INFLUENCERS OF CAPITAL ALLOCATION

CASE: VIETNAMESE TECHNOLOGY INDUSTRY FROM 2016 TO 2019

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Abstract

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Abstract

The optimal capital allocation changes according to significant factors that are exclusive to a certain firm or industry. Besides, it varies in line with exterior factors, for example, economic health, culture, religion etc. Along these lines, instead of finding an exact optimal ratio, scholars prefer to do research on factors that affect decisions on the allocation development. From investigations on their interference to capital, firms' decisions and risk management are better assessed.

The aim of this thesis was to scrutinize the significance in connections of particular factors: tangibility, firm profitability, liquidity, and size to decisions of public corporates on capital allocation within Vietnamese technology sector, limited to companies on stock market, from 2016 to 2019. From that, the author indicated current issues of capital allocation in the industry, then, proposed recommendations.

The theoretical framework covered ideas of capital structure: concepts, including optimal capital structure, WACC, risk, leverage, financial distress, taxation, agency cost, etc.; theorem with respect to capital allocation; and factors determining capital allocation decision: firm size, liquidity, profitability, etc.

In the thesis, capital allocation theories were reviewed and tested if they were applicable to Vietnamese technology industry. Therefore, deductive was an appropriate approach, with the help of quantitative method.

The empirical research's database was in panel data, which is both time-series and cross-sectional. The data was retrieved from public annual reports. Meanwhile, literature review was based on textbooks and journals.

On the one hand, the findings confirmed that liquidity and tangibility were in positive correlation with short-term leverage, while firm size was in negative one. On the other hand, with long-term leverage, there was no valid correlation.

Keywords

Corporate Finance, Capital Allocation, Vietnam, Technology

CONTENTS

LIST OF ABBREVIATIONS

MM	Modigliani and Miller
RQ	Research Question
SQ	Sub-question
WACC	Weighted Average Cost of Capital
LTD	Long-term Debt
STD	Short-term debt
FCF	Free cash flow
ROIC	Return on invested capital
DOL	Degree of Operating Leverage
DFL	Degree of Financial Leverage
DTL	Degree of Total Leverage
VND	Vietnam Dong
EBIT	Earnings before interests and taxes
NPV	Net Present Value
OEM	Original Equipment Manufacturer

1 INTRODUCTION

1.1 Research background

In finance, capital allocation mirrors a proportion between sources of financing, which are mainly equity and debt, employed by a firm. Deciding an ideal capital structure is crucial, since it helps firms limit their weighted average cost of capital (WACC), then augments their intrinsic value (Brigham & Erhardt 2011, 600). That is the reason why capital structure plays a key role in corporate finance (Ahmed & Hla 2018, 2).

An optimal capital allocation changes according to significant factors that are exclusive to a certain firm or industry. Besides, it varies in line with exterior factors, for example, economic health, culture, religion etc. Along these lines, instead of finding an exact optimal ratio, scholars prefer to do research on factors that affect decisions on structure development. From investigations on those determinants and their interference to capital, firms' decisions and risk management are better assessed.

Despite playing a vital role in corporate finance, capital allocation is not adequately studied in emerging countries (Ahmed & Hla 2018, 2). In Vietnam, a transitional economy, there are not a great deal of research regarding capital structure (Vu, Le & Nguyen 2019, 171). The fundamental explanation is that enterprise privatization has just been strongly pushed by Vietnamese government since 2018, which attracted a tremendous measure of domestic and foreign public investment (Forbes 2018). In this manner, it raises the requirement of sensible capital structure to attract investments and use it viably. If capital structures are erroneously identified, there could be financial distress or even bankruptcy due to inability of paying agency cost or debt interest.

That requirement is even more demanding in technology industry since this is anything but a traditional industry in Vietnam, hence, there are deficiencies in the analysis of capital structure's elements right now (Oxford Business Group 2019).

Understanding that, the thesis is meant to ease the information shortage. Its primary purpose is to recognize and access determinants that affect capital structure decisions of Vietnamese technology enterprises. From that, problems with regards to the field are disclosed and solutions are proposed.

The thesis will inherit previous research along the similar lines. There are already plenty of theories concerning capital allocation: Modigliani and Miller (MM) theory, pecking order hypothesis, trade-off theory, and so forth. Although those theories might conflict in

components' prioritizing order, they are constructed based on assumptions inherited from one another.

Regarding empirical research, in developed countries are there several significant articles, for example: Huang and Song (2006), Booth (2009), Chen (2003), etc. In Vietnam, there are a couple of papers from Tran (2008) or Le (2010), for example. However, those studies are not exclusive to technology industry in Vietnam. Hence, delving into specific and unique patterns of the industry is a prerequisite for the thesis.

1.2 Thesis objectives, research questions and limitations

Thesis objectives

A research goal discusses study intents (Cooper and Schindler 2008, 82). It is the key term that is in guides and determines the power of a study. In other words, it can state how the outcome of a research is applied. (Farrugia et al. 2010.)

The object of this thesis is to evaluate aspects that impact capital allocation decisions of technology firms in Vietnam. From that, the author would provide several suggestions to corporations, as well as future researchers on the same topic.

Research questions

A research objective is always made into a pyramid of research question (RQ) and sub-questions (SQ). This step enables authors to clarify a research goal, to guide a research process, and to bar those from being overemphasized. (Saunders, Lewis & Thornhill 2016, 57)

In the thesis, the pyramid is framed as below:

RQ: What are variables that shape technology firms' decisions on capital allocation in Vietnam?

- SQ1: What are ideas of capital allocation?
- SQ2: What are potential features decisive to capital allocation?
- SQ3: How do those factors determine decisions of technology firms in Vietnam about capital allocation?

Scope and limits

Firstly, the thesis is limited to Vietnamese technology industry, which is fair since Vietnam applies a distinguished accounting standard. Besides, technology industry in Vietnam is still in an inchoate stage, at which there is no significant predominant in the market.

Therefore, it is reasonable to limit the thesis to the scope of public enterprises to guarantee synchronization and cognizance among observations.

Secondly, since this research requires a managerial solution, only financial data, which is controllable, is considered and broke down. It implies that other uncontrollable determinants, for example, external components, are avoided from the analysis. Moreover, to ensure credibility, only published firms are included, since their public data is entirely audited, hence more reliable than interior information.

Thirdly, there might be incoherence in adopting determinant's measurements with other papers on the same topic. It is because there is no universal proxy for each determinant studied. For example, while firm size could be measured with three distinguished proxies, most of the similar papers use different ones without any reason. Therefore, if the thesis's result is used in any comparison, the consistency should be counted.

1.3 Theoretical Framework

A theoretical framework includes basic terms that describe research questions and objectives (Cooper and Schindler 2008, 76). In practice, they are often retrieved from research questions with the aim of simplifying and limiting term of research, spontaneously searching tertiary literature (Syracuse University Libraries 2017).

Table 1 describes the theoretical framework of the thesis.

Table 1 Theoretical framework

What are variables that shape technology firms' decisions on capital allocation in Vietnam?		
Sub-question	**Theory content**	**Content location**
What are ideas of capital structure?	Capital structure concepts and definitions	Chapter 2
	Capital structure theorem	Chapter 3
What are potential features decisive to capital allocation?	Capital structure factors	Chapter 4

Chapter 2 and Chapter 3 answer SQ1 regarding ideas of capital structure:

- In Chapter 2, all concepts and definitions needed to comprehend the research are identified and explained. They are optimal capital structure, WACC, risk, leverage, financial distress, taxation, agency cost, etc.
- In Chapter 3, all theorem with respect to capital allocation are introduced.

To answer SQ2, the author discusses several interior factors that influence capital structure in Chapter 4, based on previous papers in the same field.

1.4 Research methodology and data collection

After addressing research questions, researchers will devise a general plan to answer them, which is called research design (Cooper and Schindler 2008, 159).

Here the author follows research 'onion' to design a plan. The onion contains of three layers: research approach, research methodology, and data collection.

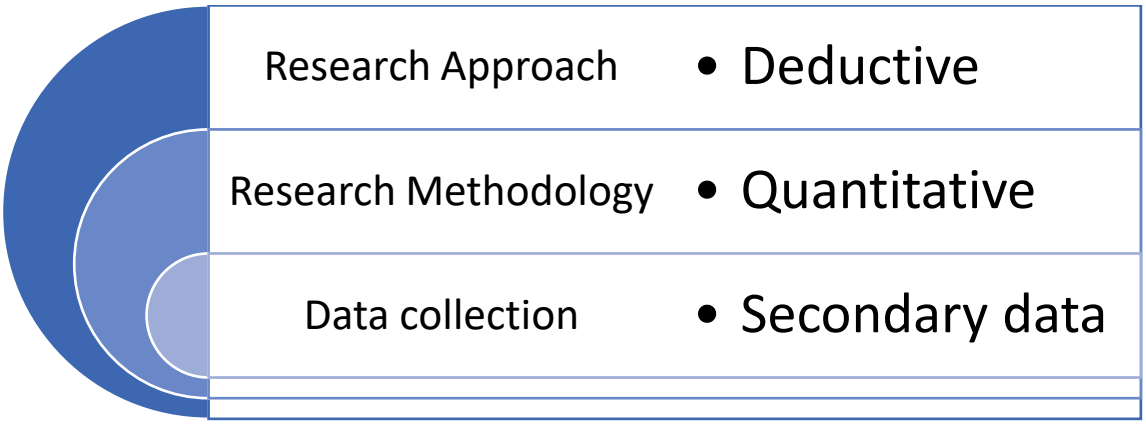

Figure 1 Research design

Research approach: Deductive

Research approaches are frequently divided into three categories: inductive, deductive, and abductive. In deductive approach, hypotheses and theories are developed and finally tested by researchers. While in inductive approach, data is collected first and from that researchers develop theories. (Saunders, Lewis and Thornhill 2016, 147). Abductive

approach is devoted to an explanation of abnormality by logicalizing fallacious phenomena (Dudovskiy 2017).

In the thesis, capital structure theories are reviewed and tested if they are applicable to Vietnamese technology industry. Therefore, a deductive approach is appropriate. Furthermore, the approach is likewise suitable with other factors, such as time frame, risk assessment, and audiences (Saunders, Lewis and Thornhill 2016, 148).

Research methodology: Quantitative

Research methodology refers to data gathering practices and analysis techniques. There are two primary frameworks: quantitative and qualitative. The fundamental distinction between them is data type used. In quantitative research, data collected is numerical. Meanwhile, in qualitative one, the data is non-numeric. Qualitative data can be either words, pictures, or video clips. (Saunders, Lewis and Thornhill 2016, 165.)

Since this research's nature is to analyze financial data, which is numerical, a quantitative framework is most applicable. Also, as deductive reasoning is all about testing hypothesis, it is mostly combined with quantitative methods (Saunders, Lewis and Thornhill 2016, 166).

Data collection: Secondary data

The last step of the thesis plan is data gathering. During this step, data is collected and categorized. Although there are sufficient techniques for data classification, there are two distinct categories to track the roots of the materials: primary and secondary data. (Allen and Cervo 2015.)

Primary data are obtained at hand by researchers themselves. It is accumulated through personal inspections, questionnaires, semi-structured, in-depth and group interview, etc. (Saunders, Lewis and Thornhill 2016, 58.) As opposed to primary data, secondary data is retrieved from other papers for other purposes. Despite that, it still can answer authors' research questions if it is further analyzed (Saunders, Lewis and Thornhill 2016, 316). It can be available as files collected via the Internet, or files on CD-ROM or DVD (Hox and Boeijie 2005, 597).

The author uses secondary materials as sources of theories and empirical research input. Secondary information is accumulated from textbooks, papers, reviews, journals, and online media to support literature review. Meanwhile, working as empirical research inputs, financial calculations are based on company annual reports, financial statements.

1.5 Thesis structure

The following figure contains a thesis structure.

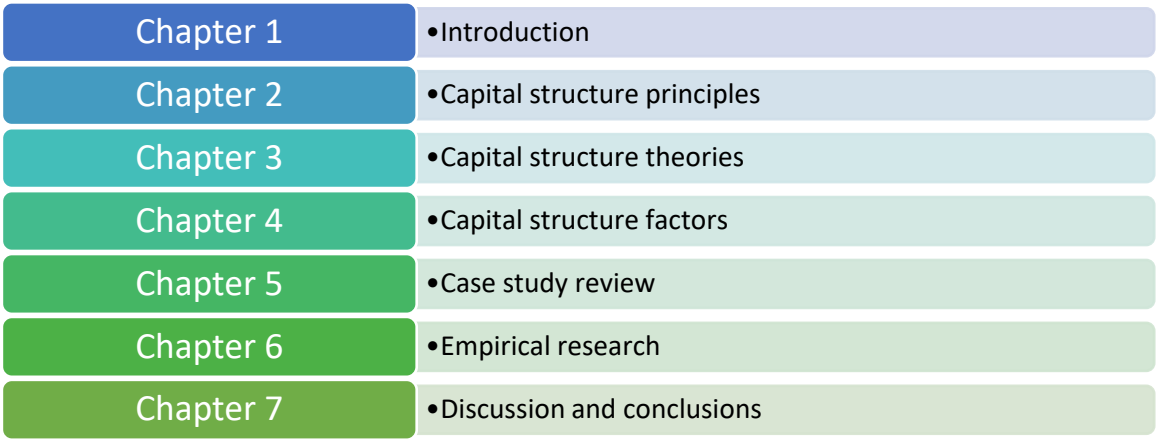

Figure 2 Thesis structure

Chapter 1 lays out the fundamental ideas of this thesis, including background, goals, research questions, purview and limitations, methodology, data gathering, etc.

Chapter 2 and Chapter 3 discuss capital structure theories. All principles regarding capital allocation are displayed in Chapter 2, while Chapter 3 is committed to theories related to the field.

Chapter 4 records potential factors that determine capital allocation based on applied theories and past discoveries.

Chapter 5 and Chapter 6 check the legitimacy of factors, which determine capital allocation decisions in Vietnamese technology industry. In Chapter 5, there is a market research that identifies highlights of technology industry in Vietnam. It also provides a glimpse of external elements that influence capital structure decisions. Then, Chapter 6 is spared to check the validity of determinants that listed previously.

Chapter 7 is the study conclusion. There, the writer crafts main arguments built on findings, which are realized in the empirical research in Chapter 6 (Haider 2015, 60). The research questions and the knowledge gap that are discussed in Chapter 1 are answered and filled in this chapter.

2 CAPITAL STRUCTURE PRINCIPLES

2.1 Optimal capital structure

Capital allocation alludes to a blend of financing sources: debt, common and preferred stock. Firms should calculate the efficiencies of capital raised from either bank loan, stock, bond, or retained earnings, by which would an appropriate capital ratio between financing be identified. The ratio is known as an optimal capital structure, which amplifies a stock's intrinsic value to the max (Brigham & Houston 2019, 476).

Capital valuation methods are under discussion, specifically, on whether using market or book value to calculate equity. Most financial scholars concur that market values are more appropriate than book ones. Even so, since stock prices often fluctuate in an imperfect world, there is no exact optimal structure identified. Rather, a range is targeted by firms. (Brigham & Houston 2019, 477).

Volatile market value, or broadly state, market actions are additionally responsible for capital structure changes from time to time. There could be changes in either debt or equity value. For instance, either could drifting in interest rate or firms' default risk alter debt's market value. (Brigham & Houston 2019, 478).

Moreover, capital structure change could be a deliberate option when firms cannot accomplish their objectives. They may volunteer to raise fund to advance toward the preset optimum (Brigham & Houston 2019, 478). However, that rebalancing incentive is weak, according to Harry DeAngelo (2016, 38). Instead of having a fixed target, companies aim for a zone, over which leverage is indifferent.

Statistically, capital structure could be expressed as:

$$total\ debt\ ratio = \frac{total\ debt}{total\ assets}$$

In the equation above, total debt already includes short-term (STD) and long-term debt (LTD). Therefore, the following equations could be concluded from the previous ratio:

$$long - term\ debt\ ratio = \frac{non - current\ liabilities}{total\ assets}$$

$$short - term\ debt\ ratio = \frac{current\ liabilities}{total\ assets}$$

Different industries, or even different individual firms in each industry have different uses of financial leverage. Heavy industry and biotechnology companies, for example, use moderately little debenture because they will, in general, follow economic cycle, which

does not guarantee a regular cash inflow to pay interest when company is in recession. Meanwhile, service industry, grocery stores, and airlines can rely vigorously on debt in light of the fact that their fixed assets are good collateral for mortgage bonds, in addition, their steady demands and sales can alleviate their credit risk, hence make it safe for borrowing. (Brigham & Houston 2019, 505.)

The table below delineates that distinction in the US. The order is from the lowest to highest company long-term debt (LTD) ratio.

Table 2 Capital structure percentage in the US 2017 (Brigham & Houston 2019, 505)

	COMPANY	**INDUSTRY**	
NAME	**LTD ratio (%)**	**Description**	**LTD ratio (%)**
ALPHABET INC.	2.91	Internet Content	2.91
NUCOR	31.51	Steel	23.66
ELI LILLY	35.06	Pharmaceutical	35.90
BP	35.90	Petroleum	23.66
ROCKWELL COLLINS	36.31	Aerospace	55.36
CONANGRA FOODS	40.12	Food Processing	36.71
CSX	48.45	Railroads	53.50
UNITED CONTINENTAL HOLDINGS	58.68	Airlines	51.69
SOUTHERN COMPANY	63.10	Electric Utilities	50.25
KROGER	65.40	Grocery Stores	59.02
FORD MOTOR COMPANY	75.96	Automobiles	42.53
THE WENDY'S CO.	82.82	Restaurants	96.04

As can be seen, great variations likewise exist among firms in a same industry. For instance, despite the average long-term debt ratio of aerospace industry being 55.36%, Rockwell Collins had the proportion of 36.31%. Therefore, it can be concluded that every

company has special issues, which are decisive in setting an optimal capital structure. (Brigham & Houston 2019, 506.)

