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THE IMPACT OF HEDGING DERIVATIVES ON THE FIRM'S VALUE: THE SINGAPORE CASE STUDY

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INTRODUCTION

In the modern business environment, every company deals with many risks that may impact their capability of reaching their business goals. Therefore, risk management should be an important part of the strategic management of any business. After the recent financial crises, from the '70s to 2007, more companies were concerned about risk management systems. Financial companies usually deal with financial risks. Therefore, they use financial tools to hedge their position while not all the non-financial companies do the same. Even if, due to the recent financial crises, the number of non-financial companies that use financial instruments, like derivatives, to hedge their risks is constantly increasing. The risk management in traditional thinking should contribute to firm's value. However, this thinking is contradicted with the proposition of Modigliani and Miller (1958) on risk management; in the opinion of the two authors, how a company deals with risk will not affect its value. On the contrary, the study of Smith and Stulz (1985) reported under the assumption of an imperfect market, a contradicting result with the proposition of Modigliani and Miller. They have proven that firms that want to maximize their value may use hedging for obtaining: taxes benefit, reduce costs of financial distress and "meet" the management risks aversion.

Although many researchers have examined, through empirical analysis, the relationship between risk management and the value of firms, the literature is still far from finding a generally accepted conclusion. Even if, Singapore is considered as one of the most developed countries in Asia, and the FTSE listed Singapore in the list of FTSE Developed Index, there are not many types of research about the relationship between risk management and firm's value of Singapore's companies.

Therefore, the main purpose of this thesis is to examine the impact of risk managements, through the use of derivatives contract, on non-financial companies in Singapore. In particular, we will verify whether using commodities derivatives, currency derivatives, and interest rate derivatives will increase the firm's value. This research was conducted by collecting data from the Singapore Exchange (SGX) Website and the annual reports of the analyzed companies.

Chapter 1 will provide some useful background about the derivatives contract, and we will analyze the types of derivatives that will be used in this thesis. In chapter 2, we will analyze how external factors and internal factors affect the firm's value. Also, we will introduce theories relevant to the arguments treated in this thesis such as the Modigliani and Miller theorem (1958) and CAPM model. In chapter 3, we will describe independent variables and dependent variables, dataset, and techniques that will use in our empirical analysis, concentrating on the panel data estimation. In particular, we will use dummy variables to distinguish between companies that use derivatives to hedge and companies that do not use them. To verify if companies use or do not use derivative we have examined the financial statements in the annual reports. The Tobin's q will be used as proxy variables for firm's value which is the dependent variables. The regression model that we will utilize is derived from the study of Khediri (2010). In chapter 4, we will explain the obtained empirical results and give the conclusions that using commodity derivatives, interest rate derivatives and currency derivatives do not contribute to the firm's value.

CHAPTER 1

HEDGING DERIVATIVES

1.1 BACKGROUND

Hedging has become an essential part of the financial market for hundreds of years. In the early 1800s, the first forward contracts have been used for the protection against unpredictable price movements by commodity producers and merchants. These activities are still very active nowadays. The term "*hedging*" was first used in 1949 when a former writer and sociologist for The Fortune magazine, named Alfred Winslow Jones, published an article mentioning that investors could obtain higher returns if hedging were applied into their investment strategy. In this empirical investment, Jones was interested in the management of money. He has used about $100,000 in which $40,000 was his own money and trying to minimize risk in holding long-term stock positions and short selling other stock positions. Nowadays, this investment is known as "*the classic long/short equity model*"[1]. And this sets initial steps for the development of hedging products in the global financial market.

Although hedging was first known in the middle of the 19th century, and it is continuing development until today. Hedging by using derivatives became popular

[1] More details at http://www.investopedia.com/terms/h/hedgefund.asp

in the last 30 years of this century. According to Mishkin (2006), together with the invention of derivatives in the 1970s, hedging derivatives become one of the new financial instruments which were widely used until today. He pointed out that the expansion of unpredicted volatility in financial markets caused by a significant demand for the financial institutions of which using hedging instruments to manage their risks. Starting in the 1970s and expansively in the 1980s and 1990s, the financial market became a riskier place for the investors as well as the financial institutions. The need of hedging is increased rapidly. Since hedging also steadily became an important and a useful risk reduction tool which is used to eliminate or decrease risks due to greater demand for risk futures. There are many different types of hedging instruments such as forward contracts, future contracts, swaps, options that are entered into by financial institutions, fund managers, and corporate treasures in the over-the-counter market. All these types of instruments have a common name called "*financial derivative*s", and nowadays these instruments are traded both on the over-the-counter (OTC) and on the exchange market.

Hedging took a giant step forward for the development of derivative products in international financial markets. The growth in the depth and breadth of these markets have made financial derivatives become one of the most important instruments to trade risks in the worldwide financial markets.

1.2 DEFINITIONS OF HEDGING

Hedging has been defined in several ways and by several sources. By Shoup (1998) hedging can be simply defined as follows: "*A hedge is the offset of a given position by an equal and opposite position, in which the effect of the offset reduces or eliminates the effects of a value change in both*."

As Kobold (1986), "*Hedging can be defined as buying or selling a position in future markets to counterbalance an existing or an anticipated position in the spot market*". Hedging always includes two markets, which are actuals markets and futures markets. The first ones are markets where hedgers have a current commercial or business interest, while the second are market in which position is taken as a temporary substitute for actual position. The substitute is temporary, afterwards the future position will be offset when the planned purchase or sale is carried out in the cash market.

Hedging is also defined in a report of Pwc company as "*a strategic policy instrument that financial entities use to eliminate or reduce their risk exposures*".

In the financial statement, a hedge is a strategy to protect your finances from a risky situation. In other words, a hedge is a financial tool used to minimize or offset the chance that underlying assets will lose its values, to protect an investment or portfolio against potential loss.

Financial entities are challenged to daily financial risks which appear from many aspects of their business. Different financial entities have to face with various risks (some entities might be faced with exchange rates or interest rates, while others might be faced with commodity prices). These financial entities need financial instruments to protect them against risks, and using derivative is one of the tools to hedge.

Risks come from entities' business activities having an impact on the cash flows or the value of assets and liabilities, and therefore, ultimately affect profit or loss. To manage these risk exposures, companies often enter into derivative contracts (or, less commonly, other financial instruments) to hedge them. Hedging can, therefore, be seen as a technique/strategy that is designed to protect investment or portfolio

against market volatility and avoid potential investment risk or loss risk management activity in order to change an entity's risk profile.

Loss can be expressed as profit loss or risk loss. In a profit loss, the hedging strategy saves the capital of companies, but they do not accumulate profits in the process when the risk does not happen. Meanwhile, in a risk loss, the hedging strategy has main purposes to protect investors against the volatile and unpredictable financial markets. Hedging works and acts as an insurance instrument against harmful or unpredicted events such as risks and fluctuation in the market.

In short, hedging is a transfer of risk without buying insurance contracts. A narrower definition of hedging is that we use derivatives contracts to trade and transfer risks.

1.3 HEDGES AND HEDGE FUNDS

Hedging funds use a lot of derivatives to hedge for investments. The manager of hedging funds will be paid a certain percent on the return they earn. So, they will receive no money if their investment fail. This attracted many investors who are frustrated by paying mutual fund fees regardless of its performance. Managers who make bad investments could lose their jobs. However, they keep the wages they have saved up during the good investment periods. If they bet a numerous money, and correctly, they could earn tons of money. If they lose, they do not lose their their money. That makes them very risk tolerant.

Hedging fund has added more risk to the global economy. The financial crisis in 2008 is an example. In this period, the managers of hedging fund bought credit default swaps to hedge the default risk of subprime mortgages. Insurance companies, such as AIG, sell a lot of credit default swaps (CDSs) taking the commitment that, in case of default of the subprime mortgages, they will pay back the principals. In this way, the insurance companies were subjected to a massive financial risk in case

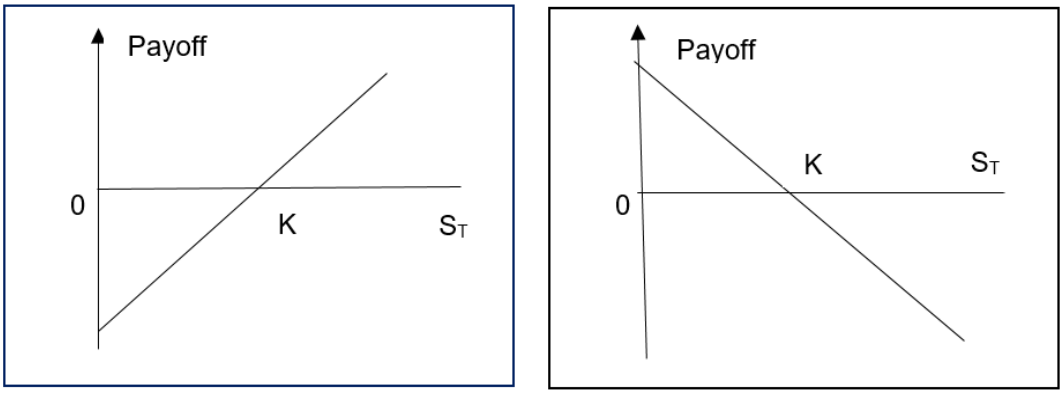
of default of the subprime mortgages. At the same time hedging managers wrongfully thought, thanks to the credit default swaps, to have a risk-free investment. When the crisis occurs the insurance companies default, due to the massive exposition in the subprime market, and the CDSs become worthless. As a result, hedge funds were not protected from risks, and therefore, the federal government had to bail out the insurers, the banks, and the hedge funds to avoid their bankrupts.

1.4 HEDGING INSTRUMENTS

There are four main types of hedging instruments, which are: future contracts, forward contracts, options contracts and swaps contracts by Song, Yong-Hua, Wang, Xi-Fan (2003)

A forward contract is a fairly simple derivative. It is an agreement to buy or sell an asset at a certain price at a certain period in the future. The opposite of a forward contract is a spot contract, which is bought or sold immediately today. A forward contract is a contract between two financial institutions or between one financial institution and one of its clients. In a forward contract, one party take a long position (buy the underlying asset) for a certain price at a certain future period, while other parties take a short position (sell the underlying asset) for the same price at the same time. The underlying assets can be physical commodities such as corn, oil, animals, metals and so on or they could be financial instruments such as bonds, stocks, stocks indexes, currencies, interest rate, other derivatives and so on. Forward contracts are very popular on foreign exchange. Utmost large banks hire both spot and forward-foreign-exchange traders. Spot traders trade a foreign currency for immediate delivery, whereas forward traders trade for delivery at a future peri time. Forward

contrast can be used to hedge risks for foreign currency. However, it can also be used to speculate and arbitrage.



(a) (b)

Figure 1: payoff from forward contract: (a) long position, (b) short position, K: delivery price, S_T asset price at maturity.

Like a forward contract, a futures contract is an agreement to buy or sell an asset between two parties for a certain price at a certain period in the future. Unlike forward contract which is usually traded in the over-the-counter (OTC) markets, a future contract is usually traded on a futures exchange such as Chicago Mercantile Exchange (CME) or Chicago Board of Trade (CBOT). There is no standard contract size or standard delivery arrangements for a forward contract. On the contrary, a futures contract is a standardized contract traded on an exchange.

Although there are some similar points, these two contracts have several differences between futures contracts and forward contracts, shown in the following tables:

Forward Contract	Future Contract
Private contract between two parties	Trade on an exchange
Not standardized contract	Standardized contract
One specific delivery time	Range of delivery time
Settled at the end of contract	Settled daily
Delivery	Closed out prior to maturity
Some credit risk	No credit risk

Source: (Hull,2012)

Table 1. Comparison between future and forward contracts

It is important to distinguish investment asset and consumption assets when you subscribe a forward or a future contract. With a consumption asset we cannot benefit from an arbitrage argument, while we can with investment assets. Investment assets are assets that are hold for investment purposes, for example, gold, silver, stocks, bonds, etc. Consumption assets are assets that are held for consumption purposes, for example, copper, oil, corn, rice, etc. The value of a forward contract at the initial time is zero. Then later, this value can be negative or positive.

Options are traded on both exchange market and OTC market. There are two types of option which are call option and put option. The holder of a call option has the right to buy the underlying asset for a certain price at a specific future time. Whereas,

the holder of a put option has the right to sell the underlying asset at a certain price at a certain future time. Contrary to future and forward contracts, standardized options do not obligate the buyers to exercise at the maturity of the contracts. Standardized options just give rights to the buyers, to take a position in the underlying assets. And similar to future and forward contracts, are options, which can be used not only for hedging but also for speculations and arbitrage. American options at any time up to the maturity, while European options can be exercised just at maturity.

Unlike most standardized options and futures contracts, swaps are not exchange-traded instruments. The first swap contracts started trading in the early1980s. Since then, swaps have gradually become new important instruments in derivative markets. Swaps are personalized contracts that are traded in the over-the-counter (OTC) market between private parties. A swap is an agreement between two parties to exchange cash flows in the future. A typical swap is when one side pays a fixed rate now and will receive a floating rate in the future, or the contrary, that party pays a floating rate now and will receive a fixed rate in the future. The two most common and most basic type of swaps is the “plain vanilla” interest rate and currency swap.

Most interest rate swap agreements use the floating rate in the London Interbank Offered Rate (LIBOR). For instance, in a “plain vanilla” interest rate swap, company A agrees to pay company B a predetermined fixed rate on a notional principal at a certain date for a certain future period. In the meantime, company B agrees to pay to company A, a floating interest rate on the same notional principal. In return, company A will receive interest at a floating rate and company B will receive interest at a fixed rate on the same notional principal for the same time.

In currency swaps, one party agrees to pay interest in one currency on a notional principal amount. In return, the party will receive interest on the same notional principal amount, but in another currency.

Types of hedging derivatives

The hedge can distinguish in two types which are a short hedge and a long hedge and a short hedge by Kobold (1986). A short hedge is a strategy which selling a position in the futures market to offset an current or expected position in the cash market. A long hedge is a strategy which buying a position in the futures to deliver a security or planned cash purchase in the cash market.

