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Testing Pecking Order and Trade Off Models on Mining and Software Industries in Canada

Master Thesis 30 hp

Abstract

This paper tests the two major capital structure theories; pecking order theory and trade off theory, in order to determine how the debt ratios in mining and software industries in Canada behave. We used a disaggregated and an aggregated model for the pecking order theory and a static adjustment model for the trade off theory. Our results indicate that there is weak support for the pecking order theory while the trade off theory is relevant for the software industry.

Keywords: capital structure, pecking order theory, trade off theory, disaggregated- and aggregated model and static adjustment model

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1. INTRODUCTION

Capital structure is one of the main fields in corporate finance today. Modern corporate capital structure theory originated with Modigliani and Miller's (1958) irrelevance theorem and numerous papers have been written on the subject ever since. Major areas of research within capital structure are what factors affect firms' debt levels and if there is a rationale in how firms choose between different financing options. Because of the constraints of Modigliani and Miller's theorem, in perfect capital markets and no taxes, other theories have been developed; trade off theory by Kraus and Litzenberger (1973) builds on Modigliani and Miller's theorem with taxes included and pecking order theory by Myers and Majluf (1984).

Trade off theory suggests that capital structure choices are made through a trade off between the pros and cons of different leverage levels and Myers (1984) introduced the idea that firms have a target debt level. Pecking order theory states that firms avoid external financing in general and external equity financing in particular. Since financing decisions does in fact affect firm value it is essential to understand the main drivers behind firms' financial choices.

The aim of this study is to test if the mining and software industries in Canada follow the pecking order theory and/or the trade off theory. Further, we want to test if there is a difference in capital structure decisions between the two industries.

Previous studies have tested if capital structure theories, such as pecking order and trade off theories, can accurately explain firms' financing decisions. Studies have been conducted on a number of different industries and indices, and cross-country comparisons have also been made (see Rajan and Zingales, 1995). The support for the theories varies depends on the specific sample and time period used. This leads us to choose two industries with very different asset structure as our sample.

The sample contains all listed mining and software firms in Canada. Firms within the mining industry have high levels of tangible assets that can be used as collateral when leveraging and therefore may have greater opportunities to leverage to a low cost. Opposite are software firms who have low levels of tangible assets and high levels of human capital and may thus have low debt capacity. Many previous studies testing pecking order and trade off theory have been conducted on an American sample. Canada is similar to the US in that it is also a market-based economy and these generally tend to use less debt and more equity (Dang, 2011). Since Canada and the US have the same main characteristics, we are able to compare our result with those of

earlier studies using a US sample. Furthermore, Canada is a large country with many mining firms; these suffice as a sample to test the theories on. Since Canada is a well-developed economy, data is easily accessible for firms in the country.

Model specifications to test the two theories are developed by e.g. Shyam-Sunder and Myers (1999), Helwege and Liang (1996), Frank and Goyal (2003), Flannery and Rangan (2006) and Dang (2011). Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) use a static trade off model in order to test the theory against pecking order theory. They conclude that the pecking order model is more robust than trade off model. Flannery and Rangan (2006) and Dang (2011) developed the trade off model further by creating a dynamic model that controls for more variables.

Our study complements previous studies and literature in the area by comparing two industries that are believed opposites in terms of level of tangible assets. It contributes with a wider understanding of capital structure within the mining and software industries and also how and possibly why industries differ in their financial decisions. Furthermore, we include size as a variable to be able to compare the differences between small and large firms.

As a summary of our result, we find support for the trade off theory in small software firms in Canada. This could be due to a high growth rate within these firms. The tests for pecking order theory provide weak support in both industries and the theory seems to be of minor importance in our sample. Finally, it is difficult to conclude whether our results for trade off theory are reliable or not due to large variation in coefficient values that depends on how leverage is defined.

2. THEORETICAL FRAMEWORK

Corporate capital structure choice first became a major area of research in the beginning of the late 1950's with the emergence of Modigliani and Miller's (MM) theorem (1958). The theorem states that in perfect market without taxes, firm value should be unaffected by the firm's financial decisions. It would not be possible to increase the value of a firm by changing how it is financed. In reality, the strong assumptions of no taxes and perfect capital markets, asymmetric information and bankruptcy costs rarely holds, which means that in most markets the MM theorem does not hold. The theorem does however provide an important theoretical base for what factors affect firm value and consequently affect firms' capital structure decisions.

The lack of real-life application of MM's theorem encouraged further research within the subject of corporate capital structure choice and through this first trade off theory and then pecking order theory evolved. The two theories can either be used as organizing frameworks that help explain the rationale behind firms' financial decisions, or they can be viewed as part of a much broader set of factors that define the capital structure of a firm. Frank and Goyal (2007) refers to them as point-of-view theories; both give us guidance in the design of models and tests. Neither model has a neither definite nor exact model formulation.
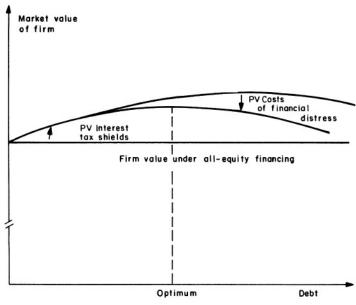
2.1. THE TRADE OFF THEORY

As the title suggests, it is a *trade off* between benefits and costs that is the main driver in this theory. There is a trade off between the rewards of a tax shield and the disadvantages of costs of debt. Taking on large debt ratios in order to get advantages from such a tax shield increases the risk of illiquidity, i.e. the firm are not able to pay the interest of the loan, and thereby increases the *cost of being in financial distress.*

Modigliani and Miller (1963) was the starting point for the traditional version of the static trade off theory when they introduced corporate income tax to the original irrelevance theorem. This new framework created a benefit of debt by a reduced tax payment. There is a benefit of financing with debt – a "tax discount" or a tax shield, as Kraus and Litzenberger (1973) stated. Myers (1984) developed the model by introducing a target debt-to-value ratio. He matches the debt tax shield against costs of being in financial distress. Shyam-Sunder and Myers (1999) and Dang (2011) among others have tested these models. Myer's (1984) target ends up in two approaches; static trade off (e.g. Shyam-Sunder and Myers, 1999) and dynamic trade off (e.g. Dang, 2011). This study uses the static model.

The key factors that decide leverage within a static trade off model are taxes and financial costs of debt. The managers have to choose a capital structure for the firm and an optimal level of leverage is decided to minimize costs and maximize benefits. In other words, marginal costs and marginal benefits must be in balance (Frank and Goyal, 2007).

Historically, debt has been used for financing long before the corporate tax was introduced to the model. Hence, we know that taxes cannot fully explain the adjustments to desired debt-equity ratio of the firm's capital structure (Frank and Goyal, 2007).

Figure 1: Trade Off Theory – The Balance Between Tax Shield and Cost of Financial Distress

A firm that maximizes its profit, which firms in general tend to do, operates on the margin, the top of the curve, in order to balance the tax shield and the costs of distress.

Source: Shyam-Sunder and Myers (1999)

2.2. THE PECKING ORDER THEORY

The pecking order theory was initially presented by Myers and Majluf (1984), as an attempt to explain the reasoning behind firms' financing decisions. It states that there exists a financing hierarchy where internal financing is preferred over external financing and external equity is only used as a last resort.

The theory's main objective is to emphasize the information asymmetry that exists between the managers of a company and potential investors where the managers have an information advantage, which in turns creates an adverse selection problem (Myers, 1984; Brealey et al, 2008, pp. 517-519). Adverse selection means that due to the information asymmetry, investors are unable to make accurate investment decisions based on the information the company conveys. Investors deal with the information asymmetry by interpreting the company's explicit financial

strategy, i.e. their use of leverage and equity, and make rational decisions accordingly. (Brealey et al, 2008, pp. 517-519)

Because of the adverse selection problem, certain types of debt are preferred over others; the issues of equity has major adverse selection problems, issues of debt less so, and internal financing, such as using retained earnings, has no adverse selection problem (Myers and Majluf, 1984). A promising investment opportunity with a large future payoff would raise a firm's value. To finance this, managers would not want to issue equity since they believe the firm will be worth a great deal more after the investment. If they issue equity, it would thus be underpriced, which is why potential investors interpret an equity issue as a negative sign that the existing firm shares are overpriced (Ross et al, 2010). Equity financing is therefore regarded as more risky by potential investors, who will require a higher rate of return after a release of new shares to be willing to hold this higher perceived risk. Firms prefer internal over external financing and only use equity as a last resort and a financing hierarchy is consequently created.