As mentioned before, the optimal structure assists firms limit weighted average cost of capital (WACC). In whatever way a company raises its fund, it faces a cost. Optimal cost of capital is the return rate projected by shareholders to earn from their average-risk investment. The most common approach to gauge the expense is to compute marginal cost of each financing source, then realize a weighted mean, which is viewed as weighted average cost of capital (WACC) or marginal cost of capital. (Courtois, Lai & Drake 2007.)

Companies usually raise a large amount of capital at once, which might temporarily overweight the latest capital. However, over the long term, firms will lean toward to their target weight. Therefore, WACC is often used to access overall cost of capital for the entire company, rather than specific projects. (Courtois, Lai & Drake 2007.)

The first key usage of WACC is in firm's long-run intrinsic value assessment. It works as a discount factor in corporate valuation, according to Brealey, Myers & Allen (2017, 497):

$$Value = \frac{FCF_1}{(1+WACC)^1} + \frac{FCF_2}{(1+WACC)^2} + \cdots + \frac{FCF_\infty}{(1+WACC)^\infty} = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+WACC)^t}$$

where:

- $FCF = free\ cash\ flow$

The second is as an essential instrument for investors to evaluate their investment. A company's WACC increments along with capital raise, while returns to investment opportunities are believed to diminish as the company makes greater investment. Henceforth, the most optimal budgeting occurs when WACC is equal to required rate of return. (Courtois, Lai & Drake 2019, 82.) If firms earn less than WACC, it signals terrible performance, which cannot appeal speculations (Makelainen 1998).

In this manner, WACC is computed based on the calculation below, with an absence of preferred stock:

$$WACC = \frac{D}{D+E}[k_d(1-t)] + \left(\frac{E}{D+E}\right)(k_e)$$

where:

- k_d = the rate at which a new debt is issued
- $k_d(1-t)$ = after-taxed cost of debt
- k_e = required return rate on common equity, which is hard to gauge

- D/(D+E) = fraction of debt in the capital
- E/(D+E) = fraction of equity in the capital

As can be acknowledged from the equation, there are a decent number of variables that influence WACC, either beyond or under firm's control: economy interest rate, stock price, tax rate, and capital structure. Among them, only capital structure is under administration, while others are decided by external economy. (Brigham & Houston 2019, 373.) Hence, it tends to be presumed that accomplishing an optimal structure is the only way companies can adapt to minimize their cost of capital.

2.2 Measures of Leverage

Leverage portrays fixed cost, which do not change in proportion to production volume. The cost is either operating expense, building and machinery lease, for example, or financial one, debt's interest payment, for instance. (Courtois, Lai & Drake 2019, 125-126.) The logic below would clarify why knowing risk and leverage metrics is important in analysis of capital structure.

From the WACC formula, if the tax is ignored to simplify the equation, the new one is:

$$WACC = \frac{D}{D+E}(k_d) + \left(\frac{E}{D+E}\right)(k_e)$$

As indicated by Ross, Westerfield and Jordan (2017, 431), WACC can be referred to required return on assets. We may, therefore, have an accompanying formula of required rate of equity return, as known as cost of equity:

$$k_e = k_a + (k_a - k_d)\frac{D}{E}$$

where:

- k_d = the rate at which a new debt is issued = before-taxed cost of debt
- k_e = required return rate on common equity, which is hard to gauge
- k_a = WACC = required rate of return on overall assets
- D/E = debt-to-equity ratio in the capital structure

As can be seen, there are two addends impacting cost of equity: the first is a required rate of return on total assets, which relies on operating activities, and the second, $(k_a-k_d)D/E$, is contingent on capital structure.

The latter addend, $(k_a-k_d)D/E$, would be zero if there is no liability. Along this line, it could be realized that equity cost rise when companies use debt financing. (Ross, Westerfield &

Jordan 2017, 432.) It is prudent since a company's stakeholders take risk when it uses debt, which raises risks of bankruptcy down to its failure to pay back, thereby they require higher rate of return (Watson & Head 2007, 261).

Hence, in capital structure analysis, understanding risk and leverage is crucial because debt, an essential cornerstone of capital structure, is a principal form of financial leverage. Operating and financial expenses will address debt's position in financing. Studying leverage and risk could therefore promote a fair debt ratio, and thus an optimal capital structure. (Watson & Hear 2007, 258.)

There are two main dimensions of risk, according to the above cost of equity calculation's addendums:

- **Business risk**, which captures inherent risk of a company when there is no debt. This risk influences on rate of return on assets, k_a, the first component of the formula.
- **Financial risk**, which is an additional risk that stockholders may cope while additional debt arises. This risk allows stockholders' requirement for a premium, which is the second component: $(k_a-k_d)D/E$.

2.2.1 Business risk

Business risk directly links to companies' operating income. It is a consequence of their unforeseen profits and unknown production expenditures. (Drake et al. 2019, 126.) Business risk is an amalgam between operating and sales risk:

- Sales risk refers to the unpredictability of revenue.
- Operating risk is an added risk when a company is unaware of operating returns by fixed operating cost. The risk is in commensurate with the ratio of fixed to variable cost. (Drake et al. 2019, 126.)

According to Brigham & Ehrhardt (2011, 604), the typical indicator of this risk is a standard deviation of return on invested capital (ROIC). ROIC is appropriate, as it does not alter according to changes in the capital structure.

$$ROIC = \frac{EBIT(1-T)}{E+D}$$

Business risk is primary risk which companies must contend with, even if they have no debt. Business risk, as capital structure, differs among industries and firms, and over time. Electric companies had been perceived to have little business risk, for example, but lately

they are confronting higher industry risks due to the growth of renewable resources and potential environmental legislation. (Brigham & Houston 2019, 479.)

Sales risk relies on numerous elements, which are frequently external: rivalry, demand instability, sales price fluctuation, input cost uncertainty, item's quickly outdated nature, exchange rate fluctuation, foreign political risks, and regulatory risks (Brigham & Houston 2019, 481.) Because of such, a company's price or sales volume may different than what was anticipated, which raises the sales risk (Drake et al. 2019, 129).

Operating risk is approximately identified with internal actions, on measure of fixed cost used, or operating leverage. If there is an overwhelming amount of fixed cost compared to variable cost, the business risk is expanded since fixed cost remains unchanged when demand falls. (Drake et al. 2019,130.)

2.2.2 Degree of Operating Leverage (DOL)

An impact of operating risk to cash flow can be examined by the elasticity concept, which quantifies sensitivity of one item to a change of another one. Elasticity can measure the responsiveness of operating income to changes in demand, which is referred to as degree of operating leverage (DOL). (Drake et al. 2019, 130.)

$$DOL = \frac{Percentage\ change\ in\ operating\ income}{Percentage\ change\ in\ unit\ sold} = \frac{\frac{\Delta EBIT}{EBIT}}{\frac{\Delta Q}{\mathrm{Q}}}$$

If DOL equation is broken down into unit cost including variable and fixed cost (Cengage 2019), we have:

$$DOL = \frac{\frac{\Delta EBIT}{EBIT}}{\frac{\Delta Q}{\mathrm{Q}}} = \frac{\frac{\Delta Q(P-V)}{Q(P-V)-F}}{\frac{\Delta Q}{\mathrm{Q}}} = \frac{Q(P-V)}{Q(P-V)-F} = \frac{S-TVC}{S-TVC-F}$$

where:

- P = price per unit
- Q = quantity of unit sold
- F = fixed cost
- V = variable cost per unit
- S = sales
- TVC = total variable cost

A high level of DOL implies that a small change in unit sold results in a massive ROIC shift, which is risky since it means operating income is vulnerable to demand (Brigham & Houston 2019, 484). The high degree could be explained through a high level of fixed cost in operating structure, since, from the equation, it is detectable that DOL is in positive correlation with fixed cost.

Operating leverages also range from sector to sector. High operating leverages are often extended to industries like software or medicals, which invest heavily in upfront research and development, but weakly in production and distribution of goods. Vice versa, enterprises with high level of variable cost such as retailers have limited operating leverage, thus low operating risk. (Drake et al. 2019, 136.) Accordingly, it is the capital budgeting mechanism that is a managerial tool for controlling companies' operating risk, and then their business risk.

2.2.3 Financial risk

Financial risk is directly related to fixed cost from debt financing. When companies use debts, interests, which are fixed expenses, must be charged (Brigham & Ehrhardt, 2011, 607). Like operating fixed cost, financial one adopts the following mechanism: the higher the fixed obligation, the greater the financial risk. Since financial risk is not inherent risks, it is not borne when companies fund their operation entirely with common equity, preferred equity, or retained earnings. (Courtois, Lai & Drake, 95.)

Financial risk is shouldered by common stockholders. Since they are not as prioritized as debt holders are if a company uses debt financing. The company pays interest first then pay dividend. And if the enterprise goes bankrupt, the lenders are likewise paid off before the stockholders are. (Courtois, Lai & Drake, 95.)

Financial risk could be calculated based on business risk, under the idea of asset beta. A firm's beta is a feature that describes the systematic business risk and financial risk of the firm. According to Hamada, the link between financial and systematic business risk is highlighted when asset beta is unlevered. (Courtois, Lai & Drake, 95.)

Asset beta can be calculated based on how a rate on asset return is calculated, which is based on WACC:

$$\beta_a = \frac{D}{D+E}(\beta_d) + \left(\frac{E}{D+E}\right)(\beta_e)$$

where:

- $\beta_a = \text{systematic risk of assets}$

- $\beta_a = \text{systematic risk of debt}$
- $\beta_e = \text{systematic risk of equity}$

One can see that asset is a blend of equity and debt. Hence, if equity beta is the total risk a company takes when it is unlevered, asset risk is the risk a company takes when it is levered. Moreover, Hamada (1972, 435) claimed that debt has no systematic risk. Therefore, the above equation could be converted into the following one:

$$\beta_{leveraged} = \left(\frac{E}{D+E}\right)\left(\beta_{unleveraged}\right) = \beta_{unleveraged}\frac{1}{1+\frac{D}{E}}$$

If the tax-deducting ability of interest is considered, hence we have the following risk measure:

$$\beta_{leveraged} = \beta_{unleveraged}\frac{1}{1+\frac{D}{E}(1-T)}$$

where T is marginal tax rate.

The equation depicts a company's risk transition from the point it is unlevered to the point it uses obligation. One can see that, if an organization does not borrow anything, D=0, leveraged risk is equivalent to unleveraged risk. If debts occur, risk is increased by an amount of [1/(1+(1-T)D/E]. The number is supplementary risk, or financial risk. (Courtois, Lai & Drake, 96.)

2.2.4 Degree of Financial Leverage (DFL)

While business risk influences earnings before interest and taxes (EBIT), financial risk has an impact on earnings after those (EBIT) (Cengage 2019).

The impact of financial risk to cash flow can be examined by the elasticity concept, which quantifies the sensitivity of one element to a change of another. Elasticity can calculate a responsiveness of net income to adjustments in operating income, which is referred to degree of financial leverage (DFL). (Drake et al. 2019, 137.)

$$DOL = \frac{Percentage\ change\ in\ net\ income}{Percentage\ change\ operating\ income} = \frac{\frac{\Delta EPS}{EPS}}{\frac{\Delta EBIT}{\text{EBIT}}} = \frac{\frac{(\Delta EBIT - \Delta I)(1-T)}{(EBIT - I)(1-T)}}{\frac{\Delta EBIT}{EBIT}}$$

where:

- EPS = (EBIT-I)(1-T)/number of outstanding stocks = earnings per share
- T = tax

- I = interest

Since debt interest is constant until maturity, $\Delta I = 0$, so we have:

$$DFL = \frac{\frac{\Delta EBIT(1-T)}{(EBIT-I)(1-T)}}{\frac{\Delta EBIT}{EBIT}} = \frac{EBIT}{EBIT-I}$$

A high level of DFL implies that a slight change in operating income contributes to a massive net income shift (Brigham & Houston 2019, 484). The high degree could be explained through a high interest amount since it is shown on the equation that DFL is in positive correlation with interest.

Unlike operating leverage, which could be affected by both internal and external factors, DFL is frequently dictated by a company's decisions on the amount of debt it uses for financing. Generally, companies with larger tangible assets levels, which can be securitized, to total assets can have higher DFL. Moreover, as mentioned, if a company is sensitive to business cycle, less financial leverage will likely be used. (Drake et al. 2019, 138.)

2.2.5 Degree of Total Leverage (DTL)

Degree of Total Leverage is the amalgam between DOL and DFL. It shows the sensitiveness of EPS to a transit in sales (Drake et al. 2019, 140).

$$DTL = DOL \times DFL = \frac{\frac{\Delta EBIT}{EBIT}}{\frac{\Delta Q}{\mathrm{Q}}} \times \frac{\frac{\Delta EPS}{EPS}}{\frac{\Delta EBIT}{\mathrm{EBIT}}} = \frac{\frac{\Delta EPS}{EPS}}{\frac{\Delta Q}{\mathrm{Q}}}$$

DTL equation suggests that both DOL and DFL should be lowered to lower DTL. If DOL is high, then reduce DFL. In other terms, if a company has a high level of business risk, which corresponds to high DOL, its use of debt financing should be restricted. (Brigham & Erhardt 2011, 613).

2.3 Corporate and personal taxes

Firms gain more from mixing debt than from financing solely with equity. The reason is that interest paid is tax exempt, while dividend payments are not excluded (Brigham & Houston 2019, 497.) It is shown in the full version of WACC measurement:

$$WACC = \frac{D}{D+E}(k_d)(1-T) + \left(\frac{E}{D+E}\right)(k_e)$$

Tax benefits are symbolized in the equation by (1-T), in which T is corporate's tax duty rate. These juxtaposing tax treatments encourage firms to leverage their capital structure, since debt ratio is in proportion with tax advantages that companies gain. For example, for each Vietnam Dong (VND) of debt interest that Vietnamese corporates have to pay in the situation of corporate tax being 20% (KPMG 2019), they can save 0.2 VND due to interest tax shield, which excludes interest from taxable income. Therefore, larger amount of interest they paid, larger amount of money they earn.

Personal tax, in this scheme of study, is bear by individual shareholders or debtholders as they profit monetarily from their investment or debt. It could be tax on either interest payment or dividend plus capital gains. In Vietnam, there is no distinction in tax on either interest or dividends (Deloitte 2019.)

Investors should choose tax-friendly investment strategies since different ways of financing have different ways of tax applying. Cash from equity is basically taxed twice before flowing to equity holders' pockets: they are firstly taxed as corporate income, and secondly levied as dividends or capital gains when shareholders receive those (PwC 2019.)

Since tax encourages companies to raise debt, it possibly has impacts on capital structure. The assumption, however, can be wrong due to possible conflicts between corporate cost and investor's or lender's favorable rate of return. Therefore, review on tax effects should be well regarded in the research.

2.4 Bankruptcy cost

If a company starts leveraging, it likewise starts taking a risk of default on its interest payment and perhaps bankruptcy. Bankruptcy is a process of terminating an organization, selling off or transferring assets to debtholders (Ross & Jordan 2017, 443). Therefore, at a certain debt level, where there is a high possibility of bankruptcy, a required rate of return is often raised by shareholders or lender to accommodate them from the risk. (Watson & Head 2007, 268).

There are two forms of bankruptcy expenses:

- Direct cost is a consequence of paying higher rate of return to lenders or shareholders to cover them from higher risk.
- Indirect cost occurs when a company is dealing with financial distress, which applies to the condition where the company lacks cash for normal operation. The cost includes potential loss of sales or even loss from selling assets beneath market value to meet quick liquidating requirements (Watson & Head, 269.)

Since financial distresses happen when operating cash is inadequate, the more volatile a firm's earnings are, the greater chance the firm faces bankruptcy. Therefore, companies that has a high degree of operating leverage should limit their debt, especially the one whose illiquid assets dominates. (Brigham & Erhardt 2019, 613).

Since bankruptcy risk raises either debt or equity cost, it discourages a corporate from financing its capital with debt, which, in turns, possibly affects to capital structure decisions. Therefore, review on bankruptcy cost should also be well regarded in this research.

2.5 Agency cost

Agency cost is referred to principle-agent relationships, which are formed when principles recruit agents to do jobs. The relationships regarded in the sense of the study are explicitly between (1) shareholder and manager, and (2) shareholder and creditor. Agency cost is connected to clashes in interests.

Conflicts amid shareholders and executives can be with regards to risk tolerance. For example, in a company, some of shareholders, who are having already diversified portfolios, might be more aggressive in corporate decision-making than its managers, who must secure their jobs and employment status.

Another example of the dispute is an issue of free cash flow. The issue suggests that managers prefer saving retained earnings to be independent from capital providers. That rationale clashes with benefits of shareholders, as they naturally demand as much retained earnings as possible through dividends, when firms have no room for expansion. (Lin & Lin 2013, 95.) This tension can be seen to arise in a scenario of low-growth opportunity, and vice versa.

Argues between shareholders and creditors could also be linked to risk favor. The reason lies in the nature of dividends and debt interest., dividend payout might be limitless according to business success and profitability. Meanwhile, debt interest is initially fixed. Shareholders, therefore, have a tendency to lean on risky corporate decisions, whilst debtholders often prefer stable performance, which reduces their default risks. (Watson & Head 2019, 269.)

There are two main agency cost concerning conflicts between shareholders and bondholders. The first concerns assets substitution problems. It is the situation where shareholders force a company to swap a low-risk investment with a riskier one after it uses debt financing. It will raise shareholder pay-off at a detriment of creditor's interest. (Ju & Ou-Yang 2014.) The second applies to underinvestment problems. It is when a company,

usually with risky debts, surrenders a positive-net-present-value (NPV) project on behalf of shareholders. It is because there are certain projects that cannot fully compensate debt interest, let alone dividends, even have positive NPV. Those disincentivize equity holders since they do not derive any benefit from it (Myers 1977, 161).

2.6 Asymmetric information

Asymmetric information demonstrates a disparity between information available to managers and investors. Managers are unquestionably able to approach better details than outside investors. For instance, when a company raises its dividend payment, investors often presume that the company is having confidence about its prospects. Hence, they act correspondingly by buying its stock. It is believed that the managers already know some information at first and act, which then the investors reflect and act accordingly. The example already highlights the information gap. (Vernimmen et al. 2017, 479.)

Another highlighted example is when a company issues new stock. An issuance is often considered as a signal of unbright future expectation from managers, as investors view the stock offering as an act of sharing risks, which is reasonably preferred by companies during hard time. Meanwhile, a company is expected to issue debt when having a positive future expectation to fully gain upcoming profit without paying much dividend. (Brigham & Houston 2019, 500.)

2.7 Summary

This chapter has laid a primitive understanding of the thesis topic, including key concerns behind capital structure decisions: risks, taxes, cost (bankruptcy, agency, etc.), information gap. It is part of the respond to SQ1: What are concepts of capital allocation?

Here are some highlights of this chapter:

- Optimal capital allocation amplifies firms' intrinsic values by lessening most of weighted average cost of capitals and financial risks.
- Tax encourages companies to raise debt. However, it possibly raises conflicts between corporate cost and investor's or lender's favorable rate of return.
- Since bankruptcy risk raises either debt or equity cost, it can discourage corporates from financing their firms with debt.

The next chapter will specify how those key concerns influence capital structure allocations.

3 CAPITAL STRUCTURE THEORY

3.1 Modigliani and Miller (MM): Tax Absence

Modigliani and Miller (1958) has coined the term of modern capital structure (Vernimmen et al. 2017, 527). According to Brigham and Erhardt (2011, 610), MM shows that capital allocation does not affect company valuation under the following strict assumptions:

- There is no existence of middleman cost
- There is no existence of taxation
- There is no existence of bankruptcy cost
- Investors can borrow at a symmetric rate as corporates
- All shareholders share the symmetric knowledge with executives concerning company future
- EBIT is not influenced by debt

To test the hypothesis, MM developed two imaginary portfolios: one invested in an unlevered company's entire equity, while the other one held both equity and debt of a partly levered company. Originally, all the firms had the same value and were expected not to grow (so investment in new assets is fallacious). Since the portfolios having the same cash flows have the same value, then to test the hypothesis, MM checked whether the two companies earned the same EBIT (Brigham & Ehrhardt 2011, 610).

When it comes to the first hypothetical portfolio: since the unlevered firm had no growth and no tax, all its EBIT could be outflowed to the first portfolio in form of dividends.

When it comes to the second one, since the levered firm also had no growth and no tax, interest company paid is in form of: D(kd), in which D is debt amount, and kd is debt's average rate of return. Then the dividends the company paid when there is no tax is: EBIT-D(kd). Hence the cash flow to the second portfolio is: D(kd)+EBIT-D(kd)= EBIT, which is equivalent to the first one.

Since the two portfolios have the same cash flow, which is equal to EBIT, it is shown that the two firms are valuated to have equal value regardless of how capital is structured.

Recall the WACC and risk of leverage, holding an equity is always riskier than owning a debt. Therefore, if cost of equity rises, weight of debt relatively rises enough to hold WACC the same, as debt is cheaper than equity, due to relatively lower risk taking. (Vernimmen et al. 2017, 531.)

Although the condition to satisfy MM's world is impractical, implying that the theory is unfound in real life, it offers some ideas of scenarios in which capital allocation may influence corporates' value. That exploration is a foundation of current papers on factors affecting capital allocation decision, which in turns, affects company value.

3.2 Modigliani and Miller 2 (MM2): Corporate and Personal Taxes

In 1963, MM enhanced the previous theory by removing the assumption of no corporate taxes. According to them, once corporate tax is included, a leveraged firm's value is equal to the debt-free one's plus tax exempt's present value. (Brigham & Ehrhardt 2011, 612.)

The amount of tax exempt is:

$$Tax\ exempt = Tk_dD$$

where k_d is debt's rate of return, T is tax rate, D is an amount of debt. If debt is perpetual, then tax exempt's present value is the tax-exempt amount perpetually discounted by rate of return, k_d. Hence, as capital structure shifts, the relationship between levered and unlevered values is newly defined, in Figure 3.

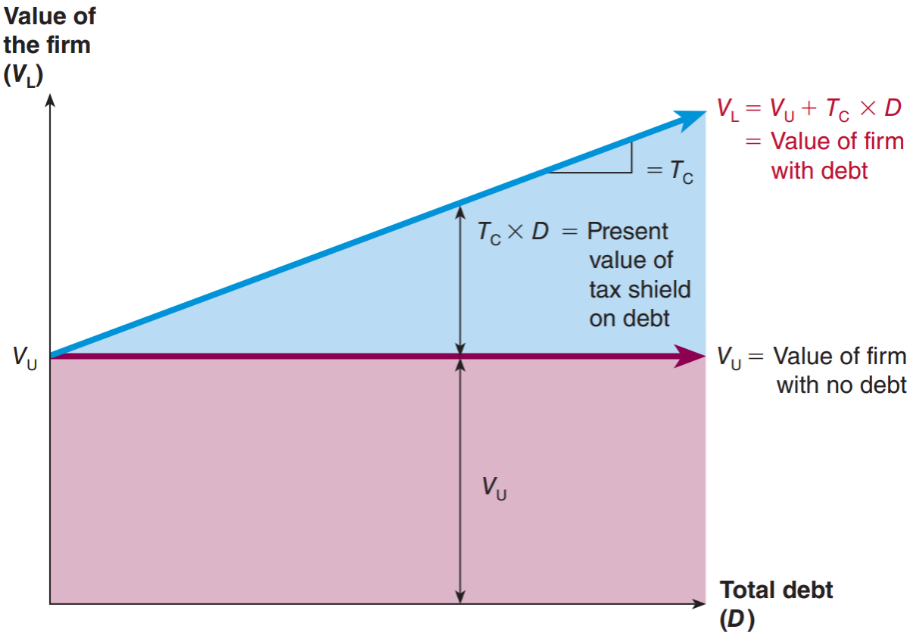

Figure 3 MM Proposition 2 (Ross, Westerfield & Jordan 2017, 435)

Based on the figure, due to tax protection on interest, firm value increases as total debt increases (Ross, Westerfield & Jordan 2017, 435). Therefore, a positive correlation between corporate tax and firm capital structure should be predicted (Faccio & Xu 2015, 280).

Miller (without Modigliani) then amended the 1963's principle by additionally eliminating the assumption of no personal taxes (Miller 1977, 267). As stated in Chapter 2, when receiving interest, dividends, and capital gains, investors must pay taxes. Even if tax rates are the same, stock return, in general is effectively taxed lower than debt return. It is because capital gains payment to stockholders is taxed only after the stock being sold. (Brigham & Erhardt 2011, 612.)

Due to that reasoning, Miller has fixed the equation into the following one:

$$V_{leverage} = V_{unleverage} + [1 - \frac{(1 - T_c)(1 - T_s)}{(1 - T_d)}]D$$

where:

- T_c = corporate taxation levying rate
- T_s = effective taxation levying rate on stock returns
- T_d = tax levying rate on debt returns
- D = amount of debt

Theoretically it can be seen that taxes on dividend and interest returns have juxtaposing impacts on corporate value. If a tax rate on debenture returns is sufficiently large, it can eliminate the others' tax advantages. In practice, personal tax's involvement, however, does reduce benefits of debt financing, but not completely. (Brigham & Erhardt 2011, 613.)

3.3 Static Theory

As mentioned in Chapter 2, bankruptcy is costly, which disincentivizes firms from debt financing. Therefore, static theory, as known as trade-off theory, was established, as a development from MM theorem, to include counter-effects of bankruptcy cost to capital structure. (Josh & Jordan 2017, 438.)

Figure 4 demonstrates trade-off theory, which explains how a company balances between its tax benefits from leveraging and bankruptcy cost. The figure is a development from the previous one with several novel ideas:

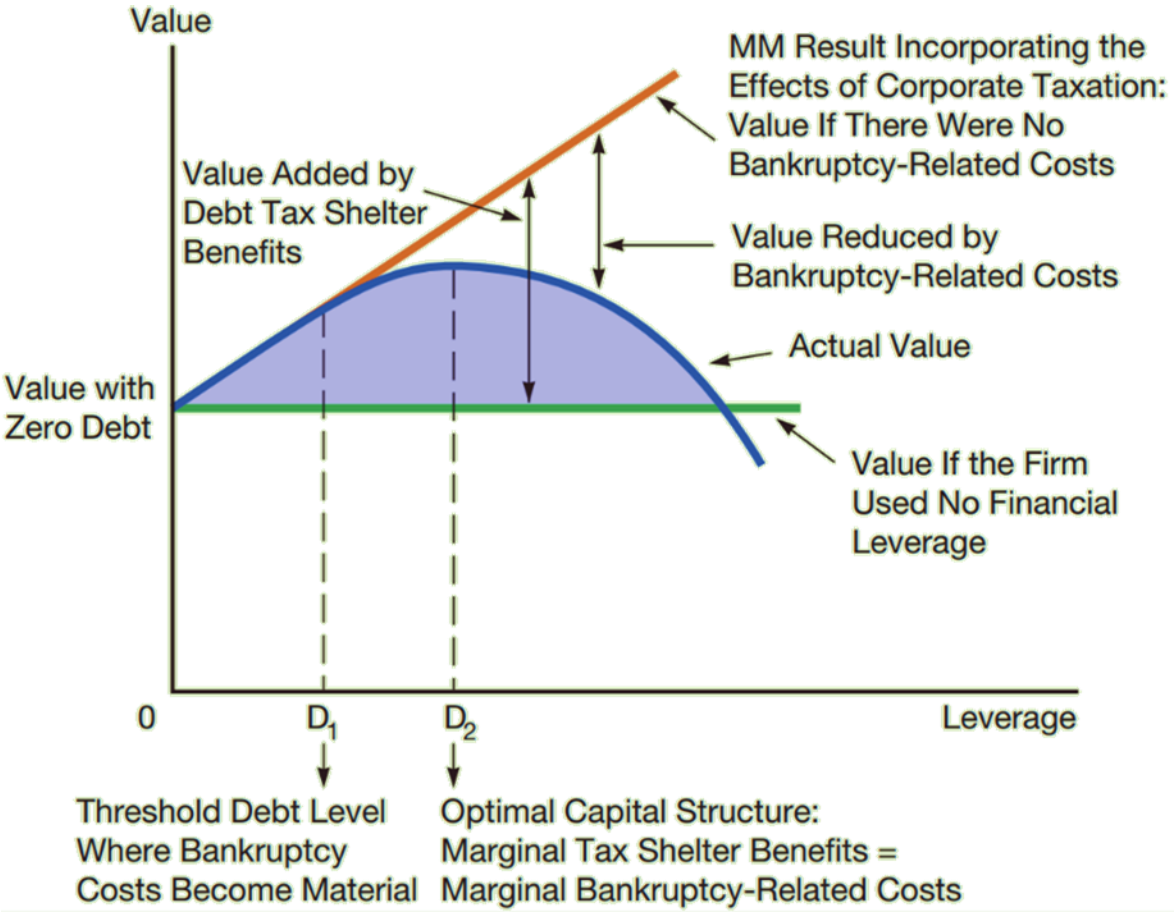

Figure 4 Static theory (Brigham & Erhardt 2011, 614)

- Instead of taking the entire advantage of interest tax protection, companies tend to maintain their leverage at a adequately high amount to offset detrimental effects of bankruptcy (Brigham & Houston 2019, 498).
- Here are certain leverage thresholds which classify impacts of bankruptcy cost to valuation of firms:
    - From 0 to D_1: the likelihood of bankruptcy is too low to be qualified as material.
    - From D_1 to D_2: bankruptcy cost start offsetting effects of taxation but not totally.
    - Above D_2: bankruptcy cost outweighs tax benefits. Therefore, D_2 is an optimum leverage level, where cost is equal to benefit. Differently put, at this level, company value is being maximized. (Brigham & Houston 2019, 498.)

- However, successful firms often fall well below the optimal debt level indicated by trade-off theory (Brigham & Houston 2019, 499). The phenomenon would be answered by the following signaling theory.

3.4 Signaling Theory & Pecking Order Hypothesis

Eliminating MM's assumption of symmetric information, signaling theory and pecking order hypothesis assume that managers and investors have asymmetric information about companies' future (Brigham & Houston 2019, 499).

3.4.1 Signaling theory

Signaling theory suggests an indication of executives' opinions on a firm's prospects, which depends on actions taken by them. For example, if a company finds that funding for a project will be fruitful, it will choose debt financing. It is because the firm's current shareholders, especially inside stakeholders, clearly do not want to share their capital gains with the new ones. Vice versa, if a company needs to insist on a disappointing plan, it will prefer stock offering to share the project's loss. (Brigham & Houston 2019, 499.)

That rationale is a foundation of signaling theory, which considers stock and bond offering as proxies for executives' view on business future. Therefore, if investors agree with the theory, they will sell or buy companies' securities according to research on firms' financing decisions, investment decisions, dividend decisions, etc. (Miglo 2016, 47.)

Knowing investors' behavior, companies often use less debt than the preset optimal level, then save its borrowing power for a good investment opportunity. If so, when a company raises fund with debt, which is already below an optimum, it does not have to issue new stock along with it to maintain the optimum. (Brigham & Erhardt 2011, 615.)

3.4.2 Pecking order hypothesis

A consequence of signaling, asymmetric information and flotation cost, which charges a company when it issues new stocks or bonds, might be to force the company to follow pecking order hypothesis, which prioritized internal fund raising first, debt financing the second, and equity financing the last. (Brigham & Erhardt 2011, 616).

3.5 Summary

This chapter has introduced theorem behind capital structure decisions. Each of theory bares different perspectives on how elements, which are analyzed in the previous chapter,

influence the decisions. Thus, together with Chapter 2, this one finishes a response to the first sub-question: What are ideas of capital allocation?

Here are some highlights of this chapter:

- Taxes on dividend and interest returns have contrasting bearings on corporate's value. If tax rate on debenture returns is sufficiently large, it can eliminate the others' tax advantages. In practice, personal tax's involvement, however, does reduce benefits of debt financing, but not completely.
- Trade-off theory explains how companies balance between tax benefits from leveraging and bankruptcy cost. Bankruptcy cost starts offsetting then outweighs effects of taxation when company raise leveraging level.
- Knowing investors' behavior, companies utilize power of asymmetric information by often using less debt than the optimal level, then save its borrowing power for a good investment opportunity.
- Pecking order hypothesis suggests firms prioritize internal fund raising first, leveraging the second, and equity financing the very last.

The next chapter will amalgamate elements that shape capital allocation decisions. They are already well researched. However, scholars always have disputes in how each of them influences the decisions. The reason could lie on differences in capital structure theorem applied. In this chapter are several main factors listed and discussed, including firms' size, tangibility, growth opportunities, liquidity, profitability, tax shield. Due to their accessibility, they are often used in empirical capital allocation study (Baker & Martin 2011, 23).

4 CAPITAL STRUCTURE INFLUENCERS

4.1 Asset tangibility and asset structure

Cash and tangible assets represent the collateral that firms can provide to its creditors. The more those assets, the less debt risk and bankruptcy cost (Acaravci 2015, 161). However, under financial distress, assets often significantly lose their value when being sold (Campello & Giambona 2013, 1336). Therefore, asset structure and tangibility are carefully considered by creditors when they decide to lend their money. The structure could be assessed with fixed-to-total assets ratio:

$$Fixed - to - total\ assets = \frac{Total\ fixed\ assets}{Total\ assets}$$

Since asset structure directly affect investors' decision, to analyze its effect on capital allocation decision, game theories should be used.

Based on signaling theory, when a company start leveraging, it signals positive prospects, which encourages investors to invest, or even to overinvest. Hence, there is possibly agency cost raised from conflicts between investors and creditors' interests. However, in this situation, if debts are well securitized with high degree of tangible assets, creditors are more confident to make loans. It means agency and bankruptcy cost decline, supported by trade-off theory. Hence, a positive association between fixed-to-total assets and debt rate can be anticipated. (Baker & Martin 2011, 24.)

Instead, on the word of pecking order hypothesis, businesses with higher rate of intangible assets often face fewer problems of asymmetric information, which lessens flotation cost if the companies issue new stock (Imtiaz, Mahmud & Mallik 2016, 26). Therefore, equity financing is more preferred since it is less costly. Differently put, pecking order hypothesis forecasts a negative association between fixed-to-total assets and debt rate. (Suder, Riviere & Lindeque 2019, 377.)

4.2 Firm size

Like asset tangibility's, firm size's influence on capital allocation is under debate. A positive association between firm size and debenture rate is supported by scholars who are pro static theory. It is explained that big firms' business sectors tend to be differentiated, rendering them resilient to risks, thereby reduces the probability of bankruptcy. The low bankruptcy cost would be preferred by debtors due to low credit risks. Furthermore, being exposed to low risks, large companies are prone to attract low interest debts, which probably encourage them to use debt funding. (Titman & Welssels 1988, 6.)

Conversely, there are disagreements focusing on pecking order hypothesis, which claims that the association between the two factors is negative. The reason is that large companies have more chances to collect funds internally due to frequent huge volume of retained earnings, compared to small ones. Furthermore, as mentioned, large companies' risk is relatively small, which allows them not to share risks. Therefore, internal financing is generally favored by big companies themselves since they will earn the whole amount of pay-off while paying neither dividend nor interest. (Kester 1972, 8.)

There are a variety of proxies to measure firm scale. Among such, sales, assets and equity's market value are taken account of as the most common metrics. Each metric is implemented for multiple purposes and constraints, for example, market value of equity is exclusive only to equity ownership and forward-looking, while sales are product oriented and not forward-looking. Therefore, the best option is either to use all the proxies or to use one of those with a rational reason. (Dang & Li 2018, 165.) In the thesis, owing to the scope and time frame, it is impossible to perform all the metrics. Hence, within the thesis scope, natural logarithm of total book-valued revenue is used as firm size measure, with an aim to highlight the diversity in sectors, which is listed as a crucial advantage of large firm size.

4.3 Asset liquidity

Liquidity's impact on debt ratio is considered differently among scholars. The rationale of a positive association depends on the clue that it costs more money to sell illiquid assets than it does to sell liquid one, which inflates bankruptcy cost from issuing debt. Hence, according to static theory, low liquidity rate forces companies to lower leveraging to avoid defaults. Furthermore, liquid assets can hurriedly be converted to cash to return bondholders. Therefore, the higher rate is also favorable to lenders. (Sibilkov 2009, 1173.)

Oppositely, high liquidity can be translated to a signal of poor governance by not settling account receivables and utilizing free cash efficiently. It raises agency cost between lenders and companies. Thus, in such situation, bondholders tend to limit their borrowing amount. (Sibilkov 2009, 1176.)

4.4 Growth opportunities

As abovementioned in signaling theory, if a company expects an upcoming project to be fruitful, it will choose debt financing. It is because shareholders, especially inside stakeholders, clearly do not want to share their capital gains with new ones. It is this reasoning which reveals a positive correlation between firm growth opportunities and debt ratio.

Nevertheless, there are rebuttals considering agency cost. Firstly, as discussed before, assets substitution and underinvestment problems are likely to rise according to the rise in opportunity. Firms, hence, would prefer equity financing to fund promising growth opportunities, with an aim to avoid cost from those conflicts. Secondly, free cash flow problems arise in the scenario of low-growth opportunity. It encourages companies to use debt financing to avoid agency cost when they have little growth opportunity. Hence, a negative correlation between debenture and growth opportunities is anticipated. (Awan et al. 2010, 92.)

There are variety of proxies to quantify firm growth opportunities: change in total assets, M/B ratio, ratio between capital expenditure and assets (Baker & Martin 2011, 25). For example, M/B ratio can highlight the agency cost via expectations of stakeholders shown in market value:

$$\frac{M}{B} ratio = \frac{Market\ value}{Book\ value}$$

M/B is often more than 1.0, which reflects desire of investors to purchase stocks at price more than their book value. The desire is often for successful companies, hence, ones with poor performance are often low at the ratio. (Brigham & Houston 2019, 122.)

4.5 Profitability

There are several arguments supporting the idea of a positive correlation between firm's profitability and debt ratio for several reasons. Firstly, the greater the profitability a company earns, the lower risks of bankruptcy it imposes, which encourages creditors to buy bonds. Secondly, because of tax shield, according to static theory, profitable firms themselves prefer debt financing. Thirdly, to reduce agency cost from paying shareholders too much excess cash when being profitable, firms often increase their leverage level, which reveals a positive correlation between the two factors. (Baker & Martin 2011, 25.)

As opposed to the previous argument, as mentioned in Chapter 2, pecking order hypothesis suggests that firms would prefer their internal funds when financing. A profitable company, accordingly, tends to prioritize its internal, instead of debt financing since it has more retained earnings.

There are two different profitability ratios which are frequently considered as measures for capital structure studies: gross margin and return on assets.

$$Operating\ margin = \frac{Operating\ income}{Sales}$$

$$Return\ on\ assets = \frac{Operating\ income}{Total\ assets}$$

4.6 Industry classification

Capital structure varies across industries. Heavy industry and biotechnology companies, for example, use moderately little debenture because they will, in general, follow economic cycle, which offers no guarantee of regular cash inflow to pay interest when company is in recession. Meanwhile, service industry, grocery stores, and airlines can rely vigorously on debt in light of the fact that their fixed assets is good as collateral for mortgage bonds, in addition, their steady demands and sales can alleviate their credit risk, hence make it safe for borrowing. (Brigham & Houston 2019, 505.) In general, companies often consider industry average ratios as benchmarks to make capital allocation decisions, since industry risks reflect almost of the risks which firms face.

4.7 Tax considerations

As mentioned earlier, firms are likely to make capital out of tax exemption of interest payments. Hence, static theory suggests that corporate tax and firm leverage are in a positive correlation.

On the other hand, if firms can access to other nondebt tax shields, tax benefits from debt financing are less desired since such firms can be exhausted due to inability to make the most of all available tax shields. Accordingly, static theory predicts a negative correlation between nondebt tax shield and firm leverage. (Baker & Martin 2011, 27.)

There are multiple proxies to measure power of nondebt tax shields on capital division: ratio of either loss carry-forward, or depreciation, or investment tax credits to total assets.

4.8 Volatility

Firms with more widely fluctuate cash flows, which can be measured with stock returns' standard deviation, are expected to expose higher financial difficulty and bankruptcy cost, according to static theory. Furthermore, the agency cost between lenders and creditors is raised since firms, during financial distress, can cancel its dividend payments but not interest payment. Hence, firms will lower their debt ratios when suffering return volatility to avoid excessive cost (Dudley & James, 2015). That is why, according to static theory, company volatility in cash flow negatively correlates with its leverage.

Sharing the common idea with static theory, pecking order hypothesis guesses a negative relationship between these two variables, also based on the previous rationale. The firms

suffering volatility are likely to fail their financial obligation because their lenders tend to raise risk premium, due to inconsistent cash flow. Furthermore, during financial distress, firms can cancel its dividend payment, which encourages them to use equity financing. (Baker & Martin 2011, 26.) Meanwhile, firms, based on signaling theory, often find it necessary to keep debt raising chances for prominent investments under low cashflow, which suggests a low leverage tendency (Stephan, Talavera & Tsapin 2011, 143). Therefore, equity financing is more prioritized during this time, which proves the argument of a negative relationship.

4.9 Summary

This chapter has introduced influencers that affect capital structure decisions and theorem behind the effects. It is part of a response to the second sub-question: What are potential factors that are definitive to capital allocation?

Table 3 summarizes expectations of main theories about likely effects of factors, which are discussed in this chapter.

Table 3 Main forecasts of capital structure theory frameworks

Factors	Static theory	Pecking order Hypothesis
Tangibility	+	-
Firm size	+	-
Growth opportunity	-	+/-
Profitability	+	-
Volatility	-	-
Nondebt tax	-	
Liquidity	+	-

Here are more highlights of this chapter:

- There are several factors that companies can partially cope with: tangibility rate, sales, which indicates firm size, profitability, liquidity.
- There are several factors that are almost certainly out of control: industry classification, tax, volatility.
- Since theorem are not universal, when there are endless quarrels about this topic, effects of the influencers are predicted differently according to different theory.

The next chapter takes the first step to empirical research part by gaining basic insight into Vietnamese technology market. This chapter also aims to identify capital structure determinants that are relevant to the thesis case study.

5 CASE STUDY REVIEW

5.1 Vietnamese Technology Industry

To develop a comprehensive vision of Vietnamese technology industry, the author conducts an analysis on both microenvironment and macroenvironment. There are multiple factors under study as presented in Figure 5.

Figure 5 Environment factors (Oxford College of Marketing 2014)

Micro environmental aspects are attached to a particular company, hence promptly influence its ability to deliver its services or products (Kotler & Armstrong 2014, 93). Porter's Five Force analysis is performed to investigate those factors, including: industry competition, potential of new players, suppliers' and customers' bargaining power, and risk of product replacement (Harvard Business Review 1979).

Macro environmental factors are greater societal influences that shapes microenvironment (Kotler & Armstrong 2014, 93). PEST analysis is conducted to investigate those factors,

including policies, economic and social-cultural status, and technology (The Economic Times 2020).

5.1.1 PEST Analysis

Policies

Political situation in Vietnam, regarding technology, is optimistic. Vietnamese authority certainly promotes IT sector by issuing accommodating policy framework, establishing multiple funds. A highlighted encouragement of the government is to issue a Directive to foster improvement of information and communication technology companies in Vietnam (Fitch Solutions 2020). The Directive concentrates on the following key issues:

- Formulate a national strategy and substitute plans on development of Vietnam's digital transformation across area.
- Reform regulations on science and technology development funds to allow investment in creative and technological start-up activities.
- Simplify managing procedures in science and technology development to increase investment in technological innovation implementation of enterprises.
- Orient, support at least 5 to 10 Vietnamese digital technology enterprises to develop a certain number of national key digital products, becoming a pillar of Vietnam's digital technology ecosystem, before 2025.
- Periodically organize the National Forum on development of Vietnam digital technology enterprises.

By those, the government aims to develop 100 thousand Vietnamese digital enterprises. It means among every 1000 residents, there is one owning a digital enterprise, which is equal to the relative rate of developed countries. (Viet Times 2020.)

Other than that, the authority also supports technology companies by applying preferential tax rates for certain kinds of company in the industry. For example, a normal corporate income tax is 20%, but for enterprises implementing new investment projects in information technology field, they are entitled to a preferential tax rate of 10% (only pay half the tax compared to other areas). The rate is applied to incomes of enterprises from execution of new investment projects. (Luat Vietnam 2020).

Economics

The economic status is optimistic in several ways. In 2019, GDP growth was constant thanks to strong trading with foreigners, with exports having increased by 8%- nearly 4 times higher than the worldwide mean. Besides, Vietnam continued being an appealing

location for overseas investors, with a mean of approximately 3 billion dollars of foreign direct investment inflow a month.

Furthermore, private consumption by households had been a gradually key factor promoting the economic development, as the working class had grown, meaning that their wages and purchasing power had been rising. Investment by private businesses has also been amplified by 17% since last year. (The World Bank 2020b.)

Although the pandemic Covid-19 has hit the global economies hard, the first-half year of 2020 still witnessed Vietnam's economy expansion by 0.4% year over year. It is consistent with full year 2.8% growth, projected by Fitch Ratings (2020).

Social-cultural status

Vietnamese technology industry is taking benefits from supportive demographics for two reasons. Firstly, citizens aged from 15-64, who are in working age, are monopolizing the population, as can be seen in Figure 6. It means that the market is full of people having purchasing power. Secondly, the number of citizens aged 15-64 is expected to bloom at compounded rate of 0.4% during 2020-2024 period (Fitch Solutions 2020, 8). It predicts an inevitable market expansion in the industry. However, the golden state is expected to fade in 2050, when there are more and more elders, who lose their own affordability.

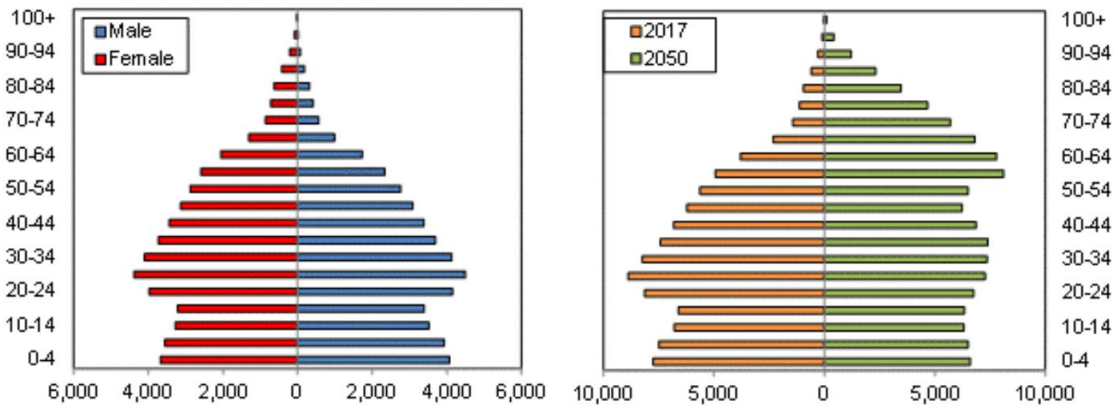

Figure 6 Vietnam population pyramid (Fitch Solutions 2020, 40)

Regarding to culture aspects, Vietnamese' culture does back a hardware but not software market expansion. In Vietnam, in 2018, there are up to 73% population owning mobile

phones, which can still rise, since replacing TVs and computers with mobile phones in daily use is still a megatrend in Vietnam. (Digital in Asia 2018.)

5.1.2 Microenvironment: Porter's Five Forces Analysis

The competition

Vietnamese technology industry could be categorized into three main segments: hardware, semiconductor, and software market.

Hardware market, including PCs and mobiles, is dominated by foreign companies: Dell, Asus in PC market while Oppo, Samsung in mobile one. In this market, there is only one local representative: VinSmart, which has taken the third place in Vietnamese smartphone market by grabbing 16.7% market shares. The market has witnessed a fierce rivalry when almost 10 brands have taken this place in recent years and no one has managed remaining the position for more than six months. (VnExpress 2020.)

On the other hand, local companies are winning software and IT services market by taking advantage of cheaper prices. Main rivals in this field are FPT, CMC, MISA, HPT Vietnam Corporation. They provide wide range of service from accounting and management software, systems launching services, information security to data processing services. (Fitch Solutions 2020, 21.)

Potential of new players

VinSmart is an example of a local-welcoming industry. It was established recently, in 2018, then after 2 years, hikes to the third place in market share. One reason behind the enterprise's accomplishment is from government's strategy to support local private enterprises to take a lead in Vietnamese market. The encouragement contains simplifying procedures, assigning them more key tasks, etc. (Viet Nam News 2019.) Hence, the following years would probably observe the expansion of local firms in the market sectors where foreigners are currently in the forerunner.

Moreover, the competitive landscape can be even more intense with presence of IT entrepreneurs. This business segment also receives immense backing from Vietnamese government since there has been a plan to develop startup ecosystem by the authorities. A sound supporting evidence is the number of 3000 IT startups in Vietnam in 2018. Out of those, 92 gained government's financial support worth USD 291 million. (Vietnam Briefing 2018.)

Suppliers' bargaining power

Suppliers do not have much power in the industry since most of local enterprises emphasize distinguished software, which they can develop all by themselves, rather than hardware, of which several components need to be outsourced. Furthermore, there are a myriad of OEM manufacturers, which provides components for PC and mobiles, in the world. It opens for local hardware manufacturers ample options to engage with. (Vietnambiz 2019.)

Customers' bargaining power

Although there is a serious rivalry in the market, which hints a great bargaining power of customers, there is still a balance between power of customers and IT suppliers. It is robust demand of customer which is behind the equilibrium. Firstly, Vietnamese customers are more and more capable to meet expenses of IT products, which are positioned as expensive goods in Vietnam, thanks to the rising economy. Especially, 2019 has witnessed 7 percent growth in real GDP, the fastest in region (The World Bank 2020a). Secondly, due to the pandemic Covid-19, there is a gigantic demand for IT solutions, which also escalates the power of IT supplier.

Risk of product replacement

A substitute product is the one from another industry that delivers similar values to consumers. Vietnamese technology companies are not facing threats of that substitute product for two reasons. Firstly, technology itself is the most updated among industries, hence, it is hard to find a more effective solution from another sector as an alternative. Secondly, Vietnam is in digitalization era, where IT is an alternative for numerous tasks. It shows that the industry is owning substitute products, hence, there is a low risk of being replaced. (Vietnam Economic Times 2019.)

5.2 Summary

This chapter has introduced key features of Vietnamese technology industry by analyzing micro and macroenvironmental factors. A main point of the chapter is to lay basic knowledge of Vietnamese technology industry, then to get a glimpse of external elements that could affect capital structure,

Here are some highlights of this chapter:

- The competition in the industry is tense, however, with the help and orientation of government, new players are still welcomed.

- There is a giant support from the authority since the industry has been one of its main focuses in recent years.
- The demand is titanic from both public and private sectors, which offers technology enormous projects to invest in, then run.

It is seen that the industry is extremely fierce but potential with emerging demand and political supports. It pushes companies to continuously improve their supply quality, which cost money and capital, to not only meet such large demand but also earn competitive advantages.

Fortunately, there are a huge monetary source available not only from government but also investors due to the potentials. It is the industry's positive prospect that offers an auspicious chance for investors to invest in shares, as discussed in Chapter 3. Therefore, it is reasonable to expect an outweighed equity in the industry's capital division.

However, it is not assured without taking other determinants into account. Hence, the next chapter is devoted to a thorough examination on several other likely determinants to capital structure, with higher level of certainty.

6 EMPRICAL RESEARCH

6.1 Data and analysis method

The intent of this thesis is to scrutinize significance in connection of particular factors such as tangibility, firm size, profitability, and liquidity to decisions of public firms on capital structure within Vietnamese technology sector, limited to listed corporates on Vietnamese stock market, from 2016 to 2019. It means that the database of this study is mutually time-series and cross-segmental, which is named panel data.

6.1.1 Analysis method: Panel data

There are two motives in considering panel data analysis as a proper approach for this study:

- Firstly, since panel data records changes of an individual through time, it is more explanatory than database which is only either cross-segmental or time-series. Thus, the estimations from panel data analysis would be more reliable due to obtaining multiple approaches (Baltagi 2011, 305).
- Secondly, panel data analysis detects more special attributes of each entity in the database than either unmixed time-series or cross-segmental data does (Baltagi 2011, 305).

There are following principal formulae that are possibly developed from panel data: Common constant, Fixed-effects Regression and Random-effects Regression.

The common constant method

This linear panel data model has double subscripts:

$$y_{it} = \alpha + X'_{it}\beta + u_{it}$$

where:

- Y = dependent variables
- X = independent variables
- α = intercept
- β = coefficient
- i = cross-section
- t = time-series
- u = error term

Fixed- Effects Model

According to Asteriou & Hall (2011, 418), if error terms are fixed parameters, and each entity has its own entity-specific intercept, fixed-effects model is the most suitable:

$$y_{it} = \alpha_i + X'_{it}\beta_i + u_{it}$$

where:

- Y = dependent variables
- X = independent variables
- α = intercept
- β = coefficient
- i = cross-section
- t = time-series
- u = error term

The model is a tool to evaluate effects of variables varying over time (Econometrics with R 2020). It is formed based on the following assumptions:

- The error is not in correlation with any independent variables for entity i over t time.
- The variables are independent across entities.
- There is no multicollinearity.
- There are no time-invariant effects.

Random-Effects Model

According to Asteriou & Hall (2011, 419), in Random-effects model, intercept, or unobserved individual effects, are random parameters. It means the intercept in this alternative model is a sum of common constant and specific variable constant. Hence the model would be:

$$y_{it} = \alpha + X'_{it}\beta + u_{it} + v_{it}$$

where:

- Y = dependent variables
- X = independent variables
- α = intercept
- β = coefficient
- i = cross-section
- t = time-series

- u = error term
- v = zero mean standard random variable

The model is analogous with fixed-effects model, excepting for error term being uncorrelated with independent variables (Asteriou & Hall 2011, 420). It is formed grounded on the next assumptions:

- The error term is not in correlation with any independent variables.
- The variables are independent across entities.
- There is no multicollinearity.

Analysis design

Understanding the analysis approach, the author has developed an analysis plan, which is presented in Figure 7:

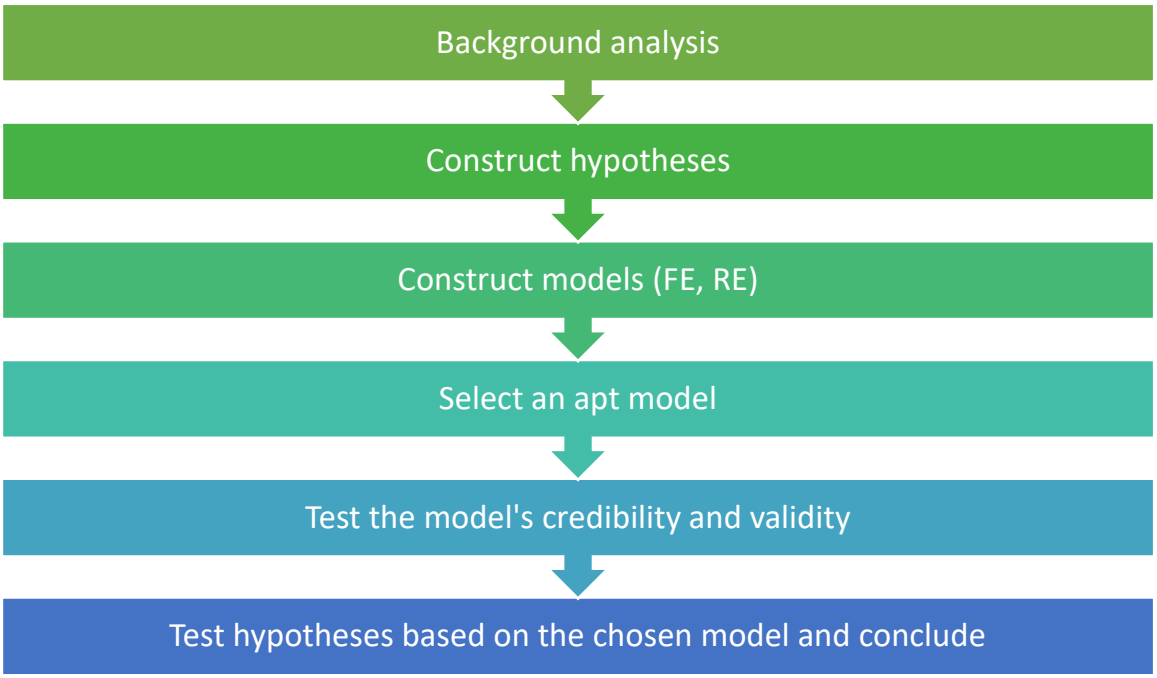

Figure 7 Analysis plan

In empirical research, a ground-breaking study is firstly conducted according to database established. Based on that, the author predicts relationships between capital structure and determinants, then form a hypothesis list.

Afterward, the author would construct both fixed and random- effects model. Those models would be tested by Hausman test to identify whether the error terms are correlated with independent variables. If they are correlated, fixed-effects regression is more appropriate for further use. And vice versa, if they are not correlated, random-effects model is chosen.

Deciding a suitable model, the author would verify whether the variables studied fulfill the model's conditions. The fulfillment means the model is dependable with high validity. If so, based on the selected one, the author concludes the relationships between capital allocation and its determining factors.

6.1.2 Data collection

Data approach

Since the target readers of this thesis are not only technology businesses but also prominent global stakeholders and debtholders, term "listed Vietnamese technology company" is defined according to Global Industry Classification Standards, which is promoted by MSCI and S&P Dow Jones, two eminent worldwide index providers. According to it, technology sector includes 3 main industries, which, subsequently, contain plenty sub-industries, as presented in Figure 8.

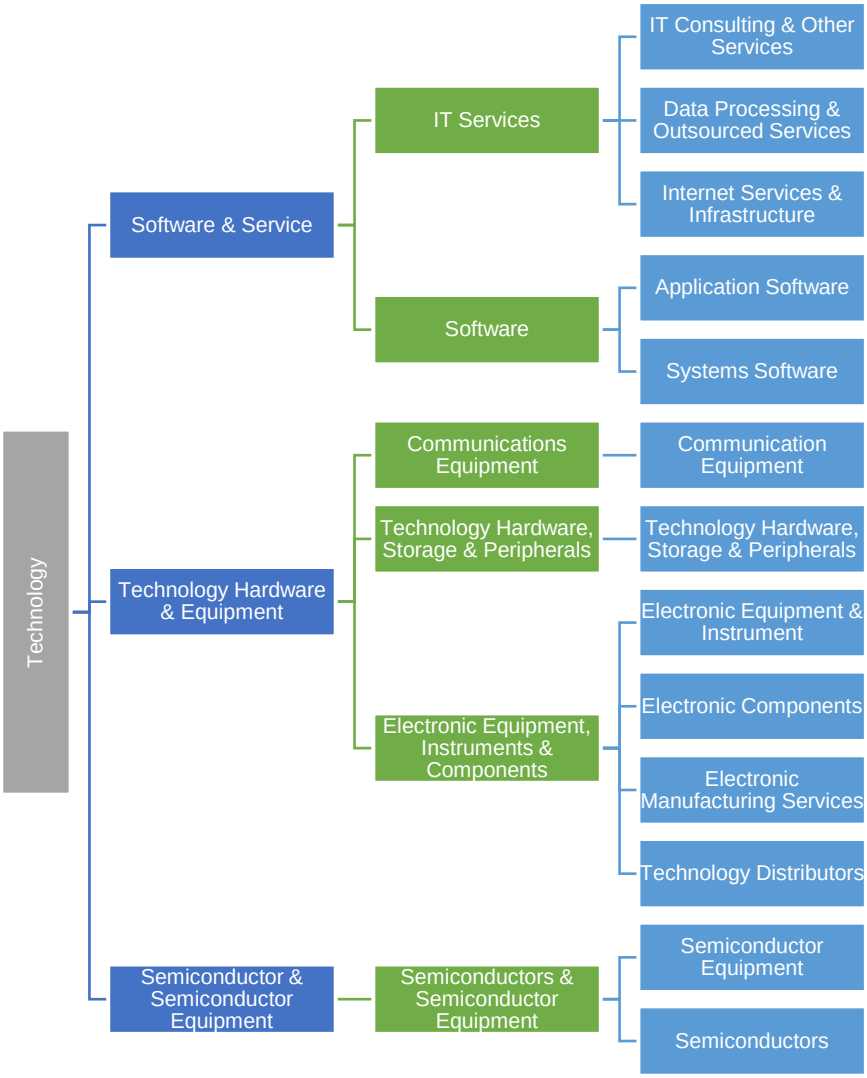

Figure 8 Technology Sector Classification Standards (S&P Global Market Intelligence 2018)

There are 50 public companies comprised in Down Jones's list and presented in Appendix 1. Among them, there are 2 corporates that are excluded from the thesis due to discontinuous operations.

Measurement of variables

As discussed in Chapter 3 & 4 apropos of proxies for capital structure and possible influencers. Due to constraint of access to only public annual reports, variables in examination

are also restricted to: Tangibility, Liquidity, Firm scope, and Profitability. Measurements of the elements are mounted in Table 4:

Table 4 Proxies of variables

	VARIABLE	PROXY
DEPENDENT VARIABLES	Debt ratio	$\frac{Total\ liabilities}{Total\ assets}$
	Long-term leverage	$\frac{Non-current\ liabilities}{Total\ assets}$
	Short-term leverage	$\frac{Current\ liabilities}{Total\ assets}$
INDEPENDENT VARIABLES	Tangibility	$\frac{Fixed\ assets}{Total\ assets}$
	Firm size	$\ln(Sales)$
	Profitability	$\frac{Operating\ income}{Sales}$
	Liquidity	$\frac{Cash\ and\ equivalents + Marketable\ Securities + Accounts\ receivable}{Current\ Liability}\ (QR)$

Data source

To warrant credibility of the thesis, financial data served this study are attained from firms' annual reports, including income statements and balance sheets, which are periodically audited by third parties. According to Table 4, from balance sheets are total assets, marketable securities, fixed assets, total liabilities, current liability, accounts receivable, and non-current liabilities, cash and equivalents amassed. Meanwhile, sales and operating income are retrieved from income statement.

A process of recording and converting raw financial data to utilizable measurements is illustrated in Figure 9:

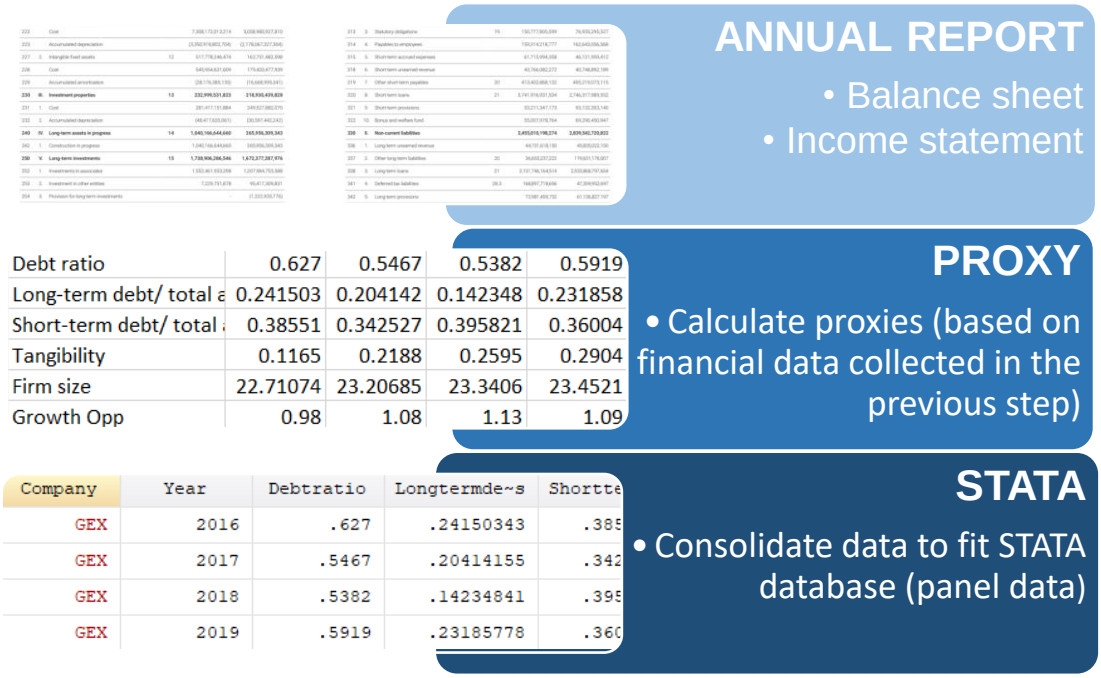

Figure 9 Data input process

After proxies are all computed, the database is consolidated to match statistics software Stata's template, which requires cross-sectional and time-series factors, then is imported into the application to perform panel data analysis. The analysis's outcomes and valuable observations are rendered in the next parts.

6.2 Background analysis

6.2.1 Descriptive summary

Table 5 describes contextual information of the 192 variables examined, including standard deviation, minimum, mean, and maximum value.

Table 5 Descriptive statistics of the study's observations

	Observations	Minimum	Maximum	Mean	Std. Deviation
Debt ratio	192	.01	.93	.5217	.23886
Long-term leverage	192	.00	.45	.0363	.0757
Short-term leverage	192	.01	.93	.4655	.23578
Tangibility	192	.00	.53	.1408	.11421
Firm size	192	12.83	23.45	19.6584	1.80644
Profitability	192	-4.10	1.00	-.0452	.51889
Liquidity	192	-.90	153.16	2.9286	12.89910
Valid N (listwise)	192				

According to Table 5, the average debt ratio of Vietnamese tech industry is 50:50, which tells the norm of balancing debt and equity amount in the industry. In terms of debt structure, short-term debt immensely outweighs long-term one. It suggests Vietnamese technology companies' predilection when borrowing.

However, there is a hefty number of companies of which debt ratios are far from the industry mean. As can be seen in Figure 10, there are several companies that exercise nearly no debt financing, while there are ample companies whose assets are mainly from borrowing.

The high deviation from average could be explained by variety of company sizes in Vietnamese technology firms. They range from companies with sales of VND 300 hundred to VND 15 billion, with assets of VND 16 million to VND 21 billion. If a company operates in small scale, its capital structure is easier to be manipulated by a small amount of debt than large ones'. Moreover, since the observations are all in the same industry, the deviation also predicts a weak influence of industrial features on Vietnamese tech companies' capital decisions.

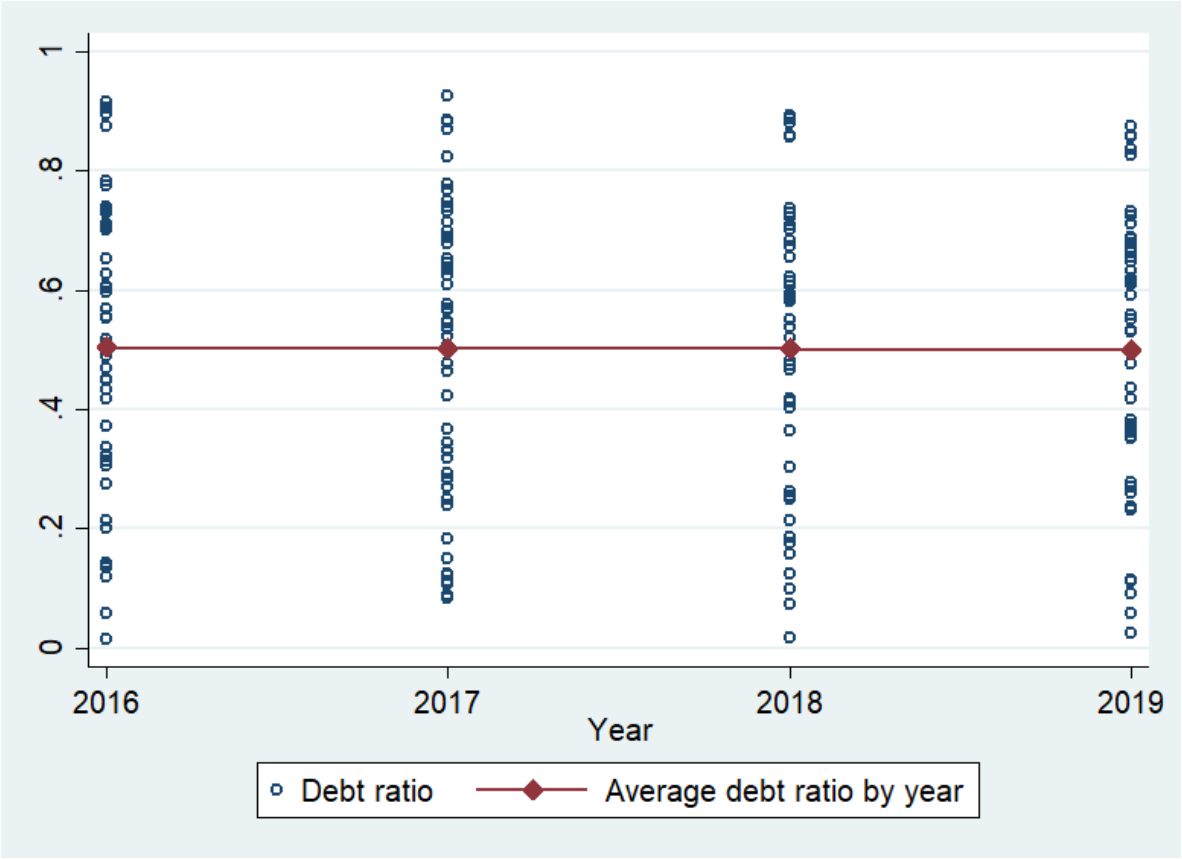

Figure 10 Capital structures of Vietnamese technology companies by year

Other determinants' statistics reveal investors' indifference towards Vietnamese technology. The safe debt rate 50:50 could be explained by the insecurity of debt holders with low rate of securitized assets, which is reflected by the low average tangibility rate of 14%, and the maximum rate of only 53%. In addition, prospects of the industry are considered negative due to the consistent negative profitability during 2016-2019, as can be seen in Figure 11. It could be a reason to the indifference of investors to the industry's stock, as the M/B is below 1 in 2019, which interpret market's expectation that the industry is overvalued (Brigham & Houston 2019, 122).