Commodity derivatives

Commodity derivatives are complicated financial tools that can include futures, options, and swaps. The value of a commodity derivative contract is determined by the value of its underlying commodities.

Commodity derivative future/forward contracts are agreements to buy or sell a certain amount of commodity at a certain future date. This type of contract is used to control the fluctuation of commodity prices such as corn, rice, oil or raw materials.

- **Commodity – forward:**

  Futures contracts trade physical commodities such as sugar, corn, gold, etc. are called commodity futures contracts.

  Commodity forward contracts can be used to store, buy or sell commodities to lock the purchase or sale prices products. A commodity forward contract is an agreement between two parties that obligate both the buyers and the sellers to exercise the contract at the maturity with a predetermined price of the underlying commodity. The payment and delivery will take place at the maturity date.

- **Average contract- swap:** an average contract swap is a commodity forward contract which allows customers buy or sell commodities at the average price. This type of contracts is used to avoid risks of unpredicted price change. The biggest

difference between a normal commodity forward and an average contract swap is that the closing transaction cost is not based on the price of commodities, but is based on the average price in a certain future period.

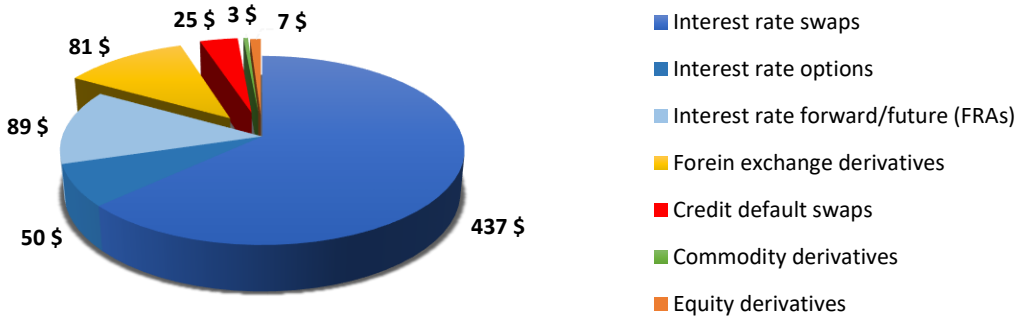
- **Commodity options:** customers have exposed risks in the future with their commodities will prefer to use commodity options to manage this type of risks. A commodity option is an agreement between two parties to limit the risk of unpredicted price change. And this type of options give to the holders the right, but not the obligation, to sell (*put option*) or to buy (*call options*) an underlying asset at a certain price (*exercise price*) at a certain time (*the maturity*). The price of the option is usually called *premium*.

Interest rate derivatives

An interest rate derivative is also a complex financial instrument that can be covered with future, options, and swaps. The value of an interest rate derivative is determined by its underlying asset, for example, fixed income (interest rate) instruments.

Interest rate derivatives are used to protect borrowers against fluctuation of interests rate on loan, without changing the term of their underlying loan. For some instrument such as options and swaps, there are various effects on the value of the instruments. For example, when the values of the underlying fixed income instruments are increasing or decreasing, this will also lead to a change in the value of the relative options. And when the price of the underlying asset change, the price of the options also changes. The largest OTC derivative market in the world is the IRD (interest rate derivatives). This type of derivatives is usually not traded on exchange markets.

The data of the graph below found in the latest report of The International Swaps and Derivatives Association (ISDA) in 2014.



Source : ISDA

Figure 2: The value of derivatives

- **Interest rate options:** an interest rate option is an agreement between two parties, which gives the holder the right, but not obligation to buy or sell an underlying asset at a certain price. An option price is referred as *premium*. When using interest rate option, we need to deposit a collateral amount. For European-type options, an option contract can be exercised at the end of the contract, while for American-style options, an option contract can be exercised at any time during the option's lifetime. Interest rate options are rarely American-style.

- **Interest rate forwards/ futures:** an interest rate forward/ future is an agreement between two parties in which both buyers and sellers commit to buy or sell the underlying asset at the predetermined price with delivery or with cash settlement. A Forward Rate Agreement (FRA) is an over-the-counter agreement designed to ensure that a certain interest rate will be applied to both borrowers and lenders on a principal during a certain future period. You are required to deposit a collateral amount when a future/forward contract is bought or sold. The collateral amount will change when the price of the underlying asset changes.

- **Interest rate swaps:** an interest rate swap is an agreement between two counterparties in which the future interest rate is exchanged for based on a notional principal. Interest rate swaps usually involve to exchanging a floating interest rate for a fixed interest rate, or vice versa. Interest rate swaps are usually traded on over-the-counter (OTC) markets. Investors often prefer the floating- rate index, which is usually done at LIBOR for one, three or six months maturities. An interest rate swap is worth close to zero at the beginning. After some time existing, its value can be positive or negative.

Currency derivatives:

Together with commodity derivatives and interest rate derivatives, currency derivatives are complex financial instruments which cover with options, futures, and swaps. Different derivative instruments have different risk levels and factors that affect the return. Therefore, it is important for us to understand each derivatives and how to apply each of them.

Currency derivatives are used to hedge the fluctuation in the future of a foreign currency or to change a currency exposure over time. A currency derivative reflects the interest spread of its component currencies. And currency derivatives are traded in the over-the-counter (OTC). Transactions in some currency derivatives require a collateral amount, and the collateral amount has to change when the price of the underlying asset changes.

- **Currency options:** a currency option gives the holder right, but not the obligation to buy or sell a currency to exchange for another currency for a strike price at a predetermined date. If the price of currency at the maturity is lower than the strike price of the call option or higher than the strike price of the put option, the option is

worthless, and we lose the premium. We can also lose the premium if the price of our currency is equal the strike price at the maturity.

- **Currency forward:** the purpose of a currency forward is to hedge a future payment or receivable at a predicted foreign exchange rate, thus against currency risks. A currency forward is an agreement that both buyers and sellers agree to trade underlying asset at a certain price with delivery at later dates. The maturity of this type of contracts is normally less than one year.
- **Currency swaps:** is one of the popular types of the swap. In simple form, this contract is an exchange of principal and interest payments in one currency for principal and interest payments in another currency. The principal amounts are exchanged at the beginning and the end of the contract's life. The principal amount is approximately equivalent at the beginning of the contract using exchange rate. When they are exchanged at the end of the contract life, their value may be different. A currency swap is usually used to transform a loan in one currency into a loan in another currency. It can also be used to transform an investment denominated in one currency into an investment denominated in another currency. (Hull, 2012).

CHAPTER 2

THE VALUATION OF FIRMS AND THEORIES

2.1 FINANCIAL INSTITUTIONS AND NON-FINANCIAL INSTITUTIONS

There are two types of firms: financial institutions and non-financial institutions. The purpose of using the financial derivatives of these two institutions are different. Non-financial institutions usually use derivatives for hedging purposes while financial institutions use derivatives for both hedging and speculating purposes. Most of the research to verify the impact of hedging derivatives on firm's value usually focus only on non-financial firms. This thesis will focus on the use of non-financial institutions to verify the impact of using commodity derivatives, interest rate derivatives and currency derivatives on the firm's value.

The Organization for Economic Co-operation and Development (OECD) defined non-financial corporations as *"corporations whose principal activity is the production of market goods or non-financial services"*. While financial companies are defined as *"Financial corporations that consist of all resident corporations or quasi-corporations principally engaged in financial intermediation or in auxiliary financial activities which are closely related to financial intermediation*".

The term "non-financial" is used widely in Asia, Europe, and Australia, but not used widely in the US. The office for Nation Statistics in the UK (INSEE) explained that nonfinancial companies are often domestic companies which produce goods based on the need and demand of local or international markets such as mobile phone, gas,

oil, electrics, or provide services such as travel, bar, restaurant, airlines, etc. These non-financial companies have trading activities not only with internal companies but also with external companies for both import and export products. These companies are not always financed enough to support their businesses, therefore, they sometimes need to ask financial support from large banks and other financial institutions. The non-profit organizations, the private companies, and public companies such as NGOs, WTO, Apple Inc, Sony Inc, IKEA Inc, etc. are typical examples of non-financial institutions.

The non-financial institutions are divided into two main sectors: the private sector and public sector.

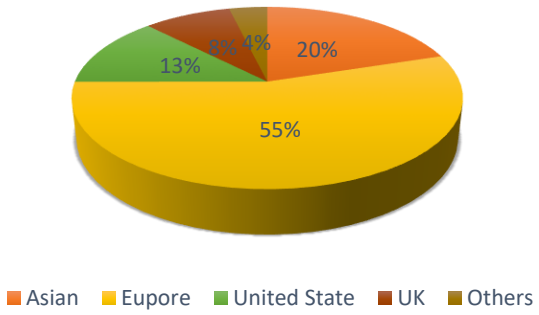
1. **The Private Sector**

These are sectors that are owned, managed and controlled by private individuals and private financial institutions. The main goal of the private sector is to maximize profit; therefore, their main business area is in finance, technology, transport, etc. In the private sector, private individuals and private financial institutions will hold the majority of the number of shares. The shares of these companies are often traded on one or many stock exchanges, and these entities are owned by shareholder groups or other corporations. The other corporations could be both domestic and foreign corporations which have many branches in different countries.

2. **The Public Sector**

Unlike the private sector. The public sector institutions are those owned, managed and controlled by governments. Their main purpose is to serve the public. Therefore, their main business areas are in the police, army, health, etc. Sometimes the business area of both the public and private sector can coincide; for example, banks, educations, and manufacturing. In the public sector, the government usually appoint

the board of directors, or government personnel's will hold important positions inside companies or corporations where governments hold 51% of total capital shares.



Source: UNCTAD

Figure 3: The World's Top 100 Non-Financial Trans-National Corporations (TNCs) ranked by Foreign Assets 2016

Financial institutions like non-financial institutions are also divided into two sectors: the private sector and public sector. Both of these sectors act as a channel for receiving and providing finance for customers who could either be individuals or financial institutions. There are two categories of financial institutions, depository institutions and non- depository institutions (Sharma, 2008).

Depository institutions such as commercial banks, loan associations and credit unions, use money obtained from loans given borrowers to pay interest for savers. Non-depository institutions such as financial companies, contractual institutions, and mutual funds, obtain income by selling their shares and their policies. Financial companies act as banks regarding assets. Their funds are collected from borrowing, issuing bonds and debentures. Thus, lending and borrowing in securities are the main business of financial companies. Secondly, insurance companies and pension funds are two main sectors of contractual institutions. Insurance companies protect

to investors against risks. While pension funds provide old age security. Thirdly, mutual funds pool money from large groups of investors and invest it in portfolios of stocks and bonds. Mutual funds do not give investors the right to vote although investors own part of the shares of this funds.

2.2 THE VALUATION OF FIRMS

There are several ways to measure the value of a firm. Damodaran (2002) introduces two approaches. The cost of capital approach and the adjusted present value approach.

2.2.1.The Cost of Capital Approach

The firm's value is determined by taking the free cash flow to firm divided by the difference between the weighted average cost of capital (WACC) and the growth rate.

A. Stable Growth Firm: a firm that has a stable growth rate can use this rate to value the firm's value by using the equation below:

$$Value\ of\ firm = \frac{FCFF_1}{WACC - g_n} \qquad (2.1)$$

Where:

$FCFF_1$ is the expected free cash flow to firm (FCFF) next year

WACC is the weighted average cost of capital

g_n is the growth rate in the FCFF forever

When using this equation, there are two conditions that need to be satisfied. Firstly, the growth rate in this model has to be smaller or equal to the nominal growth of the economy when the cost of capital is in nominal terms and has to be lower or equal

to the real growth of the economy when the cost of capital is in real terms. Secondly, the firm's characteristics have to be consistent with the stable growth assumptions. In particular, the reinvestment used to estimate FCF rate should be consistent with the stable growth rate. The best way to compute the reinvestment rate in stable growth when using the stable growth rate is by using the following equation:

$$\text{Reinvestment rate in stable growth} = \frac{\text{Growth rate}}{\text{Return on capital}} \qquad (2.2)$$

If the change in working capital and net capital expenditures are used to determine the reinvestment in the equation (2.2), then the change in working capital should be positive, and the capital expenditures should be similar to other firms in the industry.

B. General FCFF Model

In most of the cases, the general formula for the firm's value is estimated by the present value of expected free cash flow to the firm discounted back at the cost of capital:

$$Value\ of\ firm = \sum_{t=1}^{t=\infty} \frac{FCFF_t}{(1+WACC)^t} \qquad (2.3)$$

Where:

$FCFF_t$: is the free cash flow to the firm at year t

WACC: is the weighted average cost of capital

When the free cash flow to the firm is constant, and the cost of capital is minimum, then the value of the firm will be maximined.

If after *n* years a company reaches a stable state and starts increasing at a stable growth rate g_n after that, the value of the firm can be expressed as follows:

$$Value\ of\ firm = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+WACC_{hg})^t} + \frac{[FCFF_{n+1}/(WACC_{st} - g_n)]}{(1+WACC_{hg})^n} \quad (2.4)$$

Where:

hg: high growth

st: stable growth

The free cash flow to firm (FCFF) approach is suitable for a firm that has a high leverage, or a firm that is in the process of changing their leverage. The calculation of FCFF is complicated in this case because of debt payments or issuing new stocks.

* Free cash flow to the firm (FCFF)

The FCFF is the financial performance of a firm and is the total cash flow to all claim holders including stockholders, preferred stockholders, and bondholders. The methods to compute this FCFF are:

1. Adding the cash flow to equity and preferred stockholders

FCFF = Free cash flow to equity + Interest expense (1- Tax rate) + Principle payments – New debt issues + Preferred dividends

2. Estimating the cash flow prior to claims

FCFF = EBIT (1-Tax rate) + Depreciation – Capital expenditure – ⊿ Working capital

Where: EBIT is operating earnings before interest and taxes. It is also called operating profit before interest and taxes. This cash flow is also called an unlevered cash flow and is before debt payments.

* The cost of equity (R_E) is calculated at different levels of debt (Baschieri, 2015)

- Levered Beta: $\beta_{levered} = \beta_{unvelered}\,[1 + (1 - T_C)\frac{D}{E}]$ (2.5)

- Unlevered Beta: $\beta_{unvelered} = \frac{\beta_{levered}}{[1+(1-T_C)\frac{D}{E}]}$ (2.6)

- Beta levered when debt is different from 0, after some arrangement from (2.5) and (2.6), we have:

$$\beta_{levered} = \beta_{unvelered}\left[1 + (1 - T_C)\frac{D}{E}\right] - B_{debt}(1 - T_C)\frac{D}{E} \qquad (2.7)$$

- The cost of equity is estimated by using capital asset pricing model (CAPM) model

$$Cost\ of\ equity = r_f + \beta_{levered}(Risk\ premium) \quad (2.8)$$

* The weighted average cost of capital (WACC) is calculated by :

$$\text{WACC} = R_E \frac{E}{D+E} + R_D(1 - T_C)\frac{D}{D+E}$$

Where :

E: is the amount of equity

D: is the amount of debt

$T_{C:}$ tax rate for the firm

$R_{E:}$ is cost of equity

$R_{D:}$ is cost of debt

2.2.2 The Adjusted Present Value Approach (APV)

The APV is the net present value of a company or a project, if it was finance just with equity. To this value it can be summed the present value of the financing benefits obtained from debt such as tax shields.

A. Steps of APV Valuation

There are three steps in estimating the value of a firm using the APV approach:

1. **Calculating the firm's value without leverage.**

   There are two ways to estimating the unlevered firm value. Firstly, estimating the unlevered beta using the formulary (2.7). Then, estimating the firm's value using the formulary of the cost of equity (2.8). Secondly, using the following equation:

   Unlevered firm value = Current Market Value of Firm- Tax Benefit of Debt (current)+ Expected Bankruptcy cost from Debts

2. **Calculating the expected tax benefit from a given debt.**

The tax benefit is estimated at different levels of debt. The simple assumption in this estimation is that the saving is continuous, and we can use this equation to compute tax benefits : *Tax benefits = Dollar debt* tax rate*

3. Calculating expected bankruptcy costs

The expected bankruptcy cost is determined by calculating the probability of bankruptcy at every level of debt that includes both direct and indirect costs than multiple that value by the probability of bankruptcy.

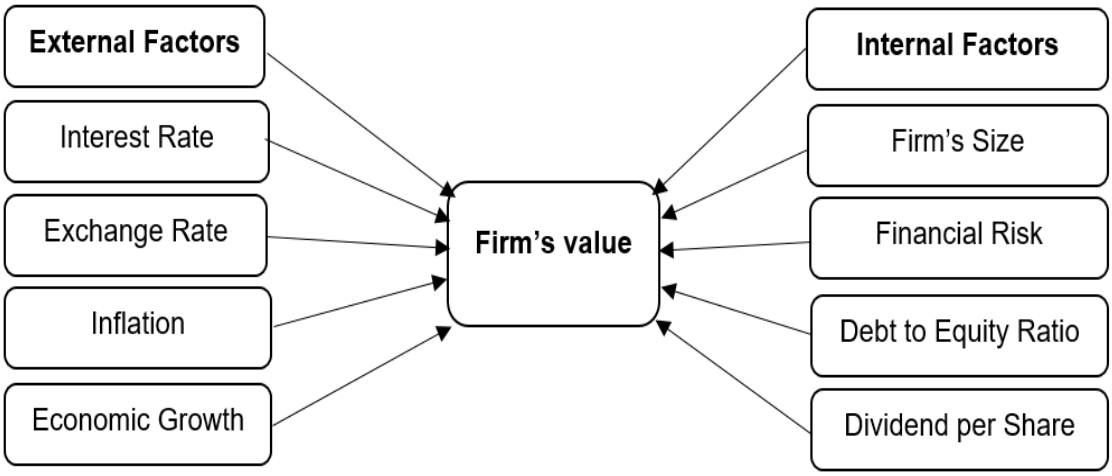
The probability of bankruptcy cost can be estimated by calculating the synthetic rating of a firm at every level of debts, that means giving a different cost for each level of interest coverage ratio[2], or it can be estimated by using the historical bankruptcy cost applied to the firm.

The direct cost of bankruptcy is generally between 5%-10% of firm's value. This 5% or 10% is based on some empirical studies. The indirect cost of bankruptcy should be higher for sectors affected by a severe default risks, like airlines, and lower for sector affected by a moderate default risks, like groceries.

[2] The interest coverage ratio is the ratio between the EBIT and the interest expenses of a company.

2.3 FACTORS INFLUENCING FIRM'S VALUE

The value of a firm could be affected by both external and internal factors. There are several relevant types of researches that examine the effects of these factors on the firm value such as *"The effect of Internal and External Factors on the Value of a Firm Through its Investment Opportunities on The Stock Exchange of The Southeast Asian Countries"* Adiputra (2016). He confirmed that internal factors had impacted significantly and directly the value of companies. Janković, et al (2016), showed how external factors affected a firm's value. Dragnić (2014) researched the impact of both external and internal factors on the performance of small size and medium size companies. Internal factors such as company's size, risk managements, the ratio between debt and equity and dividend per share are factors which can be controlled by management policies. While external factors such as interest rate, exchange rate, inflation and speed of economic growth are factors outside control and usually cannot be controlled by management policies.



Source: (Adiputra, 2016)

Figure 4 The effect of internal and external factors to the firm's value

The Effect of External Factors on the Value the Firm

1. **Interest Rate**

If an economy has a high-interest rate, entrepreneurs must make loans with high-interest rates. Entrepreneurs have tendencies to limit their businesses due to high costs of operations or they may just open a new business if they can obtain incomes higher than the interest rate they need to pay back for loans from the banks and other financial institutions. With the business that already exists, managers need to increase the price of products to compensate the high costs of buying raw materials. Consumers would like to save money because they can obtain high earning from their deposits. If a high interest rate last for a long time, then there would be.

High inflation rate have disadvantages not only for the economy of a country but also for companies inside that country. During the period of inflation, the price of goods and services will increase and the time value of money decreases continuously. An example of losing the value of money over time during inflation periods is that in the past, we spent four euros to buy one pizza, but now we need to ten euros to buy one pizza. When the value of money decreases, investors will prefer to keep goods than to keep money. From the viewpoints of investors saving money is a bad investment during the inflation, and this is harmful to the economy of any country. In this case, the government will apply a monetary policy in which it encourages investors to put their interests in savings by increasing the interest rate.

Although an interest rate increase can attract people saving money, increasing interest rates will make investors lazy to invest in a real business. Many companies may default or face a decline in their performances. The decline of company's performances can cause a fall in the stock price which is one of the main factors that decide the market value of a company. There are many types of research about

the relationship between stock price and interest rate, example Solnik (1996), Sudjono (2002), Alam (2009), etc.

2. Exchange Rate

Madura (1989) gave a common definition of the exchange rate as related to the change in the value of firms because of unexpected currency movements. The exchange rate is a direct or indirect loss in cash flow, assets, and the liabilities of a company. Exchange rate is also a reduction in the market stock prices.

Shapiro (1996) and Madura (1989) mentioned the three main types of exchange rate risks, namely transaction risk, translation risk and economic risk. Transaction risk is relevant to the time when you sign a contract and exercise that contract. If this period lasts for a long time, there will be more time for the exchange rate to fluctuate. Translation risk is relevant to the balance sheet of multinational companies, especially when these companies deal in foreign currencies or have foreign assets, liabilities, and equities on their balance sheet. The higher the ratio of asset, liabilities, and equities denominated in foreign currencies is, the higher is the translation risk. Economic risks is relevant to macroeconomic conditions such as exchange rates, government regulation, or stable politic. In general, the exchange rate is the rate at which one currency can exchange for another currency.

Exchange rates are traded in the forex market which is the largest and the most liquid market in the world. Triennial Central bank Survey of FX and OTC Market in 2016 showed that the averaged trading in FX market is $5,1 trillion per day. Ihrig and Weston (2001), suggested that companies with exposed risks in foreign currencies should pay more attention to exchange rate when they set up risk management policies. When the exchange rate changes, it will effect directly the revenue of companies which export products and import raw materials. An import company

will obtain more profit if it imports raw materials and components from countries that have the weaker currency. While an export company will obtain more profit if it sells products to countries that have a stronger currency. This advantage will be removed if we do the contrary. For example, if today the exchange rate between Italy and UK is 0.9 (1 Euro=0.9 British Pound) and tomorrow this rate becomes 1.2 (1 Euro = 1.2 Pound), the import companies in the UK needs to spend more money to buy raw materials from Italian companies. Raw materials have high prices, companies have to increase prices of their products and this can lead to a decline in competitiveness, profit, and revenue of the UK companies.

A decline in the profit of a company will display a bad performance to investors and will cause a decrease in the current stock prices of companies. The market value of firms, therefore, could be affected. A research of Robiatul (2006) pointed out that the exchange rate has a negative effect on the stock price. Parlapiano and Alexeev (2012) made a research to check the impact of the Exchange Rate Risk Exposure on the European firm's value by using 600 firms as a sample size. They concluded that exchange rate risk has a large impact on the value of these European firms.

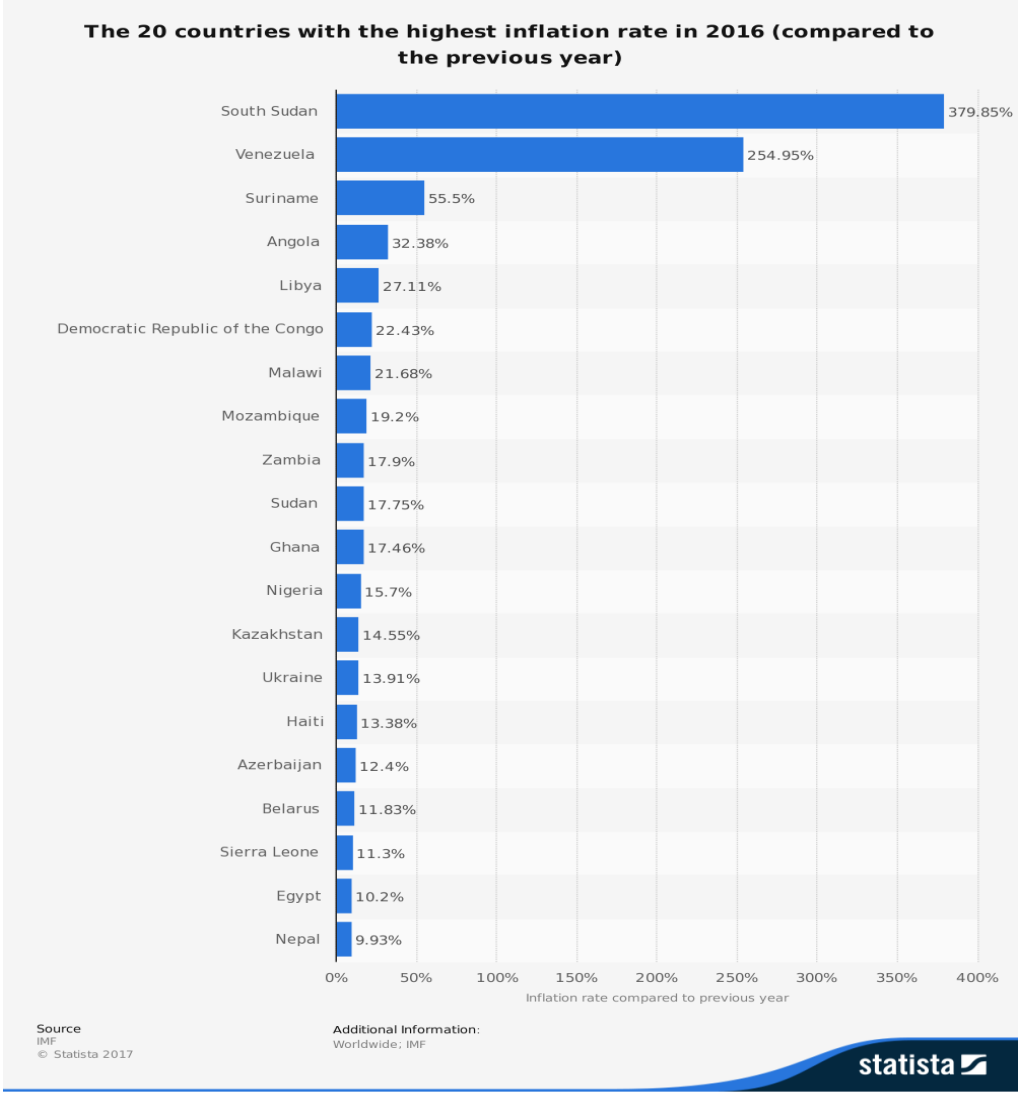
3. Inflation

The inflation tends to be higher in developing countries and under developed countries, where their central banks display weaknesses in using the monetary policy to achieve short-term goals. Developing countries attract many investments both inside and outside. Many foreign currencies will flow in these countries through investment in projects. This is good because it encourages economic growth. However, increasing capital too fast can have several disadvantages such as increased value of a domestic currency, that may reduce competition in the export of domestic product and cause of inflation. High inflation is, of course, harmful to

the economy of any country and therefore, also harmful to both domestic and international companies inside that country.

The remarkable drawback of high inflation to companies is the increasing input costs of companies due to the losing value of money. This leads to increasing price of products and services. High prices will limit capability consumption of products and reduce the competitiveness of these companies. Consequently, the profit of these companies will decline. Investors are not very interested in companies that have reducing profits. In this case, companies will show bad performances, and the stock prices of these companies will be reduced due to this negative effect. On the other side, losing the value of a currency will increase demand for cheaper goods from foreign customers. A customer with a strong currency prefers to buy products from a weak currency. Also, companies may benefit from the inflation, for example importing raw materials from weak currency country. Therefore, Most of the international companies are now using currency derivative to hedge against unpredicted currency fluctuations.

To control the negative effects of high inflation, there are various ways that government can use to achieve this goal. The two most common ways are: the issuance of treasury bills and increase the interest rate. The weakness in managing monetary policies in developing countries can cause inflation when their central bank decides to increase interest rate. Inflation does not always have negative effects. A low rate of inflation can have advantages to the economy. For example, companies will be confident and optimistic to invest; this will encourage the economic growth in the future. The European Central Bank (ECB) suggests that a suitable rate of inflation for a healthy economy should be around 2%.



Source: Statista

Figure 5 The 20 countries with the highest inflation rate in 2016

4. Economic growth

Economic growth measures the change in the gross domestic product (GDP) of a country during the fiscal year. The GDP is calculated by:

$$\boldsymbol{GDP = C + I + G + (X - M)}$$

Where:

C: is consumption,

I: is an investment,

G: is government spending,

(X – M): is net export.

The consumption spending represents the main component of the GDP in most of the country. Economic growth plays an important role in developing businesses because it encourages and increases the value of goods and services in a country. If a country displays a real economic growth, it will be characterized by big improvements in living standards, expansion of existing markets, chances to open new markets and many business opportunities for firms. Thus, a real economic growth will generate increased income that will increase demand through the spending of household and stimulate further economic growth guarantying firms expansion. Economic growth is an important factor in a company. It set targets or strategies for the future, especially for firms that are active in producing goods and services such as luxury products, restaurants, bars, cars, etc. while firms producing necessary products are less be affected by the flotation of an economy.

The stock market of a country is often the best indicator that reflects the speed of economic growth within that country. High stock prices are one signal that an economy is growing. Shareholders who hold these stocks will probably earn high income through high dividends. Thus, high stock prices will make shareholders feel more confident about their spending capability and will reduce their worries about unpredictable movement prices in the future. So, a company with a good performance will make its shares more attractive to investors, because it makes investors believe that they can receive a high dividend per share in the future.

Furthermore, economic growth can help firms to finance themselves more cheaply way by issuing new stocks. Moreover, thanks to the real economic growth, many start-up companies will be established. Even if, these new businesses are not able to borrow the amount of money that they need to work in the traditionally, due to their low credit rating. Therefore, they can still sell their stock to investors by showing their potential profit and growth in the near future. Companies that raise capital in this way do not need to pay interest on this capital because they do not borrow debts from banks and financial institutions but they sell a piece of itself to investors. In the presence of strong real economic growth investing in these companies will appear more financially secure than in the time of weak growth, and thanks to the growth it will be more easy for the companies to realize good performances that will help them attract investors. To put it short, the firm values will expand during a time of economic growth.

External factors

1. The size of firms

There are many types of research that show how the firm's size affects the profitability and market value of a firm. For example, Surajit and Saxena (2009) mentioned that the primary factor in determining the profitability and market value is the firm's size. The research of Pervan and Višić (2012), concluded that firm's size has significant positive influences on the profits of the firm. Large firms are better in diversification, management and risk tolerance than small firms that sometimes will display more difficulties in solving problems of information asymmetry and thus may have worst performances compared to larger companies.

Furthermore, larger companies have access to many financing options, due to their higher credit rating, for purposes such as buying raw materials, investment,

expanding their businesses or buying new equipment. Similarly, their size will guarantee them stronger bargaining power. On the contrary, small companies usually do not have high a credit ratings. Thus, find it difficult to obtain loans from large banks and other financial institutions, and even if they do obtain credit, its cost will be prohibitive. Normally, they will pool loans from their family, friends or personal loans, and of course, this source normally cannot supply much as compared to large banks and other financial institutions. Furthermore, these small companies often do not have many high-value assets, as large companies, that can be used as security for their loans.

When companies have money to invest and expand their business, their revenue will also increase. A company that has a good performance will attract investors and increase prices of its stocks. Also, these large companies can issue new shares to pooling money from investors. When big companies such as Coca-Cola or Universal issues new shares, these new shares are more attractive for investors than those of small companies which have no reputations. Large companies often have long histories, and investors believe that companies with a long history cannot default at least in a short period. In general, the stock of large companies usually have a higher price on the stock market, and therefore their market value will also be high.

2. Financial Risks

Financial risks are a big concern for every business because it has a great impact on the maximization of the firm's profit. These risks will also impact company's performance and its market value. There are many types of financial risks, the guideline of Federal Reserve for Rating Risk Management at State Member Banks and Bank Holding Companies divided financial risks into six key areas which are Market Risk, Credit Risk, Liquidity Risk, Operational Risk, Legal Risk and Reputational Risk. Risk management is a part of corporate governance, and its main

purpose is to maximize firm's value through the reduction of associated costs due to these types of risks.

Research by Dionne (2013) published in the journal of the American finance association says that risk management policies affect the increase of the firm's value and that most of the companies can use internal activities like risk management policies to protect themselves against financial risks. Risk management can reduce taxes. High earning usually will tend to pay high tax. Companies can use risk management to fix the level of taxable earnings because it will be deducted for certain expenditures, for example, depreciation and loss carryback. Secondly, risk management can reduce financial distress costs. A company having a poor profit is a signal that the company is being under financial distress. In particular, deteriorating credibility in relationships with customers, suppliers, and employees. This will lead to a decrease in profits in the future and consequently a decrease in the value of firms. Even if, under the perfect conditions of the market of the Modigliani and Miller (M&M) theorem, risk management should be irrelevant with firm value, the real markets are never perfect. The research "the relationship between risk management and firm value" of Weiying and Baofeng (2008) showed that based on the expectations of shareholders, risk management policies can increase a firm's value by reducing taxes, costs of financial distress, agency costs and cost of asymmetric information.

3. Capital Structure:

The Organization for Economic Co-operation and Development (OECD) defined the capital structure as the mixture of debt and equity with a specific ratio. An optimal capital structure is an optimal ratio that maximizes the firm's value. Theoretically, it is possible to use mathematical methods to find out an optimal capital structure. There are many pathways to find this optimal ratio such as:

minimizing the cost of capital, generating the best combination between low cost of capital and high operating incomes or maximize the overall value of the firm. However, it is not easy to apply it in the real financial market.

A company can have debt as a component of its capital structure or can completely remove debt from its capital structure. A company that uses debt is called a leveraged company, while a company does not use debt is call an unleveraged company. The capital structure of a firm is also preferred as the leverage ratio.

According to the proposition I of Modigliani and Miller (1958) the capital structure is irrelevant under the perfect market assumptions such as no transaction cost, competitive markets, individuals, and firms can borrow at the same interest rate, all agents have the same information, no taxes, and no bankruptcy cost. Under this hypothesis, the WACC should remain constant when we change the structure of a company. No matter how much a firm borrows debt, the WACC will be unchanged or has benefited because it will not receive any benefit from tax (interest rate payments). If there are no changes after increase or decrease in debt, the capital structure will not affect the price of the stock. Therefore, the capital structure will not affect the stock price and then no effect to the firm's value.

The proposition II of M&M (1958) theory mention that, as debt increases, shareholders will ask a higher risk premium on shares because a high debt ratio will make investment risker. This means that in return shareholders want to receive a higher return and this will increase the cost of equity. However, because the capital structure is irrelevant, the WACC will not be affected due to a change in capital structure. The M&M proposition (II) includes tax and concludes that the changing of the capital structure will affect the WACC because of saving tax payment. Thus, a higher debt ratio lowers the WACC.

4. Dividend per share:

The M&M theory supposed that under the frictionless condition of a perfect market, the dividend policy will not affect the firm value. However, *"the value of the stock was equal to the present value of the dividends that stock would pay overtime."* (Megginson and Smart, 2008 p. 568). Therefore, if the dividend is the only factor that is used to determine the market value of a firm's stock, it is not completely correct to say that dividend is irrelevant to the firm's value. Similarly, with the case of capital structure, the firm's value is always a consequent from the current and future firm's operating profits generated from its investments' projects.

When a company accepts projects that were having positive net present values (NPV), and without paying taxes, then the company can pay out its profit earnings at any dividend level it desires. However, when it pays out a dividend, it must issue new shares to collect finance for future projects. A company can choose to pay out its earning profit as the dividend or skip this profit and reinvest it in other projects. Thus, the dividend is a factor that will affect the firm's value. Several studies examined the relationship between dividend policy and firm's value. Budagaga (2017) concluded that there is a positive significant relationship between dividend policy and firm's value. Nwamaka and Ezeabasili (2017), the study also reach similar conclusion.

2.4 Theories

Under satisfactory economic conditions, shareholders can increase earnings per share by using financial leverage or capital structure. But financial leverage also increases financial risks. Therefore, it cannot be specified that leverage is a cause of increasing firm's value or not. The main objective of firms should be directed

toward the maximization of the value of the firm. If financial leverage decision can affect a firm's value, then managers of firms will prefer to have a capital structure which maximizes the market value of the firm. However, there are still conflicting theories on the relationship between a firm's value and capital structure. The traditional belief that financial leverage decision affects firm's value, while under some certain assumptions such as perfect markets and no tax assumption (Modigliani & Miller, 1958). Pandey (2015) believe that capital structure decision is irrelevant for the value of firm

THE MODIGLIANI AND MILLER(M&M) THEOREM

The basic idea of the M&M theory is that no matter how a company finances its capital structure: either using its cash, increasing equity or issuing new stocks or make debts, the financial leverage decision will not affect the value of the firm. But the value will be decided by the firm's earning power and the risks of its underlying asset (Modigliani and Miller, 1958). The theorem is composed of two proposition and for being significant is necessary that the assumptions of no taxes, no transaction costs and no bankruptcy cost hold (Ogden, et al. 2003).

Proposition 1:

Assume that company j and X_j stand before for the expected return on the assets owned by the company (that is its expected profit before paying tax). Where D_j is the market value of debts; S_j is the market value of its common shares, and $V_j \equiv D_j + S_j$ is the market value of the firm. We must have in equilibrium:

$$\boldsymbol{V_J \equiv D_j + S_j = X_j / \rho_k \text{ , for any firm j in class k}}$$

That is, *"the market value of the any firm is independent of its capital structure and is given by capitalizing its expected return at the rate* $\boldsymbol{\rho_k}$ *appropriate to its class"* (Modigliani and Miller, 1958)

The proposition can be expressed in an equivalent way in terms of "the average cost of capital" of the firm. Where X_J/V_j is the ratio of the expected return and the market value of debts:

$$\frac{\boldsymbol{X_j}}{\boldsymbol{D_j + S_j}} \equiv \boldsymbol{\rho_k}, \boldsymbol{for\ any\ firm\ j\ in\ class\ k}$$

That is, *"the average cost of capital to any firm is completely independent of its capital structure and is equal to the capitalization rate of pure equity stream of its class"* (Modigliani and Miller, 1958)

Proposition 2:

This proposition can be derived from proposition 1, it concerns the rate of return of common stock in a company whose debts are included in its capital structure. The expected rate of return or yield *i* on the stock of company *j* belong to the ***k*-th** class is:

$$\boldsymbol{i_j = \rho_k + (\rho_k - r).D_j / S_j}$$

That is, "*the expected rate of return of a share of stock is equal to the appropriate capitalization rate, ρk, for a pure equity stream in the class, plus a premium related*

to financial risk equal to the debt to equity ratio times the spread between ρ_k *and* r".

In the world of uncertainty where there are no taxes, bankruptcy costs, agency costs and information asymmetry, the firm's value is not affected, no matter how a company financed. The proposition 1 and the proposition 2 are the basis of theory of a firm's value and shares.

1. The Capital Asset Pricing Model (CAPM)

The capital asset pricing model (CAPM) is perhaps the most famous model among financial theorems. It is developed independently from Markowitz's portfolio selection model (1952), by Sharpe (1964), Lintner(1965) and Mossin(1966). It is derived by using the principle of diversification, through some simplifying assumptions (Corsi, 2015) :

- Investors are "price takers". There is perfect competition in the market.
- The investment horizon is one period.
- Investments are limited to publicly traded assets (stocks, corporate and government bonds, etc.) and you can lend and borrow at a risk free rate.
- There are no taxes and no transaction costs.
- The assets are infinitely divisible, and there are no restrictions on short selling.

Information is free and available for all investors who are "price takers" and their expectations are homogeneous. The basic idea of this model is that, given the same expected return, "price takers" will choose only an efficient portfolio that is the portfolio that minimizes variance and maximizes returns.

The model:

$$\boldsymbol{E(R_i) = r_f + \beta_i[E(r_m - r_f)}$$

Where:

$E(R_i)$: is the expected return of the asset,

$r_{f:}$ is risk free-rate,

$[E(r_m) - r_f]$: is the market premium,

βi: is the systematic risk and

$r_{m:}$ is expected market return.

An asset's risk premium is determined by the diversification of risks of that asset Rothschild (1985). An asset's diversifiable risk is measured by the systematic risk (βi) which is the risk premium. The risk premium for an individual security is a function of the covariance of returns with the stocks comprising the market portfolio:

$$\boldsymbol{\beta_i = \frac{cov(r_i, r_m)}{\sigma_m^2}}$$

The systematic risk (β_i) measures the sensitivity of the expected asset return and the expected market return. In case the previous assumptions hold, the beta of the market portfolio will be equal to 1.

It is impossible to completely remove risks from investments, no matter how much they are being diversified. From the investors' point of view, they would like to find a rate of return which can compensate loses derived from risks. The CAPM model helps compute this expected return.

According to William Sharpe who elaborate the CAPM model, there are two types of risks, relevant to individual investments, systematic risks and unsystematic risks. Systematic risk cannot diversify in any way, for example, interest rate, wars, storms

are systematic. While unsystematic risk is also called “specific risk”, can be diversified in several ways, for instance, investors can invest in several stocks at different companies to avoid loss in case of default.