The theory builds on a few important assumptions where firm managers act in the interest of existing shareholders. These shareholder are passive and do not adjust current portfolio holdings in response to firms' financing decisions. There is also a mutual understanding between managers and investors on the existing information asymmetry where managers have the information advantage. The information asymmetry would prevail even if managers managed to convey important information to investors. Since the investors may not have complete understanding of the firm and market in which it acts they could not fully comprehend and interpret the information accurately (Myers and Majluf, 1984).

Contrary to what could initially be expected from pecking order theory due to its basic assumption of information asymmetry, previous research has found that large firms seem to follow the theory to a greater extent than small firms. Small firms should have greater information asymmetry costs, which in turn would make them more inclined to issue debt. However, in reality this does not seem to be the case (Frank and Goyal, 2003). According to Brealey et al (2008, pp. 520-521), large firms tend to have higher debt ratios and the pecking order theory seems to be the most accurate for large, mature firms that have access to the public bond markets.

3. METHOD

In order to tests the significance of pecking order and trade off theory, this section applies the theoretical framework in empirical models. Frank and Goyal (2003) provide us with the model specification for pecking order theory and Shyam-Sunder and Myers (1999) for trade off theory.

3.1. THE TRADE OFF MODEL

This model provides us with a mean reverting, target adjustment model that predicts and gives estimates of changes in debt ratios over time.

The notion of an optimal capital structure for each individual firm is what drives the trade off theory. According to the theory, every firm has a target debt level towards which it continually reverts (Graham and Harvey, 2001). Driven by the need for external funds the firm strays from its target debt level but is continually reverting back towards it since the managers attempt to reach or stay at the firm's optimal capital structure. In other words, by striving towards the firm's optimal capital structure, the debt ratio constantly changes. Following the framework of Shyam-Sunder and Myers (1999), the trade off theory is tested. The economic hypothesis is that every firm has an optimal debt ratio and move towards it, using both debt and equity.

Table 1: Summary of Variables – Target Adjustment Model

Variable	Definition
ΔD_{it}	Change in debt for firm i at time t
D_{it}^*	Unobservable target debt level for firm i at time t
D_{it-1}	Debt level in previous time period
β_{TO}	Speed of adjustment coefficient

A proxy for the target debt level is set to obtain an estimated target debt level for each firm. Two different target debt levels are estimated and tested to ensure we get as good proxy as possible. The target debt level is defined by (Shyam-Sunder and Myers, 1999):

Target 1 - Historical mean of the debt ratio[1]: *Debt ratio$_i$* multiplied by *total capital$_{it}$*

Target 2 - Rolling mean for debt ratio[2] from historical data (interval of three years):

Debt ratio$_{i(t-3)-t}$ multiplied by *total capital$_{it}$*

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[1] *Average total debt* for the whole time period divided with *average total asset* for the whole time period
[2] *Average total debt* for three-year-period divided with *average total assets* for three-year-period

The estimations are based on book debt amounts and to book ratios expressed as the ratio of long-term debt to the book value of assets (Shyam-Sunder and Myers, 1999).

Specifications of the static trade off theory – a target adjustment model:

$$\Delta D_{it} = \alpha + \beta_{TO}(D_{it}^* - D_{it-1}) + \varepsilon_{it}$$

For the firms to have a debt ratio that is mean reverting around target debt level, the following must hold:

$\beta_{TO} > 0$ Denoting adjustment towards the target

$\beta_{TO} < 1$ Implying positive adjustment costs

The theory holds if the adjustment coefficient confidence interval lies within the interval above and the constant is close to zero (Shyam-Sunder and Myers, 1999).

The hypothesis tested is thus:

$$H_0: 0 < \beta_{PO} < 1$$

In other words, do we have a mean reverting process that have an adjustment coefficient that lies between zero and unity?

The adjustment coefficient estimates the proportion of current change in debt from the target debt level. If the firm could adjust to their target debt level instantly, the adjustment coefficient must be equal to unity. A coefficient value of zero would indicate no adjustment towards the target debt level. According to Dang (2011), we have a relatively quick adjustment towards the mean when the coefficient value is between 0.3 and 1. Due to transaction costs when the coefficient is between zero and unity the firm has debt adjustment costs when adjusting to target debt level (Dang, 2011).

By not testing a target adjustment model where the target is determined by firm characteristics, we deviate from Shyam-Sunder and Myers (1999). The method used is fixed-effects panel regression, same as in pecking order theory, because of the apparent problem with autocorrelation in the sample.

3.2. THE PECKING ORDER MODEL

According to pecking order theory, after an initial public offering (IPO), a company will rarely issue new equity since there are major adverse selection costs with this type of financing and this forms the basis of our hypothesis. If the pecking order holds, the firm's financial deficit or surplus should be covered by an equally large increase or decrease in corporate debt, as suggested by Shyam-Sunder and Myers (1999). By constructing a financial deficit variable from its components it is possible to evaluate the subsequent deficit's impact on change in debt. Financial deficit arises when a company has had cash outflow due to pay-out of dividends, investments, changes in working capital and/or internal cash flow. The economic hypothesis is that firms do not use equity and finance deficits (use surpluses) with new debt (to buy back debt). There is no optimal debt ratio as in the trade off theory.

Table 2: Summary of Variables – Pecking Order Model

Variable	Definition
DEF_{it}	Financial deficit for firm i at time t
DIV_{it}	Dividends paid out for firm i during time t
I_{it}	Investments for firm i during time t
ΔWC_{it}	Change in working capital for firm i during time t
IC_{it}	Internal cash flow for firm i during time t
ΔD_{it}	Issue of new debt for firm i at time t
ΔE_{it}	Issue of new equity for firm i at time t

Consequently the firm's financial deficit consists of:

$$DEF_{it} = DIV_{it} + I_{it} + \Delta WC_{it} - IC_{it}$$

If a firm has more cash inflow than outflow, the deficit dependent variable is positive and a surplus. The current portion of long-term debt could be included as a variable in the model as done by Shyam-Sunders and Myers (1999). However, Frank and Goyal (2003) found it to have a minimal impact on companies' financing decisions and has therefore been excluded from the current model. If there is a financial deficit it needs to be covered and this can be achieved either by internal or external financing, i.e. issue of new debt or equity.

$$DEF_{it} = \Delta D_{it} + \Delta E_{it}$$

The pecking order states that deficits should be completely financed through the use of debt. If there is a surplus instead, this expects to be used to pay off debt.

The aim is to test both a disaggregated and aggregated model. The former model is used to evaluate the variables' impact on the issue of new debt to cover a deficit and thereby justify the aggregation step. The disaggregated model would thus be:

$$\Delta D_{it} = \alpha + \beta_1 DIV_{it} + \beta_2 I_{it} + \beta_3 \Delta WC_{it} - \beta_4 IC_{it} + \varepsilon_{it}$$

If all variables are found to be statistically significant and a financial deficit is completely financed by debt there will be a one-to-one change between the dependent variable and each independent variable with the hypothesis being:

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 1$$

and $\alpha = 0$, where a rejection of H_0 at the chosen significance level means the study fails to find support for pecking order theory.

The aggregated model is:

$$\Delta D_{it} = \alpha + \beta_{PO} DEF_{it} + \varepsilon_{it}$$

where the hypothesis is that the potential deficit is financed completely by debt so there is a one-to-one relationship between the two:

$$H_0: \beta_{PO} = 1$$

and $\alpha = 0$. This hypothesis remains even if there is a surplus instead of a deficit. The surplus is then used to pay off existing debt.

The chosen method is fixed-effects panel regression, as used by Frank and Goyal (2003). Wooldridge autocorrelation test was performed and since there were autocorrelation in the sample fixed-effects regression is used. Frank and Goyal (2003) have tested different approaches and not found any major differences in results and conclusions between them, if you accept the classical error assumptions fixed-effects panel regression can be used. The two hypotheses, $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 1$ and $\beta_{PO} = 1$, are also tested using a Wald test.

4. DATA

The study contains an unbalanced panel of all active software and mining firms listed on the four Canadian stock markets for two or more years during the period 1990 to 2011 and their yearly statistics. All firms that have been active during the time period in each industry are included in the sample to avoid survivorship bias. We also minimize cross-sectional problems by only including companies from one country. The yearly financials are retrieved from the database Thomson Datastream who gathers and presents information from numerous sources, the underlying source for the data used in this study is Worldscope. Canadian yearly inflation rates are retrieved from Bank of Canada.

The complete dataset contains 94 mining and 22 software firms, see Appendix for full list of firm names. The sample period starts at 1990 since previous research have shown that firms' capital structure differ between the 1980's and 1990 onwards (Frank and Goyal, 2003). Furthermore, only one firm in the sample has data that starts before the time period and none of the firms are liquidated or acquired within the time period of our sample. The one percent of firms with the highest and lowest value of average net assets is removed to avoid these to have an abnormally large effect on the estimations.

Shyam-Sunder and Myers (1999) exclude firms that have had major mergers during the time-period. Major mergers trigger a change in the capital structure that affects the results. We checked for this but did not find any major mergers in our dataset that needed to be taken in to consideration.

All firms in the sample have the same annual fiscal year, where the data used is extracted from their cash flow and income statements and balance sheets. A majority of the observations are expressed as ratios, but those values that are not are deflated by the yearly Canadian inflation rate to be expressed in nominal 1990 Canadian dollars.

In general, scaling is performed in both models to avoid problems with heteroskedasticity as well as controlling for firm size. However, the pecking order model does not require it and therefore regression with both scaled and ordinary variables is performed, but only regressions with un-scaled variables are reported. If the scaling variable, in this case book value of net assets, is correlated with any of the variables in the equation it could have a major impact on the estimated coefficient, which is why scaling should be performed with precaution. (Frank and Goyal, 2003; Shyam-Sunder and Myers, 1999; Helwege and Liang, 1996) Previous studies by Frank and Goyal

(2003) and Shyam-Sunder and Myers (1999) have tried scaling with other variables such as the sum of book debt plus market equity and by sales, but not found any significant difference in results and conclusions between the methods.

Regressions will include year dummies as independent variables to remove time trends in both models, as done by Shyam-Sunder and Myers (1999). The tests controlling for firm size and industry effects in both models will be performed by including interaction terms; size dummy multiplied by the independent variable and industry dummy multiplied by the independent variable, to see the effect size and industry have on the significance of the models. This technique deviates from the technique by Frank and Goyal (2003), who instead divides the data into two groups, large and small size firms, based on their median book value of average net assets.

Our study differs from Frank and Goyal's (2003) since we have a smaller sample size and only study two industries due to time constraints. Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) also test a conventional model to further support their results from the pecking order and trade off theories tests. We have chosen not to include this model in our report.

5. EMPIRICAL FINDINGS AND ANALYSIS

5.1. DESCRIPTIVE STATISTICS

In table 3 we present the summary statistics for the whole sample and both industries.

Table 3: Summary Statistics

Software and mining industries. Descriptive statistics for a sample of 116 firms in the mining and software industries in Canada for year endings 1990, 1995, 2000, 2005 and 2010. The book debt ratio is the ratio of total debt as a fraction of total assets. Values are reported in Canadian Dollar.

	Software industry					Mining industry				
	1990	1995	2000	2005	2010	1990	1995	2000	2005	2010
No. Observations	1	3	10	20	22	0	1	27	70	89
Book Value of Debt Ratio										
Mean	0	0.189	0.052	0.079	0.047	-	0.447	0.047	0.336	0.336
Median	0	0.236	0	0	0	-	0.447	0.004	0.043	0.027
Min	0	0	0	0	0	-	0.447	0	0	0
Max	0	0.332	0.479	1.167	0.474	-	0.447	0.283	3.146	5.599
Book Value of Total Assets										
Mean	78 424	74 326	28 100	47 255	173 203	-	37 444	102 918	181 135	219 567
Median	78 424	72 604	10 575	13 289	59 160	-	37 444	30 096	20 917	35 258
Min	78 424	28 751	0	0	635	-	37 444	6 634	632	205
Max	78 424	123 344	252 361	773 599	2 462 594	-	37 444	719 251	2 808 366	3 003 021
Book Value of Debt										
Mean	0	13 073	2 467	4 793	13 930	-	16 719	5 245	13 267	38 197
Median	0	17 124	0	0	0	-	16 719	57	1 555	411
Min	0	0	0	0	0	-	16 719	0	0	0
Max	0	22 096	41 480	183 546	321 213	-	16 719	34 834	177 979	754 007

When comparing the median and the mean values it is apparent that the data is skewed. There is a large difference between the two values where the median usually has a considerably lower value than the mean. The median is therefore a more appropriate statistic to use when the sample consist of a few high-magnitude observations that drive the sample.

It is worth noting that the median values on book value of debt, and therefore also book value of debt ratio, is zero for all chosen year endings except 1995 for software firms. There are thus a few firms that stand for the majority of leveraging in the already small sample. Because the data is heavily skewed, the results need to be interpreted with caution.
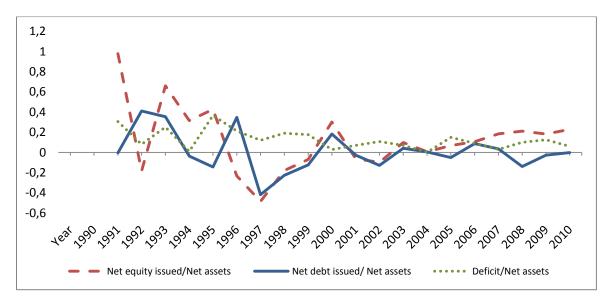
Figure 2: Average Net Debt Issued, Net Equity Issued and Financial Deficit during the Time Period 1990-2011

Since the pecking order theory predicts firms to solely rely on debt, the financial deficit should track net debt issues more closely than net equity issues. Looking at the graph in Figure 2, this does not seem to be the case. Neither net debt nor net equity issuance seem to track the deficit well, instead firms use a mixture of both to cover their financial needs. Interestingly, both net debt and net equity issuance decreases from 1996 to 1999, which means firms pay off part of the debt and repurchase equity during that time period. In order to reach an optimal level of debt in trade off theory, the firm has the option to either increase or pay off debt. According to pecking order theory, if firms achieve a surplus instead of a deficit in their cash flow they use this to pay off some of the existing debt. This is done between 1996 and 1999.

Table 4: Corporate Cash Flow

All figures retrieved from Datastream for year endings in 1990, 1995, 2000, 2005 and 2010. *Financial deficit* equals the sum of dividends, investments and change in working capital reduced by internal cash flow. *Long-term debt issued* equals long-term debt issuance reduced by long-term debt reduction. *Net equity issued* equals equity issuance reduced by equity repurchasing. *Net external financing* equals the sum of long-term debt issued and net equity issued.