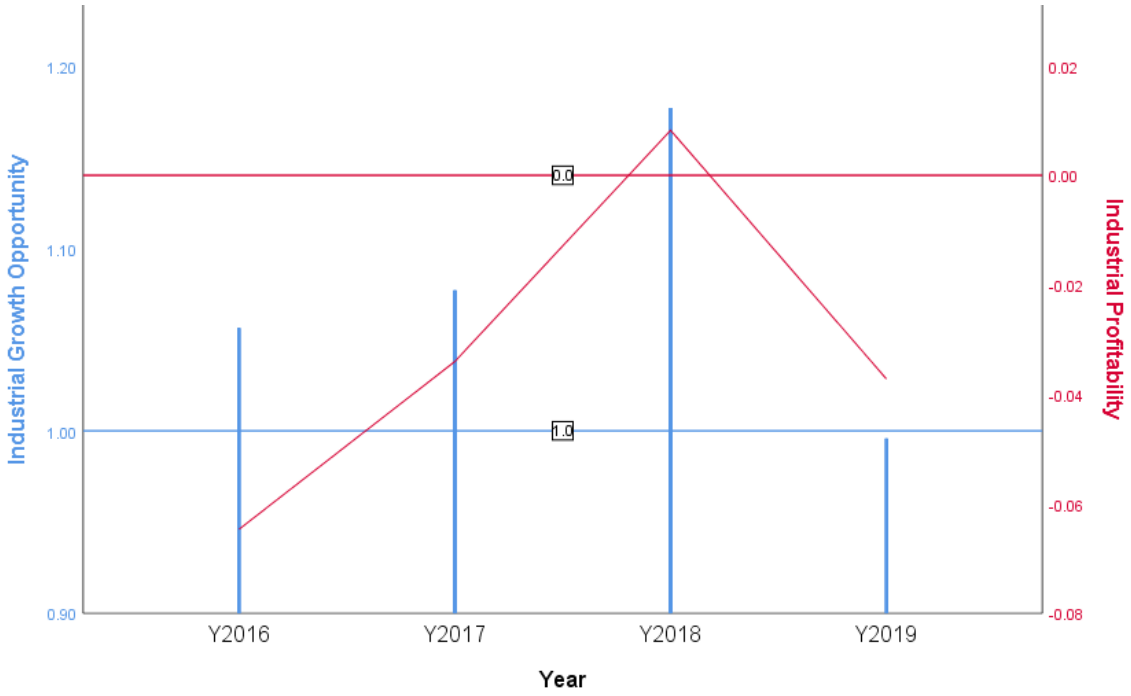

Figure 11 Industrial growth opportunity and profitability over 2016-2019

6.2.2 Correlations between determinants and capital structure

Table 6 is a correlation matrix of determinants and capital structure's indicators. The relationships between dependent and independent variables are fundamental to structure hypotheses' tests afterwards. Furthermore, correlation matrix also checks an existence of multicollinearity. It reduces the impact of independent variables to models because collinearity means the variables are dependent to each other, which loses the ability to predict a dependent one. (Hair et al. 2019, 313.)

Table 6 Correlation matrix

	Debt ratio	Long-term debt/ total assets	Short-term debt/ total assets	Tangibility	Firm size	Profitability	Liquidity
Debt ratio	1						
Long-term debt/ total assets	.223**	1					
Short-term debt/ total assets	.947**	-.134	1				
Tangibility	-.280**	-.099	-.251**	1			
Firm size	.557**	.234**	.492**	-.175*	1		
Profitability	.187**	.116	.158*	.014	.438**	1	
Liquidity	-.263**	.058	-.289**	-.103	-.167*	-.029	1

Correlations between dependent variables

According to Table 6, short-term and long-term indicators are in uphill correlation with overall debt ratio, while are not in significant correlation with each other. Specifically, while short-term debt ratio seems consistent with overall capital structure, long-term one shows a weak correlation with it. Even when time-series factor is considered, as shown in Figure 12, a status of correlation does not change, which raises a requirement of considering effects of determinants to both short and long-term debt ratios.

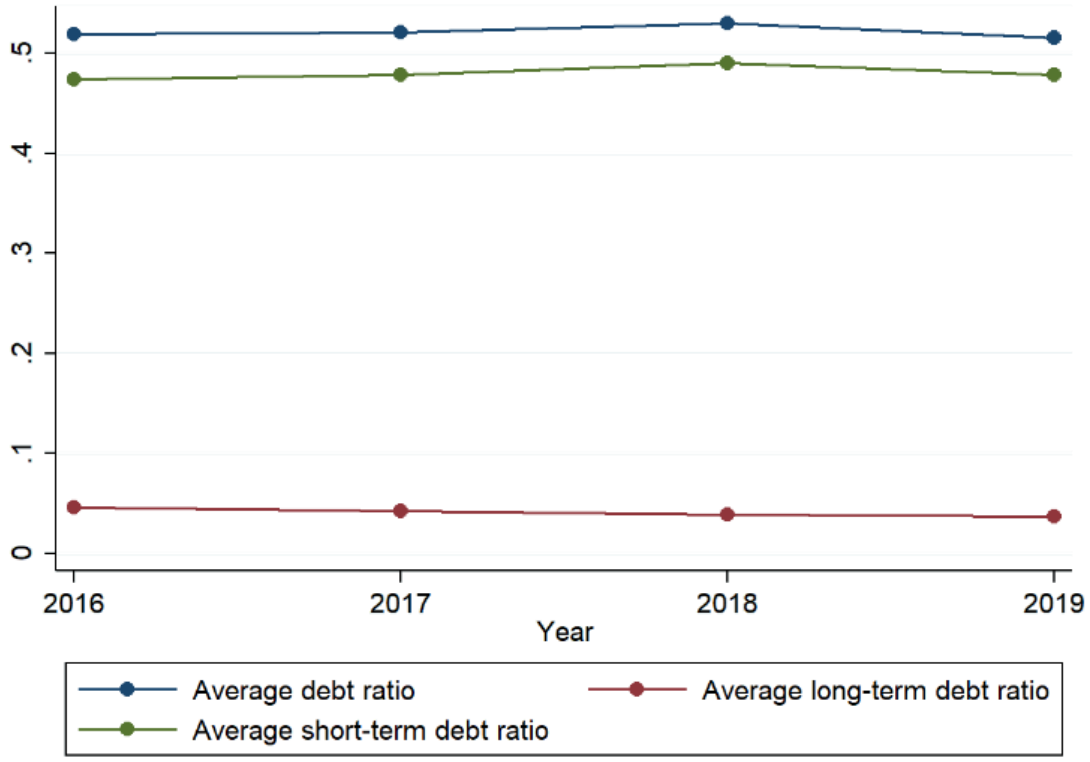

Figure 12 Capital structure indicators' correlations

Correlations between dependent and independent variables

As presented in Table 6, all the determinants are in significant correlations with debt ratio. The correlation coefficient range, which is from 0.2 to 0.6, shows either weak or moderate relationships between each of those determinants and debt ratio (Dummies 2019).

Among capital structure's indicators, long-term debt/ total assets fraction is hardly influenced by determinant as among the five independent factors, only firm size is in significant association with the long-term indicator. Meanwhile, short-term indicator is in the same trait with debt ratio, as its correlation coefficients with the five determinants are approximately equal to debt ratio's.

Correlations between independent variables

On the other hand, in Table 6 are relationships between determinants themselves. Almost all of them are in either insignificant or weak associations, of which coefficients are all below 0.6. However, the relationship between profitability and firm size is moderate, which

possibly causes sampling error, hence requires collinearity test when constructing regression model (Blalock 1963, 233).

However, the disadvantage of correlation matrix is its ignorance of time series. Hence, dealing with mixture between cross-sectional and time-series data, the matrix does not have much value for accurate relationship prediction and modelling. Therefore, even when showing consistence in correlation by year, which is presented in Appendix 2, it still needs other effective tools to check associations between the study variables.

6.2.3 Hypotheses structure

As aforementioned, a correlation matrix affords dire predictions about the relationships between capital structure and each determinant. Therefore, according to the matrix above, hypotheses in this study are formed and listed in Table 7.

Table 7 Hypotheses summary

Hypothesis	Content
H1a	Short-term leverage and tangibility are in negative association
H1b	Long-term leverage and tangibility are not related
H2a	Short-term leverage and firm size are in positive association
H2b	Long-term leverage and firm size are in positive association
H3a	Short-term leverage and profitability are in positive association
H3b	Long-term leverage and profitability are not related
H4a	Short-term leverage structure and liquidity are in negative association
H4b	Long-term leverage structure and liquidity are not related

6.3 Results

6.3.1 Short-term leverage and its determinants

Regression model construction

Table 8 summarizes the results of two panel data models: fixed-effects regression and random-effects GLS regression (a full regression models are presented in Appendix 3):

Table 8 Short-term leverage determinants: Fixed-effects and random-effects regression

	FIXED-EFFECTS REGRESSION		RANDOM-EFFECTS GLS REGRESSION	
	Coefficient	**Probability**	**Coefficient**	**Probability**
TANGIBILITY	-.9673	0.000	-.8251	0.000
FIRM SIZE	.0601	0.000	.0587	0.000
PROFITABILITY	-.0235	0.412	-.0203	0.450
LIQUIDITY	-.0015	0.007	-.0017	0.002
R-SQUARED	0.4044		0.4011	
F-TEST	23.76		104.73	

The table shows no significant difference between the two models in both type and degree of relationships between dependent variable (short-term leverage ratio) and its determinants. Despite the similarity, Hausman test is still run to identify a proper model for the study, so the author can test credibility of that model afterwards.

The test result is summarized in Table 9 and fully demonstrated in Appendix 4:

Table 9 Short-term leverage determinants: Hausman Test

Chi-squared	10.75
Probability	0.0295

**H0: difference in coefficients not systematics*

According to the test, the probability is 0.0295, lower than 0.05, which rejects hypothesis H0 in the figure: difference in coefficients not systematic. Hence, the fixed-effects regression is a more appropriate model in the study of short-term leverage determinants.

Model validity and credibility

To ensure reliability, fixed-effected model must be under validity tests to make sure it does not violate any assumptions. The tests consist of time-fixed effects, cross-sectional dependence, and heteroskedasticity. Since the database of the thesis is a micro panel with very few years, it is not essential to do further tests such as testing for serial correlation or stationery. Complete test results are presented in Appendix 5, Appendix 6, and Appendix 7 while its summary is demonstrated in Table 10.

Table 10 Short-term leverage determinants: Credibility tests for regression

CREDIBILITY TESTS		**RESULT (PROBABILITY)**
TIME-FIXED EFFECTS		0.4794
CROSS-SECTIONAL DEPENDENCE	**CD Test (Peseran)**	0.4917
	Friedman	1.0000
	Frees	1.4211
HETEROSKEDASTICITY		0.00

a) Time-fixed-effect test and result

Testing for time-fixed effects is inclusive for fixed-effects regression. Since the model is constructed based on the assumption that there is no effect changing through time but through individuals, or Vietnamese tech firm in this study. It is a joint test to clarify whether the current fixed-effects regression without time-fixed effects is valid. If the assumption of no time-invariant effects is violated, there must be an explicit proxy to measure those variables. (Baltagi 2011, 308.)

According to the result table, there is no time-fixed effects are needed by failing to discard, thus accepting the null hypothesis that there are none mutual coefficient over time with probability greater than 0.05.Hence, there are no time-invariant effects needed.

b) Cross-sectional-dependence test and result

Examining cross-sectional dependence is checking if residuals in the model are in any association across entities. Any such dependency would cause a biased regression model since it is constructed based on the assumption of only independent error terms across sections. (Hoyos & Sarafidis 2006, 483.)

There are three main tests available to check the dependencies: Pesaran, Friedman and Free. They share the same null hypothesis that residuals are not related to each other. The difference between the three are the distributions they are based on to test: Pesaran is based on normal distribution, Friedman is based on chi-square distribution, while Frees is based on Q-distribution. (Hoyos & Sarafidis 2006, 483.)

According to the result table, all the test probabilities are greater than 0.05. Accordingly, it is failed to decline the null hypothesis that there is cross-sectional independence. Hence, the fixed-effects model is free from contemporaneous correlations.

c) Heteroskedasticity test and result

Testing for heteroskedasticity is essential since the current fixed model is on assumption of homoskedasticity. If the assumption is not checked, there would be severe biases occurring in the estimation model. (Baltagi 2005, 201.) If a panel is heterogeneous, a robust fixed model is an alternative for the current one to obtain heterogeneous standard errors (Arellano 2003, 18).

According to the result table, with the probability lower than 0.05, the null hypothesis of homoskedasticity can be declined. It proves a presence of heteroskedasticity. Therefore, to eliminate the heterogeneous errors by robust standard errors, it is essential to construct

a robust fixed-effects regression, of which summary is presented in Table 11, and full model can be found in Appendix 8.

Table 11 Short-term leverage determinants: Robust fixed-effects regression

	ROBUST FIXED-EFFECTS REGRESSION	
	Coefficient	**Probability**
TANGIBILITY	-.9673	0.000
FIRM SIZE	.0601	0.031
PROFITABILITY	-.0235	0.365
LIQUIDITY	-.0015	0.007
R-SQUARED	0.4044	
F-TEST	9.73	

The robust fixed-effect regression is reliable and on a high level of explanatory power due to acceptable rate of R-squared and F-test results. The model achieves significant level of explanatory power by scoring 0.4 in R-squared test, meaning that almost half of the dependent variables can be concluded based on this model. Furthermore, with high results in F-test, which indicates low rate of unexplainable variables, the approach is reliable.

Results

According to the robust model constructed Table 11, there are three factors being in significant correlations with short-term leverage: tangibility, firm size, and liquidity. The relationship between profitability and the leverage is rejected since its probability level is above acceptance level of 0.05.

a) Tangibility

Tangibility displays a strong negative association with current liabilities. It shows that in short run, Vietnamese tech companies lean on pecking order hypothesis: companies with higher rate of intangible assets often faces fewer problems of asymmetric information,

which lessens the flotation cost if the company issue new stock (Imtiaz, Mahmud & Mallik 2016, 26).

That reason seems valid in Vietnamese technology industry since the author has found clearly high positive correlations between total equities and tangibility rates applicable for more than half of companies, as presented in Figure 13. According to the figure, Equity line is (almost) parallel to Tangibility line in most of cases, for example, CKH, THS, TSB, etc.

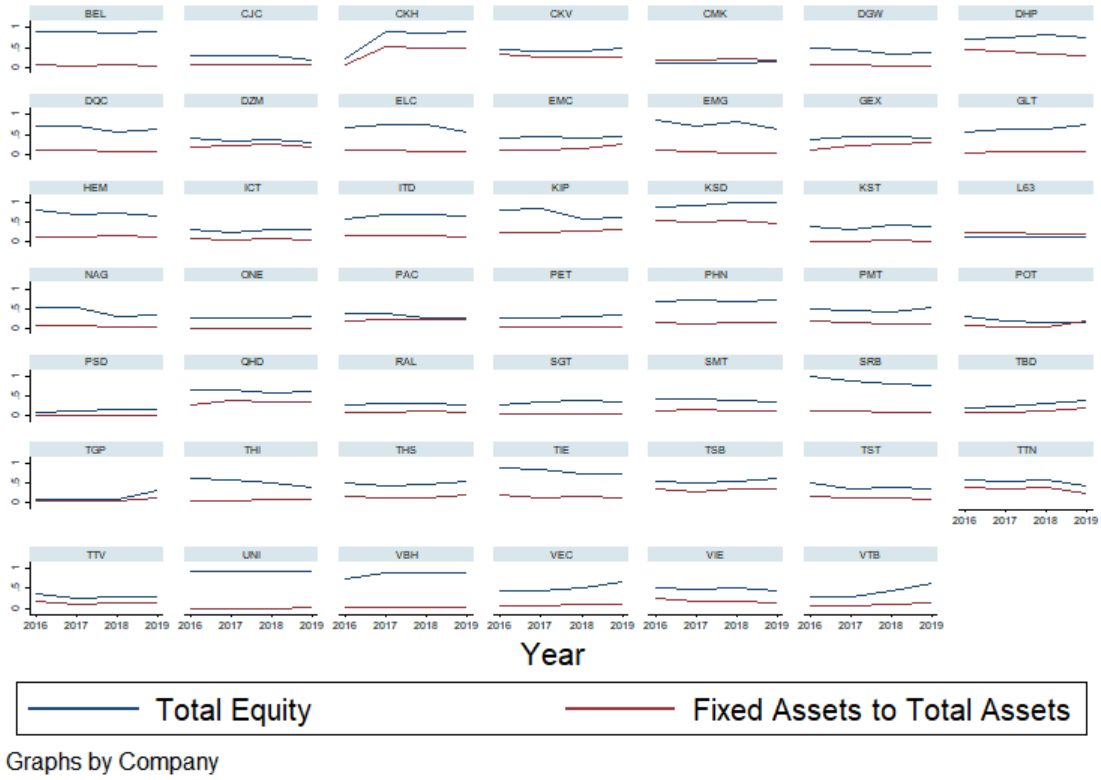

Figure 13 Correlation between Tangibility and Equity by company by year

b) Firm size

Firm size shows a weak positive correlation to short-term leverage. There is a high possibility that Vietnamese technology firms follow static theory in short run. It explains that large firms' sectors tend to be diversified, rendering them resilient to risks, thereby

reduces probability of bankruptcy. The low bankruptcy cost would be preferred by debtors due to low credit risks. Furthermore, being exposed to low risks, large companies are prone to attract low interest debt, which probably encourages them to use debt funding.

c) Liquidity

Liquidity displays a weak negative correlation with short-term leverage. Bondholders might translate high liquidity to a signal of poor governance by not settling account receivables and utilizing free cash efficiently, which raises agency cost between lenders and companies. Thus, in such situation, bondholders tend to limit their borrowing amount. (Sibilkov 2009, 1176.)

It is reasonable since an average liquidity rate of the observations is up to 2.65, which is significant high. Meanwhile, an average number of days sales outstanding is more than 6 months. Figure 14 shows that there are only nearly half of the companies managed to receive invoice return in less than 3 months, while there is up to one-tenth of total fail to clear the account within a year. Furthermore, that rate in 2019 is worse than the number of 144 in 2017, which hints their struggling in settling account receivables. (PwC 2018, 21.)

