Norwegian School of Economics

Bergen, Fall 2017

The Effects of Tax Reform on the Capital Structure of Listed Firms in Norway

An Empirical Study

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Master Thesis in Financial Economics

NORWEGIAN SCHOOL OF ECONOMICS

Abstract

The goal of this thesis is to determine how changes in the corporate tax rate affect the capital structures of Norwegian firms, and how such effects can be explained by established economic theories. We have applied propensity score matching, difference-in-differences estimates, and ordinary least squares regressions to determine if the capital structures of Norwegian listed firms have been affected by the recent reductions in the Norwegian corporate tax rate. While our models have found a significant reduction in the development of Norwegian debt to equity ratios compared to the control group during the years 2012 to 2016, we have not been able to isolate these differences to the years where tax reductions have occurred. Furthermore, the small sample of firms, along with macroeconomic factors affecting the Norwegian firms during the time period, make it difficult to conclude any causality between the reductions in corporate tax rate and the changes in capital structure. Considering these issues, we have been unable to determine whether Norwegian corporate behavior most closely resembles the behavior depicted in the trade-off theory, or the behavior depicted in the pecking order theory.

Preface

The master thesis is the concluding work in our business education at the Norwegian School of Economics, meant to teach us how to independently combine economic theory and practical methods to research a topic we have a particular interest of in our field of study.

We wish to express our gratitude to the Norwegian School of Economics for accepting us as students and providing years of excellent education. We also wish to thank Skatt Vest for financial sponsorship of the thesis, and for allowing us to present preliminary results in their offices. Finally, we wish to commend our supervisor Steffen Juranek for always being available to us, and for providing invaluable guidance, input and insight.

Contents

1 Introduction

1.1 Background

In 2013, the Scheel commission was appointed by the Norwegian government to examine the Norwegian corporate tax rate in light of the international trend of lower corporate tax rates (Norges Offentlige Utredninger 2014:13, 2014). Their main task was to determine how Norway, as a small and open economy, should change its tax regime in order to become more attractive for both national and international investors and businesses.

The average corporate tax rate in OECD countries has gone from 50 percent in the 1980s to about 25 percent in 2014 (Finansdepartmentet, 2015-2016). Since the Norwegian tax reform in 1992, where the corporate tax rate was set to 28 percent, the tax rate has only undergone minor changes. Meanwhile, neighboring countries have gone further in changing their corporate tax rate, reducing their rates to between 20 to 22 percent. In 2014, the corporate tax rate in Norway was about 1.7 percentage points higher than the OECD average and 4.4 percentage points higher than the EU average, as seen in figure 1. Furthermore, it is apparent that larger economies like the United States, Japan, and Germany have higher corporate tax rates, while small and open economies, such as Norway, have significantly lower rates.

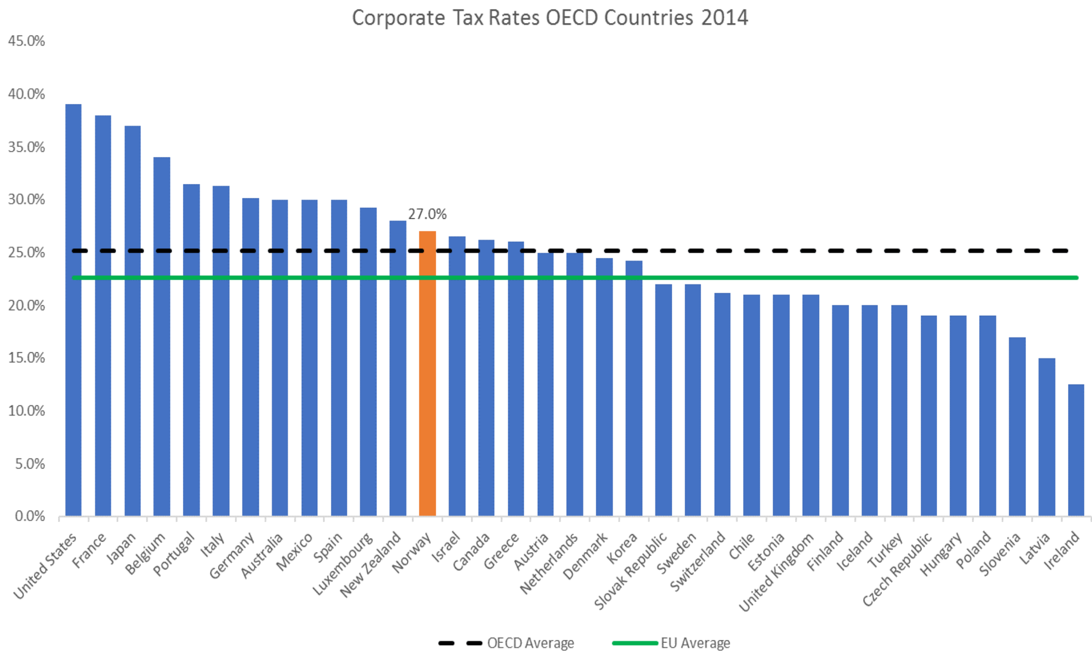

Figure 1: Corporate Tax Rates OECD Countries in 2014. Adapted from (OECD, 2017).

In recent decades, the international economy has become increasingly globalized with capital markets following suit (McKinsey Global Institute, 2016). Investors are able to invest in a global scope, making national corporate tax rates an increasingly major factor in deciding the placement of capital. As a result, consistently having a higher corporate tax rate than neighboring countries will deter investors. Digitalization has allowed for multinational corporations to move their profits out of countries with high corporate tax rates and into countries with lower corporate tax rates because they are no longer as reliant on having a physical presence. As a result, following the international trend of lower global tax rates has been put on the agenda.

The Scheel commission concluded that lowering the corporate tax rate from 27 percent to 20 percent would assure a tax rate similar to that of Norway's neighboring countries in the future (Norges Offentlige Utredninger 2014:13, 2014). A lower corporate tax rate will also reduce the cost of capital, especially for investments that are financed through equity. This would therefore also contribute to reducing the tax discrimination of companies with regard to their financing structure. Furthermore, a lower corporate tax rate will make it less attractive for multinational enterprises to move profits out of Norway. Finally, with a lower corporate tax rate Norway will be in a better position to attract businesses and investors in an international environment.

In May of 2016 the vast majority of the Norwegian parliament agreed to reduce the corporate tax rate gradually from 27 to 23 percent during the years 2016 to 2018 (Kjernli, 2016). The tax rate was reduced from 27 to 25 percent in 2016, 25 to 24 percent in 2017 and in the national budget for 2018 it is planned to be reduced to 23 percent (Finansdepartementet, 2017). The corporate tax rate was previously reduced from 28 percent to 27 percent in 2014 (Finansdepartementet, 2013).

1.2 Research Question

Considering the recent reductions in the Norwegian corporate tax rate, we wish to test how the capital structure of Norwegian corporations react to such changes. Whether or not there are any changes, we will try to explain them through economic theory. There are mainly two schools of thought concerning the capital structure of firms. As explained in the next section, the trade-off theory suggests that firms try to keep an optimal capital structure considering their operations and situation, while the pecking order theory suggests that firms are not that concerned with keeping a capital structure which maximizes their value. To determine how capital structure in Norwegian firms has changed as a result of the tax reductions, we will use annual financial statement and market capitalization data from the years 2012 to 2016, on both Norwegian and non-Norwegian listed firms. We will apply methods such as propensity score matching, difference-in-differences estimates, and ordinary least regressions.

1.3 Outline

Introduction

The introduction provides the background for our research question, and the main points of the research question itself. It also establishes restrictions we have made for the thesis and why they have been made.

Economic Theory

This section provides a definition for the term capital structure as the term is used in the thesis. Through an overview on the Modigliani-Miller theorem we show how taxes affect the capital structure of firms. The section also gives an introduction to the trade-off theory and the pecking order theory, which are the main theories on capital structure. Additionally, the section will present empirical evidence on other determinants of capital structure.

Hypotheses

In the hypotheses section we use economic intuition to determine how capital structure in firms should react to a tax reduction in accordance with both the trade-off theory and the pecking order theory. The section explains in depth what we wish to test in the later sections and how we will test our hypotheses.

Data

The data section provides an overview of the preliminary data we have gathered, where it has been gathered from, and how the data has been cleaned to create the sample used in the analyses.

Methodology

The methodology explains in some detail the methods we have used, such as propensity score matching, ordinary least squares regression, and difference-in-differences estimates. The section also show how these methods are applied to our sample.

Empirical Results

In the empirical results section the results from the analyses are presented. The section also tests and discusses any assumptions made in the methodology.

Limitations

The limitations section discusses any weaknesses or limitations in our results.

Further Research

This section provides an overview on any related research we did not have the time or data to conduct ourselves.

Conclusion

Finally, the conclusion sums up the previous sections, and how our results compare to previous research and hypotheses.

1.4 Special Tax Rates

The Norwegian tax regime practices special tax rates for petroleum activities, and shipping revenues (Finansdepartementet, 1975, 1999). While there has been a reduction in the general tax rate from 28 % in 2013 to 24 % in 2017, the tax rate for petroleum activities has remained at 78 % (Finansdepartementet, 2013, 2016). For shipping companies the tax regime is based upon tonnage and is not comparative to other companies. To deal with these issues, we propose using a sample of data that excludes these companies, on the same basis commonly exercised by Statistics Norway, known as Mainland Norway (SSB, 2012).

1.5 Personal Taxes

Any earnings made by Norwegian citizens through dividends or capital gains are subject to taxation in Norway (Skatteetaten, 2016). Certain theories on capital structure include personal taxes, but for a number of reasons, personal taxes will not be discussed in this thesis, and we will focus solely on corporate taxes (Modigliani & Miller, 1958). This decision can be justified mainly by two reasons. Firstly, Norwegian stock holders are able to delay taxation of their capital gains through holding companies, which are not subject to capital gains taxes (Skatteetaten, 2017). Secondly, almost 40% of shares noted on the Oslo Stock Exchange are held by non-Norwegian individuals not subject to Norwegian taxation (Oslo Børs, 2014; Oslo Børs VPS, 2017). We will therefore assume that if Norwegian firms calculate their optimal structure, they do not consider personal taxes when doing so, and that this assumption is also true for non-Norwegian firms.

1.6 Financial Services

We will exclude financial corporations from our analyses, and focus solely on non-financial firms. The reasoning for this are the differences in descriptive data as shown in appendix D, as well as differences in accounting principles (Finansdepartementet, 1998).

2 Economic Theory

2.1 Defining Capital Structure

Jonathan Berk and Peter DeMarzo define capital structure as ”the total amount of debt, equity and other securities a firm has outstanding” (Berk & DeMarzo, 2017, p. 519). This is the commonly used definition of capital structure, and is the one that will be used in our thesis. Our thesis will focus mainly on the proportions of debt and equity within a firm, and how the recent reductions in the Norwegian corporate tax rate has affected these proportions. While the definition given by Berk and DeMarzo mentions securities other than debt and equity, such securities are not included in this thesis.

2.2 The Modigliani-Miller Theorem

In 1958, Professor Franco Modigliani and Associate Professor Merton H. Miller of the Graduate School of Industrial Administration, Carnegie Institute of Technology, published their article on The Cost of Capital, Corporation Finance and the Theory of Investment (Modigliani & Miller, 1958). The article gave rise to the widely known Modigliani-Miller theorem on capital structure, which has formed the basis for modern thinking on capital structure (Brealey, Myers, & Allen, 2011). Both authors were later awarded with The Nobel Memorial Prize in Economic Sciences, where The Cost of Capital, Corporation Finance and the Theory of Investment was named a major contribution to modern theories of financial markets (Nobelprize.org, 1985, 1990).

The Modigliani-Miller theorem consists of two propositions considered under both perfect market conditions, where there are no taxes, bankruptcy costs, agency costs and asymmetric information, and imperfect market conditions, such as would be found in real world markets (Modigliani & Miller, 1958). Proposition I focuses on the value of enterprises based upon their capital structure while Proposition II has an emphasis on the expected rates of return based upon the capital structure of enterprises. This thesis will focus solely on Proposition I, and thus we will only provide an overview on this proposition, and the underlying assumptions for it.

2.2.1 The Capitalization Rate for Uncertain Streams

Initially, Modigliani and Miller consider an economy under perfect market conditions, in which all assets are owned by corporations only through common stock (Modigliani & Miller, 1958). These assets will yield a constant, yet uncertain stream of cash indefinitely into the future, as shown by expression (1), where $X_i(T)$ is the stream generated by the assets of the ith firm in period T.

$$X_i(1),\ X_i(2)\ ,...,\ X_i(T) \tag{1}$$

These elements are random variables subject to the joint probability distribution:

$$x_i[X_i(1),\ X_i(2),...,\ X_i(t)] \tag{2}$$

While the streams are uncertain and extend into the indefinite future, the authors assume that the mean value of the stream over time is finite and represents a random variable subject to a probability distribution, such as given by equation (3).

$$X_i = \lim_{T\to\infty} \frac{1}{T} \sum_{t=1}^{T} X_i(t) \tag{3}$$

The average value over time, X_i, is referred to as the return of a share in corporation i.

Modigliani and Miller emphasize that X_i is the stream of profits to the share, and not simply dividends. They argue that as long as there are retained earnings in the corporation, any investor should be able to sell their share for an amount that equals the initial price of the share, in addition to any dividend the share would have been eligible to provide its owner if the corporation had yielded any of its earnings as dividends instead of retaining said earnings.

Furthermore, Modigliani and Miller assume that firms can be divided into classes such that the return of the shares issued by any firm in any given class is proportional to the return on the shares issued by any other firm in the same class. This implies that the probability distribution of the ratio of the return to the expected return is identical for all shares in any same class. This assumption permits the classification of firms into groups where the shares of different firms are perfect substitutes for one another, also known as homogeneous. From this assumption it follows that in equilibrium the price per dollar of expected return must be the same for all shares in any given class such that:

$$p_j = \frac{1}{\rho_k}\bar{x}_j; \tag{4}$$

or, equivalently,

$$\frac{\bar{x}_j}{p_j} = \rho_k \tag{5}$$

Where p_j is the price, and x_j is the expected return per share of the jth firm in class k. p_k is the expected rate of return of any share in class k, and so $1/p_k$ is the price an investor must pay for a dollar's worth of expected return in class k.

2.2.2 Debt Financing and Its Effects on Security Prices Under Perfect Market Conditions

After providing the underlying assumptions to deal with uncertain streams, Modigliani and Miller drop the assumption that firms can only raise capital through the issuance of common stock (Modigliani & Miller, 1958). Introducing debt-financing allows firms to change their capital structure as they see fit, causing them to be subject to different degrees of financial risk even within the same class. As a result, each class of firms is no longer homogeneous. Following the introduction of a new component to the capital structure, the authors make two assumptions about the nature of debt. Firstly, all bonds are assumed to yield a constant income per unit of time, and that income is regarded as certain by all parties. Secondly, debt is traded in a perfect market where any two debt securities that are perfect substitutes must sell at the same price. In this sense, Modigliani and Miller assume that debt is exactly the same as equity, with the exception that while debt provides a certain stream of cash, equity provides an uncertain stream of cash. Following the underlying assumptions and theory, the authors are able to derive their two basic propositions concerning the valuation of securities in companies with different capital structures.

2.2.3 Modigliani-Miller Theorem: Proposition I

For any company j, the market value of the enterprise, V_j, is the sum of the market value of its debt, D_j, and the market value of its equity, S_j (Modigliani & Miller, 1958). Let $\bar{X}_j$ be the expected return on the assets owned by the company, then the Modigliani-Miller theorem proposition I asserts that in equilibrium, equation (6) must hold:

$$V_j = (S_j + D_j) = \bar{X}_j / \rho_k \tag{6}$$

Proposition I then argues that "the market value of any firm is independent of its capital structure and is given by capitalizing its expected return at the rate ρ_k appropriate to its class" (Modigliani & Miller, 1958, p. 268). Equivalently, the equation can be stated in terms of the firm's average cost of capital, also known as the ratio of its expected return to the market value of all its securities, $\bar{X}_j / V_j$:

$$\frac{\bar{X}_j}{(S_j + D_j)} = \frac{\bar{X}_j}{V_j} \tag{7}$$

That is, "the average cost of capital to any firm is completely independent of its capital structure and is equal to the capitalization rate of a pure equity stream of its class" (Modigliani & Miller, 1958, p. 268-269).

To prove that equation (7) holds, Modigliani and Miller argue that in the case where they do not hold, arbitrage opportunities will arise, and so equation (7) will always hold in an efficient market.

2.2.4 Modigliani-Miller Theorem: Proposition I with Taxes

Through proposition I, Modigliani and Miller theorize that under perfect market conditions, capital structure should have no effect on the value of an enterprise (Modigliani & Miller, 1958). However, under imperfect market conditions, mainly when corporate taxes are included, this is not the case. When a company is taxed a rate of its earnings after interest, debt acts as a tax shield. When adding taxes, Modigliani and Miller present the following equation for the total income for a company net of taxes:

$$\bar{X}_j^\tau = (\bar{X}_j - rD_j)(1-\tau) + rD_j = \bar{\pi}_j^\tau + rD_j \tag{8}$$

where $\bar{X}_j^\tau$ is total income net of taxes, r is the interest rate on debt, τ is the tax rate, D is debt, π is the expected net income accruing to the common stock holders.

This equation shows how adding debt will increase the total income of a corporation by rD_j when it pays taxes.

2.2.5 Effects of Interest Rates

When introducing debt, Modigliani and Miller first assumed there was only one type of bond, and it was equal for all firms within a class (Modigliani & Miller, 1958). In existing capital markets, however, there are a wide variety of bonds varying with maturity, technicalities, and the financial condition of the borrower. Referring to both economic theory and market experience, Modigliani and Miller argue that interest rates tend to increase with the debt-equity ratio of borrowers. They then assume that $r = r(D/S)$, is the same for all borrowers, and that there should be a rising supply curve for borrowed funds. While the average cost of borrowed funds will tend to increase with leverage, the average cost of funds from all sources will still be independent of leverage, as long as we do not consider the tax effect. They argue that any investor should be able to acquire a mixed portfolio of both bonds and stocks, and therefore the average cost of capital from all sources should be the same for all firms in a given class. That is, any increased cost of debt will be offset by a reduction in the yield of common stock. It should be noted that investors will only reap the benefits of the tax shield as long as there are earnings after interest. For example, if the corporation was to pay all its earnings to interest, there would be no benefit to the tax shield, and increased debt would provide no marginal value to the firm. If we consider no costs to having such a large amount of debt, then logic implies that any firm should leverage itself until it pays all of its earnings to interest.

2.3 The Trade-Off Theory

The inclusion of tax shields in the Miller-Modigliani theorem results in an optimal capital structure for firms consisting of 100% debt. As this does not reflect reality, many economists believe that there must be some cost to having debt. Kraus and Litzenberger (1973) state that the optimal leverage must reflect a trade-off between the benefits of the tax shield and some other costs, mainly the costs of bankruptcy. Kraus and Litzenberger conclude that in perfect capital markets, the Modigliani-Miller theorem holds, but in imperfect capital markets where taxes and bankruptcy penalties are included, there must be some optimal capital structure that maximizes the net value of these factors for the individual firm. Myers (1984) presents the static trade-off hypothesis in which the firm maximizes its value through the trade-off between the costs of financial distress and the benefits gained from tax shields, as seen in Figure 2. Figure 2 describes how firms can increase their value through leverage, but the inclusion of financial distress costs causes there to be an optimal point where the firm is not completely financed through debt.

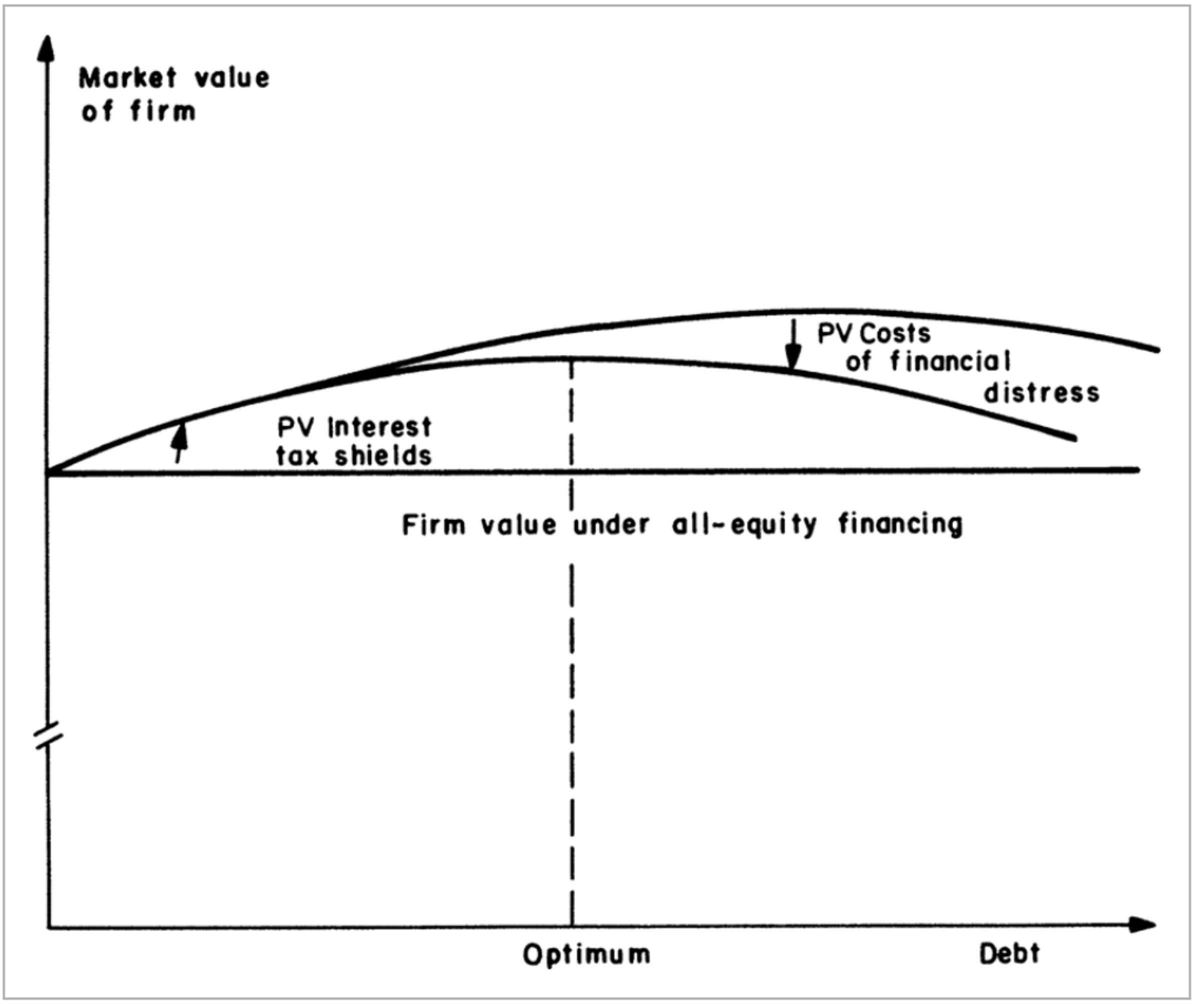

Figure 2: Capital structure according to trade-off theory. Reprinted from Myers (1984).

Myers (1984) argues that if there are no costs of adjustment for changing the capital structure, then each firm's observed debt-equity ratio should be its optimal ratio. If there are adjustment costs, however, Myers argues that there must also be lags in adjusting the capital structure to its optimum as firms can not immediately offset events that push them away from their optimal capital structure.

The costs of financial distress presented by Myers include the legal and administrative costs of bankruptcy, but also the moral hazard, monitoring and contracting costs which are present even when bankruptcy is avoided.

2.4 The Pecking Order Theory

Pecking order theory was developed by Stewart C. Myers and Nicholas S. Majluf in 1984. It introduces the idea that managers rank capital when contemplating how to raise funds. The theory stems from asymmetrical information. Information asymmetry occurs when managers have more knowledge of what the company's fair value is as they know more about its potential prospects and risks than outside investors do.

The pecking order theory states that corporate enterprises prefer to finance new investments through internal financing rather than external and when they need to finance externally, they prefer raising debt rather than issuing equity (Frank & Goyal, 2008). If managers perceive the stock price to be overvalued they will be prone to issue equity as this will maximize the financing generated. Similarly, if managers perceive the stock price to be undervalued they are more prone to finance investments through debt, instead of issuing equity. Investors are aware of this and this is reflected through changes in stock prices. An equity issue announcement will normally cause a negative reaction to stock price. Therefore, if information asymmetry exists between managers and investors and both groups are rational, then it follows that any company will raise debt rather than issuing equity (Brealey et al., 2011).

It should be noted that there are likely other factors affecting managers and investors (Brealey et al., 2011). For example, an already heavily leveraged firm could risk financial distress if it were to borrow more. An equity issuance would be preferable in this scenario. Also, technology firms and small, rapidly growing firms tend to issue equity rather than financing through debt as the costs of raising debt for such companies generally outweigh financing through equity.

In pecking order theory there is no optimal debt/equity ratio because there are two types of equity (Myers & Majluf, 1984). Internal equity is viewed as the best form of financing and external equity is viewed as the least attractive form. In this way the theory explains why the most profitable firms tend to have a low debt equity ratio since they can be sufficient using only internal funds, while low profitable firms tend to borrow more (Brealey et al., 2011).

2.5 Empirical Evidence for Trade-Off Theory and Pecking Order Theory

The main difference between the trade-off theory and pecking order theory is that the former states that all companies have an optimal debt to equity ratio while the latter does not imply an optimal ratio. Baskin (1989) states that preceding empirical evidence and his study support that companies change their capital structure in line with the pecking order theory and not the trade-off theory. Also, Shyam-Sunder and Myers (1999) find no evidence of companies adjusting to an optimal debt to equity ratio and state that ”if our sample companies did have well-defined optimal debt ratios, it seems that their managers were not much interested in getting there” (Shyam-Sunder & Myers, 1999, p. 242). At the same time, their research was done on mature firms and the pecking order theory might not provide the same results if the sample consisted of high-growth companies investing in intangible assets. Fama and French (2002) investigate which of the theories predict corporate behavior best in terms of capital structure and dividends. They find that both models do well in their tests, but both have flaws. Small low-leverage growth firms have large equity issues which contradicts the pecking order theory. The trade-off theory argues that more profitable firms should have more debt, however, there is found to be an inverse relationship. Their conclusion is that although both theories confirm many of the predictions made it is difficult to argue for causality as they are not able to tell if the results are due to the theories being correct or other factors that both theories overlook. Frank and Goyal (2009) find that the trade-off theory is superior to the pecking order theory. They argue that although pecking order theory correctly predicts that more profitable firms have lower leverage the theory does not predict the importance of industry specific leverage ratios, which they find to be the most important factor of capital structure. Furthermore, they conclude that the pecking order theory would need to undergo considerable development to completely predict the main evidence found in their study and that the trade-off theory more accurately predicts the reality of the relationship between corporate behavior and capital structure.

2.6 Other Determinants of Capital Structure

There are many other factors than corporate tax rate that can influence a company's capital structure (Titman & Wessels, 1988). The following section will outline some of these factors. We are including factors where there is a consensus among researchers that the characteristic has an effect on leverage. These factors will need to be controlled for in our analysis.

2.6.1 Profitability

Profitability is a measure of how well a company is able to generate earnings compared to its costs. Pecking order theory suggests that more profitable firms will have lower debt-equity levels because they are able to rely on internal financing. On the other hand, the trade-off theory implies higher debt-equity ratios for profitable firms because it will lower their tax burden. Also, high profitable firms are less likely to suffer from financial distress and as a result will receive loans with lower interest rates. This should encourage high profitable firms to take on more debt. Early research showed a positive relationship between leverage and profitability (Harris & Raviv, 1991). However, recent empirical results suggest there is an inverse relationship between the two (Antoniou, Guney, & Paudyal, 2008; Frank & Goyal, 2009; Fama & French, 2002).

2.6.2 Asset Structure

Asset structure or tangibility is a measure of how much fixed assets; machines, buildings, etc., a company has compared to its total asset base. Tangible assets are easier for a company to collateralize than intangible assets. A company with a high level of fixed assets will therefore have higher debt capacity. This is supported by both trade-off theory and pecking order theory. The majority of research also suggests that there is a positive relationship between leverage and tangibility (Antoniou et al., 2008; Frank & Goyal, 2009).

2.6.3 Size

Size is a measure of the scale of a firm's operations. It can be measured through a company's total revenues, total assets or market value. According to the trade-off theory larger firms are less risky because they are more diversified and have more stable cash flows. Evidence suggests that direct bankruptcy costs appear to account for a larger proportion of firm value as size decreases. Also, larger firms tend to be more diversified which means that the risk of bankruptcy is lower (Titman & Wessels, 1988). On the other hand, pecking order theory suggests a negative relationship between size and leverage as larger firms have less information asymmetry and easier access to capital markets. Mature firms also have the possibility to retain more earnings. Therefore, it will be easier to attract investors and issue equity for larger firms. Empirical results suggests that the leverage ratio is positively correlated with size, when size is measured as the natural logarithm of sales (Antoniou et al., 2008) and when measured by the total book value of assets (Frank & Goyal, 2009).

2.6.4 Liquidity

The liquidity of a company can be defined as its ability to use current assets to cover current liabilities. In other words, how capable a company is to pay off its short term obligations. In pecking order, firms accrue earnings when financing future investments because internal financing is superior. As a result, liquid firms will borrow less. This is consistent with empirical research done on British firms (Akdal, 2011). However, research done on U.S. firms suggest a positive relationship between liquidity and debt (Sibilkov, 2009). This is due to costs of financial distress increasing with illiquidity.

2.6.5 Growth

Growing companies tend to have large investments and as a result require capital, usually through external financing. Also, growth firms have a high market-to-book ratios because investors expect higher earnings in the coming years. Pecking order theory suggests that high-growth firms should acquire more debt over time if they do not have enough internal funds. However, as claimed by trade-off theory there should be a negative relationship between growing firms and debt as they are more likely to go into financial distress then more mature firms. There is a higher chance that a growing firm will invest in more risky projects. Empirically, companies with large growth opportunities have a negative relationship with debt as do firms with high market-to-book ratios (Antoniou et al., 2008; Frank & Goyal, 2009; Fama & French, 2002).

3 Hypotheses

Considering the trade-off theory, and pecking order theory described in the previous section, we would expect capital structure to change in accordance with either of these theories. According to the trade-off theory we would anticipate the debt to market value of equity to decrease through two separate stages. Firstly, there is a mechanical effect when firms are taxed less, causing their market value of equity to increase along with their profitability. Secondly, the reduced value added from debt tax shields should steer corporate behaviour to finance less investments through debt. In any way, we would not expect the debt to market value of equity to increase according to the trade-off theory. From a pecking order perspective, we would still expect the mechanical effect to increase the market value of equity. Also, the reduced taxes would result in increased net income. Consequently, managers will have more internal financing which will reduce the demand for debt, resulting in a reduced debt to market value of equity ratio. This intuition shows that no matter which of the theories explain behaviour in Norwegian firms, we should expect the same results from a reduction in the corporate tax rate.

While we expect the same results from both theories, they might happen at different points in time. For the trade-off theory firms maximize their value by changing the capital structure as soon as a tax change occurs, given that the costs of changing capital structure do not exceed the benefits gained from doing so. For the pecking order theory managers have no direct motivation to change the capital structure immediately. Instead such changes happen naturally and most likely over a longer time span.

In addition to the debt to market value of equity ratio, we wish to test changes in other variables. These include the debt to book value of equity ratio, market value of equity, book value of equity, and total liabilities. As already stated, we expect market value of equity to increase for Norwegian firms as less tax increases the net income of the firm, and as a result its value. We also expect book value of equity to increase for the same reason, but firms might pay out the increased earnings in dividends. Total liabilities should decrease in accordance with the behavioural effects expected to occur in both theories. If total liabilities are expected to be reduced, while the book value of equity is expected to increase, it follows that the debt to book value of equity should decrease.

To test our hypotheses we will match the Norwegian firms with a control group using propensity score matching. We will use the determinants of capital structure described in the previous section as matching variables. The only variable affecting the treatment and control group differently should then be the Norwegian reduction in corporate tax rate. After finding the appropriate matches, we will apply two different models to find the effect of reduced corporate tax rate. Firstly, we will use a model that regresses the dependent variables on the yearly tax changes to test if firms adjust to the tax change during the year it changes. Secondly, we will use a difference-in-differences estimator to test how the reduction in corporate tax rate has affected Norwegian firms in the entire period from 2012 to 2016.

4 Data

In the following section, the data gathering process is described. The financial statement data is collected from Compustat (S&P Global Market Intelligence, 2017). Compustat is a database with financial, statistical and market information on active, inactive, listed and unlisted global companies. The service was started in 1962.

4.1 Cleaning and Sample Construction

The preliminary data was extracted using Compustat's built-in statistical tools. The sample used consists of annual financial fundamental data for all global listed companies. We collected information on the following data points; total assets, total current assets, total liabilities, total current liabilities, book value of stockholders equity, book value of long-term debt, total revenue, EBIT, EBITDA, net property plant and equipment, and capital expenditures. In addition, we collected year end stock prices and shares outstanding in order to calculate the market value of the equity. We narrowed down the number of companies and decided to only include Western European, U.S. and Canadian companies. This is because these countries have a more similar business environment to Norway compared to other countries, with regard to rules and regulations, democratic stability and capital markets (IMF, 2016). We have also excluded any companies that were inactive at any point over the time period and companies that were missing relevant financial data, giving us a balanced panel data set.

The time period, 2012 to 2016, was chosen due to the Scheel commission being established in 2013. The first year we observe should serve as the pre-treatment period meaning there should not be any tax effect at this point and it was therefore important to mitigate any signaling effect that the establishment of the commission might have had. Some of the European countries in the sample, e.g. Sweden, Finland and Denmark, have undergone changes in the corporate tax rate during the time period (OECD, 2017). Since the companies in these countries serve as part of the control group and should not include corporate tax rate change effects they were removed from the sample.

After having cleaned up the sample we had a sample size of 133 Norwegian firms, and 4985 non-Norwegian firms. After removing oil, shipping and financial firms, we were left with 53

Norwegian firms. We grouped the remaining companies into their respective industries by using the Global Industry Classification Standard (GICS). GICS is an industry taxonomy developed in 1999 by Morgan Stanley Capital International and Standard & Poor (S&P Global Market Intelligence, 2016). Every company is assigned, based on its main business activity, a sub-industry, that fits into an industry, an industry group and sector. GICS is divided into 11 sectors, 24 industries, 68 industries and 157 sub industries. After the propensity score matching we removed five outliers from the Norwegian sample, and five from the control group. For the analyses we had a final sample of 48 Norwegian firms, and 48 non-Norwegian firms.

4.2 Currency Conversion

The majority of the companies in the sample reported their financial information in the currency of the country they were incorporated in. This meant we had to convert into one universal currency. We decided to use U.S. Dollars as it is the most widely used currency on the international market (Feige, 2012). In order to account for sales and expenses being distributed throughout the year, we used the year average currency rate for income statement items. For balance sheet items we used the year end currency rate. This is in line with international accounting methods (PWC, 2014).

5 Methodology

5.1 Propensity Score Matching

In observational economic studies, a common problem is determining the real effect of a policy change. This is due to the data being based on individuals, as it is not possible to observe an identical treated and non-treated individual at the same time. Furthermore, it is not recommended to simply compare treated individuals with non-treated individuals because the treatment or policy change is not assigned randomly to the sample and as a result selection bias could arise (Rosenbaum & Rubin, 1983).

Propensity score matching (PSM) is a method developed by Rubin and Rosenbaum in 1983, which is widely used in observational economic studies to estimate causal treatment effects. The technique matches individuals from a treated group with individuals from a control group, attempting to establish pairs that have the same statistical background. This means pairs that have the same characteristics prior to the treatment, hence pairs that would react in the same way if they both were to be treated. In this way, PSM aims to make the sample randomly selected thus mitigating selection bias. Although, it cannot completely eliminate selection bias because it only controls for the observed variables as there still could be unobserved heterogeneity left leading to biased to results (Caliendo & Kopeinig, 2008).

PSM is a probit/logit model with a dummy variable (D) serving as the dependent variable and characteristics (x) as the independent variables. The propensity score is the predicted probability of receiving the treatment given the pre-treatment characteristics (Caliendo & Kopeinig, 2008), formally:

$$p(x) = prob(D = 1|x) = E(D|x) \tag{9}$$

5.1.1 Steps

1. Assign the observations into two groups using a dummy variable. Where $D = 1$ are the treated observations and $D = 0$ are the untreated observations.

2. Estimate a probit/logit model for the propensity of observations to be assigned into the

treated group. Use relevant independent variables that affect the probability of being assigned to treatment group.

3. Match observations from treated and control groups based on their propensity scores. Use a relevant matching algorithm.

4. Calculate the treatment effects: compare the outcomes between the treated and control observations after matching. In our analyses this is done using the yearly tax change model and the difference-in-differences estimator.

5.1.2 Assumptions

Conditional Independence Assumption

This assumption states that both the outcomes of the treated and untreated individuals are independent of treatment and conditional on the x characteristics. In other words, after having controlled for the observable x characteristics, the treatment is assigned randomly and in this way avoids the occurrence of selection bias (Caliendo & Kopeinig, 2008). This can be expressed formally as:

$$(y_0, y_1) \perp D|x \tag{10}$$

Common Support Condition

This assumption states that the for each value of x, there are both treated and control observations. This means that the probability of a random individual being treated is somewhere between zero and one (Caliendo & Kopeinig, 2008). This can be expressed formally as:

$$0 < prob(D = 1|x) < 1 \tag{11}$$

Balancing condition

This assumption states that given the same propensity score, one should also observe the same x characteristics. Meaning that the assignment of the treatment is independent of the x characteristics (Caliendo & Kopeinig, 2008). This condition is testable and can be expressed formally as:

$$D \perp x|p(x) \tag{12}$$

5.1.3 Independent Variable Choice

Independent variable choice is important in order to assure good matches. We are attempting to identify companies in the control sample that are identical to the firms in the treatment group and that will continue to develop identically all else being equal. The matching variables we chose therefore have to be good proxies for companies that are of the same size, in the same industry, have the same profitability, have the same growth opportunities and so on.

The number of independent variables needed for a study is not predefined for PSM as it depends on the scope and scale of the study. However, one should always include variables that are unrelated to exposure but related to outcome. On the other hand, including variables that are related to exposure but unrelated to outcome will lead to an increase in bias (Brookhart et al., 2006). In our model, exposure is the change in corporate tax rate while the outcome is the corporations' change in capital structure.

The data set has previously been sorted into their respective GICS industries so we do not have to include industry as a matching variable. 2012 is the first year in our data set and is the year before any corporate tax changes are made, it therefore makes sense to use this year for matching. Since our main goal is to examine any significant change in leverage, we are not using this as a matching variable.

The independent variables we have chosen are:
Total Revenue is the total amount of income a company receives over the course of the year. Companies within the same industry that are of the same size tend to have similar revenue. This variable is therefore a good measure of the size of a company's operations.
Total Assets is included as a variable because it is a good measure of the size of a company. Companies that are of the same size and operate within the same industry should in theory have a similar capital structure.
Market Capitalization measures the market value of equity. It is calculated by taking the price per share multiplied by total outstanding shares.
Property, plant and equipment / Total assets is a ratio that measures a company's fixed assets to total assets.
EBITDA / Total Revenue measures how profitable a company is, through calculating how

much income a company has left after deducting its operational expenses.

Revenue / Property, plant and equipment measures how much revenue is generated by a company's fixed assets. This ratio is an important for measuring the profitability for capital intensive industries.

Current assets / Current liabilities is a liquidity ratio that measures a company's ability to cover its short-term liabilities with its short-term assets.

Price / Book compares a company's market value of equity to book value of equity. A high ratio can indicate that there are expectations that the company will perform well in the future. Therefore, companies in the same industry, that are of the same size and have a similar P/B ratio might have the same growth opportunities.

In order to achieve better matches based on the proxies for size we included interaction terms. This allows for size to be weighted more heavily and assures that companies of the same size will be matched together. Before including these interaction terms large firms were in some instances matched with significantly smaller firms.

5.1.4 Matching Algorithm

After having calculated the propensity score for each company, the next step is to match a company from the treatment group with a company from the control group. There are several matching algorithms applicable for PSM. However, we have chosen to focus on the nearest neighbor matching method because it is the most commonly used. This method matches each company from the treatment group with one company from the control group on the basis of them having the closest propensity score. One can also decide whether a company from the control group can be used as the nearest neighbor more than once (with replacement) or only once (without replacement). This introduces a trade-off, one might end up using one observation too many times with replacement but without replacement one might not get very good matches (Caliendo & Kopeinig, 2008). Since we have significantly more control observations than treated observations we decided to use without replacement.

5.2 Yearly Tax Change Model

5.2.1 Ordinary Least Squares

Ordinary least squares (OLS) is a technique widely used to estimate a linear relationship between a dependent variable and one or more independent variables (Wooldridge, 2012). This is done through minimizing the sum of squared residuals which is the difference between the observed values and the predicted values. The smaller the differences become the better the estimated model fits the data.

Assumptions of OLS

1. Linearity: there exists a linear relationship between the independent variables and dependent variables.

$$y = \beta_0 + \beta_1 x + \varepsilon \tag{13}$$

2. There is a random sample of observations of size n

$$y_1 = \beta_0 + \beta_1 x_1 + \varepsilon_1 \quad i = 1, 2, 3, ..., n \tag{14}$$

3. No multicollinearity: there is no exact relationship between the independent variables. The the outcomes of the explanatory variables are not all the same.

4. Exogeneity: The Zero Conditional Mean Assumption states that the mean of the error term (ε) is zero given the explanatory values. This also means that the explanatory variables and error term are uncorrelated.

$$E(u|x) = 0 \tag{15}$$

5. No spherical errors: meaning there is homoskedasticity and no auto-correlation.
Homoskedasticity means that the error term has the same variance given any explanatory vari-

able.

$$Var(u|x) = \sigma^2 \tag{16}$$

No auto-correlation means that the error terms of different obseravtions should not be correlated.

$$Cov(\varepsilon_i \varepsilon_j|x) = 0 \quad i \neq j \tag{17}$$

6. Normality of residuals: the error term is independent of the explanatory variables and is normally distributed with a mean of zero and variance σ^2.

$$u \quad \sim \quad Normal(0, \sigma^2) \tag{18}$$

5.2.2 Yearly Tax Change Models

To find the significance of a tax change in a year on the capital structure of firms in the given year, we use an OLS regression. In this model we create variables that track the percentage change each year for each firm, and regress these changes on the tax change for that year. For Norwegian firms there are tax changes in two years, namely 2014 and 2016, when it was reduced by 1% and 2%, respectively. There are no tax changes for the control group.

Debt to Market Value of Equity Ratio

The OLS-regression when using the percentage difference in the debt to market value of equity ratio for each year can be given mathematically as

$$DEM\_diff = \beta_0 + \beta_1 \times TaxChange + \varepsilon_i$$

where DEM_diff is the percentage change in the debt to market value of equity ratio for each year, *TaxChange* is the percentage point change in the corporate tax rate for each year, β_0 is the intercept, β_1 is the effect of a one percentage point increase in corporate tax rate on the debt to market value of equity ratio, and ε_i is the error term with expected mean of zero.

Debt to Book Value of Equity Ratio

The OLS-regression when using the percentage difference in the debt to book value of equity ratio for each year can be given mathematically as

$$DEB\_diff = \beta_0 + \beta_1 \times TaxChange + \varepsilon_i$$

where DEB_diff is the percentage change in the debt to book value of equity ratio for each year, *TaxChange* is the percentage point change in the corporate tax rate for each year, β_0 is the intercept, β_1 is the effect of a one percentage point increase in corporate tax rate on the debt to book value of equity ratio, and ε_i is the error term with expected mean of zero.

Market Value of Equity

The OLS-regression when using the percentage difference in the market value of equity for each year can be given mathematically as

$$MarketCap\_diff = \beta_0 + \beta_1 \times TaxChange + \varepsilon_i$$

where $MarketCap\_diff$ is the percentage change in the market value of equity for each year, *TaxChange* is the percentage point change in the corporate tax rate for each year, β_0 is the intercept, β_1 is the effect of a one percentage point increase in corporate tax rate on the market value of equity, and ε_i is the error term with expected mean of zero.

Book Value of Equity

The OLS-regression when using the percentage difference in the book value of equity ratio for each year can be given mathematically as

$$BookEquity\_diff = \beta_0 + \beta_1 \times TaxChange + \varepsilon_i$$

where $BookEquity\_diff$ is the percentage change in the book value of equity for each year, *TaxChange* is the percentage point change in the corporate tax rate for each year, β_0 is the intercept, β_1 is the effect of a one percentage point increase in corporate tax rate on the book value of equity, and ε_i is the error term with expected mean of zero.

Total Liabilities

The OLS-regression when using the percentage difference in the total liabilities for each year can be given mathematically as

$$TotalLiabilities\_diff = \beta_0 + \beta_1 \times TaxChange + \varepsilon_i$$

where $TotalLiabilities\_diff$ is the percentage change in total liabilities for each year, $TaxChange$ is the percentage point change in the corporate tax rate for each year, β_0 is the intercept, β_1 is the effect of a one percentage point increase in corporate tax rate on the total liabilities, and ε_i is the error term with expected mean of zero.

5.3 DID Model

5.3.1 Difference-in-Differences

To find the effect of the reduction in the Norwegian corporate tax rate on Norwegian firms, we use the difference-in-differences estimator. The difference-in-differences estimator estimates the effect of the treatment through the difference between the treatment and control groups before and after the treatment (Angrist & Pischke, 2008). For our research question we first estimate the difference in various variables from 2012 to 2016. Any difference between these differences, assuming there would otherwise not be any difference, should be the effect of the treatment. Mathematically this can be expressed as

$$Y_{i,NOR,t} = \text{D/E ratio for corporation } i \text{ in Norway if } NOR = 1, \text{ and for period } t$$

We assume that

$$E(Y_{i,NOR,t}|NOR,t) = \gamma_s + \lambda_t \tag{19}$$

where NOR denotes whether the company is Norwegian or not, and t denotes the period.
The equation shows that Y_i is determined by both a time-invariant effect of whether the corporation is Norwegian or not, and a time effect that is common regardless of the corporation's origins.

If we let D be a dummy variable for the tax reform, which is only applicable if $NOR = 1$, and $t = 2016$, we get

$$Y_{i,NOR,t} = \gamma_s + \lambda_t + \beta D_{NOR,t} + \varepsilon_{i,NOR,t} \tag{20}$$

where $E(\varepsilon_{i,NOR,t}|NOR,t) = 0$.

We then get

$$\begin{aligned} E(Y_{i,NOR,t|NOR} = 0, t = 2016) - E(Y_{i,NOR,t|NOR} = 0, t = 2012) \\ = \lambda_{t=2016} - \lambda_{t=2012} \end{aligned} \tag{21}$$

and

$$\begin{aligned} E(Y_{i,NOR,t}|NOR = 1, t = 2016) - E(Y_{i,NOR,t}|NOR = 1, t = 2012) \\ = \lambda_{t=2016} - \lambda_{t=2012} + \beta \end{aligned} \tag{22}$$

The difference-in-differences estimator is then given by

$$\begin{aligned} [E(Y_{i,NOR,t}|NOR = 1, t = 2016) - E(Y_{i,NOR,t}|NOR = 1, t = 2012)] \\ -[E(Y_{i,NOR,t|NOR} = 0, t = 2016) - E(Y_{i,NOR,t|NOR} = 0, t = 2012)] \\ = \beta \end{aligned} \tag{23}$$

In this sense the difference-in-differences estimator should be able to estimate the effect of the tax reform. It should be noted that we assume that there are no other major factors that are affecting only the treatment group after the tax reform, and that prior to the treatment there are parallel trends in Y for the treatment and control group.

5.3.2 DID Models

To find the differences-in-differences between the treatment and the control group, we used OLS regressions with the percentage difference from the year 2012 to the year 2016 on the dependent variable in question, and regressed it on an independent dummy variable for the treatment group. We ran regressions using mainly two dependent variables, including the debt to market value of equity ratio, and the debt to book value of equity ratio. To decompose any results, we also ran regressions using market value of equity, book value of equity and total liabilities as dependent variables. Considering the assumption that the propensity score matching should control for any other differences between the firms, except for the treatment, no control variables are included in the regressions.

Debt to Market Value of Equity Ratio

The OLS-regression when using the percentage difference in debt to market value of equity ratio can be given mathematically as:

$$DEM\_diff = \beta_0 + \beta_1 \times NOR + \varepsilon_i$$

where DEM_diff is the percentage change in the debt to market value of equity from 2012 to 2016 for each firm, NOR is a dummy variable for whether the company is Norwegian or not, β_0 is the intercept, β_1 is the difference in means between the Norwegian firms and the control group, and ε_i is the error term with expected mean of zero.

Log Transformation of Debt to Market Value of Equity Ratio

As the OLS-regression for the debt to market value of equity ratio does not meet the assumptions as presented in appendices Q - V, we log-transform DEM_diff into $log(DEM\_diff + 0.939)$. 0.939 is added to the log-transformation to prevent the exclusion of negative values of DEM_diff. 0.939 is slightly above the absolute value of the lowest observation of DEM_diff, which is -0.9384. The lowest observation of $log(DEM\_diff + 0.939)$ will as a result be slightly above zero. We then get the regression

$$log(DEM\_diff + 0.939) = \beta_0 + \beta_1 \times NOR + \varepsilon_i$$

where $log(DEM\_diff + 0.939)$ is the log-transformaton of DEM_diff, NOR is a dummy variable for whether the company is Norwegian or not, β_0 is the intercept, β_1 is the difference in means between the Norwegian firms and the control group, and ε_i is the error term with expected mean of zero.

Debt to Book Value of Equity Ratio

The OLS-regression when using the percentage difference in debt to book value of equity ratio can be given mathematically as

$DEB\_diff = \beta_0 + \beta_1 \times NOR + \varepsilon_i$

where DEB_diff is the percentage change in the debt to book value of equity from 2012 to 2016 for each firm, NOR is a dummy variable for whether the company is Norwegian or not, β_0 is the intercept, β_1 is the difference in means between the Norwegian firms and the control group, and ε_i is the error term with expected mean of zero.

Market Value of Equity

The OLS-regression when using the percentage difference in market value of equity can be given mathematically as

$MarketCap\_diff = \beta_0 + \beta_1 \times NOR + \varepsilon_i$

where $MarketCap\_diff$ is the percentage change in the market value of equity from 2012 to 2016 for each firm, NOR is a dummy variable for whether the company is Norwegian or not, β_0 is the intercept, β_1 is the difference in means between the Norwegian firms and the control group, and ε_i is the error term with expected mean of zero.

Book Value of Equity

The OLS-regression when using the percentage difference in book value of equity can be given mathematically as

$BookEquity\_diff = \beta_0 + \beta_1 \times NOR + \varepsilon_i$

where $BookEquity\_diff$ is the percentage change in the book value of equity from 2012 to 2016 for each firm, NOR is a dummy variable for whether the company is Norwegian or not, β_0 is the intercept, β_1 is the difference in means between the Norwegian firms and the control group, and ε_i is the error term with expected mean of zero.

Total Liabilities

The OLS-regression when using the percentage difference in total liabilities can be given mathematically as

$$TotalLiabilities\_diff = \beta_0 + \beta_1 \times NOR + \varepsilon_i$$

where $TotalLiabilities\_diff$ is the percentage change in total liabilities from 2012 to 2016 for each firm, *NOR* is a dummy variable for whether the company is Norwegian or not, β_0 is the intercept, β_1 is the difference in means between the Norwegian firms and the control group, and ε_i is the error term with expected mean of zero.

6 Empirical Results

6.1 Descriptive Statistics

Variable	Observations	Mean	Std.dev	Min	Max
DE Book	48	1.55	1.44	0.14	9.31
DE Market	48	1.23	1.34	0.06	6.82
Revenue	48	1675.39	3547.37	0.02	17488.76
Market Capital	48	1860.11	5173.05	4.71	31469.33
Assets	48	2316.48	5659.71	4.77	30459.29
Liabilities Total	48	1147.2	2730.77	2.35	16564.24
Fixed Assets	48	0.19	0.16	0.01	0.60
Fixed Assets Turnover	48	85.95	415.78	0.07	2826.84
Price / Book	48	2.54	4.91	0.25	34.66
Current Ratio	48	1.83	1.13	0.40	6.42
Profitability	48	-38.8	269.76	-1868.75	1.87

Table 1: NOR = 1 Year 2012

Variable	Observations	Mean	Std.dev	Min	Max
DE Book	48	1.12	1.98	-3.59	319.18
DE Market	48	8.8	46.16	0.07	13.01
Revenue	48	4226.95	16557.78	0.01	101214.70
Market Capital	48	3694.55	13703.25	3.89	86167.93
Assets	48	4602.75	15796.17	1.11	84819.36
Liabilities Total	48	2854.163	10012.10	0.79	50795.09
Fixed Assets	48	0.24	0.23	0.01	0.92
Fixed Assets Turnover	48	14.51	36.72	0.00	230.51
Price / Book	48	5.12	16.10	-15.30	105.33
Current Ratio	48	1.82	1.17	0.09	5.41
Profitability	48	-3.6	21.46	-146.08	0.39

Table 2: NOR = 0 Year 2012

Tables 1 and 2 show descriptive statistics for the matched treated and untreated groups for mainland Norway excluding financial institutions after having controlled for outliers. There are 48 pairs of observations. $Nor = 1$ are Norwegian firms and $Nor = 0$ are non-Norwegian firms. Ideally, the tables would show identical numbers, affirming that companies from the control and treatment group are homogeneous pre-treatment. However, this is not the case and there are differences between the groups. Looking at mean values, the current ratio and fixed assets variables indicate good matches but other variables have larger differences. Profitability is negative for both Norwegian and non-Norwegian firms. This might be explained by a significant part of the observed firms being small companies in high-growth phases, lacking market-able products to yield them substantial profits.

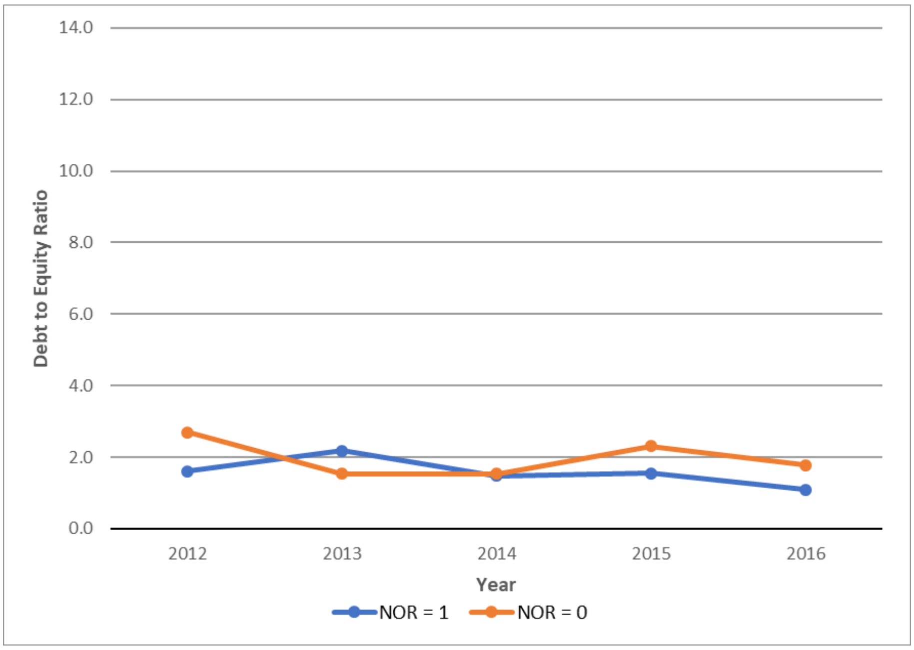

Figure 3: Debt to market value of equity. Mainland Norway excluding financial institutions.

Figure 3 depicts the change in the market debt to equity ratio for mainland companies excluding financial institutions during the time period 2012 to 2016 for Norwegian and non-Norwegian companies. It is possible to see that for both Norwegian and non-Norwegian firms that the market value debt to equity ratio has decreased. The decrease from 2012 to 2016 appears to be of the same size for both groups. This could be explained by the global surge in stock markets during the time period. However, for Norwegian companies the decreases appear from years 2013 to 2014 and 2015 to 2016 which is in line with when corporate tax rate changes have been made. In total, it is not possible to distinguish from the figure that Norwegian firms have reduced their ratios due to changes in the corporate tax rate. The next sections will attempt to uncover these effects.

6.2 Yearly Tax Change Model

6.2.1 OLS Regressions

	(1) DEM_diff	(2) DEB_diff	(3) MarketCap_diff	(4) BookEquity_diff	(5) TotalLiabilities_diff
TaxChange	0.0799	0.0223	-0.116	-0.152	-0.108
	(1.27)	(0.27)	(-0.89)	(-1.47)	(-0.98)
_cons	0.189***	0.0982	0.326**	0.0500	0.169
	(3.81)	(1.51)	(3.17)	(0.61)	(1.96)
N	384	384	384	384	384
R^2	0.004	0.000	0.002	0.006	0.003
adj. R^2	0.002	-0.002	-0.001	0.003	-0.000

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Yearly Tax Change Model Regressions

Table 3 shows five individual regressions with percentage changes debt to market value of equity ratio, debt to book value of equity ratio, market value of equity, book value of equity, and total liabilities as dependent variables, and yearly changes in the corporate tax rate as the independent variable. Positive coefficients mean that a one percentage point increase in tax rate increases the dependent variable, while negative coefficients show an inverse relationship.

Debt to Market Value of Equity Ratio

Regression (1) in table 3 shows an increase in the debt to market value of equity ratio of 0.08% for each 1 percentage point increase in the corporate tax rate within a given year, but this change is too small to be of statistical significance. This insignificance makes sense from a pecking order theory perspective, but according to the trade-off theory, if there are no lags, there should be a significant change as managers want to maximize the value of the firm at any time.

Debt to Book Value of Equity Ratio

Regression (2) in table 3 shows no significant effect from tax changes on the development of the debt to book value of equity ratio in the given year.

Market Value of Equity

Regression (3) shows an inverse, but insignificant relation between the the market value of equity and tax changes within a given year. Considering that in efficient markets a change in the market value of equity should occur as soon as a tax change is announced, this fits both theories.

Book Value of Equity

Table 3 shows no significant effect from tax changes on the development of the book value of equity in the given year

Total Liabilities

Regression (5) shows no significant effect from tax changes on the development of total liabilities in the given year.

6.2.2 Testing of Assumptions

Linearity

Linearity illustrations in appendix G show that all regressions should fulfill the assumption of linearity.

Random Sample

All available firms on the Norwegian Stock Exchange, excluding financial, shipping and oil related businesses, have been selected. The control sample is chosen from a matching algorithm. Therefore the sample chosen should not break the random sample assumptions.

No Multicollinearity

There is only one independent variable and there is therefore no multicollinearity present.

Exogeneity

The exogeneity tests in appendix H show there might be exogenous factors in regression (1).

Spherical Errors

From appendix I, the IM-tests show there might be heteroskedasticity present for regressions (1) and (2). Additionally, the Breusch-Pagan / Cook-Weisberg test presented in appendix J shows heteroskedasiticy for all regressions except regression (5). There also seems to be autocorrelation for regressions (1), (3), and (4), as using the Wooldridge test presented in appendix K.

Normality

Normality-tests in appendices L, M, and N, seem to show that all regressions break this assumption.

Fixed Effects

The fixed effects test presented in appendix O show that none of the regressions seem to suffer from fixed effects.

Random Effects

The random effects test presented in appendix P show that none of the regressions seem to suffer from random effects.

6.2.3 Discussion of Results

None of the regressions in the yearly tax change model show any significant effects on changes in debt to market value of equity ratio, debt to book value of equity, market value of equity, book value of equity, or total liabilities. This implies that we can not conclude that any of these factors are affected by tax changes within a given year. As hypothesized earlier we would expect the capital structure to change within the year of the tax change if managers acted according to the trade-off theory, given there are no lags. The lack of changes in the capital structure might therefore be in favor of the pecking order theory, or imply that from a trade-off theory perspective the costs of changing the capital structure exceed the benefits from doing so.

6.3 DID Model

6.3.1 OLS Regressions

	(1) DEM_diff	(2) logDEM_diff	(3) DEB_diff	(4) MarketCap_diff	(5) BookEquity_dif f	(6) TotalLiabilities _diff
NOR	-0.857*	-0.637*	-0.415	0.557	-1.334	-0.549
	(-2.44)	(-2.52)	(-1.19)	(0.73)	(-0.63)	(-1.64)
_cons	0.796**	-0.0417	0.581*	0.950	2.166	0.835***
	(3.20)	(-0.23)	(2.36)	(1.76)	(1.46)	(3.53)
N	96	96	96	96	96	96
R^2	0.059	0.063	0.015	0.006	0.004	0.028
adj. R^2	0.049	0.053	0.004	-0.005	-0.006	0.018

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: DID Model Regressions

Table 4 shows six individual regressions with dependent variables being the percentage changes from 2012 to 2016 for debt to market value of equity ratio, the log transformation of debt to market value of equity ratio, debt to book value of equity ratio, market value of equity, book value of equity, and total liabilities. The independent variable, NOR, is a dummy variable stating whether or not the firm is Norwegian and as result has undergone a change in corporate tax rate. The coefficients therefore simply state the differences between Norwegian and non-Norwegian firms.

Debt to Market Value of Equity Ratio

As shown in table 4, regressing the percentage change in the debt to market value of equity ratio on treatment shows that in the sample, Norwegian firms reduced their debt to market value of equity ratio by 85.7% compared to the control group. This figure is significant at the 1.7% level, and might indicate that the tax reduction had an effect on the capital structure of Norwegian firms. The model has an explanatory value of 4.9% as implied by the adjusted R-squared.

Log Transformation of Debt to Market Value of Equity Ratio

Regression (2) in table 4 show significant changes in the log transformation of the debt to market value of equity ratio. The regression was included to affirm the validity of regression (1), as regression (1) did not fulfill all OLS assumptions presented in the methodology section.

Debt to Book Value of Equity Ratio

Regressing the percentage change in the debt to book value of equity ratio on the treatment shows a reduction in the ratio for Norwegian firms, but this figure is not significant at the 5% level, and we are not able to conclude that there are any differences between the Norwegian sample and the control sample.

Market Value of Equity

Regressing the percentage change in market value of equity on the treatment shows an increase for Norwegian firms, but this figure is not significant at the 5% level, and we are not able to conclude that there are any differences between the Norwegian sample and the control sample.

Book Value of Equity

Regressing the percentage change in book value of equity on the treatment shows a reduction for Norwegian firms, but this figure is not significant at the 5% level, and we are not able to conclude that there are any differences between the Norwegian sample and the control sample.

Total Liabilities

Regressing the percentage change in total liabilities on the treatment shows a reduction for Norwegian firms, but this figure is not significant at the 5% level, and we are not able to conclude that there are any differences between the Norwegian sample and the control sample.

6.3.2 Testing of Assumptions

Linearity

Considering the independent variable *NOR* is a dummy variable for all the regressions, linearity should be satisfied as there are only two points on the x-axis.

Random Sample

All available firms on the Norwegian Stock Exchange, excluding financial, shipping and oil related businesses, have been selected. The control sample is chosen from a matching algorithm. Therefore the sample chosen should not break the random sample assumption.

No Multicollinearity

There is only one independent variable and there is therefore no multicollinearity present.

Exogeneity

Exogenuity tests presented in appendix Q show some proof of exogeneity for regressions (1) and (2).

Spherical Errors

From appendix R, the IM-tests show there might be heteroskedasticity present for the regression (3). Additionally, Breusch-Pagan / Cook-Weisberg tests presented in appendix S show heteroskedasicity for all regressions except the regression (2).

Normality

Normality-test in appendices T, U, and V, show that all regressions except regression (2) seem to break this assumption.

6.3.3 Discussion of Results

Results from the DID models show no significant differences between the treatment and the control group for changes in debt to book value of equity ratio, market value of equity, book value of equity, or total liabilities. For changes in the debt to market value of equity ratio the analysis show that while the control group increased this ratio by 79.6%, the Norwegian firms reduced the ratio by 6.1%, which is a difference of 85.7%. The assumptions for this regression were broken, but when log transforming the dependent variable, all assumptions, with the exception of endogeneity, are fulfilled, and the results from the regression might therefore be considered significant. This might indicate that the reduction in the Norwegian corporate tax rate from 2012 to 2016 causes Norwegian firms to change their capital structure by reducing the debt to market value of equity ratio. We expected an increase in the market value of equity and a decrease in total liabilities, and from the coefficients it might seem this is the development that happened in the period, but these changes are not statistically significant. While figure 3 illustrates that the mean of the debt to market value of equity has decreased for both groups, the DID model indicates that the mean of the percentage change for the individual firms has increased for the control group. This can be explained for instance by firms with low ratios doubling their debt or so. For example, a firm increasing its debt to equity ratio from 0.04 to 0.08 would have the same effect on the models as a firm increasing their ratio from 4 to 8.

6.4 Testing of Other Assumptions

6.4.1 Propensity Score Matching Assumptions

Conditional Independence Assumption

The conditional independence assumption should be considered broken as all firms subject to the treatment are Norwegian firms, while those that are not subject to the treatment are non-Norwegian firms. In this sense factors that affect the outcomes that are only subject to Norwegian firms, and independent of the treatment itself, might occur.

Common Support Condition

The Kolmogorov-Smirnov tests in appendix F show that all matching variables except profitability fulfill the common support condition. In future matching models we might therefore consider removing this as a variable.

Balancing Condition

T-tests for the balancing condition for propensity score matching is presented in appendix E, and implies that all matching variables fulfill this assumption.

6.4.2 Difference-in-Differences Assumptions

Difference-in-differences assumes parallel trends before the treatment. Considering the volatility of some of the variables, mainly the debt to market value of equity ratio, this assumption is likely to have been broken. Consequently, it is difficult to conclude that any differences between the two groups are a result of changes in corporate tax rates.

6.5 Comparing Results From Both Models

The DID model finds a significant reduction in the debt to market value of equity ratio for Norwegian firms in the period 2012 to 2016. The yearly tax change model is not able to isolate this reduction to the yearly tax changes, which might be because firms do not change their capital structure immediately when a tax change is implemented, but rather adjust before, during, and after said change. Economic intuition would suggest that the market value of equity would increase when the corporate tax rate is reduced, but the DID model was unable to find any significant increases for the treatment group. As discussed in our hypotheses, both models should expect a reduction in the debt to equity ratio. If managers act according to the trade-off theory, and there are no lags, we would expect this reduction to occur within the year of the tax reduction. The results might therefore indicate that managers are more prone to act in accordance with the pecking order theory, or that the costs of immediately changing the capital structure exceed the benefits of doing so.

7 Limitations

Our analyses are highly limited by the small sample size of listed, mainland, non-financial Norwegian firms affected by the reductions in the corporate tax rate. The small sample size allows individual firms to heavily influence the analyses, and reduces the likelihood of finding significant results. Consequently, this also makes it difficult to analyze individual industries, as the small sample size would be especially prominent in such analyses.

Additionally, other assumptions made for our models are not fulfilled. For instance, the propensity score matching assumes conditional independence, which is not fulfilled due to macroeconomic factors specific to the Norwegian economy that might affect the capital structure of firms. Such factors mainly include the major reduction in the oil price, and the depreciation of the Norwegian Krone, but might include additional macroeconomic factors (Seeking Alpha, 2016). The exact factors deciding the capital structure of a firm, are also subject to debate, and the matching algorithm used in the thesis is subject to improvement.

The debt to equity ratios were more volatile than first expected, which might break the assumption of parallel trends for the difference-in-differences estimator.

The small sample size, and the conditional dependence of the observations also causes several OLS assumptions to be unfulfilled in both the event study and the yearly tax change model. Considering these issues, we should be careful when interpreting the results of the analyses.

8 Further Research

There are a number of items we would suggest for further research. Primarily, it would be advantageous to develop a matching algorithm that is superior to ours, and is able to find a control group that closest resemble the treatment group. To do so, it is imperative to truly find what factors affect the capital structure of enterprises.

We are also interested in seeing how a change in the corporate tax rate affects different industries including financial services, but in order to do so we would need a larger sample of firms. Similarly, seeing how multinational corporations react to such tax changes would be of huge interest. Such companies are able to transfer debt within different subsidiaries, and can therefore focus the main part of their debt to countries with high corporate tax rates to maximize their tax shields. As a result, we would expect these corporations to be more affected by changes in the corporate tax rate than other corporations.

Finally, the major changes in the oil price and the value of the Norwegian Krone, combined with a small sample size, causes this kind of analyses to have major flaws when done for the Norwegian market. President Donald Trump of the United States of America has recently spoken out against the American 35% corporate tax rate, and has proposed decreasing it to 20% (Business Insider Nordic, 2017). If such a change were to happen immediately, and considering the large number of companies affected, it would provide a near-perfect environment for studies such as the one done in this thesis.

9 Conclusion

In our thesis we have used established economic theories on capital structure, such as the trade-off theory and the pecking order theory, to determine the expected changes in capital structure for Norwegian firms as a result of the recent reductions in the corporate tax rate. Through economic intuition, we have hypothesized that firms will reduce their debt to equity ratios in accordance with both theories. For the trade-off theory, we should expect such changes to occur in the year of the tax change, while the pecking order theory might lead to a more gradual change in capital structure.

Our analyses show a comparatively reduced debt to market value of equity ratio for Norwegian firms during the years 2012 to 2016. This corresponds with what we would expect according to both trade-off theory and pecking order theory. We have not been able to isolate such changes to the years in which tax changes occur, and consequently the pecking order theory might better explain Norwegian firm behavior rather than the trade-off theory, or it might indicate that the costs of immediately changing the capital structure exceed the benefits of doing so. We have not been able to find statistically significant comparative changes in neither the debt to book value of equity ratio, market value, book value, or total liabilities.

Because of the small Norwegian sample size, our results are heavily reliant on how non-Norwegian firms have been matched with the treatment group. Several important assumptions are not fulfilled, such as the conditional independence and parallel trends assumptions, and the results are therefore not definite.

For future research we highly recommend determining the exact factors of capital structure in firms to better control for such factors in analyses. We also recommend analyses between industry groups, and of multinational corporations, to see if certain sectors are more sensitive to changes in the tax rate. Finally, should the proposed 15 percentage point decrease in the U.S. corporate tax rate be enacted this would create a much better environment for future research on studies similar to our thesis.

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Appendices

A Number of matched pairs per GIC Industry, Mainland Norway excluding financial enterprises

GIC Industry	# of pairs
151010	2
151040	3
151050	1
201010	1
201020	1
201030	4
201040	1
201060	5
202010	1
203020	1
251010	1
252010	1
254010	3
302020	7
351010	1
352010	2
352020	2
451010	1
451020	5
451030	1
452030	4
453010	2
501010	2
551050	1
Total	53

Figure 4: Number of matched pairs for each industry

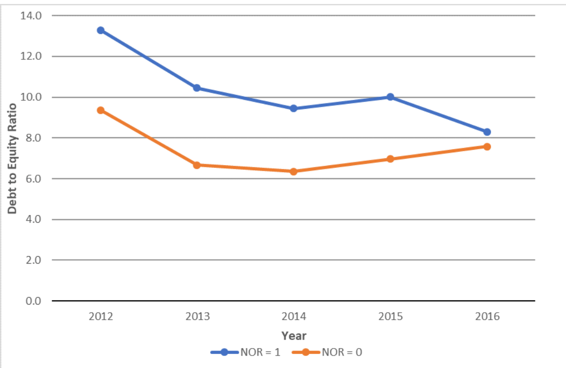
B List of companies with corresponding match, all GIC industries

NOR = 1	NOR = 0	GIC Industry	NOR = 1	NOR = 0	GIC Industry
ABG SUNDAL COLLIER HLDG ASA	SENVEST CAPITAL INC	402030	NORDIC SEMICONDUCTOR	LATTICE SEMICONDUCTOR CORP	453010
AF GRUPPEN ASA	WESTERNONE INC	201030	NORSK HYDRO ASA	ASBESTOS CORP LTD	151040
AKASTOR ASA	FORUM ENERGY TECH INC	101010	NORSKE SKOGINDUSTRIER A/S	ACADIAN TIMBER CORP	151050
AKER ASA	ABC ARBITRAGE SA	402010	NORWAY ROYAL SALMON AS	POST HOLDINGS INC	302020
AKER BP ASA	GENESIS ENERGY -LP	101020	NORWEGIAN AIR SHUTTLE ASA	SPIRIT AIRLINES INC	203020
AKVA GROUP ASA	AALBERTS INDUSTRIES NV	201060	NORWEGIAN ENERGY CO AS	OMV AG	101020
AMERICAN SHIPPING CO ASA	EAGLE BULK SHIPPING INC	203030	NORWEGIAN PROPERTY AS	S IMMO AG	601020
APPTIX ASA	HAITEC AG	451020	NRC GROUP ASA	HEIJMANS NV	201030
ARENDALS FOSSEKOMPANI ASA	ENERGIEKONTOR AG	551050	NTS ASA	MATSON INC	203030
ATEA ASA	KEYWARE TECHNOLOGIES SA	451020	OCEANTEAM ASA	C&J ENERGY SERVICES INC	101010
AURSKOG SPAREBANK ASA	COMMUNITY BANKERS TRUST CORP	401010	ODFJELL SE	GENCO SHIPPING & TRADING	203030
AUSTEVOLL SEAFOOD ASA	SOCFINASIA SA HOLDING	302020	OLAV THON EIENDOMSSELSKAP	PSP SWISS PROPERTY AG	601020
AWILCO LNG AS	TOURMALINE OIL CORP	101020	OPERA SOFTWARE ASA	XO GROUP INC	451010
BELSHIPS ASA	SLOMAN NEPTUN SCHIFFAHRTS-AG	203030	ORKLA ASA	SUEDWESTDEUTSCHE SALZWERKE	302020
BERGEN GROUP ASA	SUPERIOR ENERGY SERVICES INC	101010	OSLO BORS VPS HOLDING ASA	SPROTT INC	402030
BIOTEC PHARMACON	INTERNATIONAL STEM CELL CORP	352010	PANORO ENERGY ASA	ADAMS RESOURCES & ENERGY INC	101020
BONHEUR A/S	TERRAVEST CAPITAL INC	101010	PGS-PETROLEUM GEO-SERVICES	CSI COMPRESSCO LP	101010
BORREGAARD ASA	DOWDUPONT INC	151010	PHILLY SHIPYARD ASA	AGCO CORP	201060
BOUVET ASA	GARTNER INC	451020	PHOTOCURE ASA	ACERUS PHARMACEUTICALS CORP	352020
BYGGMA ASA	CONTINENTAL MATERIALS CORP	201020	POLARIS MEDIA ASA	ADUX SA	254010
DATA RESPONSE ASA	COGNIZANT TECH SOLUTIONS	451020	PROTECTOR FORSIKRING ASA	ECHELON FINANCIAL HLDGS INC	403010
DNB ASA	DEXIA SA	401010	Q-FREE ASA	PERCEPTRON INC	452030
DNO ASA	HESS CORP	101020	RENEWABLE ENERGY CORP AS	CANADIAN SOLAR INC	453010
DOF ASA	WILLBROS GROUP INC	101010	SAGA TANKERS ASA	WORLD FUEL SERVICES CORP	101020
EIDESVIK OFFSHORE ASA	MCDERMOTT INTL INC	101010	SALMAR ASA	OMEGA PROTEIN CORP	302020
EIENDOMSSPAR ASA	ZUG ESTATES HOLDINGS	601020	SANDNES SPAREBANK	UMWELTBANK AG	401010
EKORNES ASA	IROBOT CORP	252010	SCHIBSTED ASA	NEXSTAR MEDIA GROUP	254010
ELECTROMAGNETIC GEOSERV	ENSIGN ENERGY SERVICES INC	101010	SELVAAG BOLIG AS	VIB VERMOEGEN AG	601020
ETMAN INTERNATIONAL AS	HAMMOND MFG LTD -CL A	201040	SEVAN DRILLING LTD	NEWPARK RESOURCES	101010
FRED OLSEN ENERGY ASA	DIVESTCO INC	101010	SEVAN MARINE AS	ENERFLEX LTD	101010
GC RIEBER SHIPPING ASA	KUEHNE & NAGEL INTERNATIONAL	203030	SKIENS AKTIEMOLLE ASA	MARRET RESOURCE CORP	402010
GJENSIDIGE FORSIKRING BA	MARSH & MCLENNAN COS	403010	SKUE SPAREBANK	CALIF FIRST NATIONAL BANCORP	401010
GOODTECH ASA	ACTUANT CORP -CL A	201060	SOLSTAD FARSTAD ASA	MACRO ENTERPRISES INC	101010
GRIEG SEAFOOD AS	MHP S.E	302020	SOLVANG ASA	KIRBY CORP	203030
GYLDENDAL ASA	FUTEBOL CLUBE DO PORTO	254010	SPAREBANK 1 BV	BANQUE CANTONALE DU JURA	401010
HAVILA SHIPPING ASA	ENGLOBAL CORP	101010	SPAREBANK 1 NORD-NORGE	CRCAM TOURAINE POITOU	401010
HELGELAND SPAREBANK	VOLKSBANK VORARLBERG E GEN	401010	SPAREBANK 1 OSTFOLD AKERSHUS	ALERUS FINANCIAL CORP	401010
HEXAGON COMPOSITES ASA	AG GROWTH INTERNATIONAL	201060	SPAREBANK 1 RINGERIKE HADELA	BANK OF MARIN BANCORP	401010
HOFSETH BIOCARE ASA	NOVACYT	352010	SPAREBANK 1 SMN	BANQUE CANTONALE DE GENEVE	401010
HOLAND & SETSKOG SPAREBANK	1ST CONSTITUTION BANCORP	401010	SPAREBANK 1 SR BANK	VALIANT HOLDING AG	401010
IDEX ASA	FLEXPOINT SENSOR SYSTEMS INC	452030	SPAREBANKEN MORE	PARK NATIONAL CORP	401010
IM SKAUGEN SE	TC PIPELINES LP	101020	SPAREBANKEN OEST ASA	SANDY SPRING BANCORP INC	401010
INCUS INVESTOR ASA	COMSTOCK MINING INC	151040	SPAREBANKEN SOR AS	NATIONAL BANK HLDGS CORP	401010
INDRE SOGN SPAREBANK	METAIRIE BANK & TRUST CO	401010	SPAREBANKEN VEST AS	BASELLANDSCHAFT KANTONL	401010
INTEROIL EXPLORATION AS	PLAINS ALL AMER PIPELNE -LP	101020	SPECTRUM ASA	EUROCONTROL TECHNICS GRP INC	101010
ITERA ASA	CARDTRONICS PLC	451020	STATOIL ASA	CONOCOPHILLIPS	101020
JAEREN SPAREBANK	SOUTHERN NATIONAL BANCORP VA	401010	STOREBRAND ASA	HANNOVER RUECK SE	403010
KITRON ASA	I D SYSTEMS INC	452030	STORM REAL ESTATE AS	BURGERL BRAUHS INGOLSTADT AG	601020
KONGSBERG AUTOMOTIVE ASA	CURAEGIS TECHNOLOGIES INC	251010	STRONGPOINT ASA	ISRA VISION AG	452030
KONGSBERG GRUPPEN ASA	CUBIC CORP	201010	TECHSTEP ASA	PROLOGUE	451030
KVAERNER ASA	PULSE SEISMIC INC	101010	TELENOR ASA	TELUS CORP	501010
LEROY SEAFOOD GROUP ASA	DONEGAL INVESTMENT GROUP PLC	302020	TGS-NOPEC GEOPHYSICAL CO ASA	ION GEOPHYSICAL CORP	101010
MARINE HARVEST ASA	MALTERIES FRANCO-BELGES	302020	TOMRA SYSTEMS A/S	CASELLA WASTE SYS INC -CL A	202010
MEDISTIM ASA	VASO CORPORATION	351010	TORGHATTEN ASA	ALGOMA CENTRAL CORP	203030
MELHUS SPAREBANK	TERRA FIRMA CAPITAL CORP	401020	TOTENS SPAREBANK AS	MUTUALFIRST FINANCIAL INC	401010
NAVAMEDIC ASA	CANNABIS SCIENCE INC	352020	TTS GROUP ASA	ALAMO GROUP INC	201060
NEL ASA	BDI BIODIESEL INTL AG	201030	VEIDEKKE A/S	HC2 HOLDINGS INC	201030
NEXTGENTEL HOLDING ASA	PARETEUM CORP	501010	VOSS VEKSEL OG LANDMANDSBANK	SUSSEX BANCORP	401010
NORAM DRILLING CO AS	PETROWEST CORP	101010	WALLENIUS WILHELMSEN LOGISTI	IRISH CONTINENTAL GROUP PLC	203030
NORDIC MINING ASA	CLEVELAND-CLIFFS INC	151040	YARA INTERNATIONAL ASA	BASF SE	151010

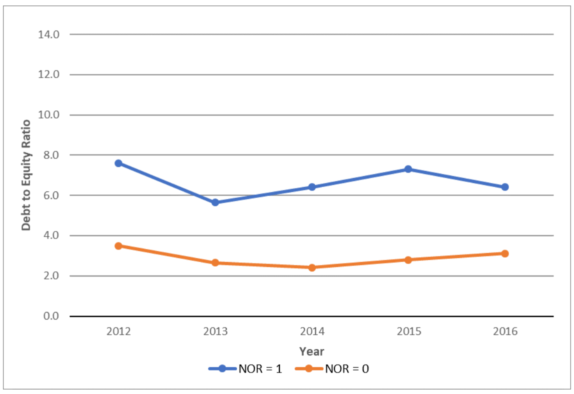
C List of companies with corresponding matches, Mainland Norway excluding financial enterprises

NOR = 1	NOR = 0	GIC Industry	NOR = 1	NOR = 0	GIC Industry
AF GRUPPEN ASA	WESTERNONE INC	201030	NAVAMEDIC ASA	CANNABIS SCIENCE INC	352020
AKVA GROUP ASA	AALBERTS INDUSTRIES NV	201060	NEL ASA	BDI BIODIESEL INTL AG	201030
APPTIX ASA	HAITEC AG	451020	NEXTGENTEL HOLDING ASA	PARETEUM CORP	501010
ARENDALS FOSSEKOMPANI ASA	ENERGIEKONTOR AG	551050	NORDIC MINING ASA	CLEVELAND-CLIFFS INC	151040
ATEA ASA	KEYWARE TECHNOLOGIES SA	451020	NORDIC SEMICONDUCTOR	LATTICE SEMICONDUCTOR CORP	453010
AUSTEVOLL SEAFOOD ASA	SOCFINASIA SA HOLDING	302020	NORSK HYDRO ASA	ASBESTOS CORP LTD	151040
BIOTEC PHARMACON	INTERNATIONAL STEM CELL CORP	352010	NORSKE SKOGINDUSTRIER A/S	ACADIAN TIMBER CORP	151050
BORREGAARD ASA	LINDE AG	151010	NORWAY ROYAL SALMON AS	POST HOLDINGS INC	302020
BOUVET ASA	GARTNER INC	451020	NORWEGIAN AIR SHUTTLE ASA	SPIRIT AIRLINES INC	203020
BYGGMA ASA	CONTINENTAL MATERIALS CORP	201020	NRC GROUP ASA	HEIJMANS NV	201030
DATA RESPONSE ASA	COGNIZANT TECH SOLUTIONS	451020	OPERA SOFTWARE ASA	XO GROUP INC	451010
EKORNES ASA	IROBOT CORP	252010	ORKLA ASA	SUEDWESTDEUTSCHE SALZWERKE	302020
ETMAN INTERNATIONAL AS	HAMMOND MFG LTD -CL A	201040	PHILLY SHIPYARD ASA	AGCO CORP	201060
GOODTECH ASA	ACTUANT CORP -CL A	201060	PHOTOCURE ASA	ACERUS PHARMACEUTICALS CORP	352020
GRIEG SEAFOOD AS	MHP S.E	302020	POLARIS MEDIA ASA	ADUX SA	254010
GYLDENDAL ASA	FUTEBOL CLUBE DO PORTO	254010	Q-FREE ASA	PERCEPTRON INC	452030
HEXAGON COMPOSITES ASA	AG GROWTH INTERNATIONAL	201060	RENEWABLE ENERGY CORP AS	CANADIAN SOLAR INC	453010
HOFSETH BIOCARE ASA	NOVACYT	352010	SALMAR ASA	OMEGA PROTEIN CORP	302020
IDEX ASA	FLEXPOINT SENSOR SYSTEMS INC	452030	SCHIBSTED ASA	NEXSTAR MEDIA GROUP	254010
INCUS INVESTOR ASA	COMSTOCK MINING INC	151040	STRONGPOINT ASA	ISRA VISION AG	452030
ITERA ASA	CARDTRONICS PLC	451020	TECHSTEP ASA	PROLOGUE	451030
KITRON ASA	I D SYSTEMS INC	452030	TELENOR ASA	TELUS CORP	501010
KONGSBERG AUTOMOTIVE ASA	CURAEGIS TECHNOLOGIES INC	251010	TOMRA SYSTEMS A/S	CASELLA WASTE SYS INC -CL A	202010
KONGSBERG GRUPPEN ASA	CUBIC CORP	201010	TTS GROUP ASA	ALAMO GROUP INC	201060
LEROY SEAFOOD GROUP ASA	DONEGAL INVESTMENT GROUP PLC	302020	VEIDEKKE A/S	HC2 HOLDINGS INC	201030
MARINE HARVEST ASA	MALTERIES FRANCO-BELGES	302020	YARA INTERNATIONAL ASA	CHEMTRADE LOGISTICS INCM FD	151010
MEDISTIM ASA	VASO CORPORATION	351010			

D Descriptive Statistics

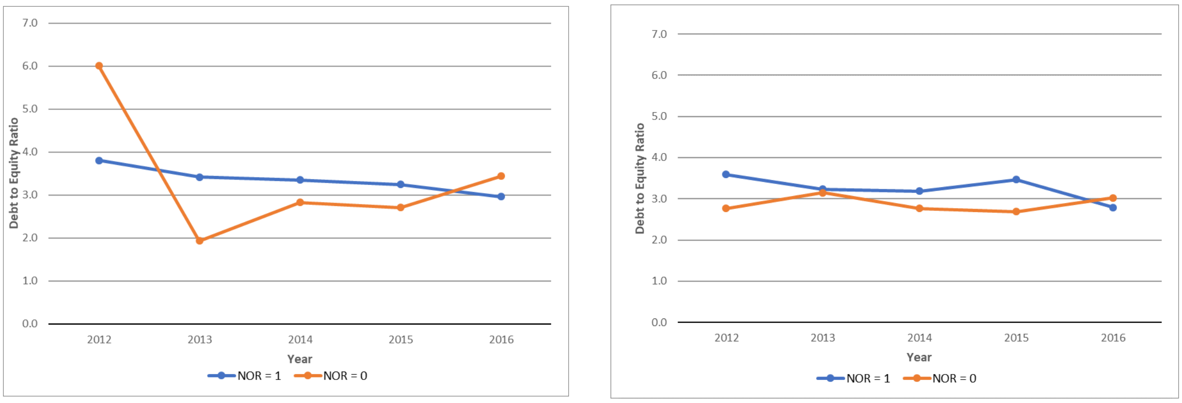


(a) D/E (MV) including outliers



(b) D/E (MV) excluding outliers

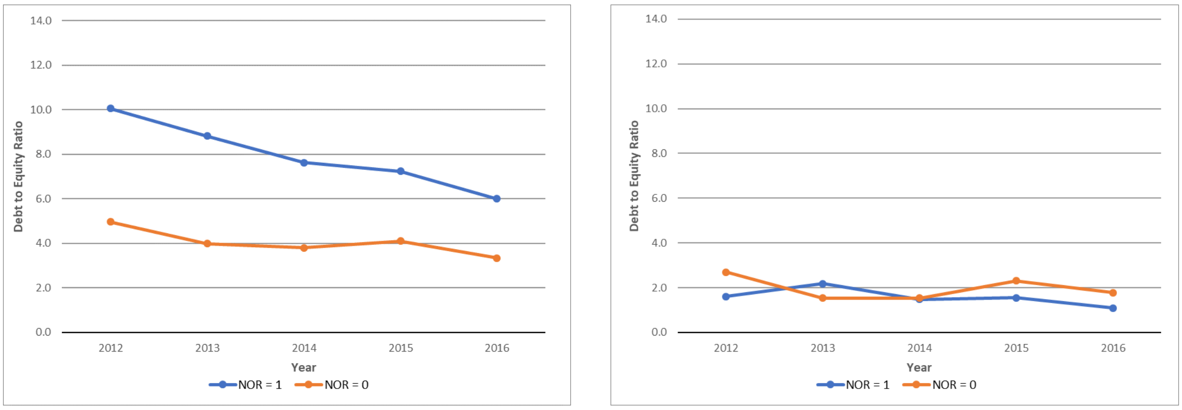
Figure 5



(a) D/E (BV) including outliers

(b) D/E (BV) excluding outliers

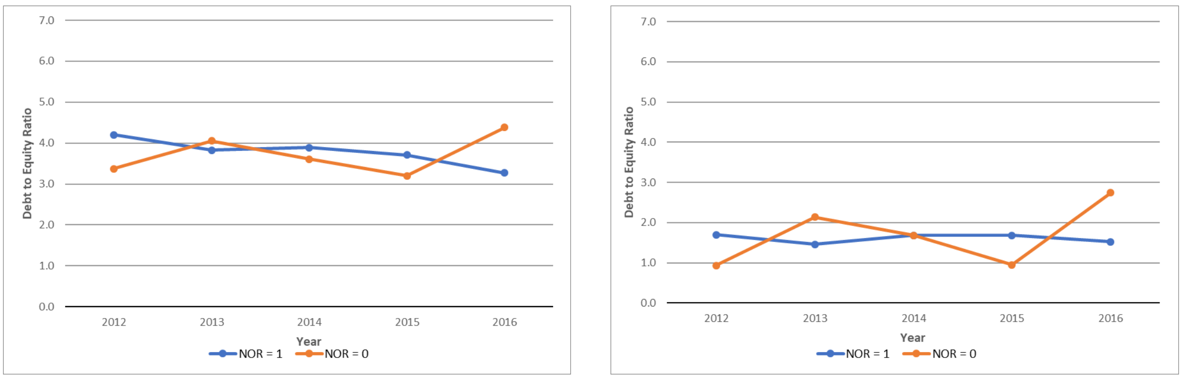
Figure 6



(a) D/E (MV) Mainland

(b) D/E (MV) Mainland excluding financial firms

Figure 7



(a) D/E (BV) Mainland

(b) D/E (BV) Mainland excluding financial firms

Figure 8

E T-tests for Propensity Score Matching Balancing Condition

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	2385.304	1341.084	9291.305	-312.6101	5083.218
1	48	1860.11	746.6648	5173.046	358.014	3362.206
combined	96	2122.707	763.8912	7484.575	606.1911	3639.223
diff		525.1939	1534.932		-2522.449	3572.837

diff = mean(0) - mean(1) t = 0.3422
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Pr(T < t) = 0.6335
Ha: diff != 0 Pr(|T| > |t|) = 0.7330
Ha: diff > 0 Pr(T > t) = 0.3665

(a) Market Capitalization

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	9.02e+07	7.92e+07	5.49e+08	-6.92e+07	2.50e+08
1	48	2.97e+07	2.10e+07	1.46e+08	-1.26e+07	7.19e+07
combined	96	5.99e+07	4.09e+07	4.01e+08	-2.12e+07	1.41e+08
diff		6.06e+07	8.20e+07		-1.02e+08	2.23e+08

diff = mean(0) - mean(1) t = 0.7388
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Pr(T < t) = 0.7691
Ha: diff != 0 Pr(|T| > |t|) = 0.4618
Ha: diff > 0 Pr(T > t) = 0.2309

(b) Market Capitalization^2

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	5.06e+12	4.86e+12	3.36e+13	-4.70e+12	1.48e+13
1	48	7.48e+11	6.50e+11	4.50e+12	-5.60e+11	2.06e+12
combined	96	2.91e+12	2.45e+12	2.40e+13	-1.95e+12	7.76e+12
diff		4.32e+12	4.90e+12		-5.41e+12	1.40e+13

diff = mean(0) - mean(1) t = 0.8810
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Pr(T < t) = 0.8097
Ha: diff != 0 Pr(|T| > |t|) = 0.3805
Ha: diff > 0 Pr(T > t) = 0.1903

(c) Market Capitalization^3

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	2325.557	1030.336	7138.379	252.7876	4398.326
1	48	2316.48	816.9087	5659.709	673.0718	3959.888
combined	96	2321.019	653.9752	6407.622	1022.714	3619.323
diff		9.076849	1314.889		-2601.666	2619.819

diff = mean(0) - mean(1) t = 0.0069
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Pr(T < t) = 0.5027
Ha: diff != 0 Pr(|T| > |t|) = 0.9945
Ha: diff > 0 Pr(T > t) = 0.4973

(d) Assets

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	5.53e+07	4.14e+07	2.87e+08	-2.80e+07	1.39e+08
1	48	3.67e+07	2.15e+07	1.49e+08	-6582004	8.00e+07
combined	96	4.60e+07	2.32e+07	2.28e+08	-89840.82	9.21e+07
diff		1.86e+07	4.67e+07		-7.41e+07	1.11e+08

diff = mean(0) - mean(1) t = 0.3981
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Pr(T < t) = 0.6543
Ha: diff != 0 Pr(|T| > |t|) = 0.6915
Ha: diff > 0 Pr(T > t) = 0.3457

(e) Assets^2

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	2.04e+12	1.80e+12	1.24e+13	-1.58e+12	5.65e+12
1	48	8.73e+11	6.16e+11	4.27e+12	-3.67e+11	2.11e+12
combined	96	1.45e+12	9.46e+11	9.27e+12	-4.25e+11	3.33e+12
diff		1.16e+12	1.90e+12		-2.61e+12	4.93e+12

diff = mean(0) - mean(1) t = 0.6124
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Pr(T < t) = 0.7291
Ha: diff != 0 Pr(|T| > |t|) = 0.5418
Ha: diff > 0 Pr(T > t) = 0.2709

(f) Assets^3

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	1363.68	503.3377	3487.226	351.0954	2376.265
1	48	1675.392	512.0184	3547.368	645.3435	2705.44
combined	96	1519.536	357.4591	3502.37	809.8899	2229.182
diff		-311.7113	717.9915		-1737.3	1113.878

diff = mean(0) - mean(1) t = -0.4341
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.3326 Pr(|T| > |t|) = 0.6652 Pr(T > t) = 0.6674

(a) Revenue

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	1.38e+07	8547562	5.92e+07	-3428455	3.10e+07
1	48	1.51e+07	7933120	5.50e+07	-830788.2	3.11e+07
combined	96	1.44e+07	5800500	5.68e+07	2932358	2.60e+07
diff		-1361570	1.17e+07		-2.45e+07	2.18e+07

diff = mean(0) - mean(1) t = -0.1168
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.4537 Pr(|T| > |t|) = 0.9073 Pr(T > t) = 0.5463

(b) Revenue^2

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	2.10e+11	1.60e+11	1.11e+12	-1.12e+11	5.33e+11
1	48	2.08e+11	1.29e+11	8.92e+11	-5.08e+10	4.67e+11
combined	96	2.09e+11	1.02e+11	1.00e+12	6.17e+09	4.12e+11
diff		1.94e+09	2.06e+11		-4.06e+11	4.10e+11

diff = mean(0) - mean(1) t = 0.0094
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.5037 Pr(|T| > |t|) = 0.9925 Pr(T > t) = 0.4963

(c) Revenue^3

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	47	-3.601927	3.130295	21.46022	-9.902884	2.699029
1	48	-38.80207	38.93599	269.7565	-117.1312	39.52704
combined	95	-21.38726	19.71445	192.1527	-60.53078	17.75625
diff		35.20015	39.47412		-43.18764	113.5879

diff = mean(0) - mean(1) t = 0.8917
Ho: diff = 0 degrees of freedom = 93

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.8126 Pr(|T| > |t|) = 0.3748 Pr(T > t) = 0.1874

(d) Profitability

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	.2435837	.0331482	.2296573	.1768981	.3102692
1	48	.1923202	.0231954	.1607023	.1456571	.2389833
combined	96	.2179519	.0202932	.1988322	.1776648	.2582391
diff		.0512634	.0404577		-.0290663	.1315932

diff = mean(0) - mean(1) t = 1.2671
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.8959 Pr(|T| > |t|) = 0.2083 Pr(T > t) = 0.1041

(e) Fixed Assets

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	14.43016	5.304409	36.75003	3.759066	25.10126
1	48	85.95499	60.0128	415.7809	-34.77519	206.6852
combined	96	50.19257	30.18823	295.783	-9.738632	110.1238
diff		-71.52483	60.24676		-191.1462	48.09654

diff = mean(0) - mean(1) t = -1.1872
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.1191 Pr(|T| > |t|) = 0.2381 Pr(T > t) = 0.8809

(f) Fixed Assets Turnover

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	5.149096	2.323495	16.09764	.4748282	9.823365
1	48	2.538301	.7092492	4.913823	1.111476	3.965127
combined	96	3.843699	1.215657	11.91096	1.430314	6.257083
diff		2.610795	2.429334		-2.212704	7.434294

diff = mean(0) - mean(1) t = 1.0747
Ho: diff = 0 degrees of freedom = 94

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.8574 Pr(|T| > |t|) = 0.2853 Pr(T > t) = 0.1426

(g) Price to Book

Figure 10

F Kolmogorov-Smirnov tests for Propensity Score Matching Common Support Condition

Smaller group	D	P-value	Exact
0:	0.0833	0.717	
1:	-0.0833	0.717	
Combined K-S:	0.0833	0.996	0.997

(a) Market Capitalization

Smaller group	D	P-value	Exact
0:	0.1250	0.472	
1:	-0.0417	0.920	
Combined K-S:	0.1250	0.847	0.853

(b) Assets

Smaller group	D	P-value	Exact
0:	0.2083	0.125	
1:	-0.0208	0.979	
Combined K-S:	0.2083	0.249	0.250

(c) Revenue

Smaller group	D	P-value	Exact
0:	0.5377	0.000	
1:	-0.0208	0.980	
Combined K-S:	0.5377	0.000	0.000

(d) Profitability

Smaller group	D	P-value	Exact
0:	0.0833	0.717	
1:	-0.1875	0.185	
Combined K-S:	0.1875	0.368	0.371

(e) Fixed Assets

Smaller group	D	P-value	Exact
0:	0.2083	0.125	
1:	0.0000	1.000	
Combined K-S:	0.2083	0.249	0.250

(f) Fixed Assets Turnover

Smaller group	D	P-value	Exact
0:	0.1667	0.264	
1:	-0.0625	0.829	
Combined K-S:	0.1667	0.518	0.522

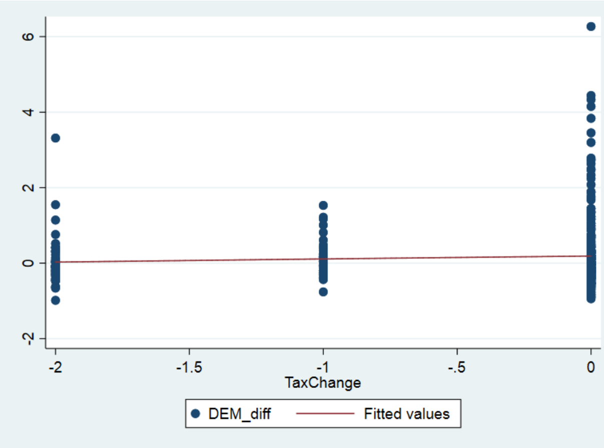
(g) Current Ratio

Smaller group	D	P-value	Exact
0:	0.0833	0.717	
1:	-0.1458	0.360	
Combined K-S:	0.1458	0.687	0.693

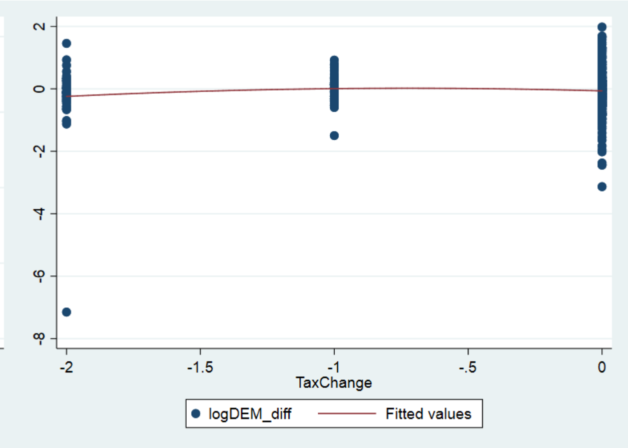
(h) Price to Book

Figure 11

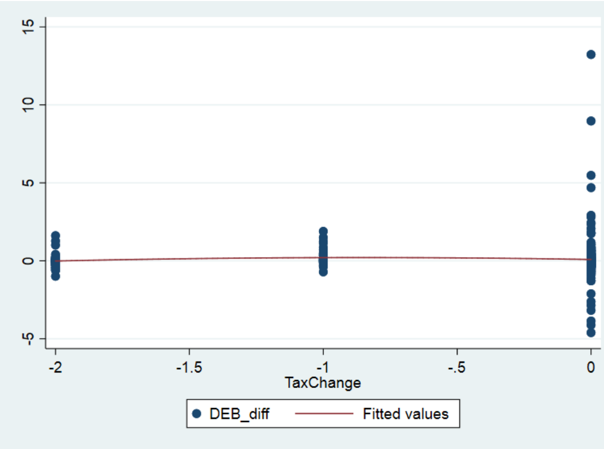
G Fitted Plot to test Linearity, YTC Model



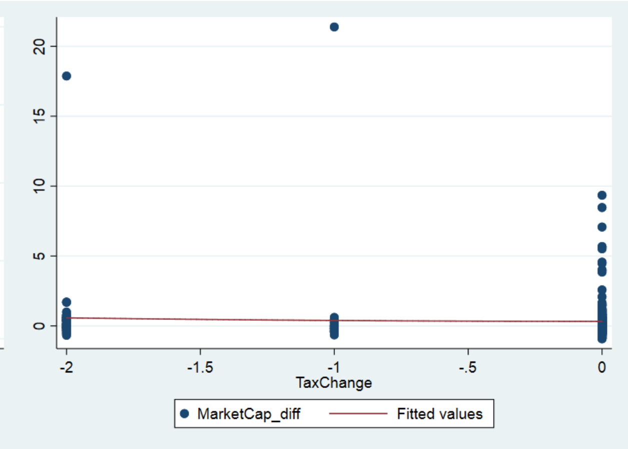
(a) DEM_diff



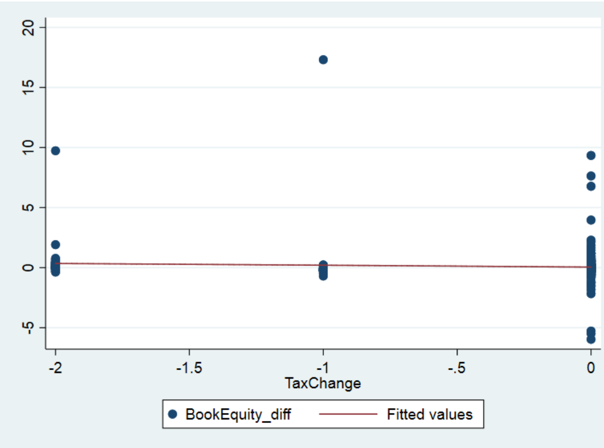
(b) logDEM_diff



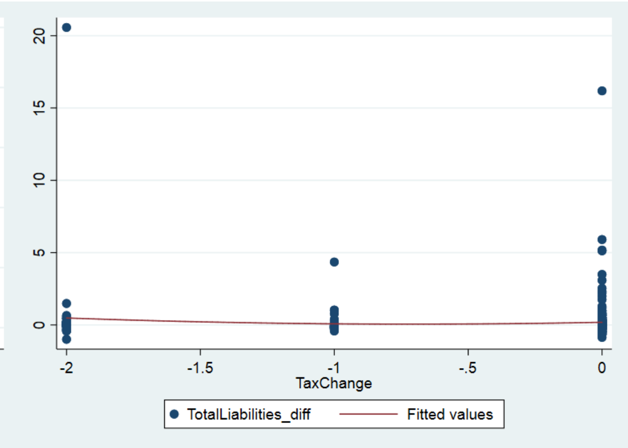
(c) DEB_diff



(d) MarketCap_diff



(e) BookEquity_diff



(f) TotalLiabilities_diff

Figure 12

H Exogeneity tests, YTC Model

Source	SS	df	MS			
				Number of obs	=	384
				F(1, 382)	=	9.06
Model	6.52672307	1	6.52672307	Prob > F	=	0.0028
Residual	275.102072	382	.720162492	R-squared	=	0.0232
				Adj R-squared	=	0.0206
Total	281.628795	383	.735323225	Root MSE	=	.84862

DEM_diff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1	.3321756	3.01	0.003	.3468786	1.653121
_hatsq	0	(omitted)				
_cons	-1.66e-09	.0684171	-0.00	1.000	-.1345213	.1345213

(a) DEM_diff

Source	SS	df	MS			
				Number of obs	=	384
				F(1, 382)	=	3.63
Model	1.89558872	1	1.89558872	Prob > F	=	0.0575
Residual	199.429981	382	.522068014	R-squared	=	0.0094
				Adj R-squared	=	0.0068
Total	201.32557	383	.52565423	Root MSE	=	.72254

logDEM_diff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1	.5247971	1.91	0.057	-.0318528	2.031853
_hatsq	0	(omitted)				
_cons	-2.91e-10	.0543125	-0.00	1.000	-.1067888	.1067888

(b) logDEM_diff

Source	SS	df	MS			
				Number of obs	=	384
				F(1, 382)	=	0.44
Model	.557700562	1	.557700562	Prob > F	=	0.5068
Residual	482.532205	382	1.26317331	R-squared	=	0.0012
				Adj R-squared	=	-0.0015
Total	483.089905	383	1.26133135	Root MSE	=	1.1239

DEB_diff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1	1.504981	0.66	0.507	-1.959083	3.959083
_hatsq	0	(omitted)				
_cons	-1.92e-09	.1469107	-0.00	1.000	-.2888548	.2888548

(c) DEB_diff

Source	SS	df	MS			
				Number of obs	=	384
				F(1, 382)	=	0.22
Model	.70079922	1	.70079922	Prob > F	=	0.6377
Residual	1205.19799	382	3.15496857	R-squared	=	0.0006
				Adj R-squared	=	-0.0020
Total	1205.89879	383	3.14856082	Root MSE	=	1.7762

MarketCap_~f	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1	2.121782	0.47	0.638	-3.171834	5.171834
_hatsq	0	(omitted)				
_cons	-3.29e-08	.7885065	-0.00	1.000	-1.550356	1.550356

(d) MarketCap_diff

Source	SS	df	MS			
				Number of obs	=	384
				F(1, 382)	=	1.48
Model	2.91560717	1	2.91560717	Prob > F	=	0.2251
Residual	754.522762	382	1.97519048	R-squared	=	0.0038
				Adj R-squared	=	0.0012
Total	757.438369	383	1.97764587	Root MSE	=	1.4054

BookEquity~f	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1	.8230761	1.21	0.225	-.6183269	2.618327
_hatsq	0	(omitted)				
_cons	-7.79e-10	.1135262	-0.00	1.000	-.2232144	.2232144

(e) BookEquity_diff

Source	SS	df	MS			
				Number of obs	=	384
				F(1, 382)	=	0.62
Model	1.38895583	1	1.38895583	Prob > F	=	0.4304
Residual	851.474752	382	2.2289915	R-squared	=	0.0016
				Adj R-squared	=	-0.0010
Total	852.863708	383	2.22679819	Root MSE	=	1.493

TotalLiabi~f	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1	1.266806	0.79	0.430	-1.490785	3.490785
_hatsq	0	(omitted)				
_cons	-1.36e-08	.2764253	-0.00	1.000	-.5435057	.5435057

(f) TotalLiabilities_diff

Figure 13

I IM-tests for Heteroskedasticity, YTC Model

Source	chi2	df	p
Heteroskedasticity	9.29	1	0.0023
Skewness	13.07	1	0.0003
Kurtosis	3.65	1	0.0562
Total	26.01	3	0.0000

(a) DEM_diff

Source	chi2	df	p
Heteroskedasticity	0.03	1	0.8708
Skewness	2.45	1	0.1178
Kurtosis	1.19	1	0.2756
Total	3.66	3	0.3004

(b) logDEM_diff

Source	chi2	df	p
Heteroskedasticity	4.66	1	0.0308
Skewness	3.21	1	0.0731
Kurtosis	1.63	1	0.2023
Total	9.50	3	0.0233

(c) DEB_diff

Source	chi2	df	p
Heteroskedasticity	1.30	1	0.2545
Skewness	4.33	1	0.0374
Kurtosis	2.03	1	0.1546
Total	7.66	3	0.0537

(d) MarketCap_diff

Source	chi2	df	p
Heteroskedasticity	0.52	1	0.4718
Skewness	3.47	1	0.0627
Kurtosis	1.62	1	0.2037
Total	5.60	3	0.1329

(e) BookEquity_diff

Source	chi2	df	p
Heteroskedasticity	0.05	1	0.8219
Skewness	2.23	1	0.1357
Kurtosis	1.73	1	0.1889
Total	4.00	3	0.2612

(f) TotalLiabilities_diff

Figure 14

J Breusch-Pagan / Cook-Weisberg for Heteroskedasticity, YTC Model

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of DEM_diff

         chi2(1)      =    62.71
         Prob > chi2  =   0.0000
```

(a) DEM_diff

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of logDEM_diff

         chi2(1)      =     0.34
         Prob > chi2  =   0.5600
```

(b) logDEM_diff

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of DEB_diff

         chi2(1)      =   145.60
         Prob > chi2  =   0.0000
```

(c) DEB_diff

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of MarketCap_diff

         chi2(1)      =    51.35
         Prob > chi2  =   0.0000
```

(d) MarketCap_diff

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of BookEquity_diff

         chi2(1)      =    18.94
         Prob > chi2  =   0.0000
```

(e) BookEquity_diff

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of TotalLiabilities_diff

         chi2(1)      =     3.21
         Prob > chi2  =   0.0734
```

(f) TotalLiabilities_diff

Figure 15

K Wooldridge test for Autocorrelation in Panel Data, YTC Model

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       95) =       6.413
           Prob > F =       0.0130
```

(a) DEM_diff

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       95) =       0.494
           Prob > F =       0.4839
```

(b) logDEM_diff

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       95) =       0.591
           Prob > F =       0.4439
```

(c) DEB_diff

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       95) =      14.984
           Prob > F =       0.0002
```

(d) MarketCap_diff

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       95) =       4.271
           Prob > F =       0.0415
```

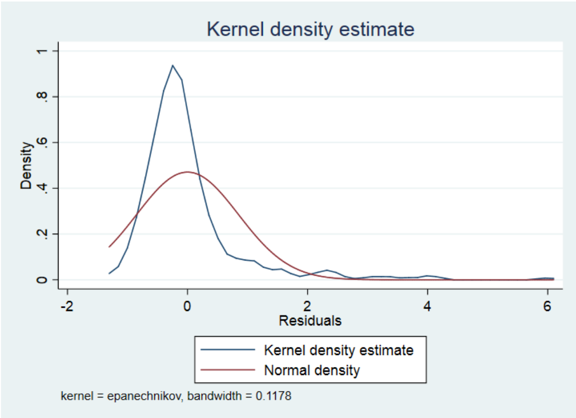
(e) BookEquity_diff

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       95) =       1.803
           Prob > F =       0.1825
```

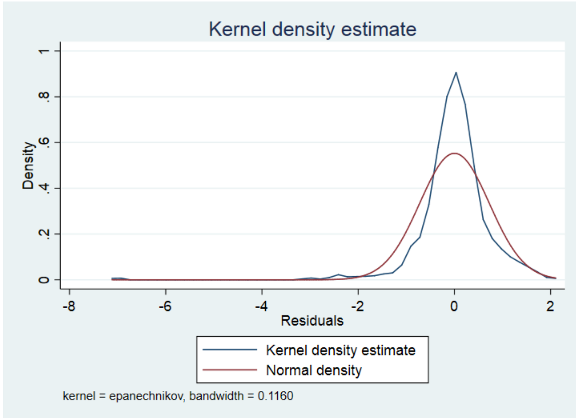
(f) TotalLiabilities_diff

Figure 16

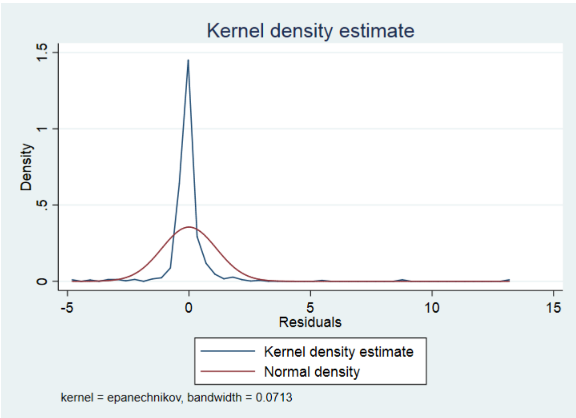
L Kernel Density Estimate to test Normality, YTC Model



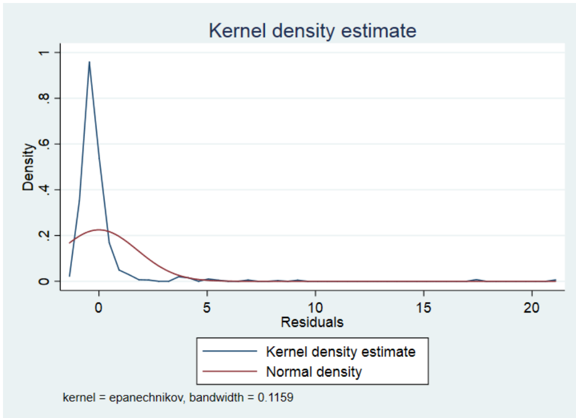
(a) DEM_diff



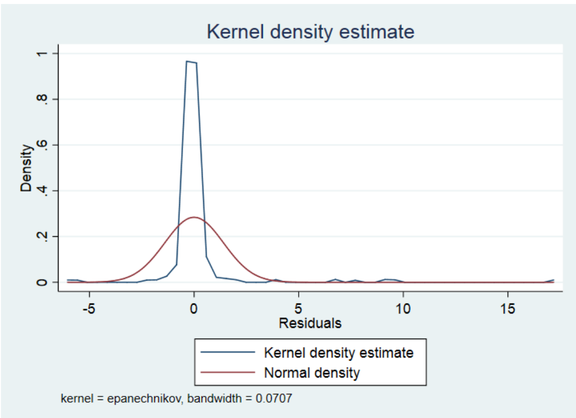
(b) logDEM_diff



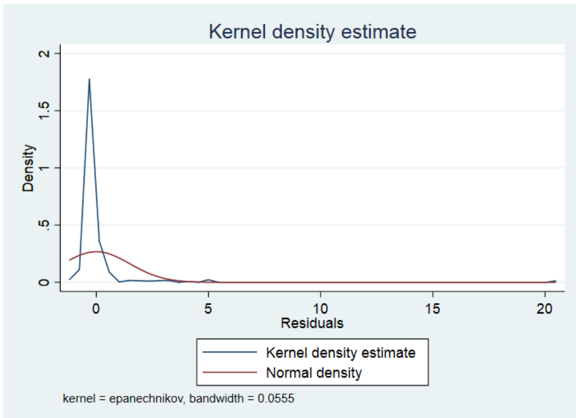
(c) DEB_diff



(d) MarketCap_diff



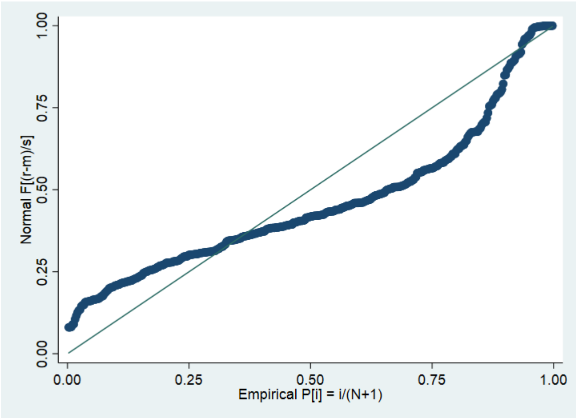
(e) BookEquity_diff



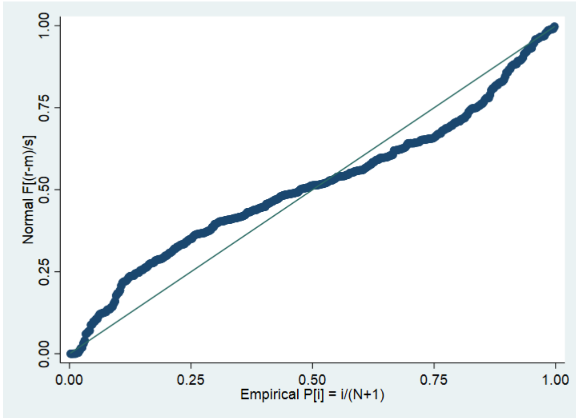
(f) TotalLiabilities_diff

Figure 17

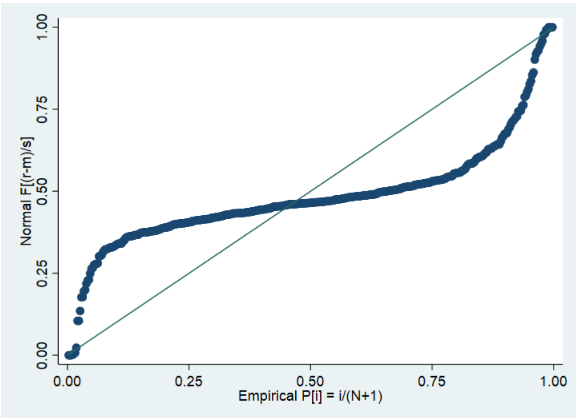
M Standardized Normal Probability Plot to test Normality, YTC Model



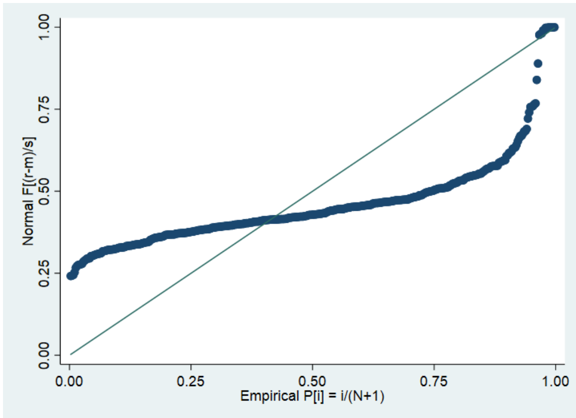
(a) DEM_diff



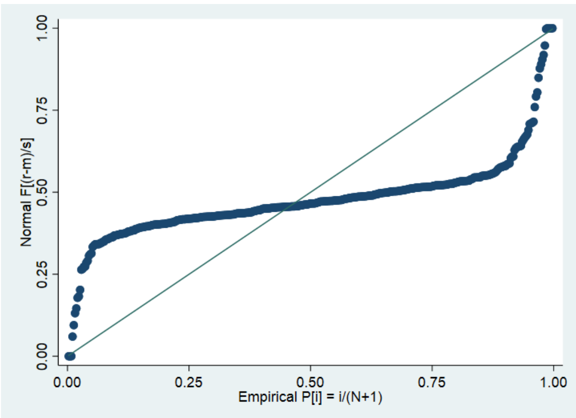
(b) logDEM_diff



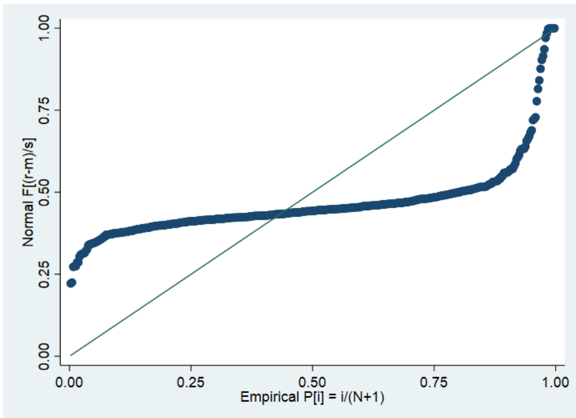
(c) DEB_diff



(d) MarketCap_diff



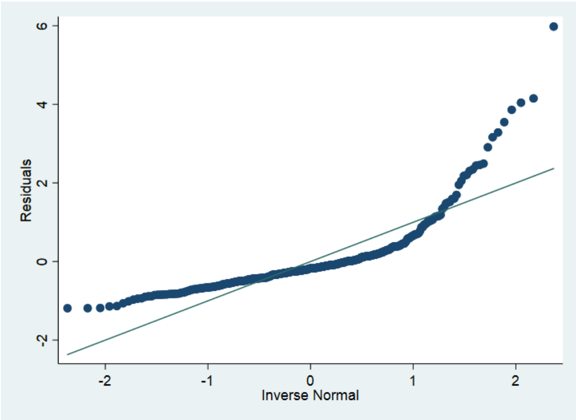
(e) BookEquity_diff



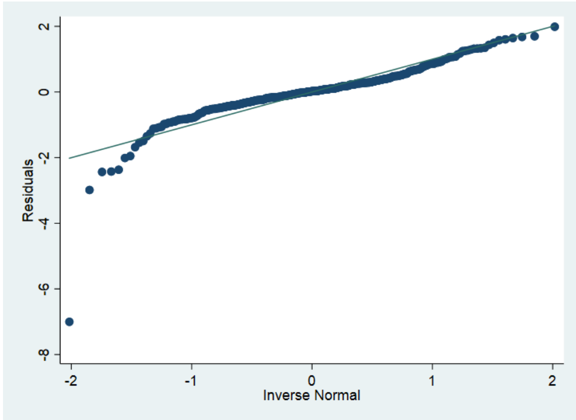
(f) TotalLiabilities_diff

Figure 18

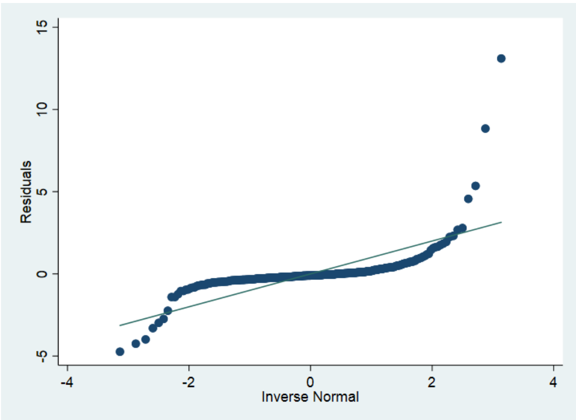
N Q-Q plot to test Normality, YTC Model



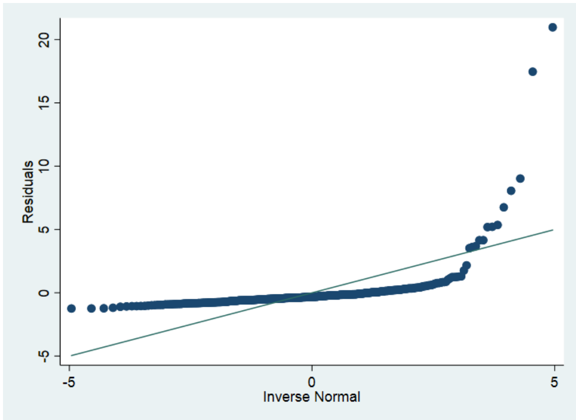
(a) DEM_diff



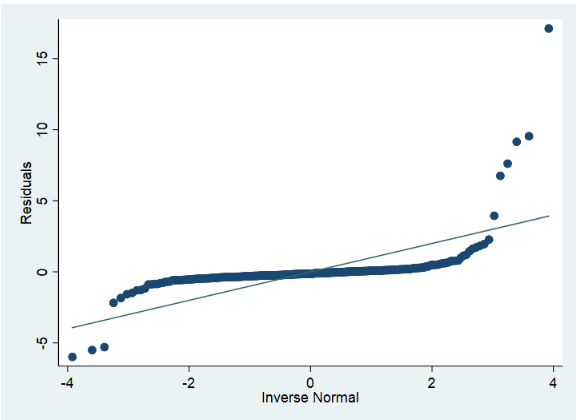
(b) logDEM_diff



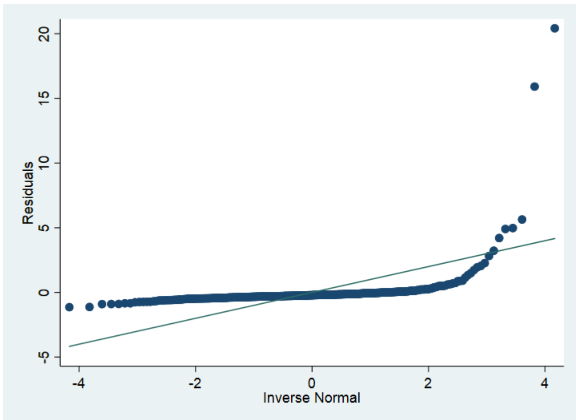
(c) DEB_diff



(d) MarketCap_diff



(e) BookEquity_diff



(f) TotalLiabilities_diff

Figure 19

O Panel Data Fixed Effects test, YTC Model

```
Fixed-effects (within) regression               Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0005                                         min =          4
     between = 0.0964                                         avg =        4.0
     overall = 0.0039                                         max =          4

                                                F(1,287)           =      0.15
corr(u_i, Xb)  = -0.1804                        Prob > F           =    0.6952

------------------------------------------------------------------------------
    DEM_diff |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |  -.0296729   .0756695    -0.39   0.695    -.1786105    .1192647
       _cons |   .1444701   .0526638     2.74   0.006     .0408139    .2481263
-------------+----------------------------------------------------------------
     sigma_u |   .4132444
     sigma_e |  .86937671
         rho |  .18430107   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(95, 287) = 0.87                     Prob > F = 0.7775
```

(a) DEM_diff

```
Fixed-effects (within) regression               Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0001                                         min =          4
     between = 0.0593                                         avg =        4.0
     overall = 0.0034                                         max =          4

                                                F(1,287)           =      0.03
corr(u_i, Xb)  = 0.1229                         Prob > F           =    0.8585

------------------------------------------------------------------------------
 logDEM_diff |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |   .0120033   .0672616     0.18   0.858    -.1203854     .144392
       _cons |    -.0745    .0468121    -1.59   0.113    -.1666386    .0176386
-------------+----------------------------------------------------------------
     sigma_u |  .27661447
     sigma_e |  .77277739
         rho |  .11357505   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(95, 287) = 0.50                     Prob > F = 0.9999
```

(b) logDEM_diff

```
Fixed-effects (within) regression               Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0000                                         min =          4
     between = 0.0049                                         avg =        4.0
     overall = 0.0002                                         max =          4

                                                F(1,287)           =      0.01
corr(u_i, Xb)  = -0.0412                        Prob > F           =    0.9179

------------------------------------------------------------------------------
    DEB_diff |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |  -.0101409   .0982699    -0.10   0.918     -.203562    .1832802
       _cons |   .0865172    .068393     1.27   0.207    -.0480982    .2211326
-------------+----------------------------------------------------------------
     sigma_u |  .55634972
     sigma_e |  1.1290351
         rho |  .19537695   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(95, 287) = 0.97                     Prob > F = 0.5618
```

(c) DEB_diff

```
Fixed-effects (within) regression               Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0019                                         min =          4
     between = 0.0023                                         avg =        4.0
     overall = 0.0020                                         max =          4

                                                F(1,287)           =      0.56
corr(u_i, Xb)  = -0.0014                        Prob > F           =    0.4546

------------------------------------------------------------------------------
MarketCap_~f |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |  -.1163095   .1553285    -0.75   0.455    -.4220369     .189418
       _cons |   .3269219    .108104     3.02   0.003     .1141446    .5396992
-------------+----------------------------------------------------------------
     sigma_u |  .87129184
     sigma_e |  1.7845883
         rho |  .19248676   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(95, 287) = 0.95                     Prob > F = 0.6006
```

(d) MarketCap_diff

```
Fixed-effects (within) regression               Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0033                                         min =          4
     between = 0.0160                                         avg =        4.0
     overall = 0.0058                                         max =          4

                                                F(1,287)           =      0.95
corr(u_i, Xb)  = 0.0343                         Prob > F           =    0.3303

------------------------------------------------------------------------------
BookEquity~f |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |  -.1188927   .1219162    -0.98   0.330    -.3588561    .1210706
       _cons |   .0603427   .0848501     0.71   0.478    -.1066647    .2273501
-------------+----------------------------------------------------------------
     sigma_u |  .70394509
     sigma_e |  1.4007108
         rho |  .20164099   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(95, 287) = 1.01                     Prob > F = 0.4673
```

(e) BookEquity_diff

```
Fixed-effects (within) regression               Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0097                                         min =          4
     between = 0.0063                                         avg =        4.0
     overall = 0.0026                                         max =          4

                                                F(1,287)           =      2.82
corr(u_i, Xb)  = -0.1003                        Prob > F           =    0.0941

------------------------------------------------------------------------------
TotalLiabi~f |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |  -.2172926   .1293495    -1.68   0.094    -.4718866    .0373014
       _cons |    .126989   .0900235     1.41   0.159     -.050201    .3041789
-------------+----------------------------------------------------------------
     sigma_u |  .75795986
     sigma_e |  1.4861129
         rho |  .20643046   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(95, 287) = 1.03                     Prob > F = 0.4187
```

(f) TotalLiabilities_diff

Figure 20

P Panel Data Random Effects test, YTC Model

```
Random-effects GLS regression                   Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0005                                          min =         4
     between = 0.0964                                          avg =       4.0
     overall = 0.0039                                          max =         4

                                                Wald chi2(1)       =      1.50
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.2204

------------------------------------------------------------------------------
    DEM_diff |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |   .0768886    .062742     1.23   0.220    -.0460834    .1998605
       _cons |   .1844307   .0496019     3.72   0.000     .0872128    .2816486
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .86937671
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

(a) DEM_diff

```
Random-effects GLS regression                   Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0001                                          min =         4
     between = 0.0593                                          avg =       4.0
     overall = 0.0034                                          max =         4

                                                Wald chi2(1)       =      1.30
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.2536

------------------------------------------------------------------------------
 logDEM_diff |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |   .0605806   .0530589     1.14   0.254     -.043413    .1645741
       _cons |  -.0562835   .0419468    -1.34   0.180    -.1384977    .0259306
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .77277739
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

(b) logDEM_diff

```
Random-effects GLS regression                   Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0000                                          min =         4
     between = 0.0049                                          avg =       4.0
     overall = 0.0002                                          max =         4

                                                Wald chi2(1)       =      0.08
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.7835

------------------------------------------------------------------------------
    DEB_diff |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |    .022656   .0824715     0.27   0.784    -.1389853    .1842972
       _cons |    .098816   .0651995     1.52   0.130    -.0289726    .2266047
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  1.1290351
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

(c) DEB_diff

```
Random-effects GLS regression                   Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0019                                          min =         4
     between = 0.0023                                          avg =       4.0
     overall = 0.0020                                          max =         4

                                                Wald chi2(1)       =      0.78
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.3786

------------------------------------------------------------------------------
MarketCap_~f |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |  -.1145498   .1300932    -0.88   0.379    -.3695278    .1404282
       _cons |   .3275817   .1028477     3.19   0.001     .1260039    .5291595
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  1.7845883
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

(d) MarketCap_diff

```
Random-effects GLS regression                   Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0033                                          min =         4
     between = 0.0160                                          avg =       4.0
     overall = 0.0058                                          max =         4

                                                Wald chi2(1)       =      2.21
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.1370

------------------------------------------------------------------------------
BookEquity~f |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |  -.1529693   .1028556    -1.49   0.137    -.3545625    .0486239
       _cons |    .047564   .0816914     0.58   0.560    -.1125482    .2076761
-------------+----------------------------------------------------------------
     sigma_u |  .09102944
     sigma_e |  1.4007108
         rho |  .00420568   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

(e) BookEquity_diff

```
Random-effects GLS regression                   Number of obs      =       384
Group variable: idc                             Number of groups   =        96

R-sq:                                           Obs per group:
     within  = 0.0097                                          min =         4
     between = 0.0063                                          avg =       4.0
     overall = 0.0026                                          max =         4

                                                Wald chi2(1)       =      1.01
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.3156

------------------------------------------------------------------------------
TotalLiabi~f |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   TaxChange |  -.1097937   .1094045    -1.00   0.316    -.3242226    .1046353
       _cons |   .1673011   .0868515     1.93   0.054    -.0029248    .3375269
-------------+----------------------------------------------------------------
     sigma_u |  .09146542
     sigma_e |  1.4861129
         rho |  .00377371   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

(f) TotalLiabilities_diff

Figure 21

Q Exogeneity tests, DID Model

Source	SS	df	MS			
				Number of obs	=	96
				F(1, 94)	=	5.93
Model	17.6341967	1	17.6341967	Prob > F	=	0.0168
Residual	279.46698	94	2.97305298	R-squared	=	0.0594
				Adj R-squared	=	0.0493
Total	297.101176	95	3.1273808	Root MSE	=	1.7243

DEM_diff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1	.4106043	2.44	0.017	.1847356	1.815264
_hatsq	0	(omitted)				
_cons	9.27e-10	.2318184	0.00	1.000	-.4602809	.4602809

(a) DEM_diff

Source	SS	df	MS			
				Number of obs	=	96
				F(1, 94)	=	6.34
Model	9.7499064	1	9.7499064	Prob > F	=	0.0135
Residual	144.503951	94	1.53727607	R-squared	=	0.0632
				Adj R-squared	=	0.0532
Total	154.253857	95	1.62372482	Root MSE	=	1.2399

logDEM_diff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1	.3970779	2.52	0.013	.2115925	1.788407
_hatsq	0	(omitted)				
_cons	4.20e-10	.1910241	0.00	1.000	-.3792828	.3792828

(b) logDEM_diff

Source	SS	df	MS			
				Number of obs	=	96
				F(1, 94)	=	1.42
Model	4.13616315	1	4.13616315	Prob > F	=	0.2359
Residual	273.249244	94	2.90690685	R-squared	=	0.0149
				Adj R-squared	=	0.0044
Total	277.385407	95	2.91984639	Root MSE	=	1.705

DEB_diff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1	.8383334	1.19	0.236	-.6645305	2.664531
_hatsq	0	(omitted)				
_cons	-9.84e-09	.3582496	-0.00	1.000	-.711313	.711313

(c) DEB_diff

Source	SS	df	MS			
				Number of obs	=	96
				F(1, 94)	=	0.53
Model	7.45842973	1	7.45842973	Prob > F	=	0.4670
Residual	1314.15347	94	13.9803561	R-squared	=	0.0056
				Adj R-squared	=	-0.0049
Total	1321.6119	95	13.9117042	Root MSE	=	3.739

MarketCap_~f	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	0	(omitted)				
_hatsq	.4068204	.5569781	0.73	0.467	-.6990727	1.512714
_cons	.5829151	.9634169	0.61	0.547	-1.329972	2.495802

(d) MarketCap_diff

Source	SS	df	MS			
				Number of obs	=	96
				F(1, 94)	=	0.40
Model	42.6892077	1	42.6892077	Prob > F	=	0.5272
Residual	9962.65574	94	105.985699	R-squared	=	0.0043
				Adj R-squared	=	-0.0063
Total	10005.3449	95	105.31942	Root MSE	=	10.295

BookEquity~f	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	0	(omitted)				
_hatsq	.3335247	.525524	0.63	0.527	-.7099155	1.376965
_cons	.6012582	1.762263	0.34	0.734	-2.897756	4.100272

(e) BookEquity_diff

Source	SS	df	MS			
				Number of obs	=	96
				F(1, 94)	=	2.70
Model	7.23200971	1	7.23200971	Prob > F	=	0.1038
Residual	251.952792	94	2.68034885	R-squared	=	0.0279
				Adj R-squared	=	0.0176
Total	259.184802	95	2.72826107	Root MSE	=	1.6372

TotalLiabi~f	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	0	(omitted)				
_hatsq	.8920013	.5430398	1.64	0.104	-.1862169	1.97022
_cons	.2130711	.2695675	0.79	0.431	-.3221614	.7483037

(f) TotalLiabilities_diff

Figure 22

R IM-tests for Heteroskedasticity, DID Model

Source	chi2	df	p
Heteroskedasticity	3.59	1	0.0581
Skewness	4.67	1	0.0307
Kurtosis	1.47	1	0.2252
Total	9.73	3	0.0210

(a) DEM_diff

Source	chi2	df	p
Heteroskedasticity	0.50	1	0.4811
Skewness	2.24	1	0.1343
Kurtosis	1.06	1	0.3033
Total	3.80	3	0.2841

(b) logDEM_diff

Source	chi2	df	p
Heteroskedasticity	5.07	1	0.0243
Skewness	6.81	1	0.0091
Kurtosis	4.11	1	0.0426
Total	15.99	3	0.0011

(c) DEB_diff

Source	chi2	df	p
Heteroskedasticity	0.98	1	0.3212
Skewness	2.20	1	0.1378
Kurtosis	1.08	1	0.2993
Total	4.26	3	0.2344

(d) MarketCap_diff

Source	chi2	df	p
Heteroskedasticity	0.85	1	0.3575
Skewness	2.15	1	0.1426
Kurtosis	1.09	1	0.2962
Total	4.09	3	0.2522

(e) BookEquity_diff

Source	chi2	df	p
Heteroskedasticity	0.93	1	0.3357
Skewness	3.29	1	0.0697
Kurtosis	1.50	1	0.2206
Total	5.72	3	0.1262

(f) TotalLiabilities_diff

Figure 23

S Breusch-Pagan / Cook-Weisberg for Heteroskedasticity, DID Model

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of DEM_diff

         chi2(1)      =    24.78
         Prob > chi2  =   0.0000
```

(a) DEM_diff

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of logDEM_diff

         chi2(1)      =     2.50
         Prob > chi2  =   0.1136
```

(b) logDEM_diff

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of DEB_diff

         chi2(1)      =    27.24
         Prob > chi2  =   0.0000
```

(c) DEB_diff

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of MarketCap_diff

         chi2(1)      =    27.29
         Prob > chi2  =   0.0000
```

(d) MarketCap_diff

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of BookEquity_diff

         chi2(1)      =    30.68
         Prob > chi2  =   0.0000
```

(e) BookEquity_diff

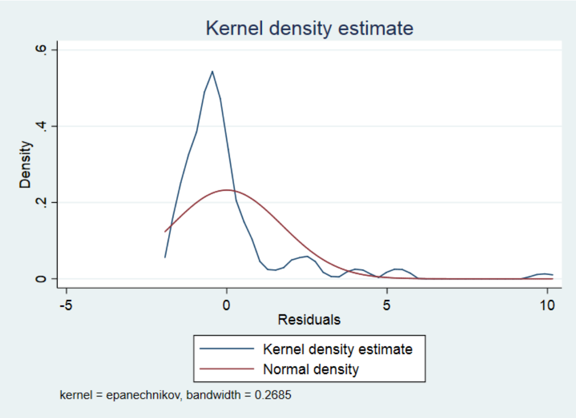
```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of TotalLiabilities_diff

         chi2(1)      =     7.97
         Prob > chi2  =   0.0048
```

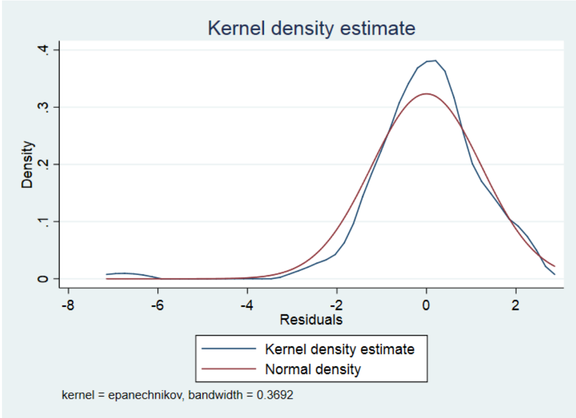
(f) TotalLiabilities_diff

Figure 24

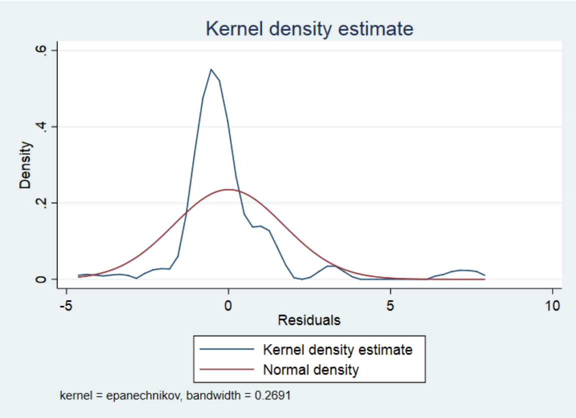
T Kernel Density Estimate to test Normality, DID Model



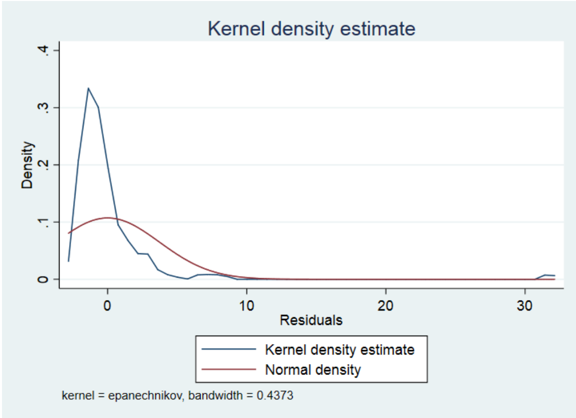
(a) DEM_diff



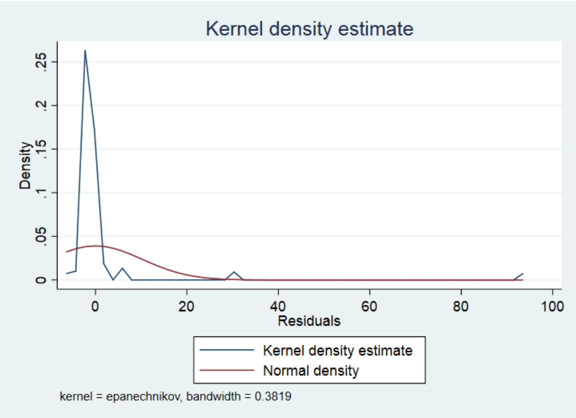
(b) logDEM_diff



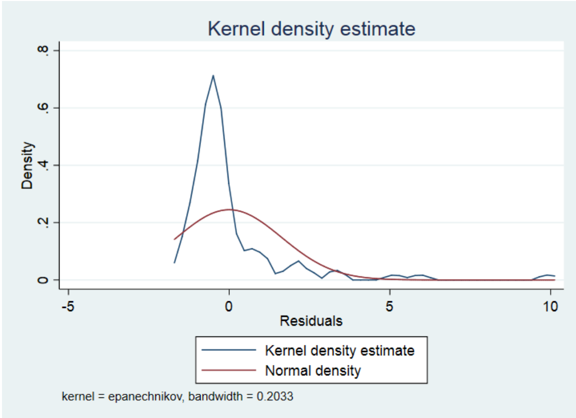
(c) DEB_diff



(d) MarketCap_diff



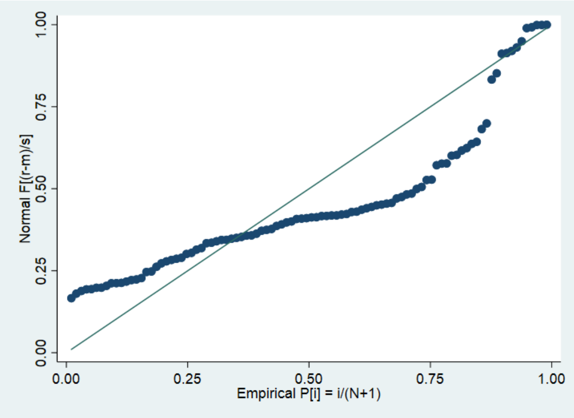
(e) BookEquity_diff



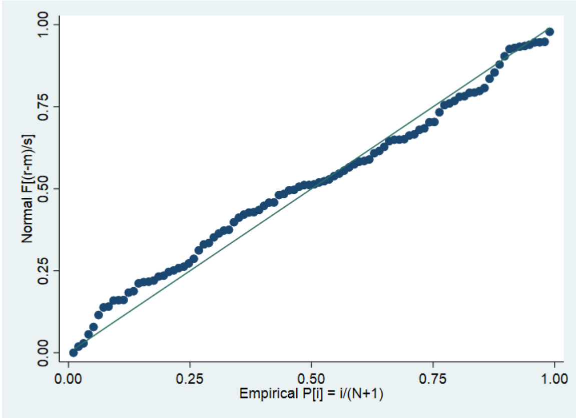
(f) TotalLiabilities_diff

Figure 25

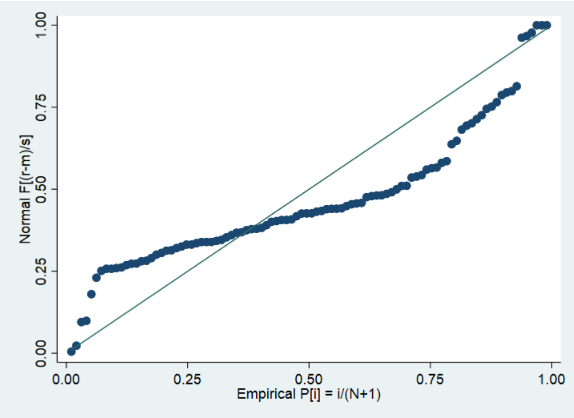
U Standardized Normal Probability Plot to test Normality, DID Model



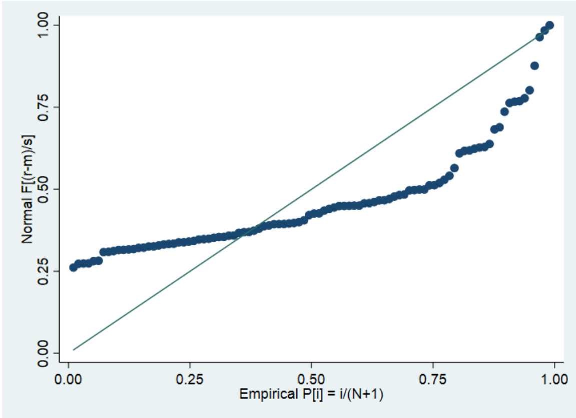
(a) DEM_diff



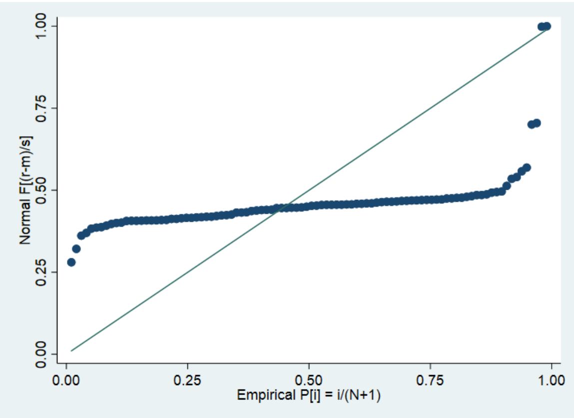
(b) logDEM_diff



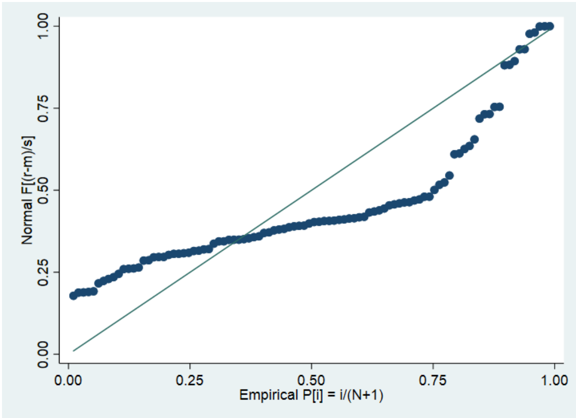
(c) DEB_diff



(d) MarketCap_diff



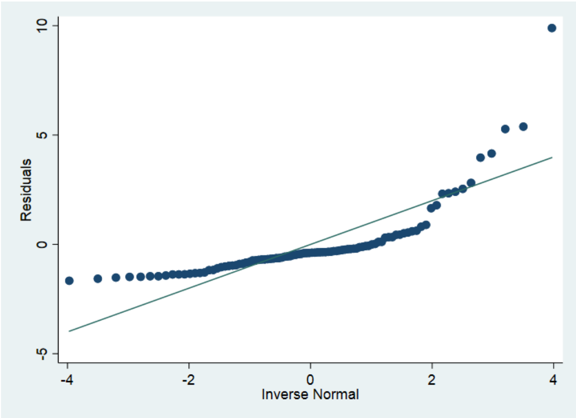
(e) BookEquity_diff



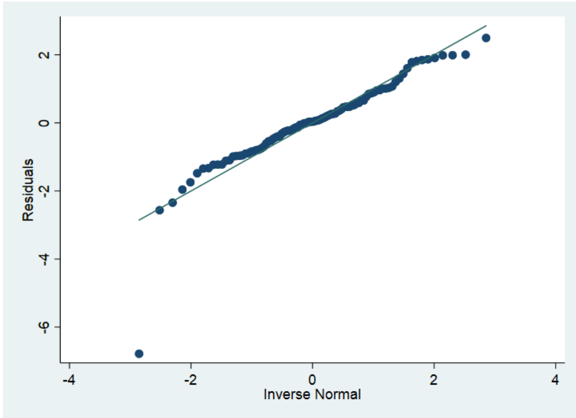
(f) TotalLiabilities_diff

Figure 26

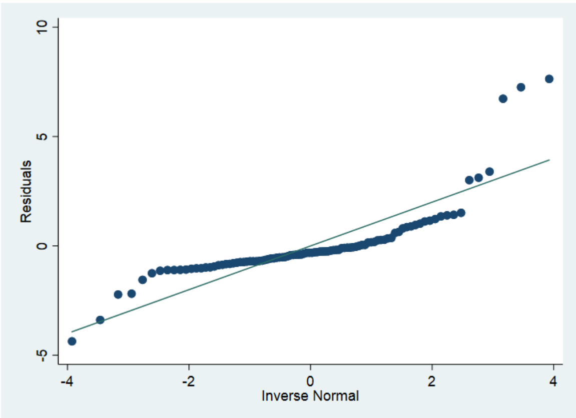
V Q-Q plot to test Normality, DID Model



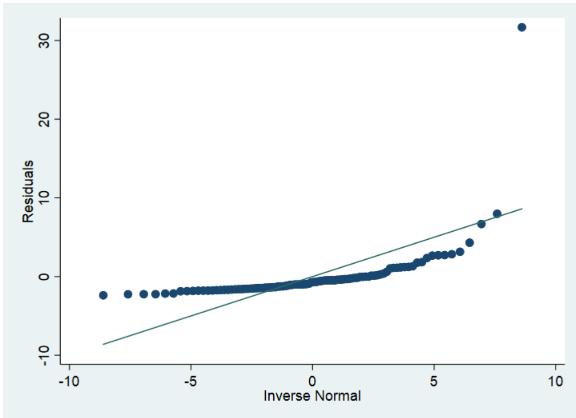
(a) DEM_diff



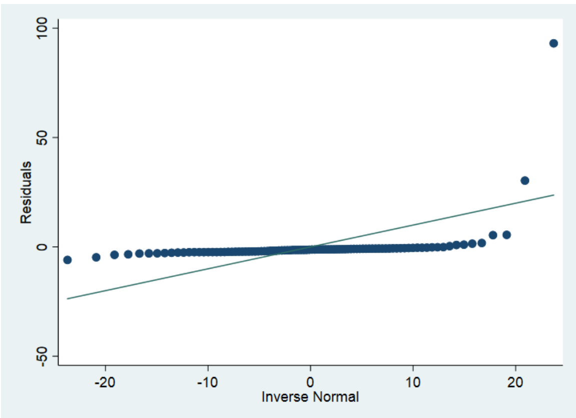
(b) logDEM_diