DERIVATIVES USAGE: VALUE-ADDING OR VALUE DESTROYING?

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Abstract

This thesis analyses a sample of 434 non-financial firms from the S&P 500 to investigate the relationship between derivative usage and firm value. The empirical tests do not produce any statistically significant results pertaining specifically to derivative usage and firm value. The study does produce statistically significant results that suggest a negative relationship between the fair value of derivative instruments and firm value. These results, although not a part of the original purpose of this thesis, suggest that investors value predictable non-extreme outcomes from risk exposures regardless of the firm's position in its derivative contracts hedging the same exposures.

KEYWORDS: (derivatives, risk-management, hedging)

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CHAPTER I

INTRODUCTION

Derivative financial markets have grown immensely since their humble origins in the early 1970s. As of June 2007 the size of the global derivatives market was estimated to be a gross market value of 10 trillion Euros, and a nominal value of 457 trillion Euros.[1] The widespread use of derivatives comes at a price. Warren Buffet has called derivative financial instruments "financial weapons of mass destruction."[2] Gambling in the derivative financial markets led to the bankruptcy of the Barings Bank in 1995.[3] Founded in 1762, the Barings Bank of London, which had helped to fund the Napoleonic wars and the Louisiana Purchase, was forced to declare bankruptcy after one of its traders, Nick Leeson, lost $1.3 billion secretly speculating in derivative markets. Derivatives also played a large part in the recent international financial crisis. A significant portion of the blame for the most recent financial crisis is attributed to credit default swaps (CDS) and collateralized debt obligations (CDO) (many of which were made up of CDSs), which are types of derivative financial instruments. The sheer complexity of these instruments led to a lack of proper risk assessment that eventually

[1] "The Global Derivatives Market: An Introduction," White Paper (Deutsche Börse AG, April 2008): 11.

[2] Collin Barr. "4 questions for Warren Buffett," CNNMoney.com, April 30, 2010. http://money.cnn.com/2010/04/30/news/companies/buffett_questions.fortune/

[3] Pierre Canac and Charlene Dykman, "'Rogue Traders': Lessons to be Learned," *Proceedings of the International Academy for Case Studies, Volume 17, Number 1* (Allied Academies International Conference, New Orleans, 2010): 8.

contributed to the collapse of credit markets around the world. While most derivative instruments are not nearly as complex as were the CDSs that led to the crisis (especially so in non-financial firms) and most traders are not committing fraud as was Nick Leeson, a certain amount of confusion and controversy concerning derivative usage remains.

Definition of Derivative Financial Instruments

Derivatives constitute the focus of this thesis. The value of these financial instruments depends on the value of another asset (the underlying asset). While the value of the derivative contract is directly tied to the value of the underlying asset, neither party of the contract necessarily possesses the underlying asset. Derivative contracts come in four basic types: futures, options, forwards, and swaps.[4] Financial managers and investors use each type of contract in a different way, but for the same general purposes: either speculation or risk management. Speculating with derivative financial instruments really means gambling on the future price movements of the underlying asset. While derivatives used for *speculative* purposes contributed to scandals described in the preceding paragraph, derivatives used for *risk management* are still controversial. Instances of individual traders slipping speculation into their risk management derivatives portfolios abound, and a fine line exists between derivatives designated as risk management instruments and those that are not.[5]

Every firm is exposed to a plethora of risks from day to day. Risk stems from uncertainty, and a number of sources provide uncertainty to firms. The completion (or failure) of a proposed project and the net present value (NPV) of the returns that it will

[4] See "Futures, Forwards, Options, and Swaps" in Chapter II for a description of each type of derivative contract.

[5] See "Speculation and Trading" and "Accounting for Derivative Usage" in Chapter II for a further discussion of the "fine line" between speculation and risk management.

generate are almost always uncertain. Legal suits from employees, suppliers, buyers, customers, competitors, shareholders (and more generally, stakeholders) provide a major source of uncertainty. Natural disasters also can have a significant impact on the firm and are largely unpredictable. Some risks are unavoidable, and some can be mitigated by, for example, hiring a competent and experienced management team or by purchasing insurance. Firms manage their exposure to other sources of uncertainty using derivative instruments. Fluctuations in interest rates (which affect firms' bond positions), currency prices (which affect firms' payables, receivables, and debt balances), and commodity prices (which affect firms' raw materials costs) all expose firms to risk and can be hedged with derivative instruments. Derivatives reduce these risks by essentially locking in future prices thereby removing the uncertainty of future price fluctuations.

Importance of the Research Question

The widespread usage of derivative financial instruments in firms around the world suggests that financial managers value them as a risk management tool. In a 2003 survey of 101 Swedish-based multinational companies, Niclas Hagelin found that sixty-one percent (61%) of firms used currency derivatives to hedge foreign exchange (FX) exposure. Other studies have found similar results, that the majority of international firms hedge using currency derivatives. Currency derivatives are only one of three major categories of financial derivatives. Firms can also, and do, hedge commodity price fluctuations and interest rate fluctuations, suggesting that an even greater number of firms hedge at least one of the three major types of derivatives. But the research question proposed by this paper is not only important to the many firms who hedge; it is important

to all non-financial firms and their financial managers whose ethical and professional duty is to maximize stockholder wealth.

If derivatives hedging increases firm value, it is in the interest of the financial manager to hedge. Conversely, if hedging does not affect firm value, or has a negative effect, financial managers should not employ derivatives to hedge, and those who do are not acting in the interest of the shareholders to whom they are responsible. This thesis will investigate the real causal (as opposed to theoretical) relationship between derivative usage and firm value, a question that is essential to risk management at the firm level.

Introduction to the Research Question

This study addresses the value-adding (destroying) effect of derivative usage by non-financial firms. Financial firms are excluded from the study because, as users and issuers of derivatives, their motives for employing derivatives differ from those of non-financial firms. This empirical study analyzes a sample of 434 firms from the February 2011 Standard and Poor's 500 (S&P 500). Firm observations are made at fiscal year end 2009. The value of each firm is regressed against derivative usage (controlling for seven additional variables) to determine the effect of derivative usage on firm value. The specific research question that this thesis addresses is: how does derivative usage by non-financial firms affect the value of the firm?

Additionally, this thesis investigates the value-adding effect of derivative usage across industries and sectors. Sectors and industries in which a large portion of revenue is dependent on commodity prices have a greater incentive to hedge commodity prices. Likewise, sectors and industries that tend to operate with a greater amount of foreign currency (FC) are incentivized to hedge FC exposure. While this may seem obvious, the

question remains as to whether or not the industries with greater incentives to use financial derivatives do, in fact, hedge more. And beyond this, is there a greater value effect for derivative instruments in sectors and industries that are flush with derivative usage? The second research question of this thesis is: Does derivative usage have a greater effect on firm value in industries that have a higher volume of derivative usage?

This chapter has introduced the topic covered by this thesis as well as the specific research questions, and it has defended the importance of the topic. The remainder of the thesis is organized as follows: Chapter II provides background on the topic, including the different types of derivative instruments (futures, forwards, options, and swaps), the different uses for derivative instruments (investing and hedging), and the regulatory environment of derivative instruments (focusing on FASB no. 133 ASC 815). Chapter III presents and discusses relevant theory, including stockholder wealth maximization, the efficient markets hypothesis, the capital structure irrelevance principle, agency theory, and Tobin's Q. Chapter IV reviews relevant literature and is organized by topic and empirical results. The literature review chapter first covers the classic 1958 Modigliani and Miller paper and its implications for derivative usage which is followed by an exploration of agency theory literature related to derivative usage. The chapter then summarizes the literature on the determinants of firms' hedging policies, alternatives to hedging with derivatives, and, finally, the value effect of derivative usage by non-financial firms. Chapter V, Data and Methodology, describes the sample and statistical models used in this study. Chapter VI presents the results of the empirical tests as well as an analysis of those results. Chapter VII concludes the thesis by commenting on the

implications of the analysis presented in Chapter VI and suggesting areas for further research.

CHAPTER II

BACKGROUND

Chapter I introduced the topic and research question of this thesis. Chapter II will provide the background information necessary to fully understand the following chapters. First, the chapter describes the four different types of derivative contracts. Second, the chapter distinguishes between derivatives used for speculation and derivatives used for risk management. The chapter then describes the accounting standards for derivative usage and how they have taken shape since the birth of derivative financial instruments. Finally, the chapter discusses the implications of these accounting standards for this study.

Futures, Forwards, Options, and Swaps

While this study does not distinguish between different types (not to be confused with different uses) of derivatives, an understanding of the different types of derivatives will help to understand how they are used and therefore how they may or may not contribute to firm value. While there are a multitude of sub-categories, the four major types are futures, forwards, options, and swaps. A futures contract is an agreement between two parties to either buy or sell an asset at a set price at a future date. Forward contracts are similar to futures contracts but with two key differences: one, forward contracts are not traded in financial markets whereas futures contracts are traded on futures exchanges, and two, forward contracts are settled at their maturity date whereas

futures contracts are marked to market and settled daily.[1] Options contracts give their owner the right to either buy or sell a specific asset at a future date at a set price. Depending on the position on the option, the contract holder will decide to either buy (sell) the underlying asset or not buy (sell) the underlying asset. A swap contract involves two parties who agree to "swap" cash flows on a recurring basis over the life of the swap based on the underlying assets. In a typical interest rate swap, one party is the claimant to a fixed interest rate bond and the other party is the claimant of a floating interest rate bond. For various reasons these two parties enter into an interest rate swap agreement in which the cash flows from the interest on each bond are paid to the opposite party. These descriptions are brief because this study does not distinguish between types of derivatives, but a general understanding of these distinctions aids in the comprehension of their potential effect on firm value.

Speculation and Trading

Generally speaking, derivative financial instruments can be used for two purposes: risk management and investing. While risk management is the focus of this study, it is important to understand how and why derivatives are used for non-hedging purposes. Investing includes speculation and arbitrage (trading). Speculation is simple in theory and difficult in practice. Speculating on a derivatives transaction involves market inefficiencies in which the investor believes she can predict the future price movements of a specific asset better than the market can. For example, if the market believes the price of crude oil will increase to $102 in six months and the investor believes that the price of crude oil will increase to $109 in six months, the investor can purchase futures

[1] Dave Carter, Dan Rogers, and Betty Simkins, "Fuel Hedging in the Airline Industry: The Case of Southwest Airlines," (July 2004). Available at SSRN: http://ssrn.com/abstract=578663: 7.

contracts for crude oil at $102 at a low premium in the open market. If in six months the investor was correct and the price increased to $109, she can sell her futures contracts at a premium, or she can purchase the oil at a discounted price. Either way, the investor comes out ahead. In many ways speculation is gambling; it is betting on the future price movements of underlying assets in derivative contracts. This is why derivatives speculation is difficult in practice (see Barings Bank example in Chapter I). Scott Topping, Director of Corporate Finance for Southwest Airlines brings up an interesting point to consider in relation to speculation and risk management. Topping said, "if we don't hedge jet fuel price risk, we are speculating. It is our fiduciary duty to try and hedge this risk."[2] The line between speculation and risk management is sometimes blurred. Some managers successfully slip speculation into their risk management strategies with no one being the wiser. Contrarily, arbitrage transactions are easy to spot and difficult to confuse as risk management.

For the purposes of this study, when the term "trading" is used in reference to derivative instruments, it is specifically referring to arbitrage. Arbitraging derivatives is less prevalent than speculation but nonetheless still occurs. In the securities markets, arbitrage takes advantage of price differences of similar, if not identical, securities between markets. An arbitrage transaction involves simultaneously buying and selling securities (in the same volume) in two markets. If there is a price difference between markets, a trader will simultaneously buy a security in the market with the lower price and sell the same security in the market with the higher price. Without changing the investment portfolio, the investor has gained the price difference. In the case of

[2] Carter, Rogers, and Simkins: 1.

derivatives, an arbitrage trade can take place when, like the general example, the price of the derivative instrument is higher in one market than in another. A derivative arbitrage trade can also happen when the price of a derivative contract is different from that of the underlying asset. If a short-term futures contract is selling for less than the underlying security, then traders could simultaneously sell their shares of the underlying security and buy the futures contracts on the same security. If traders buy and sell the same volume, then they have not changed their investment (for the most part) and have gained the price difference. While in a perfect frictionless market this cannot occur (see theory chapter) price differences between markets do appear on a daily basis.

Accounting for Derivative Usage

In June 1998 the Financial Accounting Standards Board (FASB) released Statement of Financial Accounting Standards (SFAS) no. 133 "Accounting for Derivative Instruments and Hedging Activities." SFAS 133 was intended to make companies' derivative activities more transparent to shareholders. Prior to SFAS 133 derivative instruments were kept off balance sheet. From the investor's perspective it was nearly impossible to determine how and why a firm used derivative instruments. SFAS 133 requires that derivatives be reported at fair value on the balance sheet and that gains or losses on derivatives be reported on the income statement under either earnings or other comprehensive income. SFAS 133 also requires that "the practitioner describe the exposure environment, context for the use of the derivatives, and the organization's strategy to achieve its hedging objectives."[3] Under the FASB's guidelines, derivatives can be designated as either hedging or non-hedging instruments. Changes in the fair

[3] "Derivatives Valuation (ASC 815 | FAS133)," Scalar Partners Private Equity Advising, http://www.scalarpartners.com/Derivatives-Valuation.

value of derivatives not designated as hedges must be recognized immediately in earnings. Changes in the fair value of derivatives designated as hedges are recognized in other comprehensive income. To qualify for hedge accounting, a derivative must meet the following criteria:

1. The hedging instrument must be designated as a hedge.

2. The hedged exposure must be identifiable and expose the firm to a specific risk.

3. Changes in the fair value of the derivative financial instrument and opposite changes in the fair value of the hedged exposure must have a high degree of correlation.

The FASB suggests two methods for determining correlation between derivative instrument and corresponding exposure:

1. 80 – 125 Rule: "According to the '80-125 rule' (also referred to as the dollar-value-offset method), a hedge is deemed effective if the ratio of the change in value of the derivative to the change in value of the hedged item falls between 80 % and 125%."[4]

2. Correlation Measure: The correlation coefficient (r-squared value) of the regression relation between derivative instrument and corresponding exposure should be .8 or higher.[5]

Figure 2.1 offers more information on the accounting for derivative instruments under SFAS 133.