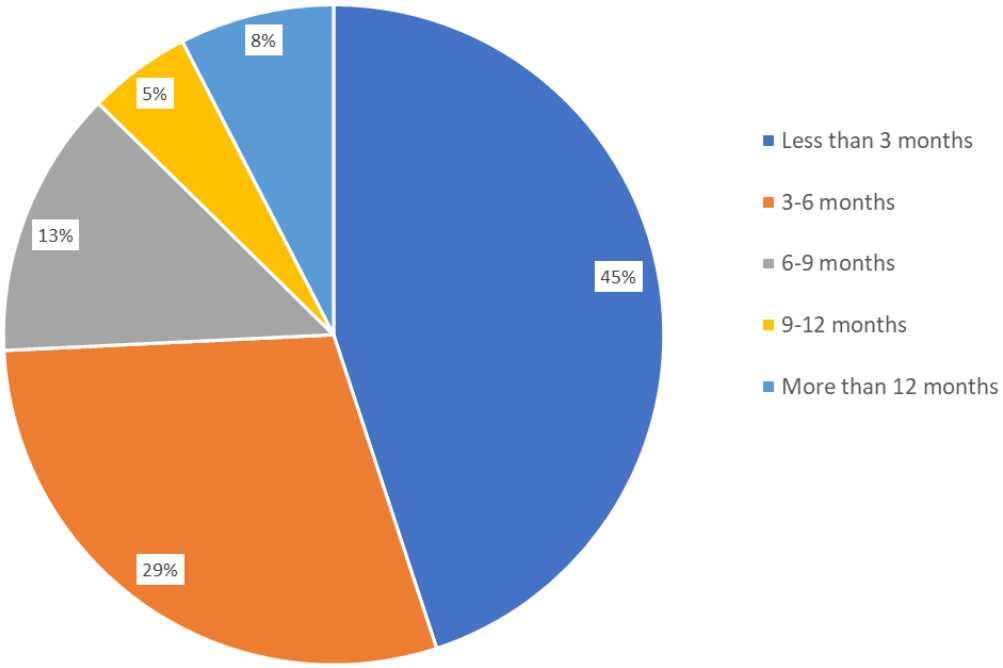

Figure 14 Vietnamese technology companies' days sales outstanding (account receivable days)

6.3.2 Long-term leverage and its determinants

Regression model construction

Table 12 summarizes outcomes of two panel data models: fixed-effects regression and random-effects GLS regression (a full regression models are presented in Appendix 9). Then, in Table 13 is Hausman test's summary presented to evaluate the appropriate model (the full one could be found in Appendix 10).

Table 12 Long-term leverage determinants: Fixed-effects and random-effects regression

	FIXED-EFFECTS REGRESSION		**RANDOM-EFFECTS GLS REGRESSION**	
	Coefficient	**Probability**	**Coefficient**	**Probability**
TANGIBILITY	.0320	0.574	.0117	0.809
FIRM SIZE	-.0083	0.276	.0031	0.530
PROFITABILITY	.0101	0.457	.0066	0.581
LIQUIDITY	.0004	0.128	.0004	0.104
R-SQUARED	0.0301		0.0132	
F-TEST	1.09		3.54	

Table 13 Long-term leverage: Hausman test

Chi-squared	4.88
Probability	0.3003

**H0: difference in coefficients not systematics*

According to the test, the probability is 0.3003, greater than 0.05, which fails to decline the null hypothesis that coefficients' difference is not systematic. Hence, the random-effects regression is a suitable model in the study of long-term leverage determinants.

Model validity and credibility

To warrant reliability, random-effected model must be under validity tests to guarantee it does not violate any assumptions. The tests consist random effects and cross-sectional dependence. Since the database of the thesis is micro panel with very few years, it is not essential to do further tests such as testing for serial correlation or stationery. Complete test results are presented in Appendix 11 and Appendix 12 while its summary is demonstrated in Table 14.

Table 14 Long-term leverage: Credibility tests

CREDIBILITY TESTS		RESULT (PROBABILITY)
RANDOM EFFECTS		0.0000
CROSS-SECTIONAL DEPENDENCE	**CD Test (Peseran)**	0.9807
	Friedman	1.0000
	Frees	1.4211

a) Random-effect test and result

Testing for random effects is for random-effects regression. Since the model is constructed based on the assumption that there are variances across individuals, or Vietnamese tech firm in this study. It is a test to clarify whether the current random-effects regression is correctly under that assumption. If there is no variance across entities, the model can be converted to simple OLS regression. (Baltagi 2011, 308.)

According to the result table, the random effects model is appropriate by rejecting the null hypothesis of zero variances across entities with probability less than 0.05.

b) Cross-sectional-dependence test and result

Checking cross-sectional dependence is to check if residuals in the model are in any association across entities. Any such dependency would cause a biased regression model

since it is constructed based on the assumption of only independent error terms across sections. (Hoyos & Sarafidis 2006, 483.)

There are three main tests available to check the dependencies: Pesaran, Friedman and Free. They share the same null hypothesis that residuals are not related to each other. The difference between the three are the distribution they are based on to test: Pesaran is based on normal distribution, Friedman is based on chi-square distribution, while Frees is based on Q-distribution. (Hoyos & Sarafidis 2006, 483.)

According to the result table, all the test probabilities are greater than 0.05. Accordingly, it is declined to reject the null hypothesis that there is cross-sectional independence. Hence, the random-effects model is free from contemporaneous correlations.

Results

According to the random model constructed in Table 12, there are no factors being in significant relationships with long-term leverage since their probability levels are all above acceptance level of 0.05.

The irrelevance between long-term debt ratio and all the determinants examined is possibly explained by the norm that long-term leverage ratios are extremely low in almost of Vietnamese technology companies. As can be seen in Figure 15, almost 90% of long-term debt ratios are under 10%. Therefore, it is a tendency of avoiding long-term debt issuing which leads to a constancy of low rates. The constancy makes long-term leverage not in any association with any determinant.

Furthermore, Vietnamese bank is decreasing its long-term lending ratio, adapting to the new policy of the authority, which limits amount of short-term debt used for long-term lending (Tap Chi Tai Chinh 2019). It could decrease chances of those companies to approach long-term debt.

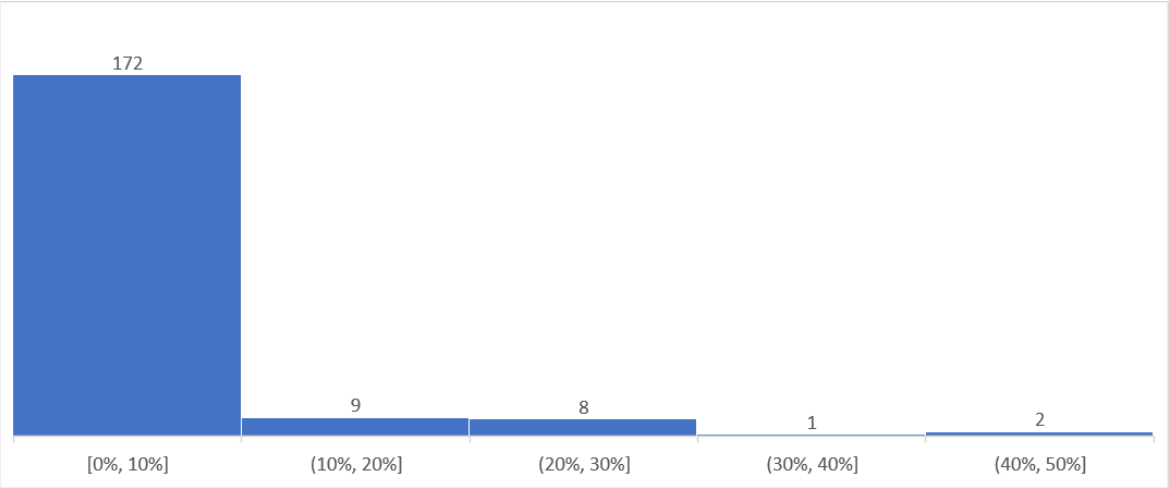

Figure 15 Histogram: Long-term debt ratios in Vietnamese tech industry

6.3.3 Synthesis of results

From the two previous analyses concerning short and long-term leverage and their determinants, the author has concluded statuses of capital structure determinants in Vietnam technology industry and summarized in the following table:

`

Table 15 Synthesis of hypothesis confirmations/ rejections

Vietnamese technology firms' attributes	What type of its correlation to capital structure?
Tangibility	• Strongly negative in short run • Irrelevant in long run
Firm size	• Positive in short run • Irrelevant in long run
Profitability	• Irrelevant in both short and long run
Liquidity	• Weakly negative in short run • Irrelevant in long run

This chapter has helped to answer the third sub-question: How do those factors determine decisions of technology firms in Vietnam about capital allocation? In the next chapter, the author will connect all the previous chapters' content to offer a comprehensive answer for the main research question.

7 DISCUSSION AND CONCLUSION

7.1 Answers to research questions

The main objective of this thesis is to evaluate factors that impact capital allocation decisions of technology firms in Vietnam. The objective is reflected throughout the research question pyramid in Chapter 1.

SQ1: What are the ideas of capital allocation?

Capital allocation suggests a blend of debt, common and preferred stock, by which a firm's assets are financed and its business risk is mitigated. An optimal capital allocation is impossibly universally precise but varies through dissimilar theories, since there is no hard proof which one is better.

However, there are several concepts helping realize possible determinants when setting a target capital structure for a firm. They are concluded in the following classical theories:

- Taxes on dividend and interest returns have contrasting bearings on corporate's value. If a tax rate on debenture returns is sufficiently large, it can eliminate others' tax advantages. In practice, personal tax's involvement, however, does reduce the benefit of debt financing, but not completely.
- Trade-off theory explains how companies balances between their tax benefits from leveraging and bankruptcy cost. The bankruptcy cost starts offsetting then outweigh effects of taxation when company raises leveraging level.
- Knowing investors' behavior, companies utilize power of asymmetric information by frequently using less debt than their optimal level, then save its borrowing power for a good investment opportunity.
- Pecking order hypothesis suggests firms prioritize internal fund raising the first, debt financing the second, and equity financing the last.

(A more specific answer could be found in subchapter 2.7 and 3.5)

SQ2: What are the potential factors that are decisive to capital allocation?

There are already heaps of papers that examine determinants of capital structure. Their effects vary depending on area, culture, management, investment philosophy, and other characteristics. In this thesis, the author selects several highlighted determinants to discuss, including firms' size, tangibility, growth opportunities, liquidity, profitability, tax shield, of which effects are summarized in Table 16.

Table 16 Main forecasts of capital structure theory frameworks

Factors	Static theory	Pecking order Hypothesis
Tangibility	+	-
Firm size	+	-
Growth opportunity	-	+/-
Profitability	+	-
Volatility	-	-
Nondebt tax	-	
Liquidity	+	-

SQ3: How do those factors determine the decisions of technology firms in Vietnam about capital structure?

After conducting two analyses concerning short and long-term leverage and their determinants, the factors' effects are summarized in Table 17.

Table 17 How do examined factors determined capital decisions of companies

Vietnamese technology firms' attributes	**How do those factors determine the decisions of technology firms in Vietnam about the capital structure?**
Tangibility	• Strongly negative in short run • Irrelevant in long run
Firm size	• Positive in short run • Irrelevant in long run
Profitability	• Irrelevant in both short and long run
Liquidity	• Weakly negative in short run • Irrelevant in long run

RQ: What are the variables that affect decisions regarding technology firms' capital structure in Vietnam?

According to the empirical results, the validity of impacts of tangibility, firm size, and liquidity on capital allocation are verified in short-term. More specifically, tangibility and liquidity are in positive correlation with debt ratio, meanwhile, firm size is in negative one.

In long-term, there is no evidence of validity of any determinants' impact. It could be explained by the industry's hesitance to issue long-term bonds, which makes long-term debt ratio indifferent with any adjustments.

In addition, the results do not show consistency to only one theory. It suggests the industry follows multiple spectrums, which makes it harder to predict companies' capital allocation decisions

7.2 Reliability and validity

Reliability and validity are conceptions that value research quality. Reliability indicates the consistency of a method, and validity refers to the precision of a measurement. If results do not vary when using the same techniques under the same conditions, the measurement is deemed reliable. Meanwhile, if a research is valid, it provides findings that parallel with real properties, features, and deviations. (Saunders, Lewis & Thornhill 2016, 202.)

Considering reliability, the findings are consistent in research methods, which contains data collection and data analysis. Firstly, the theory framework is supported by numerous academic papers. Secondly, data sources of the case study are public and strictly audited. Therefore, there is little chance that the database is inconsistent, which proves reliability of the thesis

Regarding validity, the analysis method is a popular approach among the same studies, which guarantees the tools used in this thesis are valid. A minor weakness of the thesis is that there is only one measurement used for each of determinant's indicator, among numerous possible options. Hence, the validity rate might be low for another research using different measures.

7.3 Implementations

7.3.1 For Vietnamese technology companies

According to the research results, firm size positively correlates with capital allocation. Large-scale businesses with high tangible fixed assets will more easily access external capital. Therefore, SMEs should have specific development strategies to manage capital structure effectively. It should ensure flexible adjustments to capital allocation.

Furthermore, the finding suggests that operational efficiency is not a determining factor but capital efficient usage. It is highlighted through the fact that liquidity correlates with debt ratio, while profitability does not. Hence, companies should prioritize its proficiency in cash flow management, especially its account receivables, to be attractive to debtors.

7.3.2 For Vietnamese authorities

As discussed in Chapter 5, in the current digitalization era with full of spectacular projects, technology companies need huge long-term investment to adapt to the megatrend. However, the current situation of long-term debts conflicts with the potentials of the industry, when there is nearly no company having significant long-term debts.

Hence, Vietnamese government should frame policies to help businesses access more long-term capital sources. They are the funding sources which helps businesses operate stably and effectively.

7.3.3 For commercial banks

Tangibility shows a strong negative correlation with short-term liability. It means the lower the quality of collateral, the more likelihood that companies use debt. Meanwhile, firms with high tangibility prefer equity financing due to lower cost. It raises a great credit risk on commercial banks, in which situation, the banks have the following options:

- Introduce more preferential interest rate policy for high-tangibility companies to compensate their equity financing advantages.
- Propose extra criteria for loans evaluation to mitigate credit risks. For example, profitability could be considered as a criterion. It not only places the investment into good performance companies, which encourages them to operate even more effectively, but also reduces bankruptcy risks with positive profit rates.

7.4 Suggestions for future studies

Since the optimal capital allocation cannot be universally precise but varying through dissimilar theories, it is a must to conduct studies on different scopes to gain a correct view of capital structure situation.

Firstly, future studies shall focus on private companies, which are also main representatives of Vietnamese technology industry.

Secondly, paying attention to dissimilarities in sub-sectors of the industry will be a good option to identify more unique features in capital structure, hence will possibly record more significant findings.

Thirdly, making comparisons to other technology industries can be a good option for further research. It can underline other distinct features of Vietnam’s capital structure influencers.

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APPENDICES

Appendix 1. List of listed Vietnamese technology companies (Factiva 2020)

LIVE HELP

Home | Search | Alerts | Newsletters | Analytics | News Pages | Companies/Markets | Labs

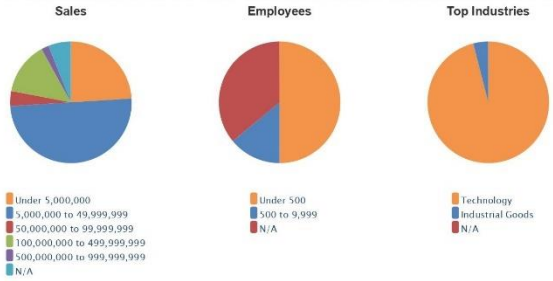
Find Companies: Go Search for companies in the news: Go More search options...