From the mathematical expression of the systematic risk (β_i), we will value a firm with systematic risk which means that beta is greater than 0. In one year, the company will earn an uncertain cash flow (CF) and then liquidate. Assume that the expected return on investment is the expected cashflow minus the firm’s value, divided by the firm’s value. Therefore, the expected return on this investment under the assumptions of CAPM becomes:

$$\frac{\boldsymbol{E[CF]-V}}{\boldsymbol{V}} = \boldsymbol{r_f + \beta_i * [E(r_m) - r_f]}$$

Where: *V* is the value of the firm. After some arrangements from the formula above, the present firm’s value can be written as:

$$\boldsymbol{V} = \frac{\boldsymbol{E[CF]}}{\boldsymbol{1 + r_f + \beta_i * [E(r_m) - r_f]}} \qquad (3)$$

Therefore, the current firm value becomes the ratio between the expected value of the cash flow and the discounted rate ($1 + r_f + \beta * [E(r_m) - r_f]$). This discounted rate is greater than the risk-free rate. So, the expected return on investment should be higher than the risk-free rate. If this expected rate is lower than the risk-free rate, investors do not need to make trading activities or invest in projects. They just need to buy bonds, or treasury bills such as 10-year government yield bonds, T-bills, etc.

Now, assume that the actual firm return includes both a systematic component and unsystematic components. Besides, if we assume that the CAPM assumptions are valid then the actual return is:

$$(\boldsymbol{R_i}) = \boldsymbol{r_f} + \boldsymbol{\beta_i}[(\boldsymbol{r_m} - \boldsymbol{r_f}) + \mu$$

Where $r_f + \beta_i[(r_m - r_f)$ is the systematic components and μ is the unsystematic component. The assumption for μ is that it is uncorrelated with systematic component and have zero mean. Then, we compute the variance of this actual return, obtaining:

$$\boldsymbol{var}[(\boldsymbol{R_i})] = \boldsymbol{var}[\boldsymbol{r_f} + \boldsymbol{\beta_i}[(\boldsymbol{r_m} - \boldsymbol{r_f}) + \mu] = \boldsymbol{\beta_i^2 \sigma_m^2} + \boldsymbol{\sigma_u^2}$$

$$\boldsymbol{Cov(i,j) = 0 \; as \; i \; is \; different \; with \; j}$$

Where:

$\sigma_{m:}^2$ is the variance of the market, and

σ_u^2 : is the variance of the unsystematic return.

From the equation above, we can see that risk management will not impact the firm value. Because the variance of the actual return depends on the beta, and the beta measures the systematic risk that cannot be diversified anyway. Therefore, the firm's value depends only on the beta while unsystematic risk does not enter into the calculation of the firm's value, as stated in the equation (3).

By traditional thinking, risk managements should be an important part of the management policy and should contribute to the firm's value. But, under the assumption of CAPM model, the risk management do not contribute to the firm's

value. Moreover, in literature, there is no prove that risk management increase firm's value and the debate is yet to be concluded.

CHAPTER 3

METHODOLOGY

3.1 TOBIN'S Q

There are many ways to evaluate the firm's value, such as the cost of capital approach, the adjusted present value approach and Tobin's q approach. Recently, Tobin's q has become a popular method utilized in empirical analysis in many countries. In particular, when these analyses need to use regression models, Tobin Q is usually used as a proxy variable for the firm's value thanks to its simple calculation procedure.

Definition:

Tobin's Q was invented by James Tobin of Yale University, who won the Nobel Memorial Prize in Economics in 1981. He introduced an alternative method replace traditional financial methods that are used to value the firm. His method used the ratio of market value of an asset and its replacement costs. Even if the calculation of the Tobin Q is simpler than others method cited above, there are still some drawbacks due to the difficulties in the market value estimation. However, its calculation simplicity compensates these estimation difficulties; indeed, this approach is still widely used.

Tobin's Q determined by the market value of a firm's assets divided the replacement cost of this asset.

$$Tobin's\ Q = \frac{Market\ value\ of\ assets}{Replacement\ cost\ of\ these\ assets}$$

Asset's replacement cost is the cost sustained to replace an asset according to its current worth. Replacement cost may increase, due to inflation, or decrease due to the reduction of the asset market value caused by the deterioration of the asset or by the technology development; making it a more updated measure of the value of assets compared with accounting book value. A Tobin's Q between 0 and 1 indicates that firms earn a negative excess return and do not use their assets effectively, while Tobin's Q higher than 1 indicates that firms use their assets more effectively. If Tobin's Q is applied to measure a stock price, a low Tobin's Q shows that the stock is undervalued, whereas a high Tobin's Q indicates that the stock is overvalued.

Although this measure has some advantages, in theory, it still has several disadvantages. Firstly, there are some assets whose replacement costs are difficult to estimate, for example, assets that are not traded on financial markets. Secondly, if these assets can be estimated, the construction of this method need much substantial information's, whereas the ratio of traditional price-book value needs less substantial information. To be simple, in practice, Tobin's Q is calculated by using markets value of debt and equity as a proxy for the market value of assets and book value of assets are used as a proxy for the replacement costs of these assets.

Description

We cannot get a cross-sectional distribution of the multiple[3] because or it is not easy to access information's which we need to estimate it or these information's are not even available. This is a serious weakness when using the multiple because a high, low, or average value of the multiple will make no sense. For example, you would like to find a company having its stock traded at two times the replacement costs of this firm's stock. Without the summary statistics of markets, we cannot know whether we undervalued or overvalued the stock's price of this company.

Analysis

The value of Tobin's Q depends on two factors market value of assets and its replacement cost. When the replacement costs increase, Tobin's Q is lower than the ratio of unadjusted price-book value. Older assets more the difference will increase. In contrast, Tobin's Q is higher than the proportion of an unadjusted price-book value when the replacement costs decrease.

How efficiently a company manages its assets will affect the value of Tobin's Q. Tobin's Q ratio is 1 when the market value of an asset equal to its replacement cost. In other words, the ratio is 1 when this asset receives its required return on investment. Tobin's Q ratio is higher than 1 when a company earns positive excess returns and lower than 1 when a company earns less than its required return.

Application

Tobin's Q is a practical method, which is used to measure the value of a firm. We consider a company with a low or even if no potential growth. It is easy to calculate the Tobin's Q ratio, we can use the firm's market value as a proxy for the asset's market value, and adjust the asset's book value when its replacement cost increase.

[3] A multiple is a measure of a company's financial, expressed by the ratio between two metric of that company, in this case the multiple is the Tobin Q.

Conversely, a company with high-growth rate, it's hard to estimate the asset's market value of this company. The equity's market value of this company will consist of a premium for future growth.

This method is a valuation the value of a firm, but it is also shown to us a valuation about efficient management of a firm. If a firm was managed poorly, its market value lower than its replacement costs (Damodaran, 2002).

3.2 THE MODELS PROPOSED IN LITERATURE

3.2.1 The general model

This thesis aims to examine the impact of using commodities derivatives, currency derivatives and interest rate derivatives on the firm value of non-financial companies.

The most widely used model for this type of empirical analysis in economics is the multiple regression models. This model is used to test a theory or estimate a relationship by predicting the value of one unknown variable base on two or more known variables. The unknown variables are called a dependent variable (or endogenous variable), the know variables are called independent variables (or exogenous variables). The independent variables and dependent variables give us quantitative meaning. However, if we combine this regression model with binary information by adding qualitative factors, the model will have an interesting interpretation and in this case, is called the linear probability model. The binary information can be captured by using binary variables or zero-one variables. The example for zero-one variables as a baby is a boy or a girl, a person has a phone or not, etc. In an econometric model, binary variables are preferred as dummy variables. The model in this thesis will use commodities derivatives, currency derivatives and interest rate derivatives as dummy variables. The value of dummy

variable will be equal to 1 if companies have used any derivatives to hedge and equal to 0 if companies have not used derivatives. Other independent variables are chosen from the economic theory such as Modigliani and Miller theorem (1958), capital asset pricing model theory (CAPM) and from similar empirical analysis research such as Khediri(2010), Folusc (2009), Smith and Stulz (1985), Nguyen (2015), etc.

3.2.2 The general multiple regression

$$\boldsymbol{Y_t = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_t X_t} + \varepsilon_{it}$$

Where:

Y_t is the firm's value

α is a constant

$\beta_1, \beta_2, \ldots, \beta_t$ are estimated coefficients

$X_1, X_2, \ldots, X_t$ are independent variables

ε_{it} are error terms

Our thesis has similar objectives as Kediri's study that examined whether the use of derivatives has a positive effect on firm's value. He estimated regression models with two specifications and extended with a panel setting. Thus, we adopted the equation used by Khediri (2010). He estimated the following equation:

$$\text{Tobin's } Q_{it} = \alpha + \beta \text{ (derivative use decision)} + \sum \lambda_j \text{ (control variable j)} + \mu_i + \varepsilon_{it} \quad (3.1)$$

$$\text{Tobin's } Q_{it} = \alpha + \beta \text{ (derivative use extension)} + \sum \lambda_j \text{ (control variable j)} + \mu_i + \varepsilon_{it} \quad (3.2)$$

Where:

Tobin's Q	The ratio between the market value of firm's assets and replacement costs of these assets.
Derivatives use decision	The value is 1 if a firm used derivatives to hedge and zero otherwise
Derivative use extension	Firm's outstanding notional amount of derivatives scaled by firm size
α	Constant
β	Estimated coefficients
μ_i	Individual effect of firm (unobserved effects)
ε_{it}	Error terms

However, our multivariate analysis only investigates the impact of using interest rate derivatives, commodity derivatives and currency derivative as dummy variables on firm's value. Therefore, we do not need to use (3.2).

3.3 Other Models and the Selection of Independent Variables

The multiple regression is the same for similar studies. However, different authors will include different independent variables in their models. These variables depend on the data they can collect and the hypothesis they make or want to verify. In the research about companies, most of the time data are collected from the annual reports of firms. However, each country has its form and legal setting for annual reports. Therefore, there are some financial indexes, present in the annual report of one country, not displayed in the annual report of others country. Moreover, sometimes it is difficult to calculate these indexes due to the difficulty in collecting the data necessary for their estimation. For example, Khediri (2010) used geographic

diversification as one of his independent variables, these variables are the ratio between the foreign sale to total sales. However, since some of the companies from which we collect our data have no trade abroad, and therefore no foreign sale we did not include this variable in our model.

3.4 APPLICATION

After reading all the information's from past empirical analysis's, we choose several factors that, in our opinion, affect firm's value and we use these factors as independent variables in this empirical analysis. These factors include firm size, leverage, the rate of return on asset (ROA), the rate of return on equity (ROE), dividend per share, profitable, investment growth. Several independent variables in my thesis coincide with several independent variables in models of similar studies. In this thesis, I will do the empirical analysis in Singapore where I can collect data as for the size of firms, leverage, ROA, ROE, dividend per share and investment.

Our model is:

$$\text{Tobin's Q} = \beta_1 + \beta_2\,\text{DUMIRD} + \beta_3\,\text{DUMCRD} + \beta_4\,\text{DUMCMD} + \beta_5\,\text{SIZE} + \beta_6\,\text{LEV} + \beta_7\,\text{ROA} + \beta_8\,\text{ROE} + \beta_9\,\text{INV} + \beta_{10}\text{DPS} + \mu_i + \varepsilon_{it}$$

Where:

β1	Constant
β2 DUMIRD	Equal to1if firm use interest rate derivative and 0 otherwise
β3 DUMCRD	Equal to1if firm use currency derivative and 0 otherwise
β4 DUMCMD	Equal to 1if firm use commodity derivative and 0 otherwise
β5 SIZE	Log of total assets

β6 LEV	Leverage; is determined by total debt divide total equity
β7 ROA	Return on asset (ROA)
β8 ROE	Return on equity (ROE)
β9 INV	Investment growth; is determined by CAPEX divide the market value of firms
β10DPS	Dividend per share
μ_i	Unobserved variables
ε_{it}	Error term

Our data are not only using quantitative data, qualitative data but also included many periods of times, specifically our data collected from 2014 to 2016. Cross-sectional data technique cannot be used in this case because cross-sectional data of study population only use data have the same point of time. Although this technique can collect many observations at the same time. However, panel data technique is more advantageous because it can collect many observations (of cross-sectional units) but at different points of time. By pooling samples from the same population, but at the different points of time, we can increase the sample size, and in an empirical study, the larger are the sample size more accurate are the test statistics. Therefore, in this thesis, we used panel data technique. In statistics and econometrics, panel data is also called with different names as longitudinal data. To collect a panel data set we collect the same observations such as individuals, families, firms, cities, states, etc. across time. For example, within this thesis, I collected observations such as ROA, ROE, dividend per share, investment, the firm 'size, leverage at four periods which are 2013,2014,2015 and 2016.A problem when using panel data is that unobserved individual effects. There are fixed effects and random effects. Most other studies assumed that these unobserved individual effects are uncorrelated with all the

explanatory variables. This assumption supposes that there is large heterogeneity [4] across firms. If our equation is controlled good, we might believe that the absence of heterogeneity only causes serial correlation between the error terms, but not cause correlation between error terms and explanatory variables (Wooldridge, 2013). Tobin's q can be estimated by using a pooled regression. To control heterogeneity, we will employ both fixed effect model and random effect models (Wooldridge, 2002). Then, we use Hausman test Hausman (Cameron and Trivedi, 2005) to verify which model is the most suitable for estimating Tobin's q ratio. If the model is correct and unobservable individual effects are uncorrelated with explanatory variables, the fixed effect model and the random effect model should not be statistical different. The null hypothesis for this test is that at 1% significant level the individual effects are uncorrelated with other regressors will be rejected.

Hausman test

The Durbin–Wu–Hausman test (also called Hausman specification test) is a statistical hypothesis test utilized in econometrics analyses. The Hausman test is used to detect the endogeneity of the regressors which implies that some of the independent variables are correlated with the residuals. Having endogenous regressors in a model can cause omitted variables issues or correlated exogenous variables. In these cases, the OLS method will not be a suitable model, because one of the assumptions of OLS is that there is no correlation between exogenous variables and error terms. If there exist endogeneity problem, we can use instrumental variables estimators such as Two-Stage least squares (2SLS) to

[4] A **heterogeneous population or sample** is one where every member has a different value for the characteristic you're interested in. For example, if everyone in your group varied between 4'3″ and 7'6″ tall, they would be heterogeneous for height. Its opposite is homogeneity

estimate. However, before using 2SLS, we should use Hausman test to check for the endogeneity of variables.

For panel data, the Hausman test help to determine the fixed effects model and random effects model, which is the most suitable model. The null hypothesis is that random effect model is a suitable, and the alternative hypothesis is that fixed effect model is suitable. As the p-value is smaller than 0.05, we reject the null hypothesis for a 5% confidence interval.

country	year	Y	X_1	X_2	X_3
1	2000	6.0	7.8	5.8	1.3
1	2001	4.6	0.6	7.9	7.8
1	2002	9.4	2.1	5.4	1.1
2	2000	9.1	1.3	6.7	4.1
2	2001	8.3	0.9	6.6	5.0
2	2002	0.6	9.8	0.4	7.2
3	2000	9.1	0.2	2.6	6.4
3	2001	4.8	5.9	3.2	6.4
3	2002	9.1	5.2	6.9	2.1

Source: (Reya, 2007)

Table 2: A panel data table

The structure of the panel data in this thesis has the same structure as this table. Both fixed effect models and random effect models measure the change in a group and are used to remove omitted variable bias. The biggest difference between these two models is inference. The fixed effect only support inference base on a collected dataset, while the random effect can suggest some infer from a collected dataset.

- **Fixed effect models**

Set *i* as a cross-sectional unit, and t is t-period of times. The equation for fixed effect models with one independent variable (explanatory variable) is:

$$Y_{it} = \beta_0 + \delta_0.d2_t + \beta_1 X_{it} + a_i + \mu_{it} \quad , t=1,2. \quad (3.3)$$

Where:

Y_{it}	is dependent variable
t	is the time period
$d2_t$	is dummy variable, equal to 0 as t=1 and 1 as t=2, this variable has not *i* subscript because it does not change over time.
β_0	is the intercept for t=1
$\beta_0 + \delta_0$	is the intercept for t=2. It is important to allow the intercept change over time in most of application.
a_i	unobserved effects that effect Y_{it}
μ_{it}	idiosyncratic error or time-varying error, capture unobserved factors that variant time and effect $Y_{it.}$

The equation (1) is also called "*unobserved effects model*" or "*fixed effect model*". In practice, you can see a_i is called as "*unobserved heterogeneity*" or individual heterogeneity or stage heterogeneity or age heterogeneity and so on (Wooldridge, 2013).

The equation for fixed effect models with several independent variables (explanatory variables) is:

$$Y_{it} = \beta_0 + \delta_0.d2_t + \beta_1 X_{it\_1} + \beta_2 X_{it\_2} + \ldots + \beta_k X_{it\_k}\, a_i + \mu_{it} \quad , t=1,2,\ldots k \qquad (3.4)$$

Fixed effects methods are applied immediately to unbalance panel data, but we must have an assumption that the missing some periods of time do not cause of systematical relation with the idiosyncratic error.

The fixed model will not work well if with data have minimal within-cluster variation and variance change slowly over time.

- **Random effect models**

We start with the same unobserved effects model

$$Y_{it} = \beta_0 + \delta_0.d2_t + \beta_1 X_{it\_1} + \beta_2 X_{it\_2} + \ldots + \beta_k X_{it\_k} + a_i + \mu_{it} \quad , t=1,2,\ldots k \qquad (3.5)$$

Assume that the *mean* of unobserved effect a_i is equal to zero, without loss of generality.

The purpose of using fixed effect is to eliminate a_i because a_i is assumed that it is correlated with one or more explanatory variables X_{itj}. Unlike the fixed effect, the random effect estimators can be used under the assumption that the unobserved effects a_i are uncorrelated with all explanatory variables in all period. Then a_i can be included in the error terms.

The equation (3.5) under the assumption that a_i is uncorrelated with each independent variable, become a random effects model:

$$Cov(X_{itj}, a_i) = 0 \quad t = 1,2\ldots T;\ j=1,2\ldots k \qquad (3.6)$$

The random effects model includes all the assumption of fixed effects model, adding that a_i is independent of all independent variables in all the period.

Summary, we should use fixed effects model if we think the unobserved effect a_i is correlated with any independent variables. We should use random-effects model if we believe that the unobserved effect a_i uncorrelated with any independent variables.

The OLS

To estimate β-parameters, we can use OLS method. Under the uncorrelated assumption of a_i, we can use a single cross-sectional data set to determine βj. But a single cross- section has a drawback which much useful information disregarded in the other periods. We can use a pooled OLS procedure, just run the OLS of the dependent variable on the independent variables and the time dummies. For pooled OLS to estimate consistently βj we need one important assumption that a_i is uncorrelated with any explanatory variable. We can see this when we re-write the third equation (3.5) as follows:

$$Y_{it} = \beta_0 + \delta_0.d2_t + \beta_1 X_{it\_1} + \beta_2 X_{it\_2} + \ldots + \beta_k X_{it\_k} + v_{it} \quad , t=1,2,\ldots k \qquad (3.7)$$

Where $v_{it} = a_i + \mu_{it}$ is usually preferred as "*composite errors*". For what we know about OLS we should assume that $Cov(v_{it}, X_{it\_k})=0$. When we assume that cov $(\mu_{it,} X_{it\_k})=0$, and when cov $(a_{it,} X_{it\_k})=0$ pooled OLS is bias and inconsistent. The consequential bias in pooled OLS caused from omitting an invariant time variable. The bias in pooled OLS is also called "*heterogeneity bias*".

3.4.1 The independent variables

- **Size**

  Lee (2009) studied whether the firm size affects the firm performance by using a large sample of more than 7000 public firms in the US and gave the conclusion that the firm size is one of the main factors that determine the profitability of firms. Furthermore, under the market imperfection theory, companies do not have the same information and priority. Large companies will be easier to access to capital market because of their market power and this give them the priority to access to investment opportunities that small size companies cannot have. Therefore, a large company can probably obtain more profitable than a small company. Furthermore, large companies are more prefer using derivative to hedge than small company because large companies have more risks and higher risks than small companies. Other research has the same conclusion that the size of firms affects to profitable of firms as Singla (2011). There is also a big difference between total asset of large firms and total asset of small firms. Therefore, the logarithm of total assets is used to determine the size of firms to avoid the asymmetric distribution of total asset.

- **Leverage**

  The financial leverage ratio is the ratio between debt and equity and known as the capital structure. Capital Structure in the Modern World of Miglo (2016) pointed out that increase debts inside the capital structure of a company will increase the probability of bankruptcy. There are two theories to help a company choose a capital structure: The trade-off theory and Pecking order theory. Trade off theory claims that when a company increases debt, it can also increase its profitability because of benefit from tax shields. By using debt, a company can finance itself in a cheaper way than issuing new stocks. Therefore, companies can be lower WACC and tend

to increase the profit. As the definition of NASDAQ (), for external financial transaction cost associated with adverse selection, company finance itself first by using internal funds, second by using new debt and finally by debt-equity hybrids (issue new stocks). Ahmad, et al. (2015), find out that the financial leverage has a significant impact on the profitability at 99 % confident interval. Hussain, et al. (2016) observe that exists a positive relationship between profitability and financial leverage. If financial leverage increases, then the profits will increase and vice versa. Leverage in this thesis is determined by taking long-term debt divide to the market value of the firm. This method is also used in previous studies as Allayannis and Weston (2011), Khediri and Folus (2010).

- **Profitability**

  To measure profitability, I use two financial indexes which are the return on asset (ROA) and return on equity (ROE). By Gildersleeve (1999), ROA is calculated by taking net income divided to total asset, and ROE is calculated by taking net income divided by shareholder's equity. ROE is one of the most important indicators which investors will look at first when they want to decide the stock of which company they want to buy. This indicator shows how effectively the manager of firms used the money of investors. The higher ROE indicator is, the more effective firm's management is. Thus, a high ROE indicator will probably be attractive to investors. While ROA measures the effectiveness of management, measuring how much profit a company can earn based on its assets value. Therefore, a high ROA indicator shows that the company is managing efficiently its assets. The previous researchers also use these two indicators for profitable variables such as Khediri (2010) and Allayannis and Weston (2011).

- **Investment growth**

  Investment growth rate is determined by taking net cash used in investing activities by the company and dividing it by its equity. This indicator shows to investors the potential growth of firms in the future. Myers (1976) and Smith and Watts (1992) pointed out that the value of the firm will be affected by future investment opportunities. Similarly, with the works of Khediri (2010) and Allayannis and Weston (2011), we will consider the investment growth as a proxy variable determined as the ratio between capital expenditures (CAPEX) and market value of a firm.

- **Dividend per share**

  Nwamaka and Ezeabasili (2017) conclude, at the end of their research, that dividend policies have a great influence on the firm's value because the correlation between dividend policies and firm value are 0.99 which is a very high correlation, almost perfect correlation. Budagaga(2017) reported that dividend per share and firm value has a positive significant relationship. Thus, the DPS appears as an important factor, with a high correlation with firm's value. Therefore, we decide to include this variable in our models.

3.4.2 The dependent variable

The dependent variable is the market value of the firms and Tobin's Q will be used as a proxy variable for this dependent variable. The q ratio in this analysis is the ratio between the market value of a company and its asset's replacement cost. Although, the Tobin's Q become common practice for analyzing financial data in empirical research it is still not easy to apply due to the difficulties in estimating the asset market value. Chung and Pruitt (1994) have developed a simple formulary for approximating Tobin's q (approximate q) which is easier to apply to financial

analysis than the L-R's Tobin's q which is Tobin's q of Lindenberg & Ross (1981). Many studies after this development have applied this new method to calculate the Tobin'q such as Khediri (2010), Nguyen (2015), Allayannis and Weston (2011), etc. The approximate q only requires basic accounting data which can be collected easily from annual reports of firms. The study of Chung and Pruitt (1994) concluded that the approximate q could be used to replace the L-R's Tobin's q because there is a very high correlation between the values using approximate q and the values using L-R's Tobin's q. The formula is the following :

$$Approximate\ q = \frac{\text{MVE} + \text{PS} + \text{DEBT}}{\text{TA}}$$

Where:

MVE is calculated by taking the share price of the firm multiplied by the outstanding number of common stock.

PS is liquidating value of the firm's outstanding preferred stock

DEBT is the value of the total liabilities.

TA is the book value of the firm's total asset

Our thesis will use the approximate q to calculate the market value of the firm instead of using L-R's Tobin's q.

3.4.3 Hypothesis

H_0 : Interest rate derivatives have a positive effect on the firm value.

H_0 : Currency derivatives have a positive effect on the firm value.

H_0 : Commodity derivatives have a positive effect on the firm value.

3.5 COMPARISION

Many studies check the impact of using derivatives to hedge on firm's value. However, until now in the literature, there does not exist a conclusion about this topic whether using derivatives to hedge will increase or decrease the value of firms. Thus, this thesis will make an empirical analysis to examine this relationship again by using the data collected in Singapore to give a view about this relationship in one of the developing Asian country.

CHAPTER 4

EMPIRICAL RESULTS

4.1 DATA

We consider nonfinancial companies listed on the Singapore Exchange market (SGX). The SGX is the most liquid offshore market for the ASEAN's benchmark equity index[5] and has its headquarter in Singapore, whose public debt has an AAA rating by the three biggest credit rating agencies[6]. We collected data on 60 companies, whose operating sectors range from the manufacturing to the hotel services, from 2013 to 2016 obtaining a 240 observations samples due to the structure of panel data. These data included both companies that use derivatives and non-using ones.

The financial data is obtained from the website of SGX and the annual reports of the companies. To know whether a company use derivatives or not, I examined the annual reports of these companies. A company is classified as derivatives users if its annual report has mentioned about this, and non-derivative users if its annual report has no mention about this.

[5] As state inside the SGX website http://www.sgx.com.

[6] The three biggest rating agencies are Standard & Poor's, Moody's and Fitch group.

4.2 STATISTICAL SUMMARY

Table 3 shows the percentage of companies using different types of derivatives. On the total of our 60 companies, 18 don't use derivatives while 42 companies use them. Within these 42 companies, some use only one type of derivatives, some use two types of derivatives, and some use all types of derivatives. Precisely, 61.7% companies used currency derivatives, 41.6% company used interest rate derivatives and 8.3% used commodity derivatives. The percentage of non-use types of corresponding derivatives is 38.3% for currency derivatives, 58.4% for interest rate derivatives and 91.7% for commodity derivatives.

	Users	%	Non-users	%
Currency Derivatives	37x4=148	148/240=61.7%	23x4=92	92/240=38.3%
Interest rate Derivatives	25x4=100	100/240=41.6%	35x4=140	140/240=58.4%
Commodity Derivatives	8x4=20	20/240=8.3%	52x4=208	208/240=91.7%

Table 3. Summary of derivatives used

Table 4 reports the statistical summary of the pooled data. The median in statistic present the middle value of data set, but it is not affected by extreme values or outliers while the mean presents the average value of data set but it is affected by extreme values. Therefore, sometimes using median is preferred than using mean.

There is not a big difference between mean and median of the Tobin's Q in the pooled data. This means that our data do not have too many outliners observations. The median value of our Tobin's Q is 0.6046. Considering that Tobin's equal to 1 when the market value of firms reflects exactly their asset values, we may observe as the computed Tobin's Q is lower than 1; suggesting that these companies are undervalued by the market. In other words, Singapore listed companies have been valued lower than their real value by the financial market. Buying undervalued stocks is one of investment strategies of mogul Warren Buffett. This suggests that Singapore can be a profitable market for investments. We observe that mean and median of size are quite similar, suggesting again that data do not have too many outliners observation. However, we also notice that size display a high standard deviation, 0.7279, suggesting that the observations differ greatly from the mean. The median of leverage is 0.255, suggests that these listed companies finance their capital structure with approximately 25% debts. The mean and median of ROA and ROE tends to be quite different, in particular, ROE's mean is almost the double of its median, implying the presence of outliners observations. We also observe a high standard deviation for both the variables, that suggests a high volatility in the profitability indicators of the companies. The investment growth rate is the only variables that have a negative mean and median; this is consistent with the nature of the variable that should measure the expenditure in the investment of the companies. Looking at the median, we notice that, on average, the percentage of equity spent by the companies in investment is quite low, being just the 7.9%. The average dividend that companies paid out is around 0.98 SGD per share.

	Tobin's Q	Size	Leverage	ROA	ROE	INVG	DPS
Mean	0.624396	3.195088	0.416553	3.286969	15.252510	-0.139070	0.097563
Median	0.604629	3.080164	0.255219	2.778500	8.408000	-0.079623	0.021500
Maximum	3.465600	5.014398	6.262206	19.720000	492.537000	0.648890	2.168000
Minimum	0.263366	1.000000	0.000000	-8.417000	-21.701000	-2.707052	-0.001000
Std. Dev.	0.288013	0.722976	0.637268	3.160212	41.613490	0.336842	0.291615
Skewness	5.035432	0.266051	5.541049	1.247530	8.299123	-4.227573	5.388034
Kurtosis	44.951450	2.843678	44.118940	8.227375	83.902150	27.206680	33.183920
Observations	240	240	240	240	240	240	240

Table 4 The statistical summary of the pooled data.

We observe that for most of our variables, except size, the null hypothesis of Jarque-Bera test was rejected at any confidence level, implying that the data are not normally distributed. This is a great concern because most of the test under OLS may display misleading results if data are not normally distributed and may also present a serious issue as heteroskedasticity. Even so, the most commonly used method to induce normality in the data, such as logarithmic transformation or square root transformation, fail in solving the problem. Either because were impossible to apply them due to the nature of the data, for example making the logarithm of a negative number, or because even if was possible to execute the transformation the data were still not normal. For dealing with this issue, we decide to use robust standard errors to avoid heteroskedasticity.

4.3 THE CORRELATION BETWEEN DEPENDENT VARIABLES AND INDEPENDENT VARIABLES

4.3.1 Multicollinearity

I used variance inflation factor (VIF) to verify if there exist multicollinearity problem. In other words, the VIF is used to check whether one independent variable in our regressive model has correlation with other variables. The result report that there are no problems because the VIF value for each variable fluctuates between 1.355 and 5.449, that is smaller than 10 according to "rule of thumb" (Cohen et all, 2003). The "rule of thumb" is that any VIF value is bigger than 10 is considered as existing serious multicollinearity.

Variance Inflation Factors
Date: 10/09/17 Time: 22:55
Sample: 1 240
Included observations: 240

Variable	Coefficient Variance	Uncentered VIF
SIZE	0.000238	5.449322
LEVERAGE	0.004328	5.338417
ROA	7.22E-05	3.196323
ROE	1.02E-06	4.258426
INVG	0.012560	3.547001
DIVIDEND	0.006741	1.355188
DUM_COMM	0.004302	1.568401
DUM_CURR	0.002636	3.258278
DUM_INT	0.002818	2.229976

Table 5 Variance Inflation Factors

4.3.2 Pearson Correlation

Table 6 reports the Pearson correlation and shows the results of a set of the bivariate correlation coefficient between the dependent variables (Tobin's Q) and independent variables (explanatory variables). The proxy of market firm's value Tobin's Q has negative linear correlations with commodity derivatives (-0.12448), interest rate derivatives (-0.08423), currency derivatives (-0.21995), size (-0.44581), investment growth (-0.15868) and dividend per share (-0.1319), ROA (-0.05818). A negative linear correlation implies that the Tobin's Q decrease as commodity derivatives, interest rate derivatives, currency derivatives, size, investment growth, dividend per share and ROA increase. While, a positive linear correlation implies that the Tobin's Q increase as leverage and return on equity (ROE), which are 0.2378927 and 0.082697 respectively.

	Tobin Q	CMD	IRD	CRD	DPS	INVG	ROE	ROA	LEVERAGE	SIZE
Tobin Q	1	-0.12448	-0.08423	-0.21995	-0.21024	-0.15868	0.082697	-0.05818	0.2378927	-0.44581
CMD		1	0.014853	0.386918	0.011335	0.025399	-0.07424	0.141591	-0.025907	0.322443
IRD			1	0.357389	0.31975	-0.11857	0.115562	-0.04989	0.1246946	0.381736
CRD				1	0.223252	-0.02575	0.036065	0.054859	-0.058557	0.343115
DPS					1	-0.00419	0.050897	0.001833	-0.031116	0.498637
INVG						1	-0.74607	0.000172	-0.78421	0.032846
ROE							1	0.000671	0.7871238	0.016567
ROA								1	-0.03474	0.045826
LEVERAGE									1	0.016222
SIZE										1

Table 6. The Pearson correlation between Tobin's Q and explanation variables

4.3.3 The empirical analysis and its results

At first, we estimate the regression model by the using Least Square (LS) method for each year. For each year we will run the regression in the case robust standard errors, white heteroskedasticity-consistent standard errors & covariance (HC), are not used and in the case that they are used; the estimation of these models is done using Eviews.

Table 7, 8, 9, and 10 display the result of the LS regressions respectively for the year 2013, 2014, 2015 and 2016.

In case we do not use robust standard error, size is statistically significant and negative related in all the four years. In case of HC are utilized, size continues to be negative related but becomes significant at 5% confidence interval in 2013 and 2014, while is not significant in 2015 and 2016.

Leverage displays, in the "normal" LS, a positive relationship with Tobin's Q for all the years; it is not significant in 2013, significant at 5% confidence level in 2014 and 2015 and significant for any confidence level in 2016. In case we use HC errors, the only difference with the normal LS regression is that in 2014 leverage becomes significant at any confidence level.

ROA is negatively related in all the four years, is significant in 2013 and 2014 for any confidence level, significant at 10% confidence level in 2015 and not significant in 2016. If we use robust standard errors, the relationship continues to be negative, but ROA becomes not significant for all the four years at any confidence level.

ROE displays a positive relationship in 2013 and 2014, while displaying a negative relationship in 2015 and 2016. It is statistically significant just in 2014, while in 2013, 2015 and 2016 are not significant at any confidence level. In case HC is used, ROE becomes insignificant for all the four years at any confidence level.

Investment growth is negatively related in 2013 and 2015, positive related in 2014 and 2016 and not significant at any confidence level in the four years. In case of HC errors, there is no significant change.

Dividend per share has a positive relation in 2013, 2014 and 2016 and a negative one in 2015; for all the years dividend is insignificant at any confidence level. These results are confirmed in the case of robust standard errors.

Commodity derivative dummy variable displays positive relationship in 2013 and 2014 and a negative one in 2015 and 2016; for all the four years the variables are not significant at any confidence level. There is no sensible change in the result if HC errors are used.

Currency derivative dummy variable has a negative relationship in 2013 and 2014 and positive relationship in 2015 and 2016; for all the four years the variables are insignificant at any confidence level. These results are confirmed in case robust standard errors are used.

Interest rate derivative dummy variable is positively related in 2013, 2014 and 2016 and display a negative relationship in 2015; for all the four years the variables are not significant at any confidence level. There is no sensible change in the result if HC errors are used.

After the estimation year by year, we decide to perform an LS regression that considers all the periods, utilizing panel data. The models are estimated based on the pooled data method, fixed effects method, and random effects method. The result represents the effect of using derivatives on the firm's value is showed in table 11, 12 and 13. Then, Hausman test is applied to choose which model is the most suitable for fixed effects and random effects model for estimating Tobin's Q equation. The results of this test are shown in table 14, and they imply that the fixed effects model is the most suitable. The null hypothesis for this test is that the

unobserved individual effects are uncorrelated with the independent variables (explanatory variables). The statistic is reported in table 14 and shows that the null hypothesis is rejected because the probability of the test is 0% which is smaller than 1% significant level.

Table 12 displays that firm size has a negative relationship with firm's value. This represents that the firm's value decrease as the firm's size increase. This result is similar to the study's conclusion of Muigai (2017). While our results are not consistent with the study of Lee (2009).

The relationship between leverage and firm value is a positive relationship. This result is consistent with the study of Masulis (1983). He reported that there is a positive relationship between debt level and the firm's value. However, the study of Calderia, et al. (2013) concluded that the relationship between the capital structure which is specific in short-term debts, long-term debts and financial constrain and firm's value is a negative correlation.

The coefficient between firm's value and ROA is negative, and at any confident interval, the relationship between them is not statistically significant. This result is not consistent with the research of Sudiyatno and Puspitasari (2010), that concludes it exists a positive relation between firm's value and ROA. The relationship between ROE and firm's value is negative, and we reject the null hypothesis of no significance at 10% and 5% confidence level; while we should accept it for a confidence level of 1%.

Also, we found that there was a negative relationship between investment growth and firm's value. When investment growth rate increase, the firm's value will decrease and vice versa. The result of the regression display as the investment growth is not significant at any confidence level. The investment growth in this thesis is determined by the ratio of the capital expenditures (CAPEX) and the

market value of the firm. The CAPEX can be used both for maintenance or productivity purposes that depend on the purpose of the company. CAPEX will be reported as a cost in the income statement and is calculated as the percentage of annual profit. CAPEX might cause a potential reduction in profit and effect the valuation of the firm. Therefore, a company uses CAPEX for maintained purpose can produce a decrease valuation while a company use CAPEX for productivity purposes can produce an increase valuation.

The results showed that dividend and firm value a have positive relationship. This result is consistent with the study of Lang and Litzenberger (1989) that an increasing dividend will reduce the overinvestment and increase the market value of the firm. However, the results indicate that the dividend is not significant at any confidence level.

The results imply that commodity and currency derivatives have a negative relation with firm's value, while interest rate derivatives have a positive relation. However, the result for commodity and interest rate derivatives are insignificant (no effect) at 1%,5% and 10% significant level. Currency rate derivatives are insignificant at 1% significance level and significant at 10% and 5% significance level. In this thesis, we decide to choose confidence level at 1%. Therefore, we can say that all the derivatives dummy variables do not affect the firm's value. The results of the regression are consistent with the study of Jin and Jorin (2004), they reported that there are no differences in the value of companies that hedge using derivatives and companies that do not. Moreover, Allayannis and Weston (2001) conclude that foreign currency derivatives do not affect firm's value. Also, Khediri (2010) indicates that derivatives do not have any effect on firm's value. Additionally, Nguyen and Faff (2003) found that using foreign currency derivatives on exchange risk was usually weak and lack of consistency.

Dependent Variable: TOBINQ
Method: Least Squares
Date: 10/09/17 Time: 03:16
Sample: 1 60
Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.857444	0.211726	8.772884	0.0000
SIZE	-0.320902	0.067734	-4.737673	0.0000
LEVERAGE	0.068117	0.184578	0.369040	0.7137
ROA	-0.079228	0.019057	-4.157479	0.0001
ROE	0.001428	0.002246	0.635863	0.5278
INVG	-0.109948	0.201144	-0.546610	0.5871
DIVIDEND	0.250962	0.174528	1.437947	0.1567
COMMODITY_DERIVATIVES	0.067999	0.128813	0.527893	0.5999
CURRENY_DERIVATIVES	-0.105698	0.105218	-1.004562	0.3199
INTEREST_DERIVATIVES	0.085578	0.108946	0.785510	0.4359

R-squared	0.508145	Mean dependent var	0.652464
Adjusted R-squared	0.419611	S.D. dependent var	0.411076
S.E. of regression	0.313171	Akaike info criterion	0.666880
Sum squared resid	4.903817	Schwarz criterion	1.015937
Log likelihood	-10.00639	Hannan-Quinn criter.	0.803415
F-statistic	5.739553	Durbin-Watson stat	1.511872
Prob(F-statistic)	0.000019		

Table 7a. OLS in 2013

Dependent Variable: TOBINQ
Method: Least Squares
Date: 10/09/17 Time: 04:40
Sample: 1 60
Included observations: 60
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.857444	0.640208	2.901314	0.0055
SIZE	-0.320902	0.152874	-2.099120	0.0409
LEVERAGE	0.068117	0.149769	0.454812	0.6512
ROA	-0.079228	0.047861	-1.655371	0.1041
ROE	0.001428	0.002650	0.539034	0.5923
INVG	-0.109948	0.138595	-0.793304	0.4313
DIVIDEND	0.250962	0.215414	1.165022	0.2495
COMMODITY_DERIVATIVES	0.067999	0.117342	0.579498	0.5649
CURRENY_DERIVATIVES	-0.105698	0.098587	-1.072138	0.2888
INTEREST_DERIVATIVES	0.085578	0.101290	0.844877	0.4022

R-squared	0.508145	Mean dependent var	0.652464
Adjusted R-squared	0.419611	S.D. dependent var	0.411076
S.E. of regression	0.313171	Akaike info criterion	0.666880
Sum squared resid	4.903817	Schwarz criterion	1.015937
Log likelihood	-10.00639	Hannan-Quinn criter.	0.803415
F-statistic	5.739553	Durbin-Watson stat	1.511872
Prob(F-statistic)	0.000019		

Table 7b. OLS in 2013 with HC

Dependent Variable: TOBINQ
Method: Least Squares
Date: 10/08/17 Time: 22:53
Sample: 1 60
Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.206653	0.149438	8.074586	0.0000
SIZE	-0.175296	0.050192	-3.492526	0.0010
LEVERAGE	0.233623	0.094564	2.470528	0.0169
ROA	-0.025234	0.009253	-2.726995	0.0088
ROE	0.000399	0.001149	0.347363	0.7298
INVG	0.099070	0.124004	0.798930	0.4281
DIVIDEND	0.046198	0.115806	0.398927	0.6916
COMMODITY_DERIVATIVES	0.001050	0.085765	0.012242	0.9903
CURRENY_DERIVATIVES	-0.055134	0.069996	-0.787667	0.4346
INTEREST_DERIVATIVES	0.037296	0.075528	0.493808	0.6236

R-squared	0.440432	Mean dependent var	0.627858
Adjusted R-squared	0.339710	S.D. dependent var	0.257040
S.E. of regression	0.208866	Akaike info criterion	-0.143238
Sum squared resid	2.181245	Schwarz criterion	0.205819
Log likelihood	14.29714	Hannan-Quinn criter.	-0.006703
F-statistic	4.372745	Durbin-Watson stat	1.503042
Prob(F-statistic)	0.000304		

Table 8a. OLS in 2014

Dependent Variable: TOBINQ
Method: Least Squares
Date: 10/09/17 Time: 04:45
Sample: 1 60
Included observations: 60
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.206653	0.322857	3.737421	0.0005
SIZE	-0.175296	0.081684	-2.146017	0.0367
LEVERAGE	0.233623	0.075105	3.110605	0.0031
ROA	-0.025234	0.022196	-1.136896	0.2610
ROE	0.000399	0.001259	0.317038	0.7525
INVG	0.099070	0.068850	1.438925	0.1564
DIVIDEND	0.046198	0.110456	0.418249	0.6776
COMMODITY_DERIVATIVES	0.001050	0.062728	0.016738	0.9867
CURRENY_DERIVATIVES	-0.055134	0.070835	-0.778343	0.4400
INTEREST_DERIVATIVES	0.037296	0.058380	0.638855	0.5258

R-squared	0.440432	Mean dependent var	0.627858
Adjusted R-squared	0.339710	S.D. dependent var	0.257040
S.E. of regression	0.208866	Akaike info criterion	-0.143238
Sum squared resid	2.181245	Schwarz criterion	0.205819
Log likelihood	14.29714	Hannan-Quinn criter.	-0.006703
F-statistic	4.372745	Durbin-Watson stat	1.503042
Prob(F-statistic)	0.000304		

Table 8b. OLS in 2014 with HC

Dependent Variable: TOBINQ
Method: Least Squares
Date: 10/08/17 Time: 23:10
Sample: 1 60
Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.997341	0.130314	7.653345	0.0000
SIZE	-0.122264	0.040515	-3.017767	0.0040
LEVERAGE	0.189943	0.076156	2.494145	0.0160
ROA	-0.023441	0.010722	-2.186311	0.0335
ROE	-0.000720	0.001338	-0.538149	0.5929
INVG	-0.189093	0.159734	-1.183799	0.2421
DIVIDEND	-0.011617	0.092429	-0.125688	0.9005
COMMODITY_DERIVATIVES	-0.025106	0.068188	-0.368184	0.7143
CURRENY_DERIVATIVES	0.005570	0.051072	0.109061	0.9136
INTEREST_DERIVATIVES	-0.016644	0.053935	-0.308598	0.7589

R-squared	0.428947	Mean dependent var	0.610749
Adjusted R-squared	0.326158	S.D. dependent var	0.201787
S.E. of regression	0.165643	Akaike info criterion	-0.606952
Sum squared resid	1.371880	Schwarz criterion	-0.257895
Log likelihood	28.20857	Hannan-Quinn criter.	-0.470417
F-statistic	4.173065	Durbin-Watson stat	1.457346
Prob(F-statistic)	0.000465		

Table 9a. OLS in 2015

Dependent Variable: TOBINQ
Method: Least Squares
Date: 10/09/17 Time: 04:58
Sample: 1 60
Included observations: 60
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.997341	0.262244	3.803110	0.0004
SIZE	-0.122264	0.069996	-1.746725	0.0868
LEVERAGE	0.189943	0.074101	2.563296	0.0134
ROA	-0.023441	0.018586	-1.261251	0.2131
ROE	-0.000720	0.001519	-0.474205	0.6374
INVG	-0.189093	0.135360	-1.396961	0.1686
DIVIDEND	-0.011617	0.079813	-0.145555	0.8849
COMMODITY_DERIVATIVES	-0.025106	0.057317	-0.438016	0.6633
CURRENY_DERIVATIVES	0.005570	0.052444	0.106209	0.9158
INTEREST_DERIVATIVES	-0.016644	0.046954	-0.354477	0.7245

R-squared	0.428947	Mean dependent var	0.610749
Adjusted R-squared	0.326158	S.D. dependent var	0.201787
S.E. of regression	0.165643	Akaike info criterion	-0.606952
Sum squared resid	1.371880	Schwarz criterion	-0.257895
Log likelihood	28.20857	Hannan-Quinn criter.	-0.470417
F-statistic	4.173065	Durbin-Watson stat	1.457346
Prob(F-statistic)	0.000465		

Table 9b. OLS in 2015 with HC

Dependent Variable: TOBINQ
Method: Least Squares
Date: 10/08/17 Time: 23:12
Sample: 1 60
Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.006998	0.153219	6.572264	0.0000
SIZE	-0.146907	0.050189	-2.927058	0.0051
LEVERAGE	0.253187	0.078777	3.213990	0.0023
ROA	-9.60E-06	4.34E-05	-0.221528	0.8256
ROE	-0.003266	0.002963	-1.102236	0.2756
INVG	0.173493	0.232847	0.745093	0.4597
DIVIDEND	0.014972	0.113309	0.132131	0.8954
COMMODITY_DERIVATIVES	-0.005214	0.088305	-0.059041	0.9532
CURRENY_DERIVATIVES	0.015855	0.067808	0.233816	0.8161
INTEREST_DERIVATIVES	0.017832	0.067006	0.266120	0.7912

R-squared	0.336410	Mean dependent var	0.606513
Adjusted R-squared	0.216964	S.D. dependent var	0.242746
S.E. of regression	0.214804	Akaike info criterion	-0.087166
Sum squared resid	2.307046	Schwarz criterion	0.261891
Log likelihood	12.61498	Hannan-Quinn criter.	0.049369
F-statistic	2.816413	Durbin-Watson stat	1.547805
Prob(F-statistic)	0.009313		

Table 10a. OLS in 2016

Dependent Variable: TOBINQ
Method: Least Squares
Date: 10/09/17 Time: 05:04
Sample: 1 60
Included observations: 60
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.006998	0.265769	3.789001	0.0004
SIZE	-0.146907	0.087633	-1.676390	0.0999
LEVERAGE	0.253187	0.073593	3.440379	0.0012
ROA	-9.60E-06	1.13E-05	-0.852238	0.3981
ROE	-0.003266	0.002608	-1.252475	0.2162
INVG	0.173493	0.362313	0.478848	0.6341
DIVIDEND	0.014972	0.093026	0.160941	0.8728
COMMODITY_DERIVATIVES	-0.005214	0.071626	-0.072790	0.9423
CURRENY_DERIVATIVES	0.015855	0.054929	0.288639	0.7741
INTEREST_DERIVATIVES	0.017832	0.052259	0.341216	0.7344

R-squared	0.336410	Mean dependent var	0.606513
Adjusted R-squared	0.216964	S.D. dependent var	0.242746
S.E. of regression	0.214804	Akaike info criterion	-0.087166
Sum squared resid	2.307046	Schwarz criterion	0.261891
Log likelihood	12.61498	Hannan-Quinn criter.	0.049369
F-statistic	2.816413	Durbin-Watson stat	1.547805
Prob(F-statistic)	0.009313		

Table 10b. OLS in 2016 with HC

Dependent Variable: TOBIN_Q
Method: Panel Least Squares
Date: 10/09/17 Time: 01:34
Sample: 2013 2016
Periods included: 4
Cross-sections included: 60
Total panel (balanced) observations: 240

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.303337	0.081810	15.93125	0.0000
SIZE	-0.198879	0.026524	-7.498036	0.0000
LEVERAGE	0.169491	0.045559	3.720234	0.0003
ROA	-0.033156	0.006067	-5.464713	0.0000
ROE	-2.46E-05	0.000706	-0.034786	0.9723
INVG	-0.013634	0.077547	-0.175820	0.8606
DIVIDEND	0.078719	0.062812	1.253241	0.2114
DUM_COMM	0.021752	0.046771	0.465073	0.6423
DUM_CURR	-0.047179	0.035575	-1.326203	0.1861
DUM_INT	0.025029	0.036718	0.681645	0.4961

R-squared	0.377073	Mean dependent var	0.624396
Adjusted R-squared	0.352698	S.D. dependent var	0.288013
S.E. of regression	0.231722	Akaike info criterion	-0.045787
Sum squared resid	12.34982	Schwarz criterion	0.099240
Log likelihood	15.49444	Hannan-Quinn criter.	0.012648
F-statistic	15.46941	Durbin-Watson stat	0.396742
Prob(F-statistic)	0.000000		

Table 11. The pooled regression

Dependent Variable: TOBIN_Q
Method: Panel Least Squares
Date: 10/09/17 Time: 16:41
Sample: 2013 2016
Periods included: 4
Cross-sections included: 60
Total panel (balanced) observations: 240

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.957302	0.294726	10.03407	0.0000
SIZE	-0.723787	0.091942	-7.872239	0.0000
LEVERAGE	0.155322	0.038310	4.054312	0.0001
ROA	-0.007813	0.005120	-1.525918	0.1289
ROE	-0.001059	0.000479	-2.210774	0.0284
INVG	-0.002407	0.041528	-0.057949	0.9539
DIVIDEND	0.137079	0.196500	0.697602	0.4864
DUM_COMM	-0.059373	0.122006	-0.486638	0.6271
DUM_CURR	-0.108402	0.047431	-2.285470	0.0235
DUM_INT	0.043161	0.039340	1.097125	0.2741

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.906020	Mean dependent var	0.624396
Adjusted R-squared	0.868648	S.D. dependent var	0.288013
S.E. of regression	0.104383	Akaike info criterion	-1.445467
Sum squared resid	1.863198	Schwarz criterion	-0.444784
Log likelihood	242.4561	Hannan-Quinn criter.	-1.042265
F-statistic	24.24317	Durbin-Watson stat	1.600711
Prob(F-statistic)	0.000000		

Table 12. The Fixed Effects Regression

Dependent Variable: TOBIN_Q
Method: Panel EGLS (Cross-section random effects)
Date: 10/09/17 Time: 02:41
Sample: 2013 2016
Periods included: 4
Cross-sections included: 60
Total panel (balanced) observations: 240
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.543805	0.130657	11.81573	0.0000
SIZE	-0.289174	0.042064	-6.874614	0.0000
LEVERAGE	0.118372	0.032863	3.601942	0.0004
ROA	-0.011450	0.004673	-2.449952	0.0150
ROE	-0.000651	0.000455	-1.429921	0.1541
INVG	-0.030069	0.040250	-0.747043	0.4558
DIVIDEND	0.153666	0.098214	1.564603	0.1191
DUM_COMM	0.053461	0.068326	0.782435	0.4348
DUM_CURR	-0.068839	0.038324	-1.796244	0.0738
DUM_INT	0.038694	0.034450	1.123193	0.2625

Effects Specification	S.D.	Rho
Cross-section random	0.210730	0.8030
Idiosyncratic random	0.104383	0.1970

Weighted Statistics

R-squared	0.234070	Mean dependent var	0.150109
Adjusted R-squared	0.204099	S.D. dependent var	0.124237
S.E. of regression	0.110835	Sum squared resid	2.825436
F-statistic	7.809841	Durbin-Watson stat	1.186923
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.288631	Mean dependent var	0.624396
Sum squared resid	14.10322	Durbin-Watson stat	0.237788

Table 13. The Random Effects Regression

Correlated Random Effects - Hausman Test
Equation: RANDOM
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	38.311956	9	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
SIZE	-0.723787	-0.289174	0.006684	0.0000
LEVERAGE	0.155322	0.118372	0.000388	0.0606
ROA	-0.007813	-0.011450	0.000004	0.0823
ROE	-0.001059	-0.000651	0.000000	0.0059
INVG	-0.002407	-0.030069	0.000105	0.0068
DIVIDEND	0.137079	0.153666	0.028966	0.9224
DUM_COMM	-0.059373	0.053461	0.010217	0.2643
DUM_CURR	-0.108402	-0.068839	0.000781	0.1569
DUM_INT	0.043161	0.038694	0.000361	0.8141

Table 14. Hausman Test

4.4 CONCLUSION

In this thesis, we want to inquire the impact of using derivatives to hedge risks on firm's value. At first, we make a recap about the functioning of three main types of derivatives which are commodity derivatives, currency derivatives, and interest rate derivatives. Then, we provide definitions of the firm's value, introducing two methods to determinate it, which is the cost of capital approach and the adjusted present value approach; moreover, we analyze internal and external factors that affect firm's value. To examine the impact of using derivative for hedging, we decide to perform a linear regression. Thus, we select 60 companies listed on the Singapore Stock Exchange (SGX) over the period 2013-2016 and we, at first, made a regression year by year, and then organize them in a panel data to perform an analysis on the whole period. An issue that occurs when panel data is utilized is the unobserved individual effects. To control this problem, we use fixed and random effects models. Then, to determinate which model is suitable, we use Hausman test from which it appears that fixed effect model is the suitable one.

From the regression results, we accept the null hypothesizes of t-test that the three types of derivatives are not significant or, in other words, have no impact on firm value at 1% significance level. We precisely observe that:

1. Interest rate derivatives: Prob (p-value) is 0.2741 that is greater than 0.01 significance level. Therefore, we accept the null hypothesis that interest rate derivatives have no effect on the firm's value.
2. Commodity derivatives: Prob (p-value) is 0.6271 that is greater than 0.01 significance level. Therefore, we accept the null hypothesis that commodity derivatives have no effect on the firm's value.

3. Currency derivatives: Prob (p-value) is 0.0235 that is greater than 0.01 significance level. Therefore, we accept the null hypothesis that currency derivatives have no effect on the firm's value.

In summary, using these their derivatives may not improve company value, and this coincides with what is written by Hull (2012).

A drawback of this thesis is that the data are collected from a short period, only four years. This is due to the fact that some companies do not have annual reports for several years and to obtain annual reports in these years we should have contacted directly the companies. Doing so would have taken a lot of time if we had expanded the period in which we collect the data. Also, we notice that the model presented by Khediri (2010) fit poorly our sample data, considering that most of the variables are not significant and that the greatest contribution to the firm's value is represented by the constant. Therefore, further research on this subject should take into account the use of alternative regression model that may fit better the data and also, in the data selection process, a longer time period that may provide more trustworthy results.

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