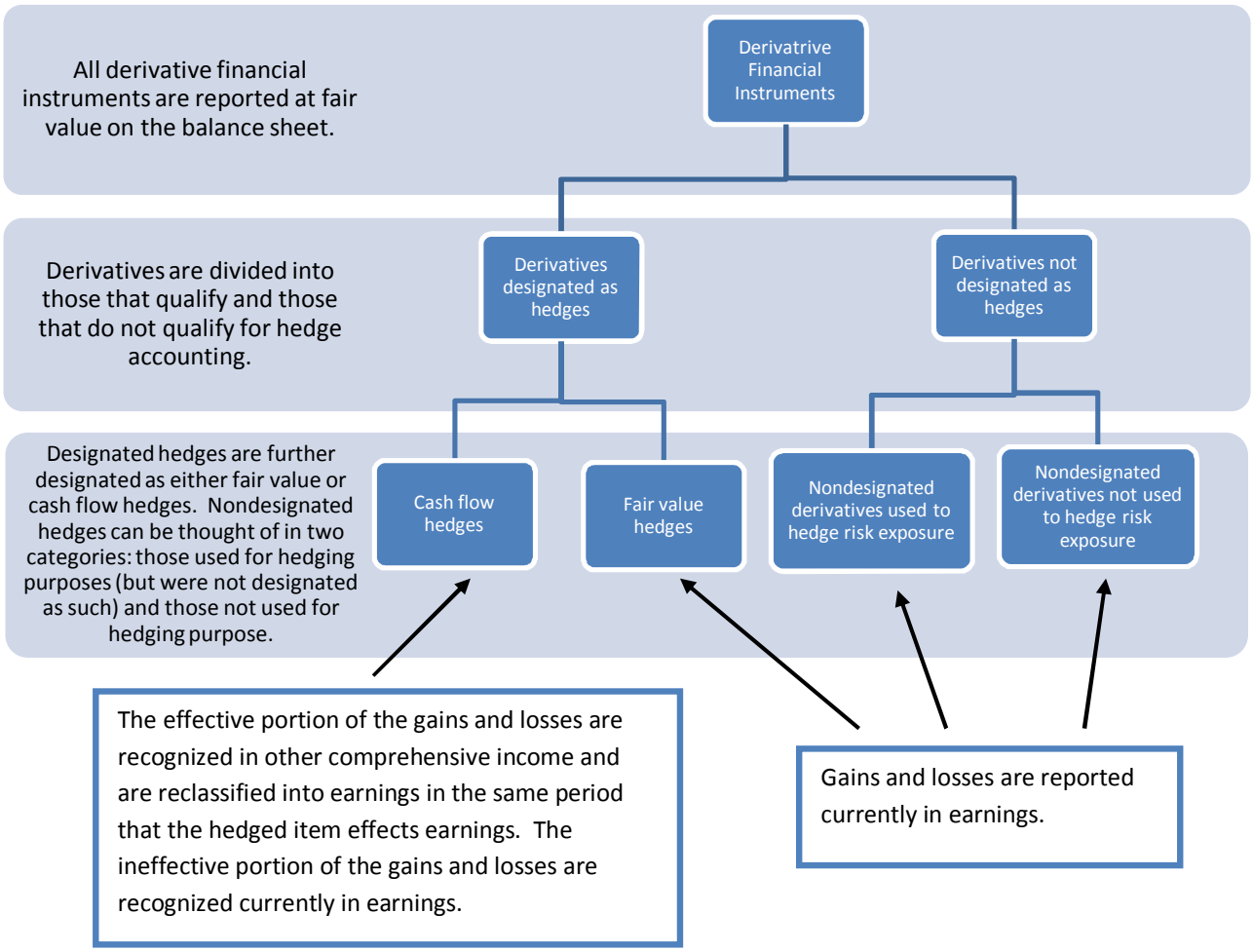
The difficulty this study faces is in regard to the designation requirements for designated hedges. The difficulty does not lie in the criteria for designating hedges but rather the *option* to designate a derivative as a hedge once the criteria have been met. If a derivative qualifies for hedge accounting, the firm can choose to either designate it as a hedge or not designate it as a hedge. For example, while in 2009 Halliburton did not use derivative instruments for speculative or trading purposes (leaving only hedging as the

[4] Ibid: 8

[5] Ibid: 8

FIGURE 2.1

ACCOUNTING FOR DERIVATIVE USAGE UNDER FSAS NO. 133



SOURCES FOR INFORMATION IN FIGURE:

Statement of Financial Accounting Standards No. 133, "Accounting for Derivative Instruments and Hedging Activity," Financial Accounting Standards Board of the Financial Accounting Foundation, June 1998.

Citrix Systems, Inc. 2009 Annual Report

only alternative purpose for derivative usage), they did not designate any derivatives as hedges. From Halliburton's 2009 annual report:

> We do not enter into derivative transactions for speculative or trading purposes. We recognize all derivatives on the balance sheet at fair value. Derivatives are adjusted to fair value and reflected through the results of operations. Gains or losses on foreign currency derivatives are included in "Other, net" in our consolidated statements of operations. Our derivatives are not designated as hedges for accounting purposes.[6]

This creates problems for a study concerned with derivatives used for hedging purposes specifically. One way around this is to assume that all derivatives used by non-financial firms are used for risk management. This, however, was found not to be the case for a very small number of firms within the sample that reported derivatives used for speculation. Another option is to remove those firms that specify derivatives used for speculative purposes in their annual reports. This is extremely time consuming and not feasible within the time constraints of this thesis. Ultimately, a concession was made whereby three regression analyses are run for derivatives designated as hedges, derivatives not designated as hedges, and all derivatives (see Chapter V, Data and Methodology).

This chapter has provided background information on derivative financial instruments, their categorization, usage, and accounting regulations, all of which contribute to the understanding of this study. The following chapter introduces theory relevant to the research question: does derivative usage by non-financial firms add value to the firm?

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[6] Halliburton 2009 Annual Report, accessed on MergentOnline.com (2009).

CHAPTER III

THEORY

This chapter offers a comprehensive review of financial management theory that relates to this thesis. To understand the impact of derivative usage on the value of non-financial firms requires familiarity with stockholder wealth maximization, the efficient market hypothesis, the capital structure irrelevance principle, agency theory, and Tobin's Q theory, the basics of which are presented in the current chapter.

Stockholder Wealth Maximization

The first chapter of every financial management textbook either includes or should include a section detailing stockholder (shareholder) wealth maximization (SWM). The financial manager, who is fundamentally an agent of the shareholders, is obligated, both professionally and ethically, "to *maximize the wealth of the firm's shareholders* through achieving the highest possible value for the firm."[1] Financial managers strive to maximize shareholder wealth in the long term. This implies that financial management focuses on long-run firm value as opposed to earnings, a measurement of short-term profitability.[2] SWM also implies that management concerns itself with the level of risk acceptable to shareholders in maximizing wealth. Shareholder wealth maximization rests at the heart of this thesis, as the value-enhancing (or value-

[1]Stanley B. Block., Geoffrey A. Hirt, and Bartley R. Danielsen, *Foundations of Financial Management* (New York, NY: McGraw-Hill/Irwin, 2009) : 11.

[2] Ibid.

destroying) effect of derivatives implies that, in employing derivatives, financial managers are fulfilling (not fulfilling) their professional duty.

Efficient Market Hypothesis

The efficient market hypothesis (EMH), first fully articulated by Fama in 1965 (see "Review of Literature" below), suggests that market prices accurately represent *all* information.[3] That is, securities are never under- or overvalued, but are always perfectly representative of *true,* intrinsic value. Market efficiency depends upon the instantaneous public availability of information and on the immediate absorption of that information by the market. When all current information is known by every individual in the market, all securities are accurately priced.

In his seminal paper, "Random Walks in Stock Market Prices," Fama ties the efficient market hypothesis to "random walks."[4] In finance, random walk theory suggests that stock prices take random "steps" from day to day. In other words, the price of security X tomorrow is not dependent on the price of security X today. These steps make up a random walk. Implicit in random walk theory is the efficient market hypothesis. Stock prices change in accordance with changes in information. Information changes on a daily basis due to a multitude of factors that are essentially unpredictable and therefore random. Who can accurately predict tomorrow's newspaper from the front page to the back? However, every one of the events described by tomorrow's newspaper can (and many likely will) affect tomorrow's stock prices in one indirect way or another. Thus, because they rely on random information, stock prices themselves are not dependent on

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[3] Eugene F. Fama, "Random Walks in Stock Market Prices," *Financial Analysts Journal 21*, no. 5 (Sept.), 1965: 55 – 59.

[4] Ibid: 56.

yesterday's prices and are similarly random. This, of course, implies and relies on the efficient flow of information, EMH.

Implications of the Efficient Market Hypothesis

EMH and random walks contain very powerful implications. Most relevant here are that asset trading cannot produce a positive net present value (NPV), fundamental and technical analysis, by definition, cannot provide information on the future prices of securities, and investors do not over or under react to information.[5] Trading assets cannot provide a positive net present value return. Under the assumptions of EMH effective arbitrage cannot exist. Arbitrage relies on differences in price of a specific asset between different markets. Price differences across markets assume friction in the flow of information. Market A must have access to different information than that to which Market B has access for there to be a difference in price between markets A and B. This difference in information or friction does not exist in an efficient market. More generally, any form of asset trading cannot generate a positive NPV, because one can only buy an asset that is properly valued and can only sell an asset at its proper value; therefore one can only obtain the risk-adjusted market rate of return.

Fundamental analysis values a firm based on its intrinsic value. Fundamental analysts look at a firm's financial statements, its current management, its comparative and competitive advantages, its future investment opportunities, and its industry and sector to determine the present value of its shares.[6] Fundamental analysis is widely used among investors, however, in an efficient market it is useless. The efficient market

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[5] Burton G. Malkiel, "The Efficient Market Hypothesis and Its Critics," *Journal of Economic Perspectives* 17, no. 1 (Winter2003). 2003: 3.

[6] Robert A. Haugen, *The inefficient stock market* (Upper Saddle River, NJ: Prentice Hall, 2002).

hypothesis asserts that market value is true value. Therefore, one can extract information about a firm's financials, its management, its comparative and competitive advantages, its future investment opportunities, and its business environment *from* the firm's market price, but not the other way around as fundamental analysis suggests. Similarly, technical analysis is not valid in an efficient market. Technical analysis predicts future price movements from past price movements.[7] Technical analysis analyzes trends. Random walk theory, however, suggests that trends do not exist. Today's security prices *are not* based on yesterday's security prices, but are random, thus, technical analysis is of no use to investors. Finally, from the financial manager's perspective, EMH implies that investors do not over react or under react to information. This means that any actions taken by the firm will be judged accurately by investors and by the market at large. Earnings smoothing (as through derivatives hedging) is therefore unnecessary, as investors will not over react to volatile earnings.

Although the efficient market hypothesis set the foundation for modern financial theory, when considering these implications, it is hard to imagine that EMH would not be surrounded by controversy. Through the controversy three forms of the EMH have emerged: weak, semi-strong, and strong. Each form of the efficient market hypothesis differs in its assumption of the extent to which information flows efficiently.

- Weak form: historical market prices and trading volume are efficiently disseminated to the market and are therefore reflected in current market prices.
- Semi-strong form: all publicly available information is represented in security prices.

[7] Ibid.

- Strong form: all information, including insider information, is instantaneously disseminated to the market and is accurately reflected in security prices.[8]

In the weak form, investors cannot beat the market using only historical price and volume information. In other words, technical analysis is not relevant. Frictions do, however, exist in the flow of other publicly available information, and therefore fundamental analysis is relevant. Contrarily, the semi-strong form of EMH does not allow for fundamental analysis to produce a positive NPV. Because all publicly available information is known by the market, the analysis of intrinsic value factors cannot produce a trading advantage. At the mid level of EMH, a positive NPV can be achieved using insider information, or information that is not publicly available. Finally, the strong form of the efficient market hypothesis does not allow for any above-market profit through trading.

The efficient market hypothesis suggests that any form of hedging (derivatives included) cannot add value to the firm. Derivatives increase certainty in future states and therefore decrease risk. Risk, however, is already perfectly reflected in prices according to EMH. Derivative usage assumes that the firm has more knowledge than the investor and can therefore better manage risk. This information asymmetry that is not possible in an efficient market is shown to exist in the Review of Literature chapter to follow.

The Capital Structure Irrelevance Principle

The capital structure irrelevance principle originated in Modigliani and Miller's seminal 1958 paper, "The Cost of Capital, Corporation Finance, and the Theory of Investment." The principle states that in an efficient market, assuming the absence of bankruptcy costs, asymmetric information, and taxes, capital structure does not affect

[8] Haugen: 144.

firm value.[9] Typically, a firm's capital structure, the ratio of debt to equity financing, is associated with a risk-return relationship. A financial manager is obligated to seek an optimum capital structure for which the return is greatest for some maximum value of acceptable risk, thus, adding value to the firm. This is not necessary or possible according to capital structure irrelevance. In an efficient market and in the absence of the frictions mentioned above, investors achieve their own preferred capital structure and risk-return relationship by choosing their own investment portfolio. An investor can purchase a spread of stocks in firms whose leverage varies greatly and of which the weighted average of leverage reflects the investor's risk preference. Investors can also artificially alter capital structure of a firm in which they are invested. For example, if an investor purchases shares of an unlevered firm and prefers a debt to equity ratio of .28, the investor can borrow against 22% of their investment. If their total investment is 100 shares, then 22 of those are debt financed and 78 are equity financed, therefore the debt-equity ratio is

$$\frac{debt}{equity} = \frac{22}{78} \approx .28.$$

Today, although none of the assumptions of the capital structure irrelevance principle actually holds in the market, the principle itself remains relevant as a tool for investigating the value adding properties of capital structure.