Company > Company Screening Results

Selected Company Screening Criteria Save | Modify

Selected Criteria		Companies Found
Ownership Type	Listed	56,489 Edit | X
Country/Region	Vietnam	1,372 Edit | X | Get List
Industry	Technology	50 Edit | X

Charts



Add to Company List Map Results | Spreadsheet

		Company Name	Location Type	Ownership Type	Dow Jones Industry	Country/Region	Sales USD m	Symbol
☑	1	Vietnam Electrical Equipment Joint Stock Corp.		Listed	Electrical Components/Equipment	Viet Nam	660.91	jVGEX
☑	2	Petrovietnam General Services JSC	Headquarters	Listed	Audio/Video Equipment	Viet Nam	431.91	jVPET
☑	3	Digiworld Corp.	Headquarters	Listed	Computing	Viet Nam	366.30	jVDGW
☑	4	Petroleum General Distribution Services Joint Stock Co.	Principal Subsidiary	Listed	Telecommunications Equipment	Viet Nam	245.93	jvPSD
☑	5	Rangdong Light Source & Vacuum Flask JSC		Listed	Electric Lighting Equipment	Viet Nam	183.66	jVRAL
☑	6	Dry Cell & Storage Battery JSC	Principal Subsidiary	Listed	Batteries	Viet Nam	132.87	jVPAC
☑	7	Electrical Equipment JSC	Principal Subsidiary	Listed	Electrical Components/Equipment	Viet Nam	129.71	jVTHI
☑	8	Dong Anh Electrical Equipment Corporation - Joint Stock Company	Headquarters	Listed	Electrical Components/Equipment	Vietnam	105.70	avTBD
☑	9	Joint Stock Company For Telecoms And Informatics	Headquarters	Listed	Telecommunications Equipment	Vietnam	97.19	jVICT
☑	10	Post & Telecommunication Equipment Factory JSC	Headquarters	Listed	Telecommunications Equipment	Viet Nam	51.42	jvPOT
☑	11	Nagakawa Viet Nam JSC		Listed	Household Appliances	Viet Nam	44.06	jvNAG
☑	12	Electronics Communications Technology Investment Development	Headquarters	Listed	Communications Software	Viet Nam	37.75	jVELC
☑	13	Dien Quang Lamp JSC	Headquarters	Listed	Electric Lighting Equipment	Viet Nam	35.60	jVDQC
☑	14	Saigon Telecommunication & Technologies Corp.		Listed	Online Service Providers	Viet Nam	29.89	jVSGT
☑	15	Viettronics Bien Hoa Js Co._Factory	Single Location	Listed	Consumer Electronics	Vietnam	25.62	avBEL
☑	16	Hanoi Electromechanical Manufacturing Joint Stock Company	Subsidiary	Listed	Electrical Components/Equipment	Vietnam	23.34	avHEM
☑	17	Thu Duc Electro Mechanical JSC		Listed	Electrical Components/Equipment	Viet Nam	18.26	jVEMC
☑	18	Cokyvina JSC		Listed	Broadband Equipment	Viet Nam	16.93	jvCKV
☑	19	One Communication Technology Corp.	Unknown	Listed	Telecommunications	Viet Nam	16.64	jvONE

					Equipment			
☑	20	Innovative Technology Development Corp.	Headquarters	Listed	Measuring/Precision Instruments	Viet Nam	16.52	jvITD
☑	21	Viettronics Tan Binh JSC	Principal Subsidiary	Listed	Personal Electronics	Viet Nam	15.52	jvVTB
☑	22	Hanoi Battery JSC		Listed	Batteries	Viet Nam	14.25	jvPHN
☑	23	No. 1 Electrical Devices Joint Stock Co.	Single Location	Listed	Industrial Electronics	Vietnam	13.36	avKIP
☑	24	Central Area Electrical Mechanical JSC	Headquarters	Listed	Electrical Components/Equipment	Viet Nam	12.73	jvCJC
☑	25	Thanh Hoa Song Da JSC	Headquarters	Listed	Household Appliances	Viet Nam	12.36	jvTHS
☑	26	Hai Phong Electrical Mechanical JSC		Listed	Household Appliances	Viet Nam	12.05	jvDHP
☑	27	Viet Nam Technology & Telecommunication Joint Stock Company	Principal Subsidiary	Listed	Online Service Providers	Vietnam	11.13	avTTN
☑	28	Viet Duc Welding Electrode JSC		Listed	Industrial Electrical Equipment	Viet Nam	10.33	jvQHD
☑	29	Công ty cổ phần Viettronics công nghiệp	Principal Subsidiary	Listed	Industrial Electronics	Vietnam	10.08	avVEC
☑	30	Sametel Corp.		Listed	Fiber Optic Equipment	Viet Nam	9.96	jvSMT
☑	31	Tiasang Battery JSC		Listed	Batteries	Viet Nam	9.31	jvTSB
☑	32	Vinacomin - Maokhe Mechanical Joint Stock Company	Single Location	Listed	Passive Components	Vietnam	9.05	avCMK
☑	33	Kasati JSC	Headquarters	Listed	Industrial Electronics	Viet Nam	8.02	jvKST
☑	34	An Giang Mechanical Joint Stock Company	Headquarters	Listed	Agricultural Machinery	Vietnam	7.28	avCKA
☑	35	Global Electrical Technology Corp.	Headquarters	Listed	Electrical Components/Equipment	Viet Nam	5.14	jvGLT
☑	36	Electrical Mechanical Equipment And Spare Parts Joint Stock Company	Headquarters	Listed	Electrical Components/Equipment	Vietnam	4.64	avEMG
☑	37	DNA Investment JSC		Listed	Household Appliances	Viet Nam	4.54	jvKSD
☑	38	Vinh Railway Signalling - Telecom Joint Stock Company	Principal Subsidiary	Listed	Alarms/Signaling Equipment	Vietnam	4.50	avTTV
☑	39	Telecommunications Industry Electronics Joint Stock Company	Principal Subsidiary	Listed	Electrical Components/Equipment	Vietnam	4.36	avTIE
☑	40	Dzi An Manufacturing Plc	Headquarters	Listed	Electrical Components/Equipment	Viet Nam	4.17	jvDZM
☑	41	Telecommunication Technical Service JSC	Headquarters	Listed	Electrical Components/Equipment	Viet Nam	4.09	jvTST
☑	42	Truong Phu Joint Stock Company	Single Location	Listed	Telecommunications Equipment	Vietnam	2.57	avTGP
☑	43	Hai Phong Machinery Manufacturing Joint Stock Company	Single Location	Listed	Electrical Components/Equipment	Vietnam	1.74	avCKH
☑	44	VITECO Vietnam Telecommunications Technology JSC	Headquarters	Listed	Mobile Communications Devices	Viet Nam	1.41	jvVIE
☑	45	Low Current Telecom JSC		Listed	Telecommunications Equipment	Viet Nam	0.92	avLTC
☑	46	Vien Lien JSC		Listed	Telecommunications Equipment	Viet Nam	0.28	jvUNI
☑	47	Sara JSC	Headquarters	Listed	Software	Viet Nam	0.12	avSRB
☑	48	Công ty cổ phần Điện tử Bình Hòa	Principal Subsidiary	Listed	Electrical Components/Equipment	Vietnam	N/A	avVBH
☑	49	Công ty cổ phần LILAMA 69-3	Principal Subsidiary	Listed	Pump Manufacturing	Vietnam	N/A	avL63
☑	50	Công ty cổ phần Vật liệu Xây dựng Bưu điện	Principal Subsidiary	Listed	Telecommunications Equipment	Vietnam	N/A	avPMT

Add to Company List

Map Results | Spreadsheet

Appendix 2. Correlation matrix between debt ratio and its possible determinants by year

-> Year = 2016

	Debtra~o	Tangib~y	Firmsize	Growth~p	Profit~y	Liquid~y
Debtratio	1.0000					
Tangibility	-0.2795 0.0544	1.0000				
Firmsize	0.5302 0.0001	-0.2892 0.0462	1.0000			
GrowthOpp	-0.0377 0.7994	-0.1929 0.1889	0.2144 0.1434	1.0000		
Profitabil~y	0.3153 0.0290	0.0016 0.9916	0.4747 0.0007	0.2081 0.1557	1.0000	
Liquidity	-0.5091 0.0002	-0.0556 0.7075	-0.4797 0.0006	-0.1066 0.4708	-0.9162 0.0000	1.0000

-> Year = 2017

	Debtra~o	Tangib~y	Firmsize	Growth~p	Profit~y	Liquid~y
Debtratio	1.0000					
Tangibility	-0.3118 0.0310	1.0000				
Firmsize	0.5809 0.0000	-0.2271 0.1206	1.0000			
GrowthOpp	-0.0097 0.9477	-0.2173 0.1379	0.1158 0.4332	1.0000		
Profitabil~y	0.2357 0.1068	0.0089 0.9520	0.4481 0.0014	0.1978 0.1779	1.0000	
Liquidity	-0.5474 0.0001	-0.1320 0.3710	-0.3363 0.0194	0.2363 0.1059	-0.0041 0.9780	1.0000

-> Year = 2018

	Debtra~o	Tangib~y	Firmsize	Growth~p	Profit~y	Liquid~y
Debtratio	1.0000					
Tangibility	-0.2903 0.0453	1.0000				
Firmsize	0.5693 0.0000	-0.1442 0.3280	1.0000			
GrowthOpp	-0.0483 0.7446	-0.1188 0.4212	0.0128 0.9310	1.0000		
Profitabil~y	0.1153 0.4351	-0.0165 0.9116	0.4335 0.0021	0.2088 0.1545	1.0000	
Liquidity	-0.3072 0.0337	-0.1405 0.3408	-0.1790 0.2235	0.2547 0.0806	0.0307 0.8360	1.0000

-> Year = 2019

	Debtra~o	Tangib~y	Firmsize	Growth~p	Profit~y	Liquid~y
Debtratio	1.0000					
Tangibility	-0.2349 0.1080	1.0000				
Firmsize	0.5538 0.0000	-0.0577 0.6968	1.0000			
GrowthOpp	-0.0102 0.9451	-0.0691 0.6409	0.1369 0.3535	1.0000		
Profitabil~y	0.0911 0.5379	0.0374 0.8008	0.4772 0.0006	0.1366 0.3545	1.0000	
Liquidity	-0.4151 0.0033	-0.1407 0.3402	-0.2328 0.1113	0.4106 0.0038	0.1091 0.4605	1.0000

Appendix 3. Short-term leverage determinants: Fixed and Random-Effects Regression

Fixed-effects (within) regression — Number of obs = 192
Group variable: **Tech_firm** — Number of groups = 48

R-sq:
within = 0.4044
between = 0.2364
overall = 0.2496

Obs per group:
min = 4
avg = 4.0
max = 4

F(4,140) = 23.76
corr(u_i, Xb) = -0.2672 — Prob > F = 0.0000

STDA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Tangibility	-.9673272	.1203642	-8.04	0.000	-1.205294	-.7293608
Firm_size	.0601091	.0161447	3.72	0.000	.0281903	.092028
Profitability	-.0235767	.028625	-0.82	0.412	-.0801698	.0330163
Liquidity	-.0015407	.000558	-2.76	0.007	-.0026439	-.0004374
_cons	-.5754191	.3208486	-1.79	0.075	-1.209754	.0589158
sigma_u	.2003731					
sigma_e	.06776509					
rho	.89736354	(fraction of variance due to u_i)				

F test that all u_i=0: F(47, 140) = 28.88 — Prob > F = 0.0000

Random-effects GLS regression — Number of obs = 192
Group variable: **Tech_firm** — Number of groups = 48

R-sq:
within = 0.4011
between = 0.2551
overall = 0.2664

Obs per group:
min = 4
avg = 4.0
max = 4

Wald chi2(4) = 104.73
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

STDA	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Tangibility	-.8251127	.1095482	-7.53	0.000	-1.039823	-.6104021
Firm_size	.0587188	.011811	4.97	0.000	.0355697	.081868
Profitability	-.0203026	.0268551	-0.76	0.450	-.0729377	.0323324
Liquidity	-.0017434	.0005616	-3.10	0.002	-.0028442	-.0006427
_cons	-.5678881	.2371396	-2.39	0.017	-1.032673	-.103103
sigma_u	.18013816					
sigma_e	.06776509					
rho	.87602924	(fraction of variance due to u_i)				

Appendix 4. Short-term leverage determinants: Hausman Test

	Coefficients (b) fe2	(B) re2	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Tangibility	**-.9673272**	**-.8251127**	**-.1422146**	**.0551522**
Firm_size	**.0601091**	**.0587188**	**.0013903**	**.0114515**
Profitabil~y	**-.0235767**	**-.0203026**	**-.0032741**	**.0113835**
Liquidity	**-.0015407**	**-.0017434**	**.0002028**	**.0000888**

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(**4**) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= **10.75**
Prob>chi2 = **0.0295**

Appendix 5. Short-term leverage determinants: Credibility test: Testing for time-fixed effects

R-sq:
within = **0.4150**
between = **0.2389**
overall = **0.2525**

Obs per group:
min = **4**
avg = **4.0**
max = **4**

F(**7**,**137**) = **13.89**
corr(u_i, Xb) = **-0.2811** Prob > F = **0.0000**

Shorttermde~s	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Tangibility	-.9808578	.1209172	-8.11	0.000	-1.219963	-.7417523
Firmsize	.0622839	.0163761	3.80	0.000	.0299013	.0946664
Profitability	-.0293081	.0289527	-1.01	0.313	-.08656	.0279439
Liquidity	-.0016638	.0005646	-2.95	0.004	-.0027802	-.0005474
Year						
2017	.0003648	.0138972	0.03	0.979	-.0271159	.0278456
2018	.0194357	.0141429	1.37	0.172	-.0085309	.0474023
2019	.008526	.0140399	0.61	0.545	-.0192369	.0362889
_cons	-.6231899	.3265168	-1.91	0.058	-1.268854	.0224745
sigma_u	.2009442					
sigma_e	.06788874					
rho	.89755185	(fraction of variance due to u_i)				

F test that all u_i=0: F(**47**, **137**) = **28.75** Prob > F = **0.0000**

```
. testparm i.Year

 ( 1)  2017.Year = 0
 ( 2)  2018.Year = 0
 ( 3)  2019.Year = 0

       F(  3,   137) =    0.83
            Prob > F =    0.4794
```

Appendix 6. Short-term leverage determinants: Credibility test: Testing for cross-sectional dependence

```
. xtcsd, pesaran abs

Pesaran's test of cross sectional independence =    -0.688, Pr = 0.4917

Average absolute value of the off-diagonal elements =     0.582

. xtcsd, frees abs

  Frees' test of cross sectional independence =     2.582
|---------------------------------------------------------|
  Critical values from Frees' Q distribution
                     alpha = 0.10 :   0.5822
                     alpha = 0.05 :   0.8391
                     alpha = 0.01 :   1.4211

Average absolute value of the off-diagonal elements =     0.582

. xtcsd, friedman abs

Friedman's test of cross sectional independence =     2.075, Pr = 1.0000

Average absolute value of the off-diagonal elements =     0.582
```

Appendix 7. Short-term leverage determinants: Credibility test: Testing for heteroskedasticity

```
Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (48)  =   63688.82
Prob>chi2 =      0.0000
```

Appendix 8. Short-term leverage determinants: Robust fixed-effects regression

```
Fixed-effects (within) regression               Number of obs      =       192
Group variable: Firm                            Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4044                                         min =         4
     between = 0.2364                                         avg =       4.0
     overall = 0.2496                                         max =         4

                                                F(4,47)            =      9.73
corr(u_i, Xb)  = -0.2672                        Prob > F           =    0.0000

                                              (Std. Err. adjusted for 48 clusters in Firm)
```

Shorttermde~s	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Tangibility	-.9673272	.2456761	-3.94	0.000	-1.461564	-.4730908
Firmsize	.0601091	.0269875	2.23	0.031	.0058173	.114401
Profitability	-.0235767	.0257879	-0.91	0.365	-.0754553	.0283018
Liquidity	-.0015407	.0005434	-2.84	0.007	-.0026339	-.0004475
_cons	-.5754191	.5375836	-1.07	0.290	-1.656898	.5060597
sigma_u	.2003731					
sigma_e	.06776509					
rho	.89736354	(fraction of variance due to u_i)				

Appendix 9. Long-term leverage determinants: Fixed and Random-Effects Regression

```
Fixed-effects (within) regression               Number of obs      =       192
Group variable: Firm                            Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.0301                                         min =         4
     between = 0.0578                                         avg =       4.0
     overall = 0.0374                                         max =         4

                                                F(4,140)           =      1.09
corr(u_i, Xb)  = -0.4034                        Prob > F           =    0.3658
```

LTDA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Tangibility	.0320693	.0569752	0.56	0.574	-.0805736	.1447123
Firm_size	-.008354	.0076422	-1.09	0.276	-.023463	.006755
Profitability	.0101121	.0135498	0.75	0.457	-.0166766	.0369008
Liquidity	.000405	.0002641	1.53	0.128	-.0001173	.0009272
_cons	.1954643	.1518758	1.29	0.200	-.1048023	.4957309
sigma_u	.07606436					
sigma_e	.03207705					
rho	.84901268	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(47, 140) = 18.12                     Prob > F = 0.0000

Random-effects GLS regression                   Number of obs      =       192
Group variable: Firm                            Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.0132                                         min =         4
     between = 0.0564                                         avg =       4.0
     overall = 0.0453                                         max =         4

                                                Wald chi2(4)       =      3.54
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.4721
```

LTDA	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Tangibility	.0117313	.0486391	0.24	0.809	-.0835995	.1070622
Firm_size	.0031131	.0049549	0.63	0.530	-.0065983	.0128245
Profitability	.0066502	.0120588	0.55	0.581	-.0169846	.0302851
Liquidity	.0004221	.0002599	1.62	0.104	-.0000874	.0009315
_cons	-.027588	.099512	-0.28	0.782	-.2226278	.1674518
sigma_u	.06910974					
sigma_e	.03207705					
rho	.8227527	(fraction of variance due to u_i)				

Appendix 10. Long-term leverage determinants: Hausman Test

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Tangibility	**.0320693**	**.0117313**	**.020338**	**.0296717**
Firm_size	**-.008354**	**.0031131**	**-.0114671**	**.0058183**
Profitabil~y	**.0101121**	**.0066502**	**.0034618**	**.0061792**
Liquidity	**.000405**	**.0004221**	**-.0000171**	**.000047**

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(**4**) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= **4.88**
Prob>chi2 = **0.3003**

Appendix 11. Long-term leverage determinants: Testing for random effects

Breusch and Pagan Lagrangian multiplier test for random effects

LTDA[Firm,t] = Xb + u[Firm] + e[Firm,t]

Estimated results:

	Var	sd = sqrt(Var)
LTDA	.0057366	.0757405
e	.0010289	.032077
u	.0047762	.0691097

Test: Var(u) = 0

chibar2(01) = 184.19

Prob > chibar2 = 0.0000

Appendix 12. Long-term leverage determinants: Testing for cross-sectional dependence

```
. xtcsd, pesaran abs

Pesaran's test of cross sectional independence =    -0.024, Pr = 0.9807

Average absolute value of the off-diagonal elements =     0.626

. xtcsd, friedman abs

Friedman's test of cross sectional independence =     3.075, Pr = 1.0000

Average absolute value of the off-diagonal elements =     0.626

. xtcsd, frees abs

  Frees' test of cross sectional independence =     8.005
|-------------------------------------------------------------|
  Critical values from Frees' Q distribution
                     alpha = 0.10 :   0.5822
                     alpha = 0.05 :   0.8391
                     alpha = 0.01 :   1.4211

Average absolute value of the off-diagonal elements =     0.626
```