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CAN CONTROL PREMIUM BE ESTIMATED BY MEASURES OF THE ECONOMIC STATE? – A FOCUS ON THE NORTH AMERICAN TECHNOLOGY INTENSIVE INDUSTRY

This thesis examines factors relevant to control premium in the external capital market of the company. External variables and the control premium percentage are correlated in a linear regression model. The result is meant to provide an indication for realizing a fair price level for a technology intensive company by looking at its external environment and the current market state.

**A bachelor thesis within
Industrial and Financial Management**

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ABSTRACT

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- Keywords:** Control Premium, Financial crisis, Mergers and acquisitions,
Stock market, Technology intensive sector, North America.
- Purpose:** The purpose of this thesis is to examine factors relevant to control premium in the external capital market of the company. The result is meant to provide an indication to realizing a fair price level for a technology intensive company by looking at its external environment and current market state.
- Background and Theory:** To further explain our idea about correlating control premium level to macro factors we have explained measures of control premium (CP), described current industry outlook, origin of the current financial crisis and then thoroughly described data collection methods as well as how we reached our conclusions.
- Method:** Quantitative data collection for all acquisitions in the North American technology intensive sector 2004-2010 has been gathered through the software *Capital IQ*. Capital market static data have been extracted from the software *DataStream*. These have been correlated with linear regression to understand their relationship.
- Analysis:** The overall control premiums have proved to be higher during the recent period of recession. Reasons for this is are explained to be inefficient markets and positive expectations of the future from the sellers' point of view well as long-term valuation methods and a belief of an intrinsic value.

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1. INTRODUCTION

In this initial chapter, the subject and our intended research will be introduced. This will start with a short explanation of control premium, and thereafter the reason for us to conduct research on the subject will be stated. Limitations will be elucidated and finally the disposition of this thesis will be presented.

1.1 Introduction Control Premium

Simply the fact of taking control over a business does not add any value, but what ought to be analyzed is the potential value the target company can add to the acquiring firm. This extra value is called synergy. This, of course differs between companies depending on their resources and visions about future outcome and can explain why control premiums of targeted firms could have different values depending on the buyer.

The control premium could be explained as the value above the market price in percentage, a buyer is willing to pay for a publicly traded company to either acquire a new firm, or the additional shares of stock needed to gain control over the business.

1.2 General Background

In today's business setting, an increasingly common way to grow and gain profitability is through merger and acquisitions, Man's. The technology intensive industry's strong presence in North America has also contributed, during the last decade, to extensive merger activities within the industry. It is of the sellers and buyers, as well as financial intermediaries, interest to identify the factors, influencing this premium to enable a fair premium to pay considering the current state of the market as of the time of the deal. The acquisition process is meant to determine a price where the corresponding control premium is meeting the synergy effects of the targeted firm and at the same time is satisfying the sellers.

Several factors contribute to the control premium, among them internal factors such as financial ratios and external such as the extent of number of bidders and the state of the market. In this research, focus will be on the macro economical factors identifying the market state and more specifically, the recent crisis.

1.3 Problem Background, Expectations for Control Premium During Recession

On one hand, the premiums could be expected to be higher during the crisis due to undervalued stock prices.

Illustrative example

Company A was before the crisis selling for \$10 per share and is offered \$12, a control premium of 20 percent.

Due to financial distress, the price is now only \$8, which may not reflect an actual decrease in value of the company but merely a decrease in the stock turnover. Thus, the company would not accept a control premium of 20 percent but require 50 percent to reach the same bid price. Consequently, higher control premiums would be expected at times of financial distress. A positive outlook on the market should also contribute to an acceptance of paying a higher premium since the synergy effects are valued higher.

On the other hand you would expect the control premiums to be lower due to fewer purchases and therefore less bidding wars and also due to the fact that fewer acquisitions would take place due to psychological cautiousness during the crisis. The fact that a potential buyer has the financial resources required does not mean that an actual deal will succeed in times of crisis. Rather one might wait and observe the market state.

1.4 Problem Formulation and Previous Research

This study will research the size of control premiums of the mergers and buyouts in the technology intensive industry throughout Canada and USA from the year 2004 to 2010 with the purpose to identify changes and differences between control premiums before and during the recent financial crisis, and thereafter undertake regression analysis to be able to deduce which, if any, factors of the market that influence this premium.

The North American Market is chosen as a focus for this study because of recent reports of positive prospect profitability within both United States

(*PriceWaterhouseCoopers*, 2010) and Canada (*Deloitte*, 2009) in the technology sector.

In previous studies numerous internal corporate variables have been examined to decide what influences control premium ranging from international comparisons to debt-level of specific companies (Österlund, M. T, 2010). Although extensive research has been surrounding the subject of control premium, nothing has been found regarding how its' percentage level correlates with factors present outside the actual corporation.

The little previous research on this subject has found that the value of synergies that the acquirer believes will be present after buying another firm is influenced by expectations on the market (Varaiya, 2006). It has also been concluded that the S&P CLOSE and control premium percentage are negatively correlated, meaning that when the stock index decreases, control premium rises (Caves, 1991). There is also a relationship between stock prices and the actual number of mergers; an increase in stock price suggests an increase in mergers as well. This in part, is expected to depend on a positive economic state (Subhash, S. C., & Mathur, I. 1989).

To be presented in the theory chapter much effort has been directed to internal factors, this thesis will instead try to establish key determinants available outside this context and to focus on capital markets and macro factors, believing that this is an important matter for both acquirers and sellers. Hopefully this thesis might provide an indication for both sides of an acquisition process concerning what price to expect when buying or selling a firm. The technology industry is chosen on the basis of its expected increasing M&A activity and therefore interesting field of study when it comes to research of the movements of control premium.

With this background in mind, the intention will be to answer the following questions:

- **How did the financial crisis affect the size of control premium?**
- **Which external market factors seem to influence the size of control premiums?**

1.5 Aim of the Study

The authors' aim is to provide some sort of guidance of what to expect from movements in the economic market, and more specifically, during financial distress, when selling or acquiring within the technology intensive industry.