Agency Theory

Because risk management decisions are not made by the owners of publicly held firms but, rather, by managers of those firms, it is important to understand and evaluate

[9] Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review* 48, no. 3 (06) 1958: 261.

agency conflicts that may arise with derivative usage. Agency theory concerns the issues that arise when one party (the agent) acts on behalf of another party (the principal). In this scenario, the agent is compensated for making decisions and taking actions that are in the best interest of the principal but that may or may not be in the best interest of the agent. The agent's compensation serves to offset the opportunity cost associated with acting as the principal's agent. Agency conflicts arise when there are misaligned incentives, when the agent can best benefit himself by not acting in the interest of the principal. These conflicts can only occur in an environment of imperfect information. In an environment of perfect information, the principal could easily and costlessly monitor the performance of the agent and, in doing so, ensure that the agent is acting in the interest of the principal. In reality, monitoring the performance of the agent is both difficult and costly. Additionally, agents are typically hired for their expertise, which the principal may not possess. It can be difficult for the principal to determine whether or not the agent's decisions are in the best interest of the principal when the agent has more expertise and experience in the matter at hand than does the principal. In general, agency conflicts can be avoided by aligning the agent's incentives with those of the principal through compensation. Tying the agents' compensation to the magnitude of the benefit that their actions bring to the principal is a general example of a solution to the agency conflict.

In economics, agency theory specifically applies to the manager–owner relationship in which managers are agents acting on behalf of the owners of the firm.[10] While this does not normally apply to privately held companies in which the owner or

[10] Block: 10.

owners are the managers, it does apply to publicly held companies. This is especially so when the position of chief executive officer (CEO) and chairman of the board are held by the same person.[11] The CEO (as well as all the executives within a firm) are agents of and are responsible to the shareholders. Agency conflicts come into play when managers' incentives are not aligned with those of the shareholders. This can occur in a number of scenarios. For example, the top executives often avoid acquisition by another firm when it is the best interest of the shareholders because the acquisition puts their jobs in jeopardy. Another example that occurs on a daily basis in many companies concerns expenses on a business related trip. It is likely that an employee of the firm, an agent of the shareholders, is tempted to use the company credit card to pay for a room at the nicest hotel, eat at the best restaurants, and travel exclusively by limousine to meetings. To a certain degree this activity is difficult to monitor within the limits of the corporate governance of the firm. While it may be easy to spot and recognize a $600 per night hotel room as overly and unnecessarily extravagant, a $400 receipt for dinner is not outside the realm of what one might spend to entertain a potential client. The necessity of this expense, i.e., its benefit to shareholders, is difficult if not impossible to monitor.

In relation to derivative financial instruments used for hedging purposes, a few subsets of agency theory apply. First, derivatives can act as a solution to the underinvestment problem, an agency cost.[12] The underinvestment problem, as described in greater detail in the Review of Literature chapter, involves managers' forgoing positive NPV projects that would add long-run value to the firm but that would not provide an

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[11] Ibid.

[12] Hendrik Bessembinder, "Forward Contracts and Firm Value: Investment Incentive and Contracting Effects," *Journal of Financial & Quantitative Analysis* 26 no. 4 (12), 1991: 531.

easily recognizable benefit to shareholders. While it is the best interest of the shareholders to invest in the project, the manager does not invest for fear that shareholders (who lack equal expertise) will not understand the benefit and that the investment would reflect poorly on the manager. Hedging with derivatives can decrease volatility in future cash flows, thereby decreasing the risk of default on debt taken on to fund the project. Agency theory also applies to managerial performance incentives in relation to hedging. Depending upon the manager's risk preference and the current worth of his stock options (whether the options are in the money or out of the money), his options portfolio can incentivize him to either hedge more or less without regard to stockholder wealth maximization.[13, 14] Again, this is described in greater detail in the following chapter.

Tobin's Q

This thesis uses Tobin's Q-ratio as a proxy for firm value. Q theory was originally introduced in 1969 by James Tobin.[15] The Q-ratio equals the ratio of a firm's market value to the book value of its assets:

$$\text{Tobin's Q} = \frac{\text{irm market value}}{\text{replacement cost of assets}}$$

and more specifically,

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[13] Niclas Hagelin, Martin Holmén, John D. Knopf, and Bengt Pramborg, "Managerial Stock Options and the Hedging Premium," *European Financial Management* 13 no. 4 (09), 2007: 722.

[14] John D. Knopf, Jouahn Nam, and John H. Thornton Jr., "The Volatility and Price Sensitivities of Managerial Stock Option Portfolios and Corporate Hedging," *Journal of Finance* 57 no. 2 (04), 2002: 810 – 813.

[15] James Tobin, "A General Equilibrium Approach To Monetary Theory," *Journal of Money, Credit & Banking* 1, no. 1 (02), 1969.

$$\boldsymbol{EQ1}: \quad \text{Firm Value} = \text{Tobin's Q}$$

$$= \frac{\text{market value of equity} + \text{book value of liabilities}}{\text{book value of equity} + \text{book value of liabilities}}$$

According to Q theory, the Q-ratio should approach one (1) for all firms, or the market value of assets should approximately equal the replacement cost of assets.[16] A Q-ratio of greater than one indicates that the firm is overvalued. Likewise, a Q-ratio of less than one suggests that the firm is undervalued. Variations in Tobin's Q away from one are attributed to factors that are not easily measured but that are included in the Q-ratio. Tobin's Q captures firms' intangible assets that are either not accounted for on the balance sheet or are improperly accounted for, as well as market perceptions of firm value. This is an important attribute when considering the value adding effect of derivative usage, as any value that derivatives hedging produces is likely due to investors' and analysts' positive perception of decreases in volatility. For this reason, this thesis uses Tobin's Q-ratio as a proxy for firm value.

This chapter has introduced a number of theories that have implications for risk management with derivative instruments and its effect on firm value. Stockholder wealth maximization suggests that financial management is primarily concerned with the wealth of its stockholders and therefore firm value. Agency theory, on the other hand, suggests that there may be incentives for financial managers to act in their own interest. And while the capital structure irrelevance principle as well as the efficient market hypothesis assert that risk management as a whole cannot add value to the firm, literature presented

[16] James Tobin and William C. Brainard, "Asset Markets and the Cost of Capital," *Cowles Foundation Discussion Papers 427,* (Cowles Foundation for Research in Economics, Yale University) 1976: 238.

in the following chapter suggests otherwise. The empirical and theoretical literature expands on, and in some cases contradicts, the theories presented in this chapter.

CHAPTER IV

REVIEW OF LITERATURE

It is the financial manager's professional and ethical duty to maximize the wealth of the shareholders. In doing so (temporarily ignoring Modigliani and Miller's capital structure irrelevance principle), managers must seek a risk management policy that maximizes firm value, and, in turn, decide on a derivatives hedging policy that maximizes firm value. While derivatives are widely used for hedging purposes [in a sampling of 7,319 non-financial firms, in 50 countries, Bartram et al. find that 60.3% use some type of hedging derivative[1]], questions remain concerning the determinants of their use by the firm and more importantly, their effect on firm value. In fact, the first study on derivatives' effect on firm value was published in 2001.[2] This is surprising considering that the relationship between financial derivatives usage and firm value has especially important implications for stockholder wealth maximization. This chapter reviews the literature on the subject of derivative usage by non-financial firms and related topics. The chapter is organized as follows: the first section covers the classic 1958 Modigliani and Miller paper and its implications for derivative usage. Following is an exploration of the literature concerning agency theory and its relation to derivative usage. The next section summarizes the literature on the determinants of firms' hedging policies

[1] Söhnke Bartram, Gregory W. Brown, and Frank R. Fehle, "International Evidence on Financial Derivatives Usage," *Financial Management* (Blackwell Publishing Limited) 38, no. 1 (Spring 2009): 193.

[2] George Allayannis and James P. Weston, "The use of foreign currency derivatives and firm market value," *Review of Financial Studies* 14, no. 1 (Spring 2001): 243 – 276.

and is divided into (1) theoretical research, and (2) empirical research. The fourth section explores alternatives to hedging with derivative instruments. The final section reviews the literature concerning the specific research question of this thesis: how does derivative usage affect the value of non-financial firms?

Capital Structure Irrelevance

According to Modigliani and Miller, the value of a firm is independent of its risk management policies and behavior.[3] Investors neither discount nor put a premium on the value of a firm based on its risk management strategies, because investors can manage their own risk through the diversification of their investment portfolio. Following the Modigliani and Miller perfect capital market hypothesis, risk management, and therefore using derivatives to hedge risk, cannot be a value-adding activity. However, the Modigliani and Miller theorem, or the capital structure irrelevance principle, only stands in the absence of frictions (noise) and in an efficient market (wherein all available information is known by the investor). When real world frictions such as bankruptcy costs, asymmetric information, taxes, and costly external financing are introduced, the perfect market on which the Modigliani and Miller model depends disappears and the door is opened for value adding risk management policy.[4]

Agency Costs

This thesis focuses on two specific agency costs described in the literature: the managerial incentive to hedge (or not to hedge) firm risk to increase the value of personal stock option portfolios (which is discussed below) and the underinvestment problem. In

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[3] Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review* 48, no. 3 (06), 1958: 292 – 296.

[4] Karim Ben Khediri. "Do investors really value derivatives use? Empirical evidence from France," *Journal of Risk Finance* (15265943) 11, no. 1 (01), 2010: 62.

1977, Myers first fully articulated the underinvestment problem: rational agents of the firm can forgo positive net present value (NPV) projects to the detriment of bondholders and to the firm itself.[5] This occurs because low-risk projects, while maintaining a positive NPV, can cede most or all of their profit to bondholders thus leaving shareholders with little to no realized return from the initial investment. Rational managers, therefore, will forgo low-risk positive NPV investments in favor of higher-risk projects more likely to return a profit to shareholders. In this situation, creditors are bearing more risk (riskier investments) without an accompanying increase in return (due to the terms of debt).

Derivative instruments, when used for hedging purposes, can reduce the incentive to underinvest. Bessembinder shows that derivatives can decrease the likelihood of default on senior claims (debt that takes repayment priority in the case of default).[6] This, in turn, decreases the likelihood that the benefits of a low-NPV project will shift from equity holders to senior debt holders. Equity holders, therefore, are more likely not to forgo the projects with low positive NPVs discussed above. Bessembinder also suggests that hedging can provide for better terms of debt as it reduces the likelihood of default. Gay and Nam test three hypotheses concerning derivative usage and underinvestment. They conclude that hedging with derivative instruments is used as a response to the

[5] Stewart C. Myers, "Determinants of Corporate Borrowing," *Journal of Financial Economics* 5, no. 2 (11), 1977: 170 – 171.

[6] Hendrik Bessembinder, "Forward Contracts and Firm Value: Investment Incentive and Contracting Effects," *Journal of Financial & Quantitative Analysis* 26, no. 4 (12), 1991: 531.

underinvestment problem.[7] While the problem of underinvestment encourages hedging as a solution, other agency costs arise as a *result* of the hedging option.

The option to hedge financial risk coupled with managerial stock options creates a system of misaligned incentives for managers (stockholders' agents). Lambert et al.[8] and Carpenter[9] lay out two distinct agency costs brought about by managerial stock options. First, because of their convex payoff structure, stock options are sensitive to changes in the volatility of the underlying stock. An increase in stock price volatility contributes to an increase in the value of the stock option. This suggests that self-interested managers do not hedge so as to increase stock price volatility, thereby increasing the value of stock options and their personal wealth. Second, stock options are sensitive to the price of the underlying stock because their value is directly related to the underlying stock price. An increase in the stock price causes an increase in the value of the option. Stock options' sensitivity to stock price influences risk-averse managers to hedge regardless of costs or benefits to the firm, a reaction contrary to that just described. A self interested risk-averse manager is encouraged to hedge his own stock options risk exposure through the firm, again without consideration for shareholder wellbeing. Knopf et al. and Hagelin et al. investigate these effects on derivative usage empirically as described in the following paragraph.

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[7]Gerald D. Gay and Jouahn Nam, "The underinvestment problem and corporate derivatives use," *FM: The Journal of the Financial Management Association* 27, no. 4 (Winter98), 1998: 66 – 68.

[8]Richard A. Lambert, David F. Larcker, and Robert E. Verrecchia, "Portfolio Considerations in Valuing Executive Compensation," *Journal of Accounting Research* 29 no. 1 (Spring91), 1991: 129 – 148.

[9]Jennifer N. Carpenter, "Does Option Compensation Increase in Managerial Risk Appetite?" *Journal of Finance* 55, no. 5 (10), 2000: 2311 – 2330.

Knopf, Nam, and Thornton look at managerial stock options, managers' risk preferences, and financial hedging for non-financial firms in the 1996 S&P 500 index.[10] They find that, consistent with theory, an increase in the sensitivity of managerial stock option portfolios to stock price is associated with an increase in hedging activity. Also consistent with theory, managerial stock option portfolios' sensitivity to stock price volatility shares a negative relationship with hedging activity. Hagelin, Holmén, Knopf, and Pramborg investigate the relationship between managerial stock options, hedging activity, and firm value.[11] The study finds that by hedging their own option portfolios, self-interested managers negatively affect firm value. While studies have shown that derivatives hedging mitigates the underinvestment problem, other studies have concluded that it brings more agency costs to bear on the firm, i.e., managers hedging their own stock option portfolios with no apparent benefit to stockholders.

Why Firms Hedge (theoretical and empirical literature)

Early research on derivative usage as a hedging option focuses on the frictions that allow derivatives to add value. Both theoretical and empirical research has been published on the reasons why firms choose to hedge using derivatives. Smith and Stulz's 1985 paper stands among the early literature on the subject. Using mathematical models, Smith and Stulz find that by reducing the variability of pre-tax firm value, derivative hedging can increase the after-tax value of the firm if the transaction costs of the derivatives employed are less than the increase in value. Smith and Stulz also find that

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[10] John D. Knopf, Jouahn Nam, and John H. Thornton, Jr., "The Volatility and Price Sensitivities of Managerial Stock Option Portfolios and Corporate Hedging," *Journal of Finance* 57, no. 2 (04), 2002: 807 – 808.