	Average Cash Flows Divided by Total Assets				
Year	1990	1995	2000	2005	2010
No. Observations	1	5	37	91	111
Dividends	0.076	0	0	0.002	0.003
Investments	0	0.122	0.046	0.065	0.073
Working Capital	.	− 0.085	0.103	0.010	0.071
Internal Cash Flow	.	− 0.004	0.015	0.067	0.056
Financial Deficit	.	0.010	0.151	0.002	0.089
Long-term Debt Issued	.	− 0.030	− 0.106	0.004	− 0.019
Net Equity Issued	.	0.257	− 0.060	0.005	0.129
Net External Financing	.	0.227	− 0.166	0.009	0.110

When looking at the corporate cash flows in table 4 we can see that dividends are only a fraction of firms' cash flows. Also, both long-term debt and net equity decreased in the year 2000. This should be due to firms buying back equity and paying off debt.

Since previous studies that we refer to have used a different database (Compustat) than the one used to retrieve the data in this study (Datastream), there may be slight differences in how the variables are defined. This could potentially affect our results, but should not be major enough to affect the conclusions. To make our definitions as clear as possible, all variables are defined in Appendix.

We have the same problem with biasness towards listed firms in our sample as Shyam-Sunder and Myers (1999). By using Datastream as a resource our sample only contains publicly traded firms. This means that our sample excludes private and unlisted firms and thereby is biased. The question we need to think trough is if we can apply our result to the chosen industries as a whole or just publicly traded. Therefore, it is s possibility that our sample does not represent the mining and software industries as a whole.

5.2. THE TRADE OFF THEORY

By following the methodology of *basic tests* by Shyam-Sunder and Myers (1999), the trade off theory is tested. Test results for the target adjustment model are presented in Panel A and Panel

B of Table 5. Firms with gaps[3] in the necessary cash flows and outliers have been removed. In Appendix, correlation tables and a list of all firms are presented.

Table 5: Target Adjustment Model

Mining and software industries. The sample period is 1990-2011. The estimated regression is: $\Delta D_{it} = \alpha + \beta_{TO}(D_{it}^* - D_{it-1}) + \beta_1 1991 + \beta_2 1992 + \cdots + \beta_{21} 2011 + \beta_{22} SIZE + \beta_{23} IT + \beta_{24} SIZE\_DIFF + \beta_{25} IT\_DIFF + \varepsilon_{it}$.
Panel A provides us with results for Target 1 and Panel B for Target 2. ΔD_{it} has two definitions: *debt issued* (long-term debt issuance – long-term debt reduction) and *change of net debt* (total debt – cash). D_{it}^* has two definitions: Target 1 is the *debt ratio multiplied with total capital*, Target 2 equals a *three year rolling average of debt ratio multiplied with total capital*. Debt ratio is the total debt divided with the total assets for firm *i*. D_{it-1} is the *debt level for the previous time period*, i.e. long term debt level at time *t-1*. $(D_{it}^* - D_{it-1})$ is the *difference between target and debt level for previous time period*. All variables are scaled with net assets (total capital - deferred tax- minority interests - long term debt). 1990 is the base year and 1991, 1992, …, 2011 are year dummies for years 1991 to 2011. *SIZE* is a *size dummy* where the reference group is small firms with average net assets above 40 000 Canadian Dollar. *IT* is an *industry dummy* where the mining industry is the reference group. The interaction variables $SIZE\_DIFF$ and IT_DIFF are the *dummy variables multiplied by* $(D_{it}^* - D_{it-1})$ for target 1 and 2. All variables are in book value. Definitions are taken from Datastream. The tests are estimated with an Ordinary Least Square fixed-effects panel regression.

Panel A	Target 1 – Target Adjustment Model with Size and Firm Dummies					
Industry	Mining Industry		Software Industry		Both industries	
Variable	Debt Issued/ Net Assets	Change in Net Debt/ Net Assets	Debt Issued/ Net Assets	Change in Net Debt/ Net Assets	Debt Issued/ Net Assets	Change in Net Debt/ Net Assets
	(1)	(2)	(3)	(4)	(5)	(6)
Constant, α	0.099*	0.650	0.164**	-0.024	0.122*	0.064
(std. err)	(0.030)	(0.479)	(0.069)	(0.211)	(0.028)	(0.249)
Difference, β$_{TO}$ $(D_{it}^* - D_{it-1})$	0.001	1.300*	0.025*	0.482*	0.234**	0.999*
(std. err)	(0.022)	(0.013)	(0.004)	(0.010)	(0.102)	(0.130)
Confidence Interval	(-0.042; 0.044)	(1.270; 1.323)	(0.016; 0.033)	(0.459; 0.505)	(0.031; 0.438)	(0.739; 1.260)
SIZE_DIFF, β$_{24}$	0.238**	-0.313*	-0.385	-0.863	-0.233**	0.328**
(std. err)	(0.110)	0.118	(0.464)	(1.139)	(0.104)	(0.136)
IT_DIFF, β$_{25}$	.	.	.	.	0.024	-0.845*
(std. err)	.	.	.	.	(0.022)	(0.033)
R^2 within	0.046	0.581	0.133	0.784	0.044	0.758
R^2 between	0.000	0.006	0.013	0.298	0.008	0.031
R^2 overall	0.029	0.404	0.102	0.728	0.024	0.684
N	571	168	164	101	735	269
	* = significant at 1% level,		** = significant at 5% level,		*** = significant at 10% level	

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[3] Since the trade off model requires a continuous dataset, firms with gaps in the net asset variable are removed from the sample.

Panel B	Target 2 – Target Adjustment Model with Size and Firm Dummies					
Industry	Mining Industry		Software Industry		Both industries	
Variable	Debt Issued/ Net Assets	Change in Net Debt/ Net Assets	Debt Issued/ Net Assets	Change in Net Debt/ Net Assets	Debt Issued/ Net Assets	Change in Net Debt/ Net Assets
	(1)	(2)	(3)	(4)	(5)	(6)
Constant, α	0.384*	0.149	0.230*	0.645	0.033	0.666
(std. err)	(0.051)	(0.141)	(0.065)	(0.489)	(0.067)	(0.508)
Difference, β_{TO} $(D_{it}^{*} - D_{it-1})$	0.264	1.105*	0.045*	0.509*	0.098	1.025*
(std. err)	(0.195)	(0.011)	(0.004)	(0.009)	(0.075)	(0.086)
Confidence Interval	(-0.124; 0.653)	(1.081; 1.128)	(0.038; 0.053)	(0.489; 0.529)	(-0.051; 0.246)	(0.852; 1.197)
SIZE_DIFF, β_{24}	-0.169	-0.066	-0.781***	-1.037	0.170	0.115
(std. err)	(0.208)	(0.095)	(0.392)	(0.813)	(0.207)	(0.092)
IT_DIFF, β_{25}	.	.	.	.	-0.223	-0.630*
(std. err)	.	.	.	.	(0.194)	(0.024)
R^2 within	0.304	0.598	0.180	0.855	0.201	0.831
R^2 between	0.842	0.001	0.041	0.562	0.717	0.046
R^2 overall	0.148	0.445	0.130	0.809	0.100	0.771
N	510	156	148	91	658	247
	* = significant at 1% level,		** = significant at 5% level,		*** = significant at 10% level	

5.2.1. MINING INDUSTRY

Both Panel A and B of Table 5 provide us with a significant target adjustment coefficients for the dependent variable *change in net debt* (see column (2) for each panel) for the mining industry. However, we reject the null hypothesis of the estimated coefficient following a mean reverting process. The confidence interval of the coefficient is above zero, indicating that we have a mean reverting process. Further, the confidence interval is above unity which may show that there are no adjustment costs for the mining industry in Canada.

The interaction effect of size, where small firms are the reference group, show no significance estimates (column (1) and (2)) and therefore we cannot interpret the value.

5.2.2. SOFTWARE INDUSTRY

Panel A of Table 5 provides us with robust results for the software industry when Target 1 is a proxy for the optimal debt level. The estimated target adjustment coefficient is significant and lies within the theoretical interval that is required for the mean reverting model, $0<\beta<1$. However, the dependent variable *debt issued* has a low value of 0.025, in comparison to Shyam-Sunder and Myers (1999) that present a significant value of 0.3. Column (4) provides a significant coefficient of 0.485 which is closer to their study. Panel A, column (3), *debt issued* as a dependent variable has an R squared value of 0.133, which is close to the results of Shyam-Sunders and Myers (1999).