1.6 Disposition

The paper is structured as follows:

<i>Chapter</i>	<i>Content</i>
1 Introduction	An introduction to the subject and our intended research will be presented. Secondly, a short explanation of control premium and thereafter our motivation for conducting research on this matter built on previous research. Finally, the disposition of this thesis will be presented.
2 Theory and Extended background	An outlook on the technology intensive industry and its sub industries as well as a clarification of the influencing factors of the financial crisis will follow. Previous research and relevant theories will be shown. The choice independent variables used in regression model will be motivated.
3 Method	The choice of method will be introduced, as well as how the research and regression model will be conducted. The specified focus of the study will be outlined, which have been chosen with consideration to the proportions of the study and ability to target relevant issues.
4 Results	The results of the two hypotheses are presented. The first hypothesis concludes whether the control premium change during financial crisis, and the second part examines which factors that can be related to the result in the first part.
5 Analysis	In this section analysis for realized results are discussed in comparison with previous theory. Limitations of our study and suggestions for further research bring this thesis to an end.

2. EXTENDED BACKGROUND AND THEORY

This chapter will present an extended background as well as theory. First an industry outlook and a presentation of the selected sub industry groups, then factors during recession. After this the selection process in choosing macro variables to test with control premium. In the theory part previous research regarding both internal and some external factors are presented together with the formula to calculate control premium.

2.1 EXTENDED BACKGROUND

2.2 Industry Review and Outlook

The technology industry faced a drastic down turn in 2009 with a steep decrease in both the number of closed M&A deals and the size of them. From 195 numbers of transactions 2008 with a value of \$77,182 to a mere 108 during 2009 with a corresponding total value of \$ 36,334, which shows the crisis' impact on the industry's merger activities (PriceWaterhouseCoopers, 2010). Still to be researched however, is to what extent the control premiums were affected.

2.3 Sub Industries

The technology industry's M&A activity frames all of following four sub industries when companies are increasingly acquiring firms within their supply chain to rationalize and to increase profitability.

The Software industry includes the creation and maintenance of computer software. North America and more specifically the US market has been the leader of the industry throughout its history (PriceWaterhouseCoopers, 2009). What is remarkable is the extent to which thousands of small companies operate throughout the world but the major players, mostly turn out to be US-based firms. The M&A's in the technology sector has for a long time been dominated by software deals but faced, as the rest of the industry, a severe downturn in 2009.

The Semiconductor industry consists primarily of the technology industry, providing the industry with electrical conductive material used in most electronic devices. The financial crisis was in particularly hard on this industry, which in the US 2009 faced its worst results since the dot.com failure in 2001.

The Telecommunication industry consists of communication mediums of various kind, both fixed and mobile phone lines, Internet and network services. It is a rapidly developing industry with current trends relating to the increasing use of the smart-phone with 21 percent of sales on the US/Canadian market relating to this (PriceWaterhouseCoopers's Entertainment, Media and Communications practice 2009).

Technology hardware and equipment industry consist of manufacturing of physical computer devices and is said to be the least affected industry by the recent crisis in contrast to earlier mentioned sub industries.

The value of the sector's total mergers was not as affected by the crisis as the others with total American mergers, amounting to \$ 10,175M dollar 2009 compared to only \$5,851M dollar as of 2008 and the number of deals staying at a constant level. The prime deal of 2009 was Cisco's \$ 590M dollar purchase of Pure Digital that has proved to be the biggest deal in this sector of the year.

2.4 Recession

Here, matters regarding the financial crisis will be presented, first the origin of the recent crisis, thereafter a presentation of what happens in M&A during crisis, and last factors identifying a recession followed by our selected variables (that will be tested for correlation with control premium) based on these indicators.

2.4.1 Origin of Crisis

The commencement of the most recent financial crisis stated as of August 2007 was in North America and had its roots in the *Asset-Backed Commercial Paper* or (ABSP) sector. The origin of the crisis can be traced back to banks giving sub prime mortgages, or high risk loans to credit takers with no or poor credit history

and thereafter, in bundles called *Collateralized Debt Obligation*, sell those loans to other worldwide based investors.

This, was, before the crisis, considered to be a positive contribution to liquidity which could be used in future investments but also comes with the drawback of a lower incentive for the issuer of the loan to demand high credit ratings since they now are collected by the new owner and not by the original creditor.

When, due to rises in interest rate, homeowners started to default on their payments this off set difficulties which affected the global market and the trigger is claimed to be when the French investment bank BNP Paribas defaulted to let investors access two of their funds on the grounds of their difficulties to value the assets in them. (BBC news, 2010)

2.4.2 M&A During Recession

During recession, weak liquidity and balance sheets can make it tempting for smaller companies to agree to buyouts and mergers. To avoid insolvency these synergy effects might be to maximize profit, to enlarge their market, to reduce competition and to expand their business. Larger more competitively efficient corporations, who possess better credit conditions, are to a greater extent acquiring and consequently saving less successful companies from insolvency. Tougher credit conditions and changed policies of investment banks will benefit companies that are using more equity and less levered capital. This will encourage their M&A activity during this time to get through the recession stronger than their competitors.

What is significant during crisis is the importance of acquisitions of companies in dissimilar industries. Complementing goods and services will provide strength, even in hard times, more than two similar companies would contribute to each other during the same conditions (Higgins, 2008).

2.4.3 Variables Identifying a Recession

The International Monetary Fund (IMF) states that global economic growth of three percent or less is "*equivalent to a global recession*" which also is a period of declining productivity. Two successive quarterly declines in gross domestic product, the measure of the nation's output, is the most commonly used definition to identify a recession.

The United States-based National Bureau of Economic Research is the authority when it comes to identifying a recession. It takes several factors into account beyond GDP before declaring a recession. NBER defines economic recession as:

"a significant decline in [the] economic activity spread across the economy, lasting more than a few months, normally visible in real GDP growth, real personal income, employment (non-farm payrolls), industrial production, and wholesale-retail sales."

(National Bureau of Economic Research, 2010).

Several factors concurrently take place in a recession. The most commonly mentioned will be stated here as an explanation for this thesis selecting the correlation factors that will further be used to examine the relation between changes in control premium and the current state of the economy.

2.5 Choice of External factors to Test in the Linear Regression

To examine a possible chance of forecasting the level of control premiums by measuring variables in the economical state on the market, numerous factors to test correlation with will be selected. First several references for selecting significant variables will be used and below the references are stated. Thereafter the chosen variables will be presented.

2.5.1 Economic Indicators

There are three classes of economic indicators and they are coordinated after their timing in the business cycle.

- Leading indicator is variables that change before the economy as a whole changes.
- Lagging indicators, are variables that 'lag' after few quarter of a year.
- Coincident indicators are variables that change at the same time as the whole economy. An index of these can show highs and lows through a business cycle.

This thesis will solitarily examine leading indicators.

2.5.2 The Conference Boards Indicators

The Conference Board is a global non-profit organization that has been creating monthly forecasts and trend analysis in nine countries for over 90 years. The “*Leading Economic Index Factor*” is an index published every month to signal business cycles. It states ten key variables that historically have turned downward before a recession and upwards before an expansion.

Leading Economic Index Factors:

- 1 *Average weekly hours, manufacturing*
- 2 *Average weekly initial claims for unemployment insurance*
- 3 *Manufacturers' new orders, consumer goods and materials*
- 4 *Index of supplier deliveries – vendor performance*
- 5 *Manufacturers' new orders, nondefense capital goods*
- 6 *Building permits, new private housing units*
- 7 *Stock prices, 500 common stocks*
- 8 *Money supply, M2*
- 9 *Interest rate spread, 10-year Treasury bonds less federal funds*
- 10 *Index of consumer expectations*

2.5.3 PriceWaterhouseCooper’s Leading Indicators of the Capital, Credit and M&A Markets

PriceWaterhouseCoopers is an advisory firm and one of the largest in the world. The company often publishes reports about industry and current market outlook and the PWC’s own list of leading indicators for the capital, credit and M&A markets can therefore be considered as recognized indicators.

1. *CAD/USD*
2. *S&P 500*
3. *S&P/TSX*
4. *U.S. LIBOR rate*
5. *TED spreads*
6. *S&P/LSTA Index*
7. *CBOE VIX Index*
8. *Baltic Dry Index*
9. *WTI crude oil*

2.5.4 Selected Variables for Hypotheses Testing Purpose

The following indicators have been chosen to be included as variables on basis on previous presented possible indicators.

2.5.4.1 Factors of the Capital Market in North America

Stock indices are important indicators since these reveals information to the market participants, thereby they have direct impact on implied equity and firm value multiples, required rate of return on equity and also an indirect impact on capital structure.

A. (β_8) S&P 500 (Standard & Poor's 500) : Stock index tracking the price of 500, in terms of market capitalization, large common stock traded in the US exchange market NYSE and NASDAQ.

B. (β_{13}) S&P/TSX: Stock index tracking the equity prices on the largest companies on the Toronto stock exchange (TSX). Of the total market capitalization, 70 percent consists of Canadian firms. The 10th of April 2010 the index included five information technology companies and five companies in the Telecommunication Services industry (Statistics Canada, 2010).

C. (β_9) NYSE Composite (New York Stock Exchange): Worlds' largest stock exchange measured in total market capitalization.

2.5.4.2 Factors of the General Economic State in North America

D. (β_{12}) Interest rate spread; US Bond yield govt. 10 year – middle rate

The interest rate used by banks when borrowing US dollar internally will be used in the regression. PWC recommends using U.S. LIBOR as they follow the rate the Federal Reserve sets as a target rate. The interest rate reflects forecasts of the economic state by monetary authorities. The interest rate affects the rate banks offer loans at to individuals and corporations, and the cost of capital.

Interest rate is thought to have an effect on control premiums through share prices. If the real rates are negative, investors will find other alternatives (shares can be one of these choices) on new markets. This will also mean that when positive returns are present in North America, the stock prices will rise. If investors are certain that

positive real interest rates will remain on the market, they might choose to invest in more fail-safe funds than stocks (Peirson, G. (2005).

E. (β_{14}) The CBOE Volatility VIX Index (S&P 500) is a measure of volatility of the S&P Index option prices. When it increases investors expect large changes in values of equities, most often downwards. If it decreases it means that the market is stabilizing of which higher confidence in credit ability follows and thereby improves credit conditions.

During recession, stock prices are very volatile due to sensitive market information. Another factor contributing to increased volatility is insider trading within the company. The market will believe that these people possess information about the state of the company and will therefore act in the same direction. (Sheldon Natenberg M., 1994).

2.5.4.3 Industry Specific Factors

More industry specific variables will be used to specifically reach a conclusion about how the control premiums in the technology sector differ from the market.

The components in these indices are stocks in the S&P Total Market Index (S&P TMI), which includes all common stocks, listed on the NYSE and the NASDAQ US exchanges, or on the Philadelphia Stock Exchange.

F. (β_7) Philadelphia Semiconductor Price Index (SOX) an index traded on the Philadelphia stock exchange. It is composited of 18 semiconductor manufacturers and thereby covers all of the market. The index is extremely volatile changes in the SOX can often predict changes in all technology sectors.

G. (β_{10}) S&P 500 Telecom Price Index

H. (β_{11}) S&P500 Technology hardware & Equipment Price Index

I. (β_6) S&P500 Software Price index

2.6 THEORY

2.6.1 Control Premium Formula

By using the formula $CP = \frac{p_0 - p_m}{p_m}$, this will provide an the percentage of control premium per transaction, expressed as the percentage change between the price paid in case of an acquisition for the acquired stock (p_0) and the market price one week prior to announcement (p_m). One week is chosen considering regular market changes and to get as close value in time to the acquisition as possible without the market price to be influenced by the announcement (Victor Dragotă, D. D., 2006).

2.6.2 Previous research made concerning determinants of control premiums

As stated before, not much research effort has been directed to control premiums correlation with external factors. Below mostly previous research about internal influences are mentioned, but it will start of with some studies on external factors.

2.6.2.1 Control Premium and the Market State

Theoretically, the fairest value offered for an acquisition of a firm should equal the market value of that firm as of the time of takeover. This is however usually not the case and extensive research has been conducted for assessment of the determinants of this excess value. Firstly, it can be explained by the estimated added value the acquired firm contribute to the acquiring firm, also called synergy effects, and secondly, the bargaining power of the buyer which can be explained by the extent of competition and anti-take over activities from the acquired firm. In addition to this, *the expectations of the market influence the estimation of the value an acquired firm contributes and this will be our focus in this study.* (Varaiya, 2006).

Other research has shown a negative correlation between S&P CLOSE and the bid premium, but under the condition of only when rival bidders are present. Thus, in upturns of the market, meaning higher S&P CLOSE, this has been related to lower control premiums and *respectively the lower S&P, the higher control premium* (Caves, 1991).

It seems to exist a relationship between stock prices and merger activities were correlated and that an *increase in stock prices increased the number of mergers*, they also suggest that this might depend on a favourable economic environment. (Sharma and Mathur, 1989).

2.6.2.2. International Differences in Control Premium

Numerous investigations about differences between countries concerning the level of customized control premiums have been made. (Nenova) . The study examines international differences in benefits with gaining private control. Here, control premium tend to rise with the estimated extent of advantage of control. It is concluded that large differences can be explained by looking at the legal system of the country. Countries in North America that use common law system express lower control premiums due to more strict legal system leading to private benefit regulations. Looking at specifically Canada and the US it could be noticed that a very high level of legal system and investor protection is correlated with a lower level of vote value and therefore lower advantage of control, compared to less developed legal systems. As much as 70 percent of the differences in vote value could be observed only by differences in law system and due to rights in control transfer. The most important conclusions in what influence control premiums were the importance of the quality of general investor protection, minority rights in the case of control transfer and standards of law enforcement. (Victor Dragotă, 2006)

Moreover, it is it is concluded that countries with more active competition in product markets, independent press, better accounting standards and high tax compliance will express lower control premiums. The median premiums their research display is two percent for United States compared to 65 percent in Brazil! (Dyck & Zingales, 2003).

2.6.2.3 Control Premium and Company Management

It has been shown that determinants of control premium consists of perceived competence of the target's current management, the extent to which operating expenses are discretionary, the value of non operating assets and the perceived net present value of currently unexploited business opportunities' (Donald M. DePhamphilis, 2010).

Other research has focused on dual class voting rights, which means that the shares have different amounts of voting power, and if so, how high premium that is being requested for the extra votes. There is a control premium hypothesis that states that the shares with higher voting power will sell more expensively than the shares without. This premium has been found to be 23 percent in Canada (Robinson, 1996) and 5 percent for United States. (Lease et al.1983)

Another examined proposition concluded a positive relationship between how large percentage shareholders will influence the control premium (Massari & Holderness, 2004).

2.6.2.4. Correlation Among Other Variables

Previous research linked to the correlation factors in this thesis examines how the volatility index (VIX) and stock indices such as S&P500 correlate and how this changes during a crisis, (Manda, 2010). This study came to the result that the volatility increases when stock prices fall. This is consistent with 'The Leverage Effect theory that suggests that as the stock index value decreases, the leverage of the market increases, and consequently makes equity more risky, or volatile (Kreps, D. M., & Wallis, K. F., 1997).

2.6.2.5 Efficient Market Theory

The Efficient Market Theory of financial economics states that the price of an asset reflects all relevant information that is available about the intrinsic value of the asset. A strong version of the theory claims that prices will immediately change according with even insider information. In informational inefficient markets prices on assets, bonds or stocks do not reflect all known information, which could be a reason for undervalued or overvalued prices and control premiums. The efficiency of a market depends partly on how low the transaction costs of obtaining information are. The US market can be seen as a market where information is relatively cheap and accessible and thus this market can be seen as efficient. (Fama, 1991)

3. METHOD

In this section, the choice of method will be presented, as well as how the research will be conducted. First the method used when collecting the data will be described. Then, the focus of the study, chosen with consideration to the proportions of the study and ability to target relevant issues will be presented. Thereafter the method concerning the regression analysis will follow, as well as the two hypotheses. The first hypothesis stated determines whether control premium change during financial crisis and the second part examines which factors can be related to result in the first part.

3.1 Method of Data Collection

When doing research there are mainly two options regarding the method used which are the quantitative and qualitative method. Since our study intends to draw general conclusions from a large sample size (the full population), it is believed that the quantitative method is the most suitable one. A qualitative method would be more appropriate in case studies with smaller sample sizes where a more thorough investigation of certain targeted companies would be conducted (David Ruppert, 2004).

The largest part of our quantitative data will be analytical statistics from which several multiple regression models will be conducted with control premium (one week prior to announcement) as dependent variable and a number of chosen market factors as independent. The aim of this is to trace a prospective relation between these variables and the size of the control premium. This would also enlighten a correlation between the control premium and the state of the market as a whole and in the technology sector's sub industries.

First, our aim will be to identify if there exist any form of difference in control premiums before and during the crisis. This test will be conducted using mean values of control premiums before as well as during the crisis divided by partly the four different sectors as well as the industry as an entity. ***If a significant difference is found a regression analysis will follow, using the presented independent variables to attempt to find out whether several general and industry specific factors are influencing this change.***

Efforts will be put into finding significant results in the statistical regression analysis so that this study will constitute value for future readers.

3.2 Obtaining Data for the Dependent and Independent Variables

Static price data have been extracted from *Capital IQ* a Standard & Poor Business database used to attain information related to M&A activity throughout different industries for determining control premium. Independent variables earlier presented have been selected out of leading recession indicators and retrieved from the software *DataStream*, the world's largest database for collection of statistical information. The data for the independent variables used have been extracted on monthly bases and then coupled together with all company transactions made during that month.

By structuring the historical data in the same way as the data from *Capital IQ* a regression analysis can thereafter be performed.

3.3 Focus of Research

To be more precise on what the focus is on in this study the data limitations will be presented below.

3.3.1 Industry

The technology sector consists of these four sub industry groups; this thesis will use the classification that *PWC* use (PriceWaterhouseCoopers, 2009).

The data examination has been narrowed down to include numbers from the technology sector more specified as

- 1. Technology hardware and equipment*
- 2. Semiconductor*
- 3. Software*
- 4. Telecommunication services*

All four-sub industries are closely related to each other in terms of operations and take-over activity to expand existing constellations. The choice of industry is based on an observed up turn and positive outlook, previously explained in the industry section.

To include all four industries will provide more data and therefore more significant results in our analysis. However dividing the technology industry into these four sub sectors makes it possible to track differences and variations that can influence the results.

3.3.2 Classification of Acquisitions

This research will be limited to the acquisitions of 100 percent of shares of publicly traded private firms to be able to achieve a fair average. This will make the prices more comparable since they are based on the same amount of stocks, which not are influenced, by discounts or prime prices. A public firms' offering of shares includes several bidders that affect prices far more than compared to private held companies. (Caves, 1991). Another aspect that is likely to affect the control premiums is the volatility of share prices, which is another reason why the results should be more comparable than when only using public firms.

Only premiums over -50 percent will be taken into consideration. A negative premium could be considered in cases when managers are badly qualified to run the business or in case of bankruptcy, which often is the case during the time period of research. (Victor Dragotă, D. D. 2006).

3.3.3 Time Frame

The time period to be examined is selected to be able to detect differences in percentage control premium, *before* and *during* the recent financial crisis.

The selected time period for the research has been chosen from January 1st 2004 to March 1st 2010.

What must be taken into consideration is the fact that price negotiations initiated and concluded before the crisis might not have resulted in an actual deal until after August 2007. The data collected will only provide times as of effective registration date and will therefore not reflect bidding processes and market outlooks from when the negotiations initiated. To more accurate be able to describe movements in control premiums *due* to the crisis, the sample defined as pre-crisis are deals closed as of February 2008. Deals closed after this time will be considered to reflect the state of the market during the crisis.

Bearing this in mind, two samples will be collected. The first including data chosen from February 1st 2004 until February 31st 2008 which gives a time frame of four years to be able to get results as excluded as possible from the effects from the crisis. The second sample, which carries values from Mars 1st 2008 until Mars 31st 2010, is expected to reflect the financial crisis different factors.

3.3.4 Geographic Market

The North American market is and has historically been, the centre of the technology intensive industry. Recent reports of positive prospect profitability have been presented including both the United States' (PriceWaterhouseCoopers, 2010) and Canada's' (Deloitte, 2009) technology sector.

Due to differences in regulations and trends among geographic areas; a focus on one specific regional market (North America) will provide more reliable statistical outcomes. Thus the data chosen on both the target and issuer will be the on the Canadian/US market. Both markets have been chosen due to larger and thus more reliable sample size, as well as the overlapping business activity existing between the countries.

3.4 Extracting Deal Prices and Calculating Control Premium Data

Data referring to deal prices were retrieved from *Capital IQ*. By using *Capital IQ*'s screening tool it was possible to retrieve data consisting of market capitalization values one week prior to closed deal as well as closing deal prizes and from this calculate control premiums (%) one week prior to closed deal for the merger. Data from 406 closed deals from four years before the crisis as well as, 148 from two years during the crisis were collected with the condition of one-week prior control premium of over -50 percent. A negative control premium means a closing price below market stock value. The control premium will be based on values in USD since the data include M&A activity throughout both Canada and USA.

A large sample size (full population) of 554 randomly chosen closed deals has been used, this includes all transactions available between 2004 and 2010 within our limitations and will therefore contribute to statistical significant results where outliers have been excluded using the Quartile method (David Ruppert, 2004).

3.5 Initial Arrangement of Control Premium Data

Microsoft's software Excel has been used to further organize the data into time series to distinguish historical patterns over the subgroups and the aggregated trend. Before deciding on conducting a regression analysis, it was analyzed if the subcategories tended to move in the same direction.

3.6 Method for Statistical Analysis

Statistical tests will be conducted, hereafter the final model will be selected based on the highest degree of explanation level of the variables used.

3.6.1 Testing for Normal Distribution

To begin with, it will be concluded whether the data follows a normal distribution to be able to make reliable assumptions about the how the average control premium moves over time in our research since a normal distributed data varies around a mean value according to the central limit theorem (Anderson, Sweeney, Williams, Shoesmith, & Freeman, 2007).

3.6.2 Correlation Matrix

Only variables with significant correlation with control premium will be used in the regression model, which is conducted after a correlation matrix, which presents the dependent as well as all independent variables' correlation with each other (Anderson, Sweeney, Williams, Shoesmith, & Freeman, 2007).

3.6.3 The Regression Model

The model we will use is an *OLS* (ordinary least square) linear regression model.

With this method the sum of squared distances between the observed information in the dataset are minimized, and the responses predicted by linear approximation (David Ruppert, 2004).

The regression analysis will take the following form;

$$Y_i = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_i X_i + e_i$$

Y_i = dependent variable
 α_i = intercept, fixed
 $\beta_1, \beta_2, \dots, \beta_i$ = Coefficients of the independent variables
 X_1, X_2, \dots, X_i = Independent variables
 e_i = error residual

Y_i = control premium

Using this model it will be possible to see which and how the tested variables affect the dependent variable control premium. Below is the name assigned to each parameter displayed.

Industry specific dummy variables

A dummy variable set equal to 1 if it displays a certain characteristic, 0 otherwise

X_1 = software (=1)
 X_2 = technology (=1)
 X_3 = semiconductor (=1)
 X_4 = telecom (=1)

Additional dummy

X_5 = recession year (=1)

Industry specific variables

X_6 = S&P500 Software Price Index
 X_7 = Philadelphia Semiconductor Price index
 X_{10} = S&P500 Telecom Price Index
 X_{11} = S&P500 Technology hardware Index

General variables

X_8 = S&P500 Composite Index
 X_9 = NYSE Composite Index
 X_{12} = US. Govt Bond yield (10 yrs)
 X_{14} = S&P500 Volatility VIX Price Index
 X_{13} = S&P/TSX 60 Price Index

To identify possible explaining variables influencing the control premium a multiple linear regression formula will be used since it is reasonable to assume that the dependent variable will be affected by several variables. To find the model with highest degree of explanatory level the *stepwise method* of regression have been used. In SPSS this means that testing at each phase for variables to be included if they are statistically significant or excluded if they are not. (SPSS, IBM, 2010)

The independent variables with highest degree of explanatory level will be chosen using a goodness of fit test. The individual parameters will be tested for significance using a t-test as well as the overall significance for the model using a F-test

Tests will be made for auto correlation, which often exist in time series data where data from one period is highly related to data from a previous period and thus will violate the concept about independent error terms. A Durbin-Watson test will give us an estimation of this where a value of 2 indicates no auto correlation. (Jay B. Abrams, W., 2010)

3.7 Constructing the Hypotheses

To conclude our research, two sets of hypotheses will be set up and tested on a significance level of 95 percent. One of the hypotheses will be rejected based on gained results and the remaining used in further analysis.

Hypothesis 1)

H_0 = the average control premium did not change in times of crisis

H_1 = the average control premium did change in times of crisis

In the next set of hypothesis, the aim is to conclude which variables that influence the control premium. If the null hypothesis is rejected for a certain β_1 value, this variable is assumed to correlate with Y, control premium.

Hypothesis 2)

H_0 = the variable does not influences the control premium

H_1 = the variable do influence the control premium

The variables will be tested one by one in stepwise regression and according to the model;

$$\mathbf{H_0: \beta_{1-14} = 0}$$

$$\mathbf{H_1: \beta_{1-14} \neq 0}$$

4. RESULTS

In this part the outcome of the statistical tests will be presented from both the normal distribution and mean tests regarding the first hypothesis, as well as for the regression model and the significance test regarding the second. The final model, with the best explanation level, is displayed in the end of this chapter.

4.1 Testing for Normal Distribution to find if the Control Premium Data is Further Testable

To be able to use the collected control premium data it needs to be normally distributed, otherwise the coming results will not be significant.

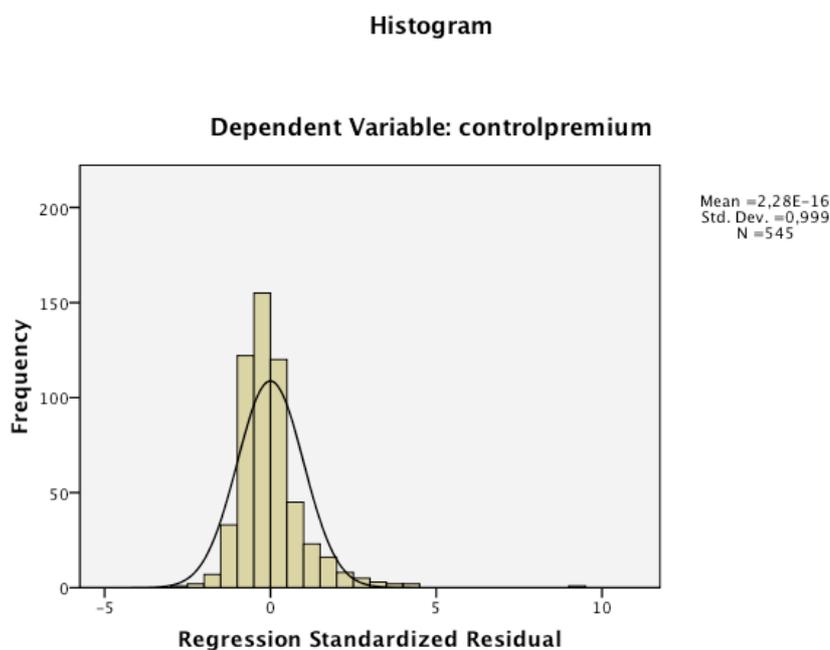


Figure 1. *SPSS output. This figure shows if the dependent variable; control premium is normally distributed by conducting a regression of its standardized residuals.*

Looking at the residuals it can be concluded that the data for control premium follows a normal distributed curve, and is therefore further testable.

4.2 Testing Hypothesis 1; the Results

What is foremost to conclude is if there exists a trend difference between the categories. Next issue to investigate is the similarities between the categories further, using the software *SPSS*.

The variables being tested for significance by mean value	df	Sig. (2-tailed)	Mean Difference
Software before	220	,000	30,46923
Software during	74	,000	35,75107
Technology before	113	,000	28,17632
Technology during	36	,000	32,62216
Semicond.before	24	,000	30,05280
Semicond.during	17	,001	42,15222
Telecom before	48	,000	22,42327
Telecom during	18	,000	51,06526
Total before	405	,000	28,85520
Total during	146	,000	37,71517

Figure 2. The output from *SPSS* is showing the mean per sample before and during crisis for all factors that will be correlated in the regression model. The column *Sig. (2-tailed)* is showing if the variables are significant when comparing their means within every variable. *Df* stands for degrees of freedom and is the sample size +1.

Looking at the column *Sig. (2-tailed)* it is seen that all data in all categories are significant (all values under 0.05 are significant) and therefore valid for further testing.

COMPARISION CP% AVERAGES BEFORE AND DURING	TOTAL	TELECOM	SEMICONDUCTOR	TECHNOLOGY	SOFTWARE
Average per transaction before	28.86	22.42	30.05	28.17	30.47
Average per transaction during	37.70	51.07	42.15	32.62	35.75
Percentage change before: during	76.55%	43.90%	71.29%	86.36%	85.23%
Percentage change during: before	130.63%	227.77%	140.27%	115.80%	117.33%

Figure 3. This table is displaying in a lucid way the same figures as above in the *SPSS* table; what the average control premium per transaction was before the crisis, what the average control premium per transaction was during the crisis, and thereafter ratios before to during and during to before.

The most interesting result is that the telecom category went from being the lowest in the selection to have the highest average during the crisis; displaying a 128 percentage

increase. Technology is the category that changes the least, only 15.80 percent higher premium than during the crisis.

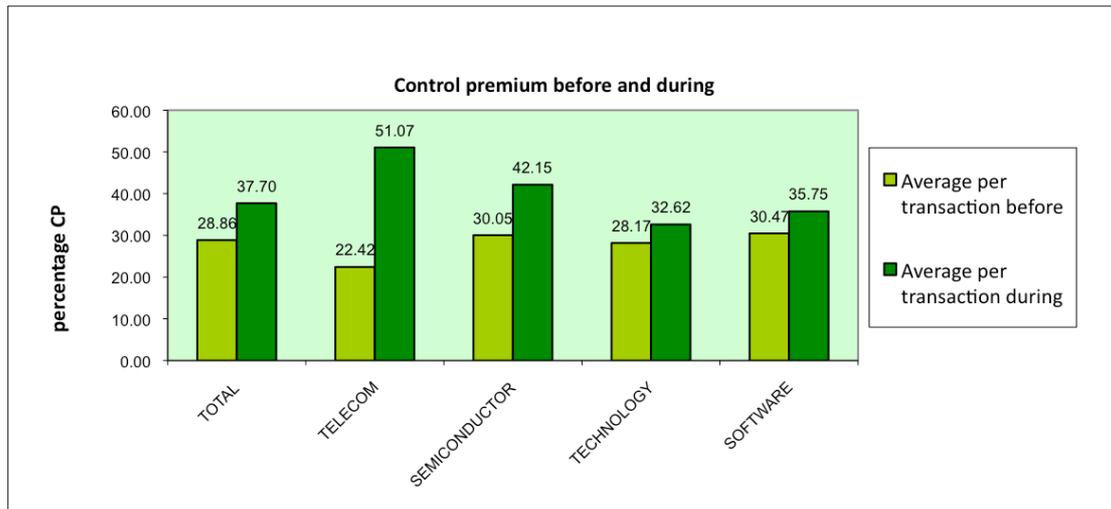


Figure 4. The diagram above displays how the average control premium percentage changed during, compared to before the financial crisis. The light green column shows average per transaction before, and the dark green column during.

By observing that the percentage change before and during the financial crisis differ substantially it is concluded that the categories will be tested as a ‘total’ group as well as one by one in the regression analysis using dummy variables to avoid insignificant grouping of data and thereby false results.

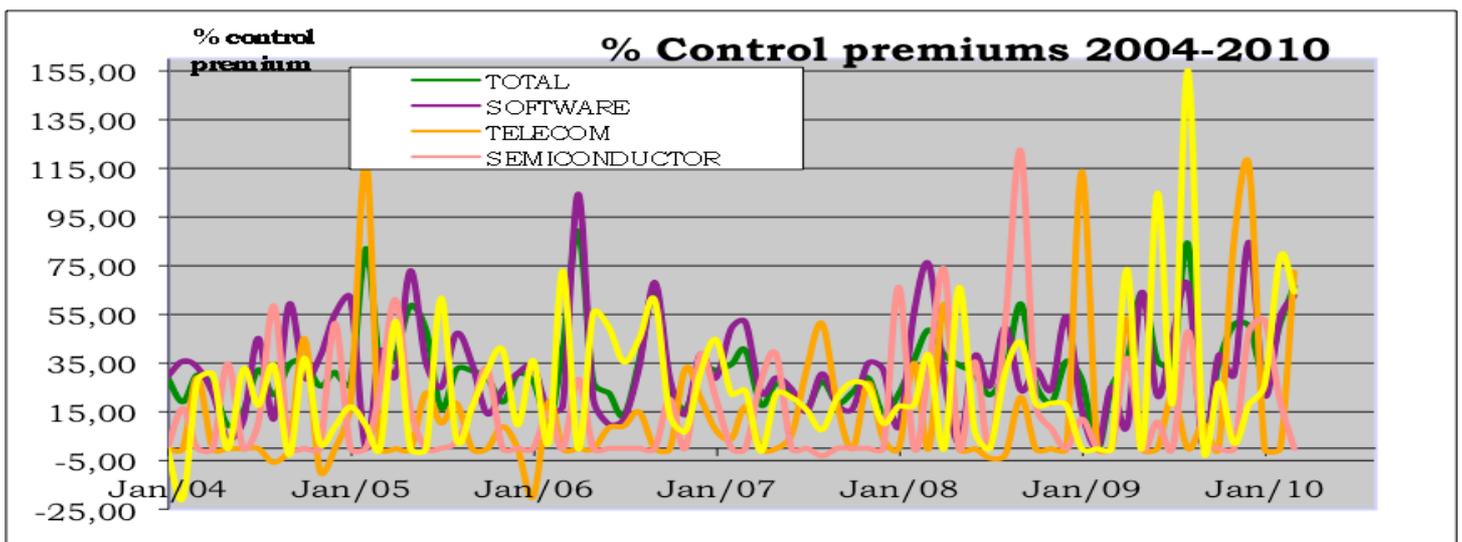


Figure 5. The time serie diagram above displays changes over time for all industry groups and the aggregated total. It displays the control premium as a percentage on the Y-axis and time on the X-axis.

Concluded from the diagram above is that the four subcategories do not have corresponding trend lines over this time period. This thesis will not investigate the reason for this further.

4.3 Testing Hypothesis 2; the Results

In this section, several statistical outputs from the software SPSS multiple linear regression models will be presented as well as explanatory comments from which several conclusions can be drawn from.

4.3.1. Outcome When Conducting Linear Regression; the Significant Models

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,099 ^a	,010	,008	34,48913	
2	,159 ^b	,025	,022	34,24609	1,989

a. Predictors: (Constant), crisis

b. Predictors: (Constant), crisis, volatility

c. Dependent Variable: control premium

Figure 6. *The above figure is a SPSS output of the models that became significant in the linear regression. The first model only engages the variable crisis as an explainable factor for control premium. Model 2 involve two factors; crisis and volatility accounting for control premium concurrently. The R Square column shows the degree to which they explain the variance in control premium. Durbin-Watson is a test used to detect the presence of autocorrelation in the residuals from a regression analysis.*

The only significant variables resulting from stepwise regression are X_5 , *recession* and X_{14} , *S&P500 Volatility VIX Price Index*. Model 1 shows results including only *recession* as independent variables and model 2 with *volatility* as an additional independent variable. Model 2 is the one model that will be used in further analysis in this thesis since it offers the highest explanation for movements in control premium. When both variables are integrated in the regression, the dependent factors' variability can be accounted for by 2,5 percent of the variables, which is a lower value than expected but still significant. Finally the Durbin-Watson factor of 1.99 assures that the assumption of independent errors and autocorrelations is tenable since it carries a value close to 2.

4.3.2 Testing Model 2 for Significance

Here, the final model with 2 independent variables will be tested fro significance.

4.3.2.1 F-test for Model 2

Model		df	F	Sig.
2	Regression	2	7,074	,001 ^b
	Residual	542		
	Total	544		

Figure 7. The above figure is a SPSS output of ANOVA. The F column shows the result of an F-test that is used for overall significance of the model. The Sig. column shows if the result of the F test is significant. Df (degrees of freedom) shows number of samples in the test + 1.

The F-test shows a significant result of 0,001 for model 2, this includes both variables with control premium as the dependent one.

The ANOVA table is also conducted to predict how well the independent factors explain the outcome rather than using the mean. Since our F-value of 7.07 is higher than 1 this is interpreted as how many times this is a better estimation of the outcome relative to the inaccuracy that still exist in the model.

4.3.2.2 T-test and Explanation Extent in Model 2

Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
2	(Constant)	37,802	3,480		,000
	Crisis	17,817	4,769	,224	,000
	Volatility	-,560	,189	-,178	,003

Figure 8. The picture shows a SPSS output for a t-test that is testing the individual parameters for significance (sig.). The Beta and B explain different aspects of the impact of dependent variable control premium.

When a significant F-test has been concluded, a t-test follows to test for individual significant variables. Both variables show results for significance with p-values ≤ 0.05 with a slightly higher significance for crisis.

From this table it is also possible to recognize that the control premium is expected, in this model to start with the constant 37.802 and to increase with 17.82 percentage points during times of recession which is a result of similar characteristics as previous

presented when calculating average control premiums over time for different industries.

Due to the *volatility* factor the control premium decreases 0.56 percentage points with every percentage change in *volatility*.

The standardized beta values are both measured in standard deviations and give a more thoroughly insight in the explanatory level of the variables since they are not dependant on the units of measurement. The crisis value of 0.224 demonstrate a higher level than volatility's -0.178 and thus explains the model to a greater extent. Attention to multicollinearity should be taken into consideration.

4.4 Correlation Between the Two Explaining Variables

		Crisis	Volatility
Crisis	Pearson Correlation	1,000	,683**
	Sig. (2-tailed)		,000
	N	545,000	533
Volatility	Pearson Correlation	,683**	1,000
	Sig. (2-tailed)	,000	
	N	533	533,000

Figure 9. The picture is a SPSS output when testing how the two variables in Model 2 correlate with each other to see if they are significant individually or only when used concurrently.

In this table, a significant correlation of 0.683 between the independent variables have been traced which leads to conclude that the explanatory level of the individual parameters not is as significant as the model as whole. This does not however decrease the model's reliability when using both variables but the variables should not be used as individual estimators of the dependent variable.

4.5 The Final Model; Model 2

The final model now looks like this;

$$\text{Control Premium \%} = 37.802 + 17.817X_5 - 0.560X_{14}$$

Where 37.802 is the starting point of the percentage control premium. The following term shows that if the current year is a recession year control premium will be 17.817 percentage points lower. The last term states that with every percentage point of higher volatility (in VIX), the percentage of control premium will decrease 0.56 percentage points.

5. ANALYSIS

In this part, our problem discussion and previous theory of the area will be linked to obtained results in previous chapter as well as a conclusion stating four possible explanations, including our own reflections. Last of all, limitations of the study and suggestions for future research will be presented.

5.1 Empirical Evidence

Our aim with this thesis has been to find variables other than micro factors that could be related to control premium. We used linear regression to establish relationships between macro factors and our dependent variable, control premium percentage, which showed that the level of control premium is inter-related to *crisis* and *volatility of the market*. It could also be seen that control premiums have increased during the crisis compared to four years before. One can therefore expect a higher percentage control premium during a recession than in normal market conditions.

It is now possible to answer the two hypotheses created in chapter 3, the Method chapter;

Hypothesis 1)

H_0 = the average control premium did not change in times of crisis

H_1 = the average control premium did change in times of crisis

→ H_0 can be rejected since a significant increase of average control premium was noticed in all four sub-industries

Hypothesis 2)

H_0 = the variable does not influence the control premium

H_1 = the variable influences the control premium

$H_0: \beta_{1-14} = 0$

$H_1: \beta_{1-14} \neq 0$

→ β_5 and β_{14} can be rejected since significant results are gained for both variables

5.2 Conclusions

Hence, what reasons actually do influence the fact that the average control premium is increasing during the crisis in all of the four sub categories?

5.2.1 The Market State's Influence

Clearly, on average buyers tend to be willing to pay a price well above market value.

We believe the main reason for this is the intrinsic value the company carries.

Although the stock market crash-dived during the recession, this is not necessarily a true and fair value for most companies during this time.

The companies' tendency to decrease in values on the stock market and consequently lowers their market capitalization. To close a deal which was initiated before the crisis, a higher control premium is demanded to compensate for the decreased market capitalization if the values of the synergy effects are valued as high as before. As long as not in serious distress, a seller would rather wait until after the crisis than sell to a price below their valuation. Thus a higher control premium would be demanded to make all equity holders willing to let go of their shares since the valuation most likely is based on a long-term perspective. This is supported by the theory presented, which states that the control premium is based on expectations of the market state.

Moreover, the valuation should be based on normal business conditions and not reflect times of crisis to a large extent. In other words, our results indicate the sellers' expectations of their value, which obviously is higher than the market's. This could also reflect an optimism and positive outlook from the buyer's side on the industry's future where a recovery of the company's value is expected and thus should be included in the price.

5.2.2 Industry Specific Reasons

This study has been focused on the technology intensive industry and we believe the reason for the increase in specifically this sector is the knowledge-based advantage the owners of businesses within this sector have compared with the overall stock market. This sector is often characterised by active owners, often even the founders themselves, who possess exclusive information about the product mix and future projects and therefore can justify a higher premium in times of crisis, just because of

their larger source of information. From this conclusion it could be further investigated whether this industry might have higher control premium in crisis compared to other, less knowledge intensive businesses, this is however outside the framework of this research.

5.2.3 Inefficient Markets

According to the theory, a higher M&A activity can be justified in times of crisis where mergers can prevent companies from going bankrupt through various synergy effects, and might therefore justify higher control premiums during a recession. A sudden boost in stock price for a specific company can be explained by inefficient market conditions where the only explanation feasible to find is a future merger under progression. Insider trading can occur when executives purchase company shares, knowing that the price will rise when the acquiring corporation buys total market capital. Often before a takeover, stock price decrease due to, in many cases, the company being inefficient and non-profit making. If the management is disorganized and stock prices low at first, but large synergies are expected, this will result in a high control premium since the acquiring company know what the advantages will lead to. Worth to mention is also the fact that not all observed transactions carried positive control premium values, which could to be explained by the lack of efficient market information, which the bidders can benefit from, when acquiring illiquid companies, mentioned in previous theory.

5.2.4 External vs. Internal Factors

Secondly, our result indicates difficulties to explain increases of control premiums by external market factors, which better explains the overall market, since the premium to a greater extent seem to be more correlated with internal factors. As previous theory has shown, the *number* of mergers can be explained by the stock markets' down turn, something we also have noticed, but the size of control premiums seems to have only a weak relation with two of our factors, stock index as well as volatility. These are however the factors we expected to be correlated with control premium since they are strong indicators of the crisis. Previous research has also shown a negative correlation between S&P 500 and control premium which is lower premium in times of lower S&P500 values

5.3 Limitations to the Study

Here, a few limitations will be presented that might have skewed the results in the opposite direction than intended.

- This thesis has only examined the technology sector, and is thereby not applicable on other industries. Technology is a dynamic and rapidly changing business displaying strong annual growth figures and thus differs from the remainder of the North American market.
- Multicollinearity have been present in our resulting model. This does not affect the actual prediction of the model as a whole but it is not possible to make conclusion concerning single variables' influence on the outcome.
- Since the variance of the data has been high it proved to be difficult to identify a trend in the dependent variable over time and correlate this with corresponding independent variables.
- Average monthly data have been use for the external correlation factors because of time limits and it is possible that the results would have differed if daily data had been used as with data concerning control premium.
- External variables have been chosen subjectively and only a few have been examined, all being leading indicators. Further factors would be favourable to test to get a more accurate and encompassed result.

5.4 Suggestions for Further Research

- More sectors could be included in the research as well as to examine why the technology subcategories differ from each other and display different trend patterns concerning control premium.
- To include both internal and external variables in the linear regression to find a more explanatory model.
- Test similar methodologies on other geographical markets. This thesis has been limited to North America and might explain patterns in other countries better than it did here.
- A *GARCH* model (*Generalized Autoregressive Conditional Heteroskedasticity*)

could have been preferred instead of linear regression due to non-constant variance within the sample (heteroscedatic). More programs and models for this specific kind of correlation would most probably favour the outcome.

- An interesting continuation would be to make the same analysis in a few years on when the crisis is considered over, which hopefully would show results of lower control premiums and thereby justify our conclusions of a rise of premiums during crisis.

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