[11] Niclas Hagelin, "Why firms hedge with currency derivatives: an examination of transaction and translation exposure," *Applied Financial Economics* 13, no. 1 (01), 2003: 721 – 723.

by reducing the future variability of firm value, derivative usage can decrease the expected costs of bankruptcy. [12]

Adding to the literature on the incentives for hedging, Bessembinder finds that derivative usage can reduce underinvestment, as follows:

> By shifting individual future states from default to nondefault outcomes, hedges increase the proportion of future states in which equity holders are the residual claimants. This reduces the fraction of the benefit from incremental investment that accrues to nonequity claimants, thereby reducing incentives for equity holders to underinvest.[13]

Bessembinder also discovers that the use of derivative hedging (especially continual hedging) can increase the contract terms of the firm's debt. Similar to Bessembinder's findings on the positive impact of derivative usage on terms of debt, Leland reveals that derivatives allow a firm to increase its debt capacity. [14] He concludes that while equity holders lose value to bond holders by increasing a firm's leverage through derivatives hedging, the increased debt provides income-increasing tax benefits that more than offset the value lost to bond holders. Finally, DeMarzo and Duffie theorize that hedging policies reduce noise, thereby allowing investors to make better portfolio decisions with regard to risk management.[15] In addition to the body of theoretical research on the incentives for firms to hedge with derivatives, a substantial amount of empirical work on the subject also exists.

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[12] Clifford W. Smith and René M. Stulz, "The Determinants of Firms' Hedging Policies," *Journal of Financial & Quantitative Analysis* 20, no. 4 (12), 1985: 395 – 396.

[13] Bessembinder: 531.

[14] Hayne E. Leland, "Agency Costs, Risk Management, and Capital Structure," *Journal of Finance* 53, no. 4 (08), 1998: 1235 – 1237.

[15] Peter M. DeMarzo and Darrell Duffie, "Corporate incentives for hedging and hedge accounting," *Review of Financial Studies* 8, no. 3 (Fall96), 1995: 767 – 769.

Of the empirical research on hedging incentives, some studies support theory while others reject it. Continuing Smith and Stulz's theoretical work on reducing financial distress costs, Purnanandam studies a sample of 2,256 non-financial, non-utility firms, finding that financially distressed firms, in highly concentrated industries, do, in fact, hedge more.[16] Geczy et al., in their study of 372 of the *Fortune 500* non-financial firms in 1990 find that higher quick ratios (a measure of immediately available internal funds) are associated with a lower probability of hedging. The study also finds that firms with more growth opportunities (as reflected through greater R&D expense) have an increased probability of hedging. This suggests that hedging is used to ensure the availability of internal funds for future projects, especially when the firm is financially constrained.[17] Contrary to most literature in the field, Bartram et al. reject many of the derivative usage determinant theories. Their results do not support the underinvestment hypothesis (R&D and capital expenditures are negatively correlated with hedging) nor the financial distress hypothesis (derivative users are found to be larger and more profitable than non-users). Bartram et al. suggest that previous research lacks the power of their study, which includes 7,319 non-financial firms, a sample that "covers about 80% of global market capitalization of nonfinancial firms."[18] While a plethora of research exists on the determinants of firm's hedging policies, or how the use of derivatives *can*

[16]Amiyatosh Purnanandam, "Financial distress and corporate risk management: Theory and evidence," *Journal of Financial Economics* 87, no. 3 (03), 2008: 733.

[17] Christopher Géczy, Bernadette A. Minton, and Catherine Schrand, "Why Firms Use Currency Derivatives," *Journal of Finance* 52, no. 4 (09), 1997: 1339 – 1340.

[18] Söhnke Bartram, Gregory W. Brown, and Frank R. Fehle, "International Evidence on Financial Derivatives Usage," *Financial Management* (Blackwell Publishing Limited) 38, no. 1 (Spring 2009): 186.

increase firm value, not until recently has research been conducted on how derivative usage *affects* firm value.

Alternative Hedging Strategies and their Contribution to Value

Before diving into derivatives' value-adding effect, we must first consider some alternatives to derivatives that can potentially add value to the firm. Zou explores the value-adding effect of insurance usage as an alternative to hedging with derivative instruments. He argues that property insurance is a "cleaner" setting from which to analyze the value of risk management behavior. This is so because property insurance hedges pure risk and cannot be used for speculative purposes as can derivatives. Zou demonstrates that insurance usage helps to increase new debt usage and capital expenditures in future periods. He hypothesizes:

> If the market can reasonably anticipate the new debt financing that a firm is likely to obtain in the next year based on its insurance policy, growth opportunities, and current capital structure, the effect of new debt financing and associated new investment may be incorporated into the current firm valuation.[19]

The results of the regression analysis indicate that new debt financing and associated new investments are priced by the market, and therefore insurance usage does have a positive effect on firm value.[20] While the effect of insurance on firm value is fairly straightforward, diversification's effect on firm value is clouded and controversial.

Diversification and debt held in foreign currency represent two important hedging options in addition to insurance and derivatives. Geographic diversification can give

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[19] Hong Zou, "Hedging Affecting Firm Value via Financing and Investment: Evidence from Property Insurance Use," *Financial Management* (Blackwell Publishing Limited) 39, no. 3 (09), 2010: 987.

[20] Ibid: 990 – 991.

firms the operational flexibility to move production in response to changes in the geoeconomic environment. Industrial diversification in negatively correlated industries can have a coinsurance effect, thereby balancing income streams.[21] The literature, however, lacks consensus as to whether or not diversification adds value. Berger and Ofek conclude that industrial diversification has a negative effect on firm value. In their study, diversification experiences a negative relationship with firm value as measured by Tobin's Q, and individual segments of diversified firms have lower profitability than that of single-line businesses.[22] Kim et al. conclude that agency costs are at least a partial cause of the value-reducing effect of diversification. They suggest that managers are more likely to pursue sub-optimal diversification strategies (strategies that are not shareholder wealth maximizing) when they are given the freedom to do so through lax corporate governance.[23] Pramborg, on the other hand, finds a positive relationship (significant at the 10% level) between geographic diversification and firm value (as proxied by Tobin's Q) in a multivariate regression analysis.[24] Similarly, Gande et al. find a positive relationship between geographic diversification and firm value (as proxied by

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[21] Philip G. Berger and Eli Ofek, "Diversification's effect on firm value," *Journal of Financial Economics* 37, no. 1 (1), 1995: 40 – 42.

[22] Berger and Ofek: 59 – 63.

[23] Pornsit Jiraporn, Young Sang Kim, Wallace N. Davidson, and Manohar Singh, "Corporate governance, shareholder rights and firm diversification: An empirical analysis," *Journal of Banking and Finance* 30 (2006): 961 – 962.

[24] Bengt Pramborg, "Derivatives hedging, geographical diversification, and firm market value," *Journal of Multinational Financial Management* 14, no. 2 (04), 2004: 123 – 127.

Tobin's Q) in a sample of U.S. firms from 1994 to 2002.[25] Overall, the literature on diversification's contribution to firm value is not conclusive.

The literature also explores foreign currency (FC) debt as an alternative to derivative risk management. Holding foreign debt can act as a natural hedge against foreign exchange risk exposure.[26] Géczy et al. suggest that foreign currency debt can have two opposing effects. One, FC debt can increase exposure to foreign currency exchange rate fluctuations. Two, FC debt can act as a natural hedge and reduce a firm's exposure to currency exchange rate fluctuations.[27] Géczy et al. and Bartram et al. conclude that foreign debt contributes to exchange rate exposure and therefore is not an alternative to hedging, but rather a complement.[28, 29] That is to say, in both studies, foreign debt use is found to be positively associated with foreign currency derivatives use, suggesting that foreign debt results in an increase in risk exposure that is counteracted by the use of derivative hedges. On the contrary, studies by Berger and Ofek[30] and Elliott et al.[31] suggest that foreign debt is an alternative (substitute) for

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[25] Amar Gande, Christoph Schenzler, and Lemma W. Senbet, "Valuation effects of global diversification," *Journal of International Business Studies* 40, no. 9 (12), 2009: 2 – 40.

[26] Géczy, Minton and Schrand: 1332.

[27] Ibid: 1331.

[28] Ibid: 1325 – 1326.

[29] Bartram et al.: 198.

[30] Berger and Ofek: 59 – 63.

[31] William B. Elliott, Stephen P. Huffman, and Stephen D. Makar, "Foreign-denominated debt and foreign currency derivatives: complements or substitutes in hedging foreign currency risk?" *Journal of Multinational Financial Management* 13, no. 2 (04), 2003.

hedging FC risk exposure with derivatives. Finally, Aabo[32] and Clark and Judge[33] find that FC debt is not an alternative (substitute) for FC derivatives in that FC debt is used primarily to hedge long-term exposure, whereas FC derivatives are used primarily to hedge short-term exposure. However, because both studies conclude that FC debt is used to hedge FC risk exposure, FC debt could be an alternative to other derivative instruments (specifically currency swaps). More importantly, for Aabo "foreign debt is an important alternative to the use of currency derivatives in actual decision making in non-financial firms,"[34] based on questionnaires sent to Danish firms.

Clark and Judge further investigate the role of foreign currency debt in looking at their value-adding effect.[35] Their study samples 412 non-financial firms ranked in the top 500 firms in the UK based on market value at year-end 1995. By separating FC risk management into FC debt users, FC derivative users, and combination FC debt and derivative users, the study reveals interesting results. First, when firms managed exchange rate exposure using only FC debt, there was no premium placed on the risk management strategy. FC debt, when used alone, is not value enhancing. Second, FC derivatives, when employed as the sole FC risk management tool, are value enhancing. Third, when used in conjunction with FC derivatives, FC debt is value enhancing with an associated premium of 12%.

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[32] Tom Aabo, "The Importance of Corporate Foreign Debt in Managing Exchange Rate Exposures in Non-Financial Companies," *European Financial Management* 12, no. 4 (09), 2006: 645.

[33] Ephraim Clark and Amrit Judge, "Foreign Currency Derivatives versus Foreign Currency Debt and the Hedging Premium," *European Financial Management* 15, no. 3 (06), 2009: 628 – 639.

[34] Aabo: 634.

[35] Clark and Judge: 632 – 634.

Alternative hedging techniques, including insurance usage, diversification, and foreign currency debt, are reviewed above. While each of these is at least potentially viable as an alternative, derivatives are still widely used for risk management. It is only logical to next investigate the *viability* of derivatives as a risk management tool.

The Value Effect of Derivative Usage

Only a few studies take the determinants of firms' hedging policies one step further and investigate whether or not a firm's decision to hedge increases its value. Without focusing on derivatives specifically, Rountree, Weston, and Allayannis empirically investigate the value-adding effect of smoothing performance.[36] Smooth performance is directly connected to derivative usage as it is the goal of derivative hedges to smooth firm performance (specifically smooth cash flow). The study explores both earnings smoothing via accrual accounting and cash-flow smoothing via risk management activity. Using Tobin's Q as a proxy for firm value, it finds a significant negative relationship between cash-flow volatility and firm value. This suggests that risk management activity *is* value enhancing. Earnings smoothing via accruals, however, does not add value, suggesting that investors can see through this type of behavior. In reviewing the literature, the study explains that because financial derivatives have been found to reduce cash-flow volatility, reduce exposure to risk, and increase firm value, its "results on cash-flow volatility may simply be a proxy for the use of derivatives."[37] In response to this, the study looks at the value-adding effect of derivative usage specifically. Rountree, Weston, and Allayannis find a significant positive relationship

[36] Brian Rountree, James P. Weston, and George Allayannis, "Do investors value smooth performance?" *Journal of Financial Economics* 90, no. 3 (12), 2008: 237.

[37] Ibid: 247.

between derivative usage and firm value. A number of other studies find similar positive, statistically significant relationships between derivative usage and firm value.

In a study conducted by Allayannis and Weston,[38] a sample of 720 non-financial firms exposed to foreign exchange rate risk is analyzed using Tobin's Q as a measure of firm value.[39] The results suggest that firm value is related positively to derivative usage with a 4.87 percent premium placed on hedging. Allayannis and Weston also test and reject a possible reverse causality (firms with high Tobin's Q's are incentivized, and more likely, to hedge). Nelson et al. examine stock price performance and derivative usage for over 5770 firms. The results support the hypothesis that firms that hedge using derivatives are valued higher (stock price performs 4.3 percent per year on average better than that of firms that don't use derivatives). However, they also find that the increased performance is driven largely by currency derivatives. In fact, currency derivatives are the only type of hedge that produce gains for the firm.[40] Pramborg expands the literature by analyzing the effect of hedging on firm value using survey data from Swedish non-financial firms. He specifically looks at foreign exchange exposure and finds that hedging transaction exposure is value-adding, while hedging transaction exposure is not.[41] Graham and Rogers, in investigating tax incentives for corporations to hedge, find that derivatives increase a firm's debt ratio by an average of 3 percent, which contributes

[38] This is the first study known to this author to investigate the value adding effects of derivative usage.

[39] Allayannis and Weston: 244.

[40] James M. Nelson, Jacquelyn S. Moffitt, and John Affleck-Graves, "The impact of hedging on the market value of equity," *Journal of Corporate Finance* 11, no. 5 (10), 2005: 867 – 873.

[41] Pramborg: 117.

to a 1.1 percent increase in firm value (in the form of tax shields).[42] Adam and Fernando find that derivative hedging by gold and silver mining companies increases the firms' cash flows. Because the increased cash flows are not met with a greater risk exposure, the derivative usage has a positive effect on firm value. The study also finds that "selective hedging," in which managers slip some speculation into their "hedging" strategy, provides a significant (however small) increase in cash flows.[43] Carter, Rogers, and Simkins, in a study of 28 airlines, find that hedging jet fuel prices using derivative contracts has a positive effect on firm value. The study finds a hedging premium of between five and ten percent, which it largely attributed to the increase in availability of internal funds for investment opportunities.[44]

Hagelin, Holmén, Knopf, and Pramborg and Jin and Jorion continue the research into the value effect of derivatives but find inconclusive (statistically insignificant) results. Hagelin et al. perform three tests: an ordinary least squares (OLS) regression, a Treatment Effects regression, and a two-stage least squares (2SLS) regression. While all three tests return a positive correlation between hedging and firm value, only the OLS and Treatment Effects regressions contain statistically significant results.[45] Jin and Jorion find dissimilar results. Their study of 119 U.S. oil and gas producers finds that, while derivative usage is successful in reducing the sensitivity of stock prices to oil and gas

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[42] John R. Graham and Daniel A. Rogers, "Do Firms Hedge in Response to Tax Incentives?" *Journal of Finance* 57, no. 2 (04), 2002: 833 – 837.