The R squared values for column (2) and (4) (Panel A) equals 0.581 and 0.784, which is higher than the value of Shyam-Sunder and Myers (1999) and might indicate spurious data.

Surprisingly, Target 2 (see Panel B of Table 5) for software industry also has significant coefficients of 0.045 and 0.509 (see column (3) and (4)) and it is within the 95% confidence interval zero to unity, which deviates from the study by Shyam-Sunder and Myers (1999). They did not have any significant estimates for the rolling average of debt ratio as a proxy for the target.

As predicted Target 1 have a constant that is close to zero for dependent variable *change in net debt*, which is also found in earlier research by Shyam-Sunder and Myers (1999), Auerbach (1985) and Jalilvand and Harris (1984). This result indicates that firms in the sample do not operate below their optimal debt level.

We conclude that the adjustment target model is robust and statistically significant for software industries in Canada irrespective of what dependent variable we use. Our results show that there is a speed of adjustment towards a targeted debt level within this industry.

Target 2 in Panel B of Table 5 column (3), dependent variable *debt issued* show significant values for the interaction effect of size. The coefficient is significant at ten percent level. This result indicates that there is a significant difference between small and large software firms. Large firms tend to have a much lower coefficient than small firms, the difference in size coefficient equals minus 0.781, and thereby large software firms have a target adjustment coefficient that is below zero. The hypothesis states that the coefficient needs to be larger than zero in order to have a mean reverting process. If not, the theory implies that there is no movement towards it optimal debt level. Due to these findings there might be reason to state that small software firms follow the theory better than large firms. Small software firms, with Target 2, tend to have a movement towards it optimal debt level according to the trade off theory.

Columns (5) and (6) of Table 5, presents the result from the model where we include interaction effects for size and the specific industry. Target 1 has significant target adjustment coefficients, however only the regression with the dependent variable *debt issued* (column (5)) falls within the confidence interval that support the mean reverting process in trade off theory. For the same dependent variable, we show significant results for the interaction effect size. This result supports the statement earlier that small software firms has a significant higher speed of adjustment towards it optimal debt ratio than large firms within the software industry.

Target 1 and dependent variable *change in debt* (column (6)) show significant results for both size and industry as an interaction effect. This indicates that software firms support the trade off theory.

Due to specific industry and country effects, we are not able to make wider conclusions for other industries or countries

5.2.3. ANALYSIS TRADE OFF THEORY

We have found some significant evidence that firms, software in particular, seem to adjust towards a targeted debt ratio in order to maintain an optimal capital structure and the adjustment target model were used. On the other hand, we also present some result that does not give support for the theory, this is in line with the result by Baker and Wurgler (2002) and Welch (2004). They reject that firms have a mean reverting process towards a targeted debt level.

When analysing the trade off theory, the most important information we are given concerns the coefficient. A significant coefficient determined by a mean reverting process indicates the speed of adjustment. According to Graham and Harvey (2001), 81% of the firms strive to reach their optimal debt level at all times and the optimal debt level demonstrate that there is a trade off between tax benefits and costs of debt (Frank and Goyal, 2007). If the firm deviates from the targeted optimal debt level it adjusts its debt ratio by debt issuance or debt reduction. However, this adjustment is followed by a transaction cost which might explain the speed of adjustment; in order to have low costs of adjustment and instantanious adjustment towards the optimum debt ratio, the significant coeffecient equals unity. A coeffecent above 0.3 is suggested to be a quite quick speed of adjustment according to Dang (2011) and Flannery and Rangan (2004).

The literature presents many studies that test the model on US firms and the overall findings are that firms in the US tend to have a quite low speed of adjustment. Similar to the US, Canada is a market-based economy, thus we expect the speed of adjustment coefficients to be low. Contrary, Germany and France are bank-based economies and have higher overall coefficients according to Dang (2011). He claims that firms in bank-based countries are assumed to have a closer relationship with banks and acquiring debt faster and to a lower cost. Altogether, lower costs of debt should lead to a high speed of adjustment to the optimal debt level, whereas a low speed of adjustment with the coefficient close to zero, might indicate a higher costs of debt.

Overall, small firms tend to grow at a higher rate than large firms. According to Alti (2004), the growth rate could affect the consistency of the theory where fast growing companies have reduced cost of adjusting to their optimal debt. In order to conclude why small software firms in

our sample tend to follow the theory more accurately than large firms, one approach might be to check if small software companies have high growth rates or at least higher growth rates than large firms in the software and mining industries. This might be a subject for further research.

According to earlier studies, there are two important variables that are used as a proxy for the target optimum debt level. First, we use a proxy of historical average of the debt ratio, which we expect to have a significant result as this is what has previously been found. Second, a rolling average of the debt ratio does not provide us with significant results in the literature. (Shyam-Sunders and Myers, 1999)

There is two approaches for modeling the trade off theory. The static adjustment model, used in this study and the dynamic model, which uses lags and therefore is more sensitive to changes. Accordning to Dang (2011), estimations done with a dynamic process delivers a more accurate outcome than the static model. On the other hand, it is appropriate to test a static model against the pecking order theory (Shyam-Sunder and Myers, 1999). Therefore, it is essential to know the purpose of the modeling beforehand in order to chose an appropriate approach.

To determine the robustness of the trade off theory in general, we should analyse the period when corporate tax was introduced to Canada in 1917. Only then can we really understand and get strong evidence of how well the trade off theory describes the capital structure of a firm.

5.3. THE PECKING ORDER THEORY

By following the methodology by Frank and Goyal (2003), the pecking order theory is tested. Test results for the pecking order theory model specification are presented in three tables: Table 6 – Aggregated model, Table 7 – Aggregated model with size and firm dummies and Table 8 – Disaggregated model. In Appendix, additional results, correlation tables and a list of firms are presented.

Table 6: Pecking Order Tests on Aggregated Model

Mining and software industries. The sample period is 1990-2011. The estimated regression is: $\Delta D_{it} = \alpha + \beta_{PO} DEF_{it} + \beta_1 1991 + \beta_2 1992 + \cdots + \beta_{21} 2011 + \varepsilon_{it}$, where the dependent variable, ΔD_{it}, has two definitions; *long-term debt issued* (long-term debt issuance – long-term debt reduction) and *total debt issued* (long-term + short-term debt). DEF_{it} is the *financial deficit* (dividends + investments + change in working capital – internal cash flow). 1990 is the base year and, 1991, 1992, …, 2011 are *year dummies* for the years 1991 to 2011. All variables are in book value. Definitions are taken from Datastream. The tests are estimated with an Ordinary Least Square fixed-effects panel regression. All variables are deflated by yearly Canadian inflation rates reported by Bank of Canada.

	Aggregated Model					
Industry	Software Industry		Mining Industry		Both Industries	
Variable	Long-term Debt Issued	Total Debt Issued	Long-term Debt Issued	Total Debt Issued	Long-term Debt Issued	Total Debt Issued
	(1)	(2)	(3)	(4)	(5)	(6)
Constant, α	-54484.83*	-43953.82*	-422.339	-639.512	-2708.52	-2726.121
(robust std. err)	(6186.019)	(5330.202)	(1604.214)	(1875.583)	(3376.076)	(3107.359)
DEF, β_{PO}	0.152*	-0.026	0.230**	0.203**	0.160*	0.061
(robust std. err)	(0.023)	(0.033)	(0.092)	(0.098)	(0.051)	(0.084)
N	214	215	715	716	929	931
R^2 (overall)	0.027	0.055	0.227	0.148	0.034	0.008
R^2 (between)	0.810	0.115	0.476	0.499	0.163	0.054
R^2 (within)	0.073	0.063	0.173	0.101	0.054	0.022
H_0: $\beta_{PO} = 1$	0.000	0.000	0.000	0.000	0.000	0.000

* = significant at 1% level,   ** = significant at 5% level,   *** = significant at 10% level

As can be seen in Table 6, the results from fixed-effects panel regression do not provide any strong support for the theory for software firms, independent of what dependent variable is used ($\beta_{PO} = 0.152 \text{ and} - 0,026$). Earlier, we predicted the constants to be zero under the pecking order theory; this hypothesis is rejected at a one percent significance level by the software firm sample, which further emphasize that this part of our sample does not support the theory. A significant, negative coefficient, as we have in all regressions for software firms in tables 6-8, indicates that those firms constantly cover their deficits with some other type of financing than debt. Their debt levels are persistently below those of their deficits.

The major consequence with using un-scaled variables is that the constants are very large and not comparable to those of Frank and Goyal (2003) and Syam-Sunder and Myers (1999), as they use only scaled variables. However, we are only interested in if the constant is significantly different from zero and not its absolute value, so this does not affect our interpretations or conclusions.

The mining industry does provide some support for the theory ($\beta_{PO} = 0.230 \text{ and } 0.203$), similar to the results reported by Frank and Goyal (2003) with deficit coefficients of around 0.2 and insignificant constant values. The pecking order hypothesis of the financial deficit being covered by an equally large increase in debt, H_0: $\beta_1 = 1$, is however rejected using a Wald's test at a one

percent significance level for all regressions, columns (1) to (6). The R squared is low, ranging from 0,063 to 0,173, for the regressions where the sample of mining industry has a higher R squared than the software sample. However, it is not lower than for other similar studies with gaps permitted in the relevant cash flows.

All regressions in this report have been run with both scaled and un-scaled variables, but only the scaled variable regressions are reported. Observing the sign and magnitude of the correlations between the scaled key variables (see Appendix A1.2) there seem to be problems with multicollinearity in the software industry sample; investments and change in working capital for instance have a correlation of 0.993 compared to -0.044 when the variables are left unscaled. This could be the reason that the regressions with scaled variables get abnormally high R squares (0.9<) and we have a problem with spurious data, which supports our decision to only use un-scaled variables. Using robust standard errors also reduces our need for scaling.

Table 7: Pecking Order Tests on Aggregated Model with Size and Firm Dummies

Mining and software industries. The sample period is 1990-2011. The estimated regression is: $\Delta D_{it} = \alpha + \beta_{PO} DEF_{it} + \beta_1 SIZE + \beta_2 IT + \beta_3 SIZE\_DEF + \beta_4 IT\_DEF + \beta_5 1991 + \beta_6 1992 + \cdots + \beta_{25} 2011 + \varepsilon_{it}$, where the dependent variable, ΔD_{it}, has two definitions; *long-term debt issued* (long-term debt issuance – long-term debt reduction) and *total debt issued* (long-term + short-term debt). DEF_{it} is the *financial deficit* (dividends + investments + change in working capital – internal cash flow). *SIZE* is a *size dummy* where the reference group is small firms with average net assets above 40 000 Canadian Dollar. *IT* is an *industry dummy* where the mining industry is the reference group. The interaction variables *SIZE_DEF* and *IT_DEF* are the *dummy variables multiplied by deficit*. 1990 is the base year and 1991, 1992, …, 2011 are *year dummies* for years 1991 to 2011. All variables are in book value. Definitions are taken from Datastream. The tests are estimated with an Ordinary Least Square fixed-effects panel regression. All variables are deflated by yearly Canadian inflation rates reported by Bank of Canada.

	Aggregated Model with Size and Firm Dummies					
Industry	Software Industry		Mining Industry		Both Industries	
Variable	Long-term debt issued	Total debt issued	Long-term debt issued	Total debt issued	Long-term debt issued	Total debt issued
	(1)	(2)	(3)	(4)	(5)	(6)
Constant, α	-55074.4*	-44567.88*	-227.351	-980.987	-2863.994	-1642.095
(robust std. err)	(7284.483)	(5189.5)	(1514.829)	(179614)	(3176.053)	(2830.45)
DEF, β_{PO}	0.410	0.255	-0.006	-0.041**	-0.008	-0.037
(robust std. err)	(0.505)	(0.520)	(0.029)	(0.018)	(0.044)	(0.031)
SIZE_DEF, β_3	-0.258	-0.291	0.264*	0.272**	0.250**	0.255**
(robust std. err)	(0.487)	(0.530)	(0.029)	(0.107)	(0.097)	(0.100)
IT_DEF, β_4	.	.	.	.	-0.134	-0.283*
(robust std. err)	.	.	.	.	(0.099)	(0.106)
N	214	215	715	716	929	931
R^2 (overall)	0.027	0.054	0.247	0.166	0.057	0.073
R^2 (between)	0.738	0.072	0.502	0.523	0.335	0.470
R^2 (within)	0.073	0.064	0.194	0.117	0.063	0.049
$H_0: \beta_{PO} = 1$	0.256	0.167	0.000	0.000	0.000	0.000
$H_0: B_3 = 1$	0.017	0.024	0.000	0.000	0.000	0.000

* = significant at 1% level,   ** = significant at 5% level,   *** = significant at 10% level

Pecking order theory builds on the assumption of an information asymmetry on the market where firms with high information asymmetry, such as small firms, have larger incitement to use debt instead of equity (Helwege and Liang, 1996). When testing the hypothesis this does not however seem to be the case for the mining industry. The interaction coefficients for large mining firms are positive and significant for the mining industry. Subsequently, large firms offer greater support for the theory than small firms in the mining industry. The hypothesis $H_0: \beta_1 = 1$ is however rejected at a one percent significance level.

None of the deficit coefficients for the software industry are significant in table 7. However, the hypothesis of a deficit coefficient equal to zero cannot be rejected at a ten percent significance level for small firms in the industry. This is the opposite of the results from the mining industry and the industries thus do not display the same tendency.

Table 8: Pecking Order Tests on Disaggregated Model

Mining and software industries. The sample period is 1990-2011. The estimated regression is: $\Delta D_{it} = \alpha + \beta_1 DIV_{it} + \beta_2 I_{it} + \beta_3 \Delta WC_{it} - \beta_4 IC_{it} + \beta_5 1991 + \beta_6 1992 + \cdots + \beta_{25} 2011 + \varepsilon_{it}$, where: ΔD_{it}, has two definitions; *long-term debt issued* (long-term debt issuance – long-term debt reduction) and *total debt issued* (long-term + short-term debt). DIV_{it} is *cash dividends* paid, I_{it} is the *investments*, ΔWC_{it} is the *change in working capital* and IC_{it} the *internal cash flow*. 1990 is the base year and 1991, 1992, …, 2011 are year dummies for years 1991 to 2011. All variables are in book value. Definitions are taken from DataStream. The tests are estimated with an Ordinary Least Square fixed-effects panel regression. All variables are deflated by yearly Canadian inflation rates reported by Bank of Canada.

	Disaggregated Model					
Industry	**Software Industry**		**Mining Industry**		**Both Industries**	
Variable	**Long-term Debt Issued**	**Total Debt Issued**	**Long-term Debt Issued**	**Total Debt Issued**	**Long-term Debt Issued**	**Total Debt Issued**
	(1)	(2)	(3)	(4)	(5)	(6)
Constant, α	-62921.18*	-36798.08*	-788.648	-297.862	-2826.183	-2730.611
(robust std. err)	(13920.68)	(7776.399)	(1011.289)	(1699.127)	(3593.629)	(3550.922)
DIV, β_1	0.798	-0.349	0.313	-0.079	0.147	-0.344
(robust std. err)	(0.622)	(0.479)	(0.487)	(0.551)	(0.198)	(0.368)
I, β_2	0.815*	2.090*	0.282**	0.226	0.236	0.148
(robust std. err)	(0.225)	(0.688)	(0.128)	(0.139)	(0.116)	(0.158)
Δ wc, β_3	0.052	-0.257	0.221***	0.205	0.151***	0.050
(robust std. err)	(0.085)	(0.219)	(0.115)	(0.148)	(0.086)	(0.149)
IC, β_4	-0.287*	-0.280**	-0.215***	-0.151	-0.154*	-0.053
(robust std. err)	(0.071)	(0.123)	(0.127)	(0.102)	(0.039)	(0.037)
N	214	215	715	716	929	931
R^2 (overall)	0.024	0.081	0.223	0.144	0.040	0.018
R^2 (between)	0.835	0.038	0.419	0.428	0.175	0.102
R^2 (within)	0.079	0.098	0.178	0.104	0.056	0.025
$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 1$	0.000	0.000	0.000	0.000	0.000	0.000
	* = significant at 1% level,		** = significant at 5% level,		*** = significant at 10% level	

In the theoretical section, assumptions on the components of the independent variable financial deficit were made. To justify the aggregation step the disaggregated model is tested to evaluate the impact of each component on financial deficit. As can be seen in Table 8, the disaggregated model has approximately the same R squares and subsequently the same explanatory power as the aggregated model.

The null hypothesis, $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 1$, of all independent variables having a one-to-one impact on the dependent variable, is statistically rejected at a one percent significance level for all regressions in Table 7, which has been tested with Wald tests. The results in column (1) are quite supportive of the aggregation step. However, the other columns do not offer such compelling support. Frank and Goyal (2003) found equal weak support and our coefficients are similar to theirs both in sign and magnitude when they allow for gaps in reported cash flow data.

Increases in investments have a positive impact on debt issuance, as do changes in working capital which may be due to timing issues. When firms borrow money these are usually deposited into bank accounts before being used and this increases working capital in the short-run. Dividends have a positive impact on the dependent variable long-term debt issuance, but negative impact on total debt, i.e. short- and long-term debt issuance. Frank and Goyal (2003) and Fama and French (2002) found that dividend-paying firms generally issue and pay back less long-term debt than non-dividend-paying firms. This explains the different signs on the dividend coefficient. Internal cash flow is expected to have a negative impact on debt issuance and this is also the case for all regressions in Table 8.

5.3.1. ANALYSIS PECKING ORDER THEORY

The mining industry does offer support for the theory, even if it is substantially weaker than the theory predicts, whereas the software industry does not offer any statistically and economically significant support. The reason for this could be higher level of tangible assets in the mining industry which could be used as collateral when taking new loans and thus decrease the cost of debt (Helwege and Liang, 1996). Solid evidence of what causes this difference between the industries can naturally not be supplied, which simply makes us able to speculate of the reasons behind it.

Leary and Roberts (2010) found similarly weak support for the pecking order theory in their samples as we did for the software industry and no indication of firms' avoiding external financing. Even for samples where the pecking order should perform well, they failed find significant support. However, there are a compelling number of studies that speak in favor of the

theory and find stronger support than we did for the mining industry (e.g. Frank and Goyal, 2003 and Graham and Harvey, 2001).

The support for the theory seems to be time variant as well. During the 1980's it appears firms act more according to pecking order theory than in the later decades (Frank and Goyal, 2003). Our sample covers the time period after 1990 where the general trend is for firms not to support the theory.

Numerous studies provide empirical evidence on the negative market reaction that does follow an announcement of equity issuance, which provides support for the rationale behind the theory (Masulis and Korwar, 1986; Asquith and Mullins, 1986). There is a possibility that firms act on this knowledge and refrain from issuing equity as a first financing option. A competing theory called market-timing theory suggests that firms may at times avoid equity financing, but what determines capital structure is the market's current attitude towards different financing options. The firm does not have a preference on what financing to use, but instead follows the markets opinion and chooses the financing alternative which is most favored by the market at the time (Baker and Wurgler, 2002). Both theories could hold if markets have a persistently bad attitude towards equity financing, even if the rationale behind them differs. It is therefore difficult to determine what drives observed behavior.

There is also evidence that the market's reaction to an equity issuance depends on the predictability of it. Thus, firms who frequently issue equity do not get the same negative market reaction to an issuance as those that seldom do (Smith, 1986). This behavior is further supported by Jansson (2000) who finds trends in financing behavior; firms who previously used equity financing are more likely to do so again in the future. Firms seem to be able to wipe out this argued information asymmetry problem by adapting a consistent financing behavior.

Even if the current study does not provide strong empirical evidence for the theory, Constantinides and Grundy (1989) argue that an information asymmetry may in fact exist. Because of the wide range of financing options available, it does not have to result in firms having a fixed financial hierarchy and following pecking order theory. Lemmon and Zender (2004) suggest that if firms' debt capacity is uncontrolled for, we may falsely reject the theory. Firms may simply use equity issuance because they do not have any other option due to low debt capacity. The theory behind the model could thus be correct, but the model does not accurately predict firms' financing decisions.

Large firms in the mining industry provide some support for the theory whereas small firms do not. This is contrary to what could be expected from the theoretical framework of the model (Helwege and Liang, 1996). The information asymmetry that drives the model should be larger for small firms since these have less available data. Brealey et al (2008, pp. 520-521) suggest that large firms tend to have higher debt ratios since these have greater possibilities to leverage to a low interest rate, thus making debt issuance an even more attractive financial alternative. Another explanation is brought forward by Lemmon and Zender (2004), who suggest controlling for firms' debt capacity in the model. Small firms have greater debt capacity constraints than large firms and this could explain why large firms seem to support the theory better than small firms when debt capacity remains uncontrolled for. Furthermore, they find that the market reacts with a smaller price drop to an equity issuance by small, high-growth firms than large firms, which indicate that the market is aware of this debt capacity problem.

5.4. PECKING ORDER THEORY VERSUS TRADE OFF THEORY

The financing deficit is the only effect to take in to consideration when testing the pecking order theory, but if deficit is simply one of many variables that determine leverage we have a general version of trade off theory (Fama and French, 2002).

Changes in debt ratios are driven by different needs in pecking order theory and trade off theory. In pecking order theory, the change is driven by the need for external financing when internal funds are exhausted. While trade off theory is driven by costs an benefits of leverage in order to sustain an optimal debt level (Shyam-Sunder and Myers, 1999).

We report results for the dependent variables: *Debt Issued/Net Assets* and *Change in Net Debt/Net Assets* for the trade of theory (Shyam-Sunder and Myers, 1999) and *Long-term debt issued* and *Total debt issued* for the pecking order theory (Frank and Goyal, 2003). The results for pecking order theory do not differ greatly between the two dependent variables. However, the trade off theory have inconsistent results between the dependent variables. This might be because the net debt variable includes short-term debt. We are mainly interested in long-term debt and how the capital structure changes over longer periods of time and not short-term adjustments.

One of the conclusions of Shyam-Sunder and Myers (1999) is that the trade off theory outcomes might be statistically significant while the pecking order theory results are not. We could thus end up with significant results that are false for the trade off theory and commit a type two error. Therefore, we need to be cautious when interpreting the results for the adjustment process.

6. CONCLUSION

In this study, we have tested two of the most important theories within capital structure, pecking order and trade off theories, on mining and software industries in Canada. The results offer weak support for the pecking order theory on both industries. On the other hand, trade off tests show statistically and economically significant results for the software industry. The mining industry does not follow the static trade off theory. Overall, our results cannot be used to draw any wider conclusions of the applicability of the two theories/industries. We contribute with a new approach to tests for size effects by including a size variable in the model.

In order to get a better understanding of why small firms tend to adjust quicker to the optimal debt ratio, tests controlling for more variables such as growth could to be done. Also, since the trade off theory stresses the influence of a tax shield, it would be of interest to test if the tax rate has an effect on the capital structure decisions.

It would be interesting to control for the government ownership because there is a possibility that it affects the firm debt capacity, which in turn should increase the robustness of the pecking order theory.

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APPENDIX

A1. VARIABLE DEFINITIONS

Variables retrieved from Datastream with definitions taken from Thomson (2007) as follows:

Cash:
(WC02003) CASH represents money available for use in the normal operations of the company. It is the most liquid of all of the company's assets.

Deferred taxes:
(WC03263) DEFERRED TAXES represent the accumulation of taxes which are deferred as a result of timing differences between reporting sales and expenses for tax and financial reporting purposes.

Dividends, DIV:
(WC04551) CASH DIVIDENDS PAID – TOTAL represent the total common and preferred dividends paid to shareholders of the company. Excludes dividends paid to minority shareholders.

Internal cash flow, IC:
(WC04860) NET CASH FLOW - OPERATING ACTIVITIES represent the net cash receipts and disbursements resulting from the operations of the company. It is the sum of Funds from Operations, Funds From/Used for Other Operating Activities and Extraordinary Items. Data for this field is generally not available prior to 1989.

Investments, I:
(WC04601) CAPITAL EXPENDITURES represent the funds used to acquire fixed assets other than those associated with acquisitions.

Long-term debt, D:
(WC03251) LONG TERM DEBT represents all interest bearing financial obligations, excluding amounts due within one year. It is shown net of premium or discount.

Minority interest:
(WC03426) MINORITY INTEREST represents the non-cash adjustment to income for profits attributable to interests in subsidiaries held outside the group.

Working capital, WC:
(WC03151) WORKING CAPITAL represents the difference between current assets and current liabilities. It is a measure of liquidity and solvency.

Total assets:
(WC02999) TOTAL ASSETS represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets.

Total capital:

(WC03998) TOTAL CAPITAL represents the total investment in the company. It is the sum of common equity, preferred stock, minority interest, long-term debt, non-equity reserves and deferred tax liability in untaxed reserves. For insurance companies policyholders' equity is also included.

Total debt, *D*:

(WC03255) TOTAL DEBT represents all interest bearing and capitalized lease obligations. It is the sum of long and short term debt.

A2. FIRM NAMES

A2.1. Software Firms

1. 01 Communique Lab
2. Absolute Software
3. Catamaran Corp
4. CGI Group Inc
5. Computer Modelling
6. Constellation Soft
7. Criticalcontrol Sol
8. Cyberplex Inc
9. Descartes Systems Gr
10. Enghouse Systems Lim
11. Espial Group Inc
12. Guestlogix Inc
13. Hartco Inc
14. Intrinsyc Software
15. Mediagrif Interactive
16. Nexj Systems Inc
17. Northcore Tech Inc
18. PNI Digital Media
19. Redknee Solut
20. Softchoice Corp
21. Tecsys Inc
22. Terago Inc

A2.2. Mining Firms

1. Aberdeen Inter
2. Alacer Gold Corp
3. Alamos Gold Inc.
4. Alderon Iron
5. Almeden Minerals
6. American Bonanza
7. Americas Bullion
8. Anaconda Mining
9. Aquila resources
10. Argonaut Gold Inc.
11. Asanko Gold Inc.
12. Atna Resources Ltd
13. Augusta Resrc Corp
14. Aura Minerals
15. Aurico Gold
16. Aurizon Mines
17. Avnel Gold min
18. B2gold corp
19. Banro Corporation
20. Besra Gold Inc
21. Braeval Mining
22. Brigus Gold Corp
23. Caledonia Mining
24. Canada Lithium Corp
25. Canarc Resources Corp

26. Candente Gold Corp
27. Canickel
28. Cardero Resrc Corp
29. Carlisle Goldfield
30. Carpathian Gold Inc
31. Centerra Gold Inc
32. Champion Iron Mines
33. Chieftain Metals Inc
34. China Gold Inter
35. Claude Resources Inc
36. Cline Mining Corp
37. Continental Precious
38. Continental Gold Ltd
39. Coro Mining Corp
40. Corvus Gold
41. Crocodile Gold Corp
42. Crosshair Energ
43. Dalradian Resources
44. Delrand Res
45. Detour Gold Corp
46. Diamond Fields Intl
47. Dominion Diamond Corp
48. Duluth Metals Ltd
49. Dundee Precious
50. Dynacor Gold Mines
51. Dynasty Metals
52. Eastern Platinum Ltd
53. Eco Oro Min
54. Eldorado Gold Corp
55. Elgin Mining
56. Endeavour Mining
57. Endeavour Silver
58. Entrée Gold Inc
59. Evolving Gold Corp
60. Excellon Resrcs
61. Exeter Resource Corp
62. Far Resources Ltd
63. First Majestic
64. First Point Minerals
65. Forsys Metals Corp
66. Fortuna Silver
67. Fortune Minerals Ltd
68. Freegold Ventures
69. Frontier Rare
70. Gabriel Resources
71. Geologix Expl
72. Globex Mining
73. Gogold Resource
74. Golden Queen Mining
75. Gran Columbia
76. Gryphon Gold Corp
77. Guyana Goldfields
78. Harte Gold Corp
79. Iamgold Corp
80. IC Potash Corp
81. Intl Minerals Corp
82. International Tower
83. Ivanplats

A3. OTHER TABLES

Table A1: Correlation Between Scaled Key Variables – Pecking Order Model

Mining and software industries. Correlation between scaled key variables in pecking order theory. The sample period is 1990-2011.

Table A1.1: Mining Industry

Mining industry

	Dividends/Net assets	Investments/Net assets	Δ Working capital/Net assets	Internal cash flow/Net assets	Deficit/Net assets	Long-term debt issued/Net assets	Total debt issued/Net assets
Dividends/Net assets	1						
Investments/Net assets	0,117	1					
Δ Working capital/Net assets	-0,009	-0,096	1				
Internal cash flow/Net assets	0,073	-0,077	0,640	1,00			
Deficit/Net assets	-0,036	0,288	0,370	-0,438	1,00		
Net debt issued/Net assets	0,012	0,314	0,065	-0,040	0,214	1,00	
Total debt issued/net assets	0,007	0,386	0,016	-0,018	0,157	0,755	1,00

Table A1.2: Software Industry

Software industry

	Dividends/Net assets	Investments/Net assets	Δ Working capital/Net assets	Internal cash flow/Net assets	Deficit/Net assets	Long-term debt issued/Net assets	Total debt issued/Net assets
Dividends/Net assets	1						
Investments/Net assets	0,014	1					
Δ Working capital/Net assets	0,015	0,993	1				
Internal cash flow/Net assets	0,033	0,687	0,707	1,00			
Deficit/Net assets	-0,028	-0,107	-0,129	-0,793	1,00		
Long-term issued/Net assets	-0,016	0,289	0,262	-0,484	0,905	1,00	
Total debt issued/Net assets	0,019	-0,294	-0,267	0,485	-0,911	-0,974	1,00

Table A2: Correlation – Trade Off Model

Table A2.1: Correlation between Variables in the Mining Industry

Mining Correlation	Difference 1	Difference 2	Debt Issued/Net Assets	Change in Net Debt/Net Assets
Difference 1	1.000			
Difference 2	0.966	1.000		
Debt Issued/Net Assets	-0.778	-0.750	1.000	
Change in Net Debt/Net Assets	0.664	0.660	-0.513	1.000

Table A2.2 Correlation between Variables in the Software Industry

Software Correlation	Difference 1	Difference 2	Debt Issued/Net Assets	Change in Net Debt/ Net Assets
Difference 1	1.000			
Difference 2	0.988	1.000		
Debt Issued/Net Assets	0.028	0.128	1.000	
Change in Net Debt/ Net Assets	0.804	0.862	0.559	1.000

Table A3: Yearly Canadian Inflation Rates in Percent

Year	Inflation rate (%)
1990	4,80
1991	5,60
1992	1,50
1993	1,90
1994	2,00
1995	2,10
1996	1,60
1997	1,60
1998	1,00
1999	1,70
2000	2,70
2001	2,50
2002	2,30
2003	2,80
2004	1,90
2005	2,20
2006	2,00
2007	2,10
2008	2,40
2009	0,30
2010	1,80
2011	2,90

Source: Bank of Canada