we are not surprised that our independent variables cannot explain non-operating investment.

In conclusion, we found some empirical results consistent with theoretical concepts while others are not. Also many variables do not illustrate significant relationship. Overall, important finding is that A/P turnover, Inventory turnover, and Current ratio have positive relationship with operating investment while none of variable in our model explains non-operating investment.

We review share holding structure of our sample firms and found that almost all firms have significant major shareholders. Only 2 firms out of 28 do not have significant major shareholders. Most of the firms have major shareholders holding more than 20% of outstanding shares. These major shareholders may have significant influence on firms' investment decision as well. However, we used fixed effect model in our test as well, so it could capture effect on firms' specific characteristic occurred from major shareholders.

Further study should focus more in broader sample, e.g. in other countries or more sample size, as well as in more details of each industry as they have different business model.

BIBLIOGRAPHY

1 Agrawal, A., & Mandelker, G. N. (1987). Managerial Incentives and Corporate Investment and Financing Decisions. The Journal of Finance , 42 (4), 823-837.

2 Altman, E. I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance , 23* (4), 589-609.

3 Boyle, G. W., & Guthrie, G. A. (2003). Investment, Uncertainty, and Liquidity. The Journal of Finance , 58 (5), 2143–2166.

4 Brealey, R. A., Myers, S. C., & Marcus, A. J. (2006). Corporate Finance (8 ed.). New York: McGraw-Hill/Irwin.

5 Carlson, M., Fisher, A., & Giammarino, R. (2004). Corporate Investment and Asset Price Dynamics: Implications for the Cross-Section of Returns. The Journal of Finance , 59 (6), 2577–2603.

6 Central Intelligence Agency. (2010). THE WORLD FACTBOOK. Retrieved November 15, 2010, from www.cia.org.

7 Chensavasdijai, V. (1999). An Empirical Analysis of Corporate Investment Behaviour and Financing Patterns in Thailand. Oxford, United Kingdom: University of Oxford

8 Cleary, S. (1999). The Relationship between Firm Investment and Financial Status. The Journal of Finance , 54 (2), 673-692.

9 Fazzari, S. M., Hubbard, R. G., & Petersen, B. C. (2000). Investment-Cash Flow Sensitivities are Useful: A Comment on Kaplan and Zingales. The Quarterly Journal of Economics , 115 (2), 695-705

10 Fazzari, S. M., Hubbard, R. G., Petersen, B. C., Blinder, A. S., & Poterba, J. M. (1988). Financing Constraints and Corporate Investment. Brookings Papers on Economic Activity , 1988 (1), 141-206.

11 Fazzari, S., Hubbard, R. G., & Petersen, B. (1988). Investment, Financing Decisions, and Tax Policy. *The American Economic Review , 78* (2), 200-205.

12 Hoshi, T., Kashyap, A., & Scharfstein, D. (1991). Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups. The Quarterly Journal of Economics , 106 (1), 33-60.

13 Hovakimian, G., & Titman, S. (2003). Corporate Investment with Financial Constraints: Sensitivity of Investment to Funds from Voluntary Asset Sales. National Bureau of Economic Research Working Papers Series, Working Papers 9432.

14 Kaplan, S. N., & Zingales, L. (1997). Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints. The Quarterly Journal of Economics , 112 (1), 169-215.

15 Kaplan, S. N., & Zingales, L. (2000). Investment-Cash Flow Sensitivities are not Valid Measures of Financing Constraints. The Quarterly Journal of Economics , 115 (2), 707-712.

16 Malmendier, U., & Tate, G. (2005). CEO Overconfidence and Corporate Investment. The Journal of Finance , 60 (6), 2661-2700.

17 Whited, T. M. (1992). Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data. The Journal of Finance , 47 (4), 1425-1460.

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