[43] Tim R. Adam and Chitru S. Fernando, "Hedging, speculation, and shareholder value," *Journal of Financial Economics* 81, no. 2 (08), 2006: 297.

[44] David A. Carter, Daniel A. Rogers, and Betty J. Simkins, "Hedging and Value in the U.S. Airline Industry," *Journal of Applied Corporate Finance* 18, no. 4 (11), 2006: 32 – 33.

[45] Niclas Hagelin, Martin Holmén, John D. Knopf, and Bengt Pramborg, "Managerial Stock Options and the Hedging Premium," *European Financial Management* 13, no. 4 (09), 2007: 738.

prices, it does not increase firm value. To the contrary, most of the tests result in a negative relationship between derivative usage and firm value.[46] While none of these results is statistically significant, other studies have shown a statistically significant negative value effect for derivative usage.

Nguyen and Faff and Ben Khediri produce results contrary to the majority of the literature. Nguyen and Faff, find that hedging interest rates with derivatives has a negative impact on firm value. However, in their study of 428 Australian firms, Nguyen and Faff cannot suggest with statistical significance that foreign currency derivatives or commodities derivatives affect firm value.[47] This is the first study known to this author to find a negative relationship between hedging and firm value. In a more recent study focused on this question, Ben Khediri, in a sample of 250 non-financial French firms from 2000 to 2002, finds similar results to those of Nguyen and Faff. The study finds that the decision to use any type of derivative for hedging purposes is associated with a 26.3 percent lower market value (significant at the ten percent level).[48] Ben Khediri attributes the results to the difference in analyst and investor perceptions regarding derivative usage in France compared to those in the U.S. While much of the empirical research on the question of how derivative usage affects the value of non-financial firms suggests a positive relationship, the question is by no means answered. As seen above, some of the most recent literature suggests that derivative usage has a negative effect on firm value. The current paper expands the literature with an analysis of the effects of

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[46] Yanbo Jin and Philippe Jorion, "Firm Value and Hedging: Evidence from U.S. Oil and Gas Producers," *Journal of Finance* 61, no. 2 (04), 2006: 915 – 916.

[47] H. Nguyen and R. Faff, "Does the Type of Derivative Instrument Used by Companies Impact Firm Value" *Applied Economics Letters* Vol. 17 Issue 7, 2010: 681-683.

[48] Ben Khediri: 68.

derivative usage on firm value in a sample of non-financial firms. The study further separates those firms by sector and industry to analyze the effectiveness of derivatives hedging trends within sectors and industries.

This review of the literature on the topic of derivatives hedging makes it clear that the Modigliani and Miller proposition of perfect capital markets does not hold in the real world. Numerous theoretical and empirical studies find a number of frictions that, when introduced to the Modigliani and Miller model, can encourage firms to hedge. Among these frictions are convex tax rates, financial distress and bankruptcy costs, agency costs and underinvestment, and information asymmetries between financial managers and equity holders. Expanding this body of literature on the determinants of firms' hedging policies is the relatively recent literature on the value-adding affects of derivative usage by non-financial firms. Within this body of literature no consensus emerges. As seen in Table 4.1, Clark and Judge, Rountree et al., Allayannis and Weston, Nelson et al., Pramborg, Graham and Rogers, Adam and Fernando, and Carter, Rogers, and Simkins find that derivative usage has a positive effect on firm value, while Nguyen and Faff and Ben Khediri find the opposite. It is in this confusion that the current study is grounded. The following chapter describes the data and methodology employed to investigate the question: does derivative usage affect the value of non-financial firms?

TABLE 4.1

SUMMARY OF PREVIOUS EMPIRICAL STUDIES ON THE VALUE EFFECT OF DERIVATIVE USAGE BY NON-FINANCIAL FIRMS

Author	**Resulting relationship between derivative usage and firm value**
Clark and Judge[1]	Positive
Rountree, Weston, and Allayannis[2]	Positive
Allayannis and Weson[3]	Positive
Nelson, Moffitt, and Affleck-Graves[4]	Positive
Pramborg[5]	Positive
Graham and Rogers[6]	Positive
Adam and Fernando[7]	Positive
Carter, Rogers, and Simkins[8]	Positive
Hagelin, Holmén, Knopf, and Pramborg[9]	Positive (NS)*
Jin and Jorion[10]	Negative (NS)*
Nguyen and Faff[11]	Negative
Ben Khediri[12]	Negative

*NS: not statistically significant results

SOURCES (continued on following page):

[1] Ephraim Clark and Amrit Judge. "Foreign Currency Derivatives versus Foreign Currency Debt and the Hedging Premium," *European Financial Management* 15, no. 3 (06), 2009.

[2] Brian Rountree, James P. Weston, and George Allayannis. "Do investors value smooth performance?" *Journal of Financial Economics* 90, no. 3 (12), 2008.

[3] George Allayannis, and James P. Weston. "The use of foreign currency derivatives and firm market value," *Review of Financial Studies* 14, no. 1 (Spring 2001).

[4] James M. Nelson, Jacquelyn S. Moffitt, and John Affleck-Graves. "The impact of hedging on the market value of equity," *Journal of Corporate Finance* 11, no. 5 (10), 2005.

[5] Bengt Pramborg. "Derivatives hedging, geographical diversification, and firm market value," *Journal of Multinational Financial Management* 14, no. 2 (04), 2004.

[6] John R. Graham and Daniel A. Rogers. "Do Firms Hedge in Response to Tax Incentives?" *Journal of Finance* 57, no. 2 (04), 2002.

[7] Tim R. Adam and Chitru S. Fernando. "Hedging, speculation, and shareholder value," *Journal of Financial Economics* 81, no. 2 (08), 2006.

[8] David A. Carter, Daniel A. Rogers, and Betty J. Simkins. "Hedging and Value in the U.S. Airline Industry," *Journal of Applied Corporate Finance* 18, no. 4 (11), 2006.

[9] Niclas, Hagelin, Martin Holmén, John D. Knopf, and Bengt Pramborg. "Managerial Stock Options and the Hedging Premium," *European Financial Management* 13, no. 4 (09), 2007.

[10] Yanbo Jin and Philippe Jorion. "Firm Value and Hedging: Evidence from U.S. Oil and Gas Producers," *Journal of Finance* 61, no. 2 (04), 2006.

[11] H. Nguyen and R. Faff, "Does the Type of Derivative Instrument Used by Companies Impact Firm Value" *Applied Economics Letters* Vol. 17 Issue 7, 2010: 681-683.

[12] Karim Ben Khediri. Do investors really value derivatives use? "Empirical evidence from France," *Journal of Risk Finance* (15265943) 11, no. 1 (01), 2010.

CHAPTER V

DATA AND METHODOLOGY

Chapters III and IV discussed the underlying theories and academic literature relevant to this thesis. These chapters set a framework upon which the Data and Methodology chapter builds with empirical evidence. This chapter first introduces the sample used in this thesis and discusses the reasons for selecting the S&P 500. Second, this chapter describes the independent, dependent, and control variables and explains their inclusion in the empirical tests. The chapter concludes by defining the regression equations and explaining the five empirical tests used in this thesis.

Data Selection

Sample Selection

The sample was taken from companies on the S&P 500 in February 2011. Financial depository institutions, financial nondepository institutions, and securities and commodities brokers are excluded, as they are outside the scope of this thesis. Because financial institutions can purchase as well as issue derivatives, their motives for using derivatives can deviate from those of non-financial institutions. The distinction between financial and non-financial firms was determined by companies' primary SIC codes (those beginning with 60, 61, and 62 are considered financial firms). Thirty banks and fourteen securities and commodities brokers were excluded. Firms that were on the S&P 500 in February 2011 but that did not have a 2009 annual report in the MergentOnline

database are also excluded. This amounted to eleven firms. In total, 434 firms are included in the sample.

The S&P 500 was chosen because it is a broad-based index that is generally considered a reasonably accurate spread of firms across industries. The Conference Board includes the S&P 500 on the Index of Leading Indicators, which supports its role as a representation of the U.S. economy and contributes to its validity as a sample for this thesis. Additionally, as has been suggested by Ben Khediri,[1] differences in the regulatory environment between countries (governments) can influence the value-enhancing effect of derivative usage. By sampling the S&P 500, this variable has been removed, as all firms are based in the U.S.

Data Description

As mentioned in the previous section, 434 firms (and therefore 434 observations) are used in the empirical tests. Of the 434 firms, 328 firms (75.6%) use derivative instruments (24.4% do not use derivatives). Of those 328 firms, 88 use only derivatives designated as hedges (27% of derivative users) and 66 use only derivatives not designated as hedges (19% of derivative users); 179 firms use both derivatives designated and not designated as hedges (54% of all derivative users). See Figure 5.1 for more information concerning the sample.

Dependent Variable

The dependent variable is firm value. Tobin's Q Ratio (Tobin's Q or Q-ratio) is the standard proxy for firm value in research on the value-adding effects of derivative usage and is used as such in this thesis. As mentioned in Chapter II, Tobin's Q is the

[1] Karim Ben Khediri, "Do investors really value derivatives use? Empirical evidence from France," *Journal of Risk Finance* (15265943) 11, no. 1 (01), 2010: 62 – 72.

FIGURE 5.1

SAMPLE INFORMATION

	Non-Users	Designated Users Only	Non-Designated Users Only	Users
Number of Firms				
Aggregate	106	88	61	328
Mining	1	4	10	22
Construction	0	1	4	5
Manufacturing	33	38	20	160
Transportation	5	2	2	6
Communication	4	6	3	13
Utilities	0	5	6	35
Wholesale Trade	7	3	1	5
Retail Trade	22	10	3	20
Insurance	5	2	4	18
Real Estate	5	2	4	15
Services	21	12	7	34
% of Total				
Aggregate	24.42%	20.28%	14.06%	75.58%
Mining	4.3%	17.4%	43.5%	95.7%
Construction	0.0%	20.0%	80.0%	100.0%
Manufacturing	17.1%	19.7%	10.4%	82.9%
Transportation	45.5%	18.2%	18.2%	54.5%
Communication	23.5%	35.3%	17.6%	76.5%
Utilities	0.0%	14.3%	17.1%	100.0%
Wholesale Trade	58.3%	25.0%	8.3%	41.7%
Retail Trade	52.4%	47.6%	23.8%	7.1%
Insurance	21.7%	8.7%	17.4%	78.3%
Real Estate	53.3%	33.3%	33.3%	46.7%
Services	38.2%	21.8%	12.7%	61.8%

ratio of the market value of the firm to the replacement cost (book value) of its assets. Tobin's Q is used because it compares the market value of the firm to the book value. In other words, Tobin's Q describes intangible values that investors attribute to the firm such as premiums for derivative usage. Firm value is calculated as follows:

$$\boldsymbol{EQ1}: \quad \text{Firm Value} = \text{FV} = \text{Tobin}'\text{s Q} = \frac{\text{market value of equity} + \text{book value of liabilities}}{\text{book value of equity} + \text{book value of liabilities}}$$

The book value of equity and the book value of liabilities are both taken from the MergentOnline database as "total stockholder equity" and "total liabilities" from fiscal year 2009. The market value of equity (market capitalization) is equal to the product of the total number of shares outstanding and the market price of a single share. The market value of equity is calculated from data collected from the MergentOnline database. Market value and replacement cost data were collected for December 31, 2009.

Independent Variable

The independent variable is derivative usage. Under ASC 815 (FASB no. 133), derivative usage must be disclosed at fair value in a firm's annual report. Most firms also report the notional value of derivative usage, or the value of the underlying asset being hedged, in their annual report. Thus, data on derivative usage comes from companies' annual reports, typically from the notes to the consolidated financial statements. ASC 815 and FASB no. 133 also stipulate that firms must designate between hedging derivatives and non-hedging derivatives. To qualify for hedge accounting, a derivative must meet the following criteria:

1. The hedging instrument must be designated as a hedge.

2. The hedged exposure must be identifiable and expose the firm to a specific risk.

3. Changes in the fair value of the derivative financial instrument and opposite changes in the fair value of the hedged exposure must have a high degree of correlation (negative sign).

The total fair value of derivatives designated as hedges and the total fair value of derivatives not designated as hedges at fiscal year end 2009 were collected for each company in the sample. The fair value of asset derivatives and liability derivatives are summed (both assets and liabilities taken as positive numbers) to reach a gross fair value of derivatives used by each firm. The gross fair values are then scaled by total assets. The notional value of derivatives was also collected for each company in the sample for which it was available. The notional value of derivatives is scaled by total assets.

Control Variables

Control variables include: profitability, geographic diversification, industrial diversification, firm size, investment growth opportunities, dividends, and leverage. Each of these variables affects (or has the potential to affect) firm value.

- Profitability (ROA): Firm profitability is measured by the return on assets (ROA), or the ratio of net income to total assets. There is little debate as to the effect that a firm's profitability has on its value. ROA and Tobin's Q are expected to be positively correlated.

- Geographic Diversification (GEO): Geographic diversification is represented by the ratio of foreign sales to total sales. As mentioned previously, geographic diversification can act as a natural hedge against geoeconomic volatility and for this reason should be valued by the market. On the other hand, operating in multiple countries exposes firms to a greater number of risks and can lead to greater agency conflicts.[2] These factors should cause the market to discount the value of the firm. Following the results of Ben Khediri[3] and Allayannis and

[2] Ben Khediri: 65.

[3] Ibid: 71.

Weston,[4] a positive relationship is expected between geographic diversification and firm value.

- Industrial Diversification (IND): Industrial diversification is represented by the number of business segments that contribute to revenue. Similar to geographic diversification, industrial diversification can have both value-adding and value-reducing effects. By operating in multiple industries firms can smooth performance (both income and cash flows) as was Boeing's publicized intention with its acquisition of McDonnell Douglas. Rountree, Weston, and Allayannis have shown that the market values smooth cash flows.[5] Industrial diversification also can increase agency costs thereby reducing firm value.[6] Whatever the effect, industrial diversification must be controlled for.

- Firm Size (SIZE): The logarithm of total assets represents firm size. Firm size may be correlated with both firm value and derivative usage, where larger firms are more likely to employ derivatives. High fixed costs can deter smaller firms from using derivatives. Allayannis and Weston,[7] Pramborg,[8] and Ben Khediri[9] find that firm size is negatively related to firm value.

- Investment Growth Opportunities (ING): Following Pramborg[10] the ratio of capital expenditures to firm market value proxies investment growth opportunities. It is generally agreed that the market takes into account a firm's investment growth opportunities (in the form of discounted future cash flows) when valuing a firm. Investment growth opportunities are expected to be positively related to firm value.

- Dividends (DIV): Dividends are accounted for as a dummy variable (1 if the firm paid dividends during the fiscal year 2009 and 0 if the firm did not issue dividends during the fiscal year 2009). The effect of DIV on FV is unknown. While investors value dividends as a positive sign of firm performance by management, they may also not value dividends, as they can be seen as a sign of a lack of investing opportunities.

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[4] George Allayannis and James P. Weston, "The use of foreign currency derivatives and firm market value," *Review of Financial Studies* 14, no. 1 (Spring 2001): 260.

[5] Brian Rountree, James P. Weston, and George Allayannis, "Do investors value smooth performance?" *Journal of Financial Economics* 90, no. 3 (12), 2008.

[6] Philip G. Berger and Eli Ofek, "Diversification's effect on firm value," *Journal of Financial Economics* 37, no. 1 (1), 1995.

[7] Allayannis and Weston: 261.

[8] Bengt Pramborg, "Derivatives hedging, geographical diversification, and firm market value," *Journal of Multinational Financial Management* 14, no. 2 (04), 2004: 123 – 127.

[9] Ben Khediri: 71.

[10] Pramborg: 124.

- Leverage (LEV): Leverage is represented by the ratio of the firm's long-term debt to equity. Allayannis and Weston[11] and Ben Khediri[12] find a negative relationship between leverage and firm value, suggesting that levered firms are discounted.

Methodology

Univariate Tests

This study initially conducts univariate tests to determine the effect of derivative usage on firm value. The tests find both the mean and median Tobin's Q for firms that do not use derivatives (non-users), firms that use only derivatives designated as hedging instruments (designated users), firms that use only derivatives not designated as hedging instruments (non-designated users), and all firms that use derivatives (users). These tests use the fair value of firms' derivative usage rather than the notional value of derivative usage as fair value data allows for the separation of designated users from non-designated users. Additionally, univariate tests are conducted for firms broken down by industry. These tests only distinguish between users and non-users.

OLS Estimator and the General Regression Equation

The data are investigated using an ordinary least squares (OLS) estimator. Firm value is regressed against derivative usage (FV against DERX). In the general equations, DERX represents DER, DERH, DERN, or DERT. This gives the simple univariate regression equation,

$$\textbf{EQ2}: \qquad FV_i = C + A(DERX_i)$$

Where C is a constant and the vertical axis intercept, FV_i, is firm value for any given value, i, $DERX_i$ is derivative usage for any given value, i, and A is the regression

[11] Allayannis and Weston: 262.

[12] Ben Khediri: 71.

coefficient of $DERX_i$. This equation, however, ignores many variables that can affect a firm's Q ratio. As previously mentioned, these variables include size of the firm (SIZE), leverage ratio (LEV), profitability (ROA), investment growth opportunities (ING), dividend payments (DIV), geographic diversification (GEO), and industrial diversification (IND).[13] The following regression equation controls for each of these variables:

$$\textbf{EQ3}: \quad FV_i = C + A(DERX_i) + B(SIZE_i) + D(LEV_i) + E(ROA_i) + F(ING_i) + G(DIV_i) + H(GEO_i) + I(IND_i)$$

Where A, B, D, E, F, G, H, and I are regression coefficients. EQ3 is the general regression equation used in Model N, Model A, Model B, and Model C described below where DER, DERH, DERN, and DERT replace DERX, respectively. A positive relationship is expected between DERX and FV in all models. That is to say, it is expected that derivative usage by non-financial firms will have a positive effect on firm value. Therefore,

$$\boldsymbol{h_0} = \textit{derivative usage does not have a positive effect on irm value}$$

$$\boldsymbol{h_a} = \textit{derivative usage has a positive effect on irm value}$$

Regression Model N

Model N (**n**otional) investigates the relationship between the total volume of derivative usage, defined as the notional value of derivatives, and firm value. The regression equation used in Model N is:

$$\textbf{EQ4}_\textbf{1}: \quad FV_i = C + A(DER_i) + B(SIZE_i) + D(LEV_i) + E(ROA_i) + F(ING_i) + G(DIV_i) + H(GEO_i) + I(IND_i)$$

[13] Khediri: 62 – 74.

TABLE 5.2

VARIABLE DESCRIPTIONS AND FORMULAS

Variable	Type of variable	Description	Formula
DER	IV	Notional value of **der**ivatives (total)	$\frac{\text{total notional value of derivative instruments}}{\text{total assets}}$
DERD	IV	Fair value of **der**ivatives **d**esignated as hedging instruments	$\frac{\text{total fair value of derivatives designated as hedging instruments}}{\text{total assets}}$
DERN	IV	Fair value of **der**ivatives **n**ot designated as hedging instruments	$\frac{\text{total fair value of derivatives not designated as hedging instruments}}{\text{total assets}}$
DERT	IV	Fair value of all **der**ivatives (**t**otal)	DERD + DERN
DERA	IV	Fair value of **a**sset **der**ivatives	$\frac{\text{total fair value of asset derivatives}}{\text{total assets}}$
DERL	IV	Fair value of **l**iability **der**ivatives	$\frac{\text{total fair value of liability derivatives}}{\text{total assets}}$
FV	DV	Firm value, or Tobin's Q	$\frac{\text{market value of equity} + \text{book value of liabilities}}{\text{book value of equity} + \text{book value of liabilities}}$
ROA	CV	Profitability	$\frac{\text{net income}}{\text{total assets}}$
GEO	CV	Geographic diversification	$\frac{\text{foreign sales}}{\text{total sales}}$
IND	CV	Industrial diversification	Number of business segments that contribute to revenue
SIZE	CV	Firm size	ln(total assets)
ING	CV	Investment growth opportunities	$\frac{\text{capital expenditures}}{\text{irm market value}}$
DIV	CV	Dividends	Dummy variable: 1 if dividends paid during 2009 0 if no dividends paid during 2009
LEV	CV	Leverage	$\frac{\text{Long} - \text{term Debt}}{\text{Equity}}$

IV = Independent Variable, DV = Dependent Variable, CV = Control Variable

Regression Model A

Model A investigates derivatives specifically used for and accounted for as hedging instruments and their relationship with firm value. The regression equation used in Model A is:

$$\mathbf{EQ4_2}: \quad FV_i = C + A(DERH_i) + B(SIZE_i) + D(LEV_i) + E(ROA_i) + F(ING_i) + G(DIV_i) + H(GEO_i) + I(IND_i)$$

Regression Model B

Model B looks at derivatives that may or may not be used for hedging purposes but that are not accounted for as hedges. This includes derivatives that firms employ to hedge specific exposure, but that may not qualify for hedge accounting. This also includes derivatives that are intended for hedging purposes and qualify for hedge accounting, but that firms do not designated as accounting hedges. The accounting justification for this is discussed in the final chapter. The regression equation used in Model B is:

$$\mathbf{EQ4_3}: \quad FV_i = C + A(DERN_i) + B(SIZE_i) + D(LEV_i) + E(ROA_i) + F(ING_i) + G(DIV_i) + H(GEO_i) + I(IND_i)$$

Regression Model C

Model C takes into account all derivative financial instruments used by the sampled firms and tests their relationship with firm value. Model C assumes that any derivative used by a non-financial firm is a hedge. This assumption is accurate to a certain extent, as the vast majority of the firms sampled specifically noted that they do not use derivative instruments for trading or speculative purposes. However, there were a small number of firms within the sample that did acknowledge the usage of derivatives for trading and speculation; thus the assumption is not completely valid. Model C is included for comparison purposes. The regression equation used in Model C is:

$$\mathbf{EQ4_4}: \quad FV_i = C + A(DERT_i) + B(SIZE_i) + D(LEV_i) + E(ROA_i) + F(ING_i) + G(DIV_i) + H(GEO_i) + I(IND_i)$$

This study hypothesizes that DERH will have the highest correlation with FV, followed by DERT, and DERN will have the lowest correlation with FV (however still positive).

Value Effect of Derivatives by Industry

Univariate and multivariate tests are used to determine the relationship between derivative effectiveness by industry and volume of derivative usage by industry. Industries in which a large portion of revenue is dependent on commodity prices have a greater incentive to hedge commodity prices. Likewise, industries that tend to operate with a greater amount of foreign currency (FC) are incentivized to hedge FC exposure. While this may seem obvious, the question remains as to whether or not the industries with greater incentives to use financial derivatives do, in fact, hedge more. And beyond this, is there a greater value effect for derivative instruments in industries that are flush with derivative usage? The industry specific tests seek to answer these questions through the following hypotheses:

$\boldsymbol{h_0}$ = *the volume of derivative usage is not higher in industries in which derivative usage has a greater effect on firm value*

$\boldsymbol{h_a}$ = *the volume of derivative usage is higher in industries in which derivative usage has a greater effect on firm value*

The univariate and multivariate tests for individual industries are identical to the models described above.

This chapter has introduced the empirical tests used in this thesis. The following chapter presents the results of the tests and discusses their implications for derivative usage by non-financial firms.

CHAPTER VI

RESULTS AND ANALYSIS

The previous chapter defined the empirical tests used in this study. This chapter presents the results of those tests including the univariate tests of the entire (aggregate) sample and the multivariate regression models of the entire sample. This includes tests of both the notional values and fair values of derivative usage within the sample. The univariate tests and multivariate rests of the sub-samples divided by industry are not presented in this chapter due to the tests' lack of power.[1]

Univariate Tests

The aggregate univariate tests return surprising results. The average Tobin's Q of non-users is higher than that of users. This is true for both the smaller sample related to the notional values of derivatives and the larger sample related to the fair value of derivatives. These results are presented in the descriptive statistics of Table 6.1 and Table 6.2. A description and analysis of the larger sample related to the fair value of derivatives (seen in Table 6.2) follows. The mean Tobin's Q for derivative users is 1.84 while the mean Tobin's Q for non-users is 2.11. This result supports the null hypothesis and suggests that the market discounts derivative usage by non-financial firms. The median Tobin's Q for derivative users and non-users also supports a discount for

[1] The univariate test results and multivariate test results for the industry and sector specific sub-samples are not statistically significant due to the small size of the sub-samples. Some industry sub-samples were as small as five observations. Due to the lack of power of the tests, they are omitted from the Results and Analysis Chapter.

TABLE 6.1

DESCRIPTIVE STATISTICS FROM THE UNIVARIATE TESTS

(NOTIONAL VALUES)

	Tobin's Q	
	Non-Users	*Users*
Mean	2.223504*	1.856712*
Standard Error	0.122001	0.05658
Median	1.951307*	1.525321*
Standard Deviation	1.124797	1.004189
Sample Variance	1.265167	1.008395
Minimum	0.869843	0.700246
Maximum	5.966031	6.670185
Count	85	315

* Significant at 95%

TABLE 6.2

DESCRIPTIVE STATISTICS FROM THE UNIVARIATE TESTS (FAIR VALUES)

	Tobin's Q			
	Non-Users	*Designated Users*	*Non-Designated Users*	*Users*
Mean	2.1140*	2.0213*	1.6596*	1.8393*
Standard Error	0.1060	0.1174	0.1216	0.0541
Median	1.7516*	1.6455*	1.4431*	1.5213*
Standard Deviation	1.0914	1.1013	0.9504	0.9811
Sample Variance	1.1913	1.213	0.9032	0.9626
Minimum	0.8698	0.9708	0.7002	0.7002
Maximum	5.9660	6.6057	6.6701	6.6701
Count	106	88	61	328
Confidence Level (90%)	0.175932	0.195194	0.203297	0.089361

*Significant at 90%

derivative usage. The medians suggest a 15.1% premium for non-users over users, or a 13% discount for derivative usage versus non-usage. The aggregate univariate tests also suggest that firms using only derivatives designated as hedges are valued at a premium over both firms that use only non-designated derivatives and those that use both. Firms that use only designated hedge derivatives are valued at a 21.8% premium over those that use only non-designated derivatives and at a 9.9% premium over those that use both designated and non-designated derivatives. Table 6.3 includes the premiums for different levels of derivative usage as calculated by the univariate tests. These results suggest that the market values derivatives designated as hedges more than derivatives not designated as hedges. All univariate test results are significant at the 90% confidence level. The possibility exists that the univariate tests are misleading because they include firms that are not exposed to risk factors that can be hedged with derivative instruments. In the absence of risk exposure, a firm's value is not dependent on its derivative usage.

While the univariate tests suggest that derivatives are value-destroying for non-financial firms, they also suggest that a premium is placed on hedging derivatives over non-hedging. Both the median and mean Tobin's Q of firms that account for all of their derivatives as hedging instruments are higher than those of firms that account for all of their derivatives as non-hedges. Between these two groups sits the mean and median Tobin's Q values of firms that designate derivatives as both hedges and non-hedges. This suggests that **(1) designating derivatives as hedges is an effective signal to the market (as is not designating derivatives as hedges) and (2) the market values the designation of derivatives as hedging instruments.** The univariate tests do not account for variables other than derivative usage that are known to affect firm value. For this

TABLE 6.3

PREMIUMS PLACED ON DERIVATIVE USAGE AS REPORTED BY THE UNIVARIATE TESTS (BY MEDIAN TOBIN'S Q)

	Non-Users	Designated Users Only	Non-Designated Users Only	Users
Premium (Discount) with respect to:				
Non-Users	0.00%	-4.38%	-21.49%	-12.99%
Designated Users	4.59%	0.00%	-17.89%	-9.01%
Non-designated Users	27.38%	21.79%	0.00%	10.82%
All Users	15.13%	8.16%	-5.14%	0.00%

This table reports the premiums and discounts placed on different levels of derivative usage returned by the univariate tests. For example, firms that use only designated hedging derivatives receive a 21.79% premium over firms that use only non-designated hedging derivatives. Firms that use only non-designated derivatives receive a 21.49% discount compared to firms that do not use derivatives.

reason, univariate tests are only used in a preliminary manner and are reported here because of the interesting implications of their results.

Multivariate Tests

Aggregate Results (Notional Values)

The multivariate tests of the notional values of firms' derivative contracts return results contrary to those of the corresponding univariate test. The multivariate tests support a positive relationship between the volume of derivative usage and firm value. The positive coefficient for the DER variable is not, however, significant at the 95% confidence level and falls just outside of the 90% confidence level with a P-value of .12. The results are significant at the 85% confidence level which is beyond the range of acceptable significance. The results of Regression Model N are presented in Table 6.4.

To control for possible industry effects the study includes dummy variables for industries (using two digit SIC codes) in Regression Model N. The results are similar to those of Model N with no industry variables contributing to firm value with statistical significance. As a robustness test, the top five and bottom five percent of Tobin's Q values are excluded from Model N. The test returns similar results to those of the entire sample and are included in Appendix A. In addition to testing the relationship between the notional value of firms' derivative usage (the volume of usage) and Tobin's Q, this study tests the relationship between the fair values of firms' derivative contracts and firm value.

Aggregate Results (Fair Values)

The aggregate multivariate tests for the fair values of firms' derivative contracts return results similar to those of the aggregate univariate tests. The multivariate tests of

TABLE 6.4

RESULTS OF REGRESSION MODEL N, NOTIONAL VALUE OF DERIVATIVES

Source	SS	df	MS
Model	197.097	8	24.63712
Residual	234.8187	3.91E+02	0.600559
Total	431.9157	399	1.082496

Number of obs	400
F(8, 425)	41.02
Prob > F	0
R-squared	0.4563
Adj R-squared	0.4452
Root MSE	0.77496

FV	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
DER	2.79E-06	1.79E-06	1.56	0.12	-7.30E-07	6.31E-06
ROA	0.082621	0.0065	12.71	0	0.069842	0.0954
GEO	0.166263	0.145588	1.14	0.254	-0.11997	0.452497
IND	-0.01533	0.020041	-0.76	0.445	-0.05473	0.024076
SIZE	-0.23987	0.036845	-6.51	0	-0.31231	-0.16744
ING	0.141552	0.217353	0.65	0.515	-0.28577	0.568879
DIV	-0.10375	0.09522	-1.09	0.277	-0.29096	0.083453
LEV	-0.00091	0.002511	-0.36	0.717	-0.00585	0.004025
_cons	6.949316	0.850161	8.17	0	5.277857	8.620775

each derivative usage variable (DERD, DERN, and DERT) suggest a negative relationship between derivative usage and firm value. All results are significant at the 99% confidence level. [See Table 6.5, Table, 6.6, and Table 6.7 for the complete regression outputs of regression models A, B, and C, respectively.] Firms that use only derivatives designated as hedges are associated with the greatest decrease in value, followed by firms using only derivatives not designated as hedges. These results are *contrary* to those of the univariate tests in which designated hedging derivatives were valued higher than non-designated hedging derivatives. Firms using derivatives regardless of designation are associated with the smallest decrease in value. These results are consistent with those of Nguyen and Faff[2] and Ben Khediri[3] and contradict those of Clark and Judge,[4] Rountree et al., Allayannis and Weston,[5] Nelson et al.,[6] Pramborg,[7] Graham and Rogers,[8] Adam and Fernando,[9] and Carter, Rogers, and Simkins.[10]

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[2] H. Nguyen and R. Faff, "Does the Type of Derivative Instrument Used by Companies Impact Firm Value" *Applied Economics Letters* Vol. 17 Issue 7, 2010.

[3] Karim Ben Khediri. Do investors really value derivatives use? "Empirical evidence from France," Journal of Risk Finance (15265943) 11, no. 1 (01), 2010.

[4] Ephraim Clark and Amrit Judge. "Foreign Currency Derivatives versus Foreign Currency Debt and the Hedging Premium," *European Financial Management* 15, no. 3 (06), 2009.

[5] Brian Rountree, James P. Weston, and George Allayannis. "Do investors value smooth performance?" *Journal of Financial Economics* 90, no. 3 (12), 2008.

[6] James M. Nelson, Jacquelyn S. Moffitt, and John Affleck-Graves. "The impact of hedging on the market value of equity," *Journal of Corporate Finance* 11, no. 5 (10), 2005.

[7] Bengt Pramborg. "Derivatives hedging, geographical diversification, and firm market value," Journal of Multinational Financial Management 14, no. 2 (04), 2004.

[8] John R. Graham and Daniel A. Rogers. "Do Firms Hedge in Response to Tax Incentives?" *Journal of Finance* 57, no. 2 (04), 2002.

[9] Tim R. Adam and Chitru S. Fernando. "Hedging, speculation, and shareholder value," *Journal of Financial Economics* 81, no. 2 (08), 2006.

[10] David A. Carter, Daniel A. Rogers, and Betty J. Simkins. "Hedging and Value in the U.S. Airline Industry," Journal of Applied Corporate Finance 18, no. 4 (11), 2006.

The results of the multivariate regression models using fair values of derivative contracts suggest that **derivative usage by non-financial firms is value-destroying**. The possibility exists, however, that the derivative usage variable used in models A, B, and C is not an accurate proxy for the magnitude of derivative usage by non-financial firms. Because the fair value of a derivative contract is determined by the price difference between the face value of the contract and the underlying asset, it really measures the firm's position in its derivative contracts. A low gross fair value of derivative contracts means that the risk exposure the derivative portfolio is hedging did not create extreme outcomes for the firm. The prices of the underlying assets moved very closely to how the market had expected prices to move at the time the firm entered into the derivative contracts. A low gross fair value means that, while the firm was exposed to risk and hedged that risk with derivative contracts, the risk did not create extreme or unwanted outcomes. The risk was benign. A firm that has a high gross fair value (relative to the size of the firm) was exposed to risk that provided extreme (and unwanted) outcomes. The prices of the underlying assets of the firm's derivative contracts deviated from what it had predicted. The results of the three regression models suggest that the market penalizes the firm value based on these uncertain outcomes.

There also exists the possibility that the market discounts the position of the contract reflected in the market value of derivative contracts as opposed to unpredicted outcomes provided by the hedged risk. To test this theory, the study divides the fair value of derivative contracts into those in asset positions and those in liability positions. The general regression model is then used to test the relationship between derivative contracts in asset positions and firm value and derivative contracts in liability positions

TABLE 6.5

RESULTS OF REGRESSION MODEL A, FAIR VALUE OF DERIVATIVES DESIGNATED AS HEDGING INSTRUMENTS

Source	SS	df	MS
Model	43.3182	8	5.414775
Residual	41.13171	425	0.09678
Total	84.44991	433	0.195034

Number of obs	434
F(8, 425)	55.95
Prob > F	0
R-squared	0.5129
Adj R-squared	0.5038
Root MSE	0.3111

FV	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
DERD	-2218.76	808.7347	-2.74	0.006	-3808.38	-629.144
ROA	0.030033	0.001969	15.26	0	0.026163	0.033902
GEO	0.084228	0.054728	1.54	0.125	-0.02334	0.1918
IND	-0.00486	0.007843	-0.62	0.536	-0.02028	0.010555
SIZE	-0.13175	0.013031	-10.11	0	-0.15736	-0.10613
ING	-0.04341	0.087509	-0.5	0.62	-0.21541	0.128597
DIV	-0.0743	0.037002	-2.01	0.045	-0.14703	-0.00157
LEV	-0.00045	0.001008	-0.44	0.657	-0.00243	0.001533
_cons	3.495484	0.296018	11.81	0	2.913643	4.077325

TABLE 6.6

RESULTS OF REGRESSION MODEL B, FAIR VALUE OF DERIVATIVES NOT DESIGNATED AS HEDGING INSTRUMENTS

Source	SS	df	MS
Model	43.89096	8	5.48637
Residual	40.55895	425	0.095433
Total	84.44991	433	0.195034

Number of obs	434
F(8, 425)	57.49
Prob > F	0
R-squared	0.5197
Adj R-squared	0.5107
Root MSE	0.30892

FV	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
DERN	-741.407	200.7858	-3.69	0	-1136.06	-346.75
ROA	0.029832	0.001948	15.32	0	0.026003	0.033661
GEO	0.078827	0.05439	1.45	0.148	-0.02808	0.185733
IND	-0.00517	0.007776	-0.67	0.506	-0.02046	0.01011
SIZE	-0.13065	0.012947	10.09	0	-0.1561	-0.1052
ING	-0.03736	0.086929	-0.43	0.668	-0.20823	0.133503
DIV	-0.07301	0.036747	-1.99	0.048	-0.14524	-0.00078
LEV	-0.00046	0.001001	-0.46	0.645	-0.00243	0.001506
_cons	3.468921	0.294135	11.79	0	2.890781	4.047062

TABLE 6.7

RESULTS OF REGRESSION MODEL C, FAIR VALUE OF TOTAL DERIVATIVE INSTRUMENTS

Source	SS	df	MS
Model	43.86049	8	5.482562
Residual	40.58942	425	0.095505
Total	84.44991	433	0.195034

Number of obs	434
F(8, 425)	57.41
Prob > F	0
R-squared	0.5194
Adj R-squared	0.5103
Root MSE	0.30904

FV	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
DERT	-609.161	166.9997	-3.65	0	-937.409	-280.913
ROA	0.029917	0.00195	15.34	0	0.026084	0.033749
GEO	0.079142	0.054407	1.45	0.147	-0.0278	0.186083
IND	-0.00497	0.007782	-0.64	0.523	-0.02027	0.010326
SIZE	-0.13064	0.012952	10.09	0	-0.1561	-0.10518
ING	-0.038	0.086957	-0.44	0.662	-0.20892	0.132919
DIV	-0.07321	0.03676	-1.99	0.047	-0.14547	-0.00096
LEV	-0.00046	0.001001	-0.46	0.646	-0.00243	0.001507
_cons	3.469343	0.294253	11.79	0	2.890969	4.047716

and firm value. The results of these tests are reported in Table 6.8 for derivatives in an asset position and Table 6.9 for derivatives in a liability position. Both tests result in a negative significant relationship. While the coefficient of the asset position variable is smaller than that of the liability position variable, the confidence intervals are very similar (at the 95% level); thus the market does not distinguish between derivatives in an asset position versus a liability position in determining firm value. This suggests that **investors do not discount firm value based on the position of their derivative contracts, which further suggests that investors do not value speculative derivative usage by non-financial firms.**

Control Variables

The four aggregate regression models (N, A, B, and C) return similar results for control variables. As expected, profitability (ROA) is positively and significantly related to firm value. Size is negatively and significantly related to firm value. This result was expected and follows Allayannis and Weston,[11] Pramborg,[12] and Ben Khediri.[13] Dividend payments are also negatively and significantly related to firm value. This result suggests that investors do not value dividends as a sign from management that the firm is performing well. One possible reason for the negative relationship (as suggested in Chapter V) is that dividend payments signal a lack of investing opportunities. A positive relationship between investment growth opportunities and firm value would have supported this theory, however the regression models do not return statistically significant results for the investment opportunities variable.

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[11] Allayannis and Weston: 261.

[12] Pramborg: 123 – 127.

[13] Ben Khediri: 71.

TABLE 6.8

RESULTS OF ASSET POSITION DERIVATIVES REGRESSION MODEL D

Source	SS	df	MS
Model	43.69726	8	5.462158
Residual	40.75267	425	0.095889
Total	84.44994	433	0.195034

Number of obs	434
F(8, 425)	56.96
Prob > F	0
R-squared	0.5174
Adj R-squared	0.5084
Root MSE	0.30966

FV	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
DERA	-1151.3	338.7677	-3.4	0.001	-1817.17	-485.433
ROA	0.0299	0.001954	15.3	0	0.026059	0.03374
GEO	0.080869	0.054501	1.48	0.139	-0.02626	0.187994
IND	-0.00511	0.007797	-0.66	0.513	-0.02043	0.010218
SIZE	-0.13109	0.012974	-10.1	0	-0.15659	-0.10559
ING	-0.03872	0.087131	-0.44	0.657	-0.20998	0.132544
DIV	-0.073	0.036835	-1.98	0.048	-0.1454	-0.0006
LEV	-0.00046	0.001003	-0.45	0.65	-0.00243	0.001515
_cons	3.478721	0.294757	11.8	0	2.899358	4.058084

TABLE 6.9

RESULTS OF LIABILITY POSITION DERIVATIVES REGRESSION MODEL E

Source	SS	df	MS
Model	43.98986	8	5.498732
Residual	40.46008	425	0.0952
Total	84.44994	433	0.195034

Number of obs	434
F(8, 425)	57.76
Prob > F	0
R-squared	0.5209
Adj R-squared	0.5119
Root MSE	0.30855

FV	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
DERL	-1245.52	324.7825	-3.83	0	-1883.9	-607.142
ROA	0.02992	0.001946	15.37	0	0.026094	0.033746
GEO	0.077673	0.054334	1.43	0.154	-0.02912	0.18447
IND	-0.00487	0.00777	-0.63	0.531	-0.02014	0.0104
SIZE	-0.13027	0.012936	-10.07	0	-0.1557	-0.10485
ING	-0.03759	0.086818	-0.43	0.665	-0.20823	0.133058
DIV	-0.07351	0.0367	-2	0.046	-0.14565	-0.00138
LEV	-0.00046	0.000999	-0.46	0.643	-0.00243	0.001501
_cons	3.461883	0.293854	11.78	0	2.884295	4.039471

The remaining control variables do not demonstrate statistically significant relationships with firm value. The models return a negative coefficient for ING (investing growth opportunities), however the relationship is not statistically significant. The unknown relationships between industrial diversification and firm value and geographic diversification and firm value merely support the mixed results found in the literature. In all three models leverage is negatively related to firm value as is expected but, again, these results are not statistically significant.

Industry and Sector Specific Results

The results of the multivariate regression models for the sector and industry sub-samples do not return statistically significant results for the derivative usage variables. This is, again, likely due to the small sample size of each sub-sample.

This chapter has presented the results of the empirical tests. The tests of the industry sub-samples did not have the power to return statistically significant and interpretable results. The aggregate tests did return interpretable results. The regression models using the notional volume of derivative usage suggest that there is a positive relationship between derivative usage and firm value (at the 85% confidence level). If the fair value of derivative usage provides a good proxy for the volume of derivative usage, then regression models A, B, and C contradict the results of regression model N (notional values) and the market discounts derivative usage. It is likely, however, that they do not. If the fair value of derivatives usage does not proxy the volume of derivative usage but, rather, the firm's position in its derivative contracts, then the market discounts the value of firms that experience more negative outcomes as a result of risk exposure. The following chapter discusses this further and suggests areas for further research.

CHAPTER VII

CONCLUSION

This thesis has presented the hypothesis that derivative usage by non-financial firms is value adding. The hypothesis stems from the body of previous research suggesting a number of reasons why derivative usage has the potential to increase firm value[1] and on the body of empirical research suggesting that, for the most part, derivatives usage does increase firm value for non-financial firms.[2] Univariate empirical tests with the notional value of derivative usage and the fair value of derivative usage by non-financial firms suggest that derivative usage is value-destroying. These results may be skewed because (1) the tests do not include factors other than derivative usage that affect firm value (factors that are controlled for in the multivariate tests, and (2) some of the derivative non-users may not have been exposed to risk that could be hedged with derivative instruments. The multivariate empirical tests using the notional value of derivative contracts suggest a positive relationship between derivative usage and firm value however these results are insignificant. The multivariate empirical tests using the fair value of derivative contracts result in a negative relationship between derivative contracts measured at fair value and firm value. As discussed in the previous chapter,

[1] These reasons include decreasing the expected costs of bankruptcy, reducing the underinvestment problem, strengthening the terms of debt thereby increasing debt capacity, and reducing noise. Hedging incentives are described in detail in the Review of Literature chapter.

[2] See the Review of Literature chapter for a description of these studies or see Table 4.1 for a summary of the results of these studies.

this is not likely a sign that derivative *usage* is value destroying, but rather that the market discounts firms that have high gross positions in their derivative contracts relative to their size.

Summary of Preceding Chapters

Chapter I described a few infamous uses of derivatives and provided a brief description of derivative financial instruments. The chapter also introduced the research question and laid out the case for its importance. This included the widespread use of derivative instruments among companies and the essential purpose of the financial manager, stockholder wealth maximization.

Chapter II provided the background information needed to fully comprehend this thesis. The chapter first included a definition of the four major types of derivative instruments, forward, futures, option, and swap contracts. Next the chapter distinguished between the two major uses of derivative contracts, speculation/trading and risk management. This distinction is vitally important to the understanding of how and why investors might discount or enhance a firm's value based on its derivative usage. The chapter then described the standards for accounting for derivative instruments. An understanding of these standards is important because they provide some of the limiting factors of this thesis. The chapter concluded with a discussion of precisely this.

Chapter III provided an overview of the many theories on which this study is founded. The chapter first discussed stockholder wealth maximization (first presented in the Introduction chapter). The financial manager of a firm must maximize stockholder wealth. It is her professional and ethical responsibility to do so. Thus, the question of whether or not derivative usage increases firm value (stockholder wealth) is essential to

financial managers' risk management policies. The second theory, the efficient market hypothesis (EMH), is also crucial to this thesis. Chapter III suggested that in order for derivative usage to add value, an information asymmetry must exist wherein the financial manager(ment) has more information concerning the firm's risk exposure than does the stockholder. Next the chapter discussed the capital structure irrelevance principal introduced by Modigliani and Miller.[3] The principal suggests that in an efficient market and in the absence of the frictions mentioned above, investors achieve their own preferred capital structure and risk-return relationship by choosing their own investment portfolio. Again, this eliminates the need for internal risk management. Chapter III then discussed agency theory and described how derivative usage can both reduce and create new agency conflicts. Finally, the chapter defines Tobin's Q ratio and describes the theory behind its use as a proxy for firm value.

Chapter IV reviewed academic literature relevant to the thesis. This first included an overview of the classic 1958 Modigliani and Miller paper, "The Cost of Capital, Corporation Finance and the Theory of Investment." This section concluded by suggesting that when real world frictions such as bankruptcy costs, asymmetric information, taxes, and costly external financing are introduced to the Modigliani and Miller model the door is opened for value adding risk management policy. Derivative instruments are one of many risk management tools. The chapter followed with an exploration of literature concerning agency theory and its relation to derivative usage. This section included a study by Hendrik Bessembinder,[4] which concludes that derivative usage can reduce

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[3] Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review* 48, no. 3 (06) 1958: 261 – 297.

[4] Hendrik Bessembinder, "Forward Contracts and Firm Value: Investment Incentive and Contracting Effects," *Journal of Financial & Quantitative Analysis* 26, no. 4 (12), 1991: 531.

incentives to underinvest (an agency conflict) as well as studies by Lambert et al,[5] Carpenter, Knopf et al.,[6] and Hagelin et al.[7] that suggest derivative usage can increase agency conflicts. The next section summarized the literature on the determinants of firms' hedging policies and was divided into (1) theoretical studies, and (2) empirical studies. The fourth section explored alternatives to hedging with derivative instruments. The final section reviewed the literature concerning the specific research question of this thesis: how does derivative usage affect the value of non-financial firms?

Chapter V introduced the sample, variables, and empirical tests used in this thesis. To summarize, the S&P 500 was selected for its inclusion of a spectrum of large cap companies across industries and because it is generally considered to be a good indicator of the U. S. economy. The dependent variable, Tobin's Q, is considered to be a good proxy for firm value and is fairly standard among literature comparable to this study. The notional value of derivative usage, defined in Chapter V as one of the main independent variables, is a measure of the volume of a company's derivative usage. Similarly, the fair value of derivative usage (while described in Chapter VI as a proxy for a firm's position in its derivative contracts) is also described as a proxy for the volume of a company's derivative usage in Chapter V. The chapter then describes the control variables and defends their inclusion in the thesis. The chapter concludes by defining and explaining the empirical tests, univariate and multivariate, used in the study.

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[5] Richard A. Lambert, David F. Larcker, and Robert E. Verrecchia, "Portfolio Considerations in Valuing Executive Compensation," *Journal of Accounting Research* 29 no. 1 (Spring91), 1991: 129 – 148.

[6] Jennifer N. Carpenter, "Does Option Compensation Increase Managerial Risk Appetite?" *Journal of Finance* 55, no. 5 (10), 2000: 2311 – 2330.

[7] Niclas Hagelin, Martin Holmén, John D. Knopf, and Bengt Pramborg. 2007. Managerial Stock Options and the Hedging Premium. European Financial Management 13, no. 4 (09): 721-741.

The previous chapter, Chapter VI, presented and analyzed the results of the empirical tests. Univariate tests compared the mean and median Tobin's Q for firms that used derivative instruments during fiscal year 2009 with firms that did not use derivative instruments in the same time period. These tests show a higher Tobin's Q for firms that did not use derivative instruments. While the univariate tests were significant at the 90% confidence level, they should be viewed with some skepticism. As mentioned at the beginning of this chapter, these tests do not include a number of control variables that are found in the literature to influence firm value (Tobin's Q). These variables are included in the multivariate tests. Additionally, the sample of non-users in the univariate tests likely included a number of firms that were not exposed to risk that could be mitigated with derivative instruments during 2009. These firms stand in contrast to those firms that *were exposed* to risk that could be mitigated with derivative instruments but *chose* not to hedge the risk exposure with derivatives. The former could have contributed to poor results as the market will neither value nor devalue a firm based on its derivative contracts if there is no risk exposure to hedge.

Multivariate tests were conducted using data on the notional value of firms' derivative contracts and the fair value of firms' derivative contracts. The notional value of derivative contracts shared a positive but statistically *insignificant* relationship with firm value. Five regression models were used to test the relationship between the fair value of derivative contracts and firm value. The models were identical but for the leading independent variable which was the fair value of derivatives designated as hedging instruments, the fair value of derivatives not designated as hedging instruments, the fair value of all derivative contracts, the fair value of derivative contracts in an asset

position, and the fair value of derivative contracts in a liability position in regression models A, B, C, D, and E, respectively. While the fair value of derivative contracts was originally included in this study as an additional proxy for the *volume* of a firm's derivative usage it became evident that this was not the case. The fair value represents a firm's *position* in its derivative contracts. Because the effectiveness of derivative policy changes from firm to firm, the fair value is not a scaled approximation of the total volume of a firm's derivative contracts. Regardless, the fair value multivariate tests returned interesting results that support a negative relationship between the fair value of derivative contracts and firm value.

Areas for Improvement

While this study attempted to investigate the research question as thoroughly as possible, due to time and resource constraints, there are significant ways in which it could be improved upon. First, and most easily attainable, is increasing the sample size. The research question of this thesis was left largely unanswered due to a lack of statistically significant results concerning the notional value of derivative contracts. The power of these tests could be increased by increasing the sample size. There are a number of ways to broaden the scope of the sample without affecting the bias of the empirical tests. A very simple way to do this would be to use the S&P 900 which includes the S&P 500 and the S&P 400 mid-cap. Mid-cap companies may be less likely to use derivatives than large-cap companies due to the high fixed costs associated with derivative contracts but this effect could be controlled for in regression models. Aside from this suggestion, there are too many different ways of selecting a representative sample of mid/large-cap firms to list here. This study chose to use the S&P 500, in part, for its size. Data acquisition

for a larger sample would not have been attainable within the time constraints of this thesis. Along with the sample size, methods of data organization could be improved upon.

Firms that do not use derivative instruments could be separated into one category of firms that are exposed to risk that can be hedged with derivatives and a second category of firms that are not exposed to such risks. Removing those firms that are not exposed to risks that can be reduced with derivative instruments would improve the accuracy of the statistical models used in this study. This is described in greater detail in the final paragraph of the first section of this chapter.

Another general criticism concerns control variables. While the control variables used in this study are, to a certain degree, the standard in comparable empirical literature, they are by no means all inclusive. An infinite number of factors can affect a firm's value, from the political stability of an entire country to the personal relationship between a single securities analyst and a senior executive at a publicly traded company. It is the belief of this study that the control variables included in the multivariate regression models account for the majority of valuation factors; with that being said, a number of value effects remain outside the scope of this empirical analysis. The inclusion of more control variables could also help to increase the power of this study.

Implications and Further Research

In addition to the above mentioned improvements room for further research remains. The question of the link between derivative usage and firm value is by no means answered. While it was the aim of this thesis to expand the empirical research on this question, it cannot contribute any statistically significant results. This thesis does,

however, contribute to a relatively unexplored question: does the position of a non-financial firm's derivative contracts affect the value of the firm. Concerning this question, there exists plenty of room for further exploration.

This thesis suggests that the market values non-financial firms whose derivative contracts have low fair values. Derivative contracts with low fair values suggest that while the firm was exposed to risks, and those risks were hedged with derivative contracts, they did not provide the firm with "extreme" outcomes. Uneventful or temperate outcomes include commodity prices, interest rates, foreign currency exchange rates, etc., moving in close proximity to a firm's derivative contracts. Extreme outcomes occur when the prices of the underlying assets of derivative contracts do not move in close relation to the contract price. This thesis suggests that the former is value-enhancing and that the latter is value-destroying. The most important implication that arises from this conclusion is that derivative usage may be less relevant than previous research has suggested. Derivative instruments are used to manage risk exposure caused by price fluctuations of a specific asset. The effectiveness of a derivative *hedging* contract is measured by the net gain/loss to the firm. The closer the net gain/loss is to zero, the more effective the derivative contract. According to theory, regardless of the outcome of the underlying asset, the market should value the derivative contract based on its effectiveness. This thesis suggests otherwise. The outcomes of a firm's risk exposure affect the value of the firm and the hedging techniques used to mitigate that exposure are *potentially* ignored.[8]

[8] No conclusions can be drawn one way or another from the statistically insignificant results of the empirical tests of the notional value of derivative usage.

A simple extension of this study would be to regress the ratio of the fair value of a firm's derivative contracts to the notional value of its derivatives against firm value. This would more accurately test the effect of extreme outcomes on firm value. However, the best proxy for extreme outcomes of a firm's risk exposure would be a specific measure of the difference between the underlying asset price and contract price of derivative contracts over time. Further research would also benefit by removing derivative non-users from the sample. Because the focus of this study was to determine the effect of derivative *usage* on firm value, derivative non-users were included in the sample. In determining the effect of the outcomes of a firm's risk exposure on firm value using any of the above mentioned proxies, derivative non-users offer no information on the outcome of risk exposure. These firms should, therefore, be omitted from the sample.

Further investigation of derivatives usage could help to answer the ultimate question of this thesis: is derivatives usage value-adding or destroying? Derivatives have become front page news in the past few years, and rightly so. Derivatives usage is vitally important to stockholder wealth maximization and is a topic that should be closely followed by financial management across the globe. The more researchers can uncover, the better economic understanding of these complex instruments, and the better firms can take advantage of them.

APPENDIX

RESULTS OF REGRESSION MODEL N, NOTIONAL VALUE OF DERIVATIVES, UPPER 5% AND LOWER 5% OF FIRMS REMOVED (BY TOBIN'S Q)

Source	SS	df	MS
Model	66.9492	8	8.36865
Residual	116.469	351	0.33182
Total	183.4181	359	0.510914

Number of obs	360
F(8, 425)	25.22
Prob > F	0
R-squared	0.365
Adj R-squared	0.3505
Root MSE	0.57604

FV	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
DERL	1.64E-06	1.49E-06	1.1	.272	-1.29E-06	4.57E-06
ROA	0.050477	0.005655	8.93	0	0.039356	0.061598
GEO	0.389756	0.113259	3.44	0.001	0.167003	0.612508
IND	-0.00826	0.015599	-0.53	0.597	-0.03894	0.022415
SIZE	-0.19134	0.03024	-6.33	0	-0.25081	-0.13186
ING	-0.02125	0.163202	-0.13	0.896	-0.34223	0.299725
DIV	-0.01766	0.077004	-0.23	0.819	-0.16911	0.133787
LEV	-0.00086	0.001868	-0.46	0.644	-0.00454	0.002809
_cons	5.815343	0.692481	8.4	0	4.45341	7.177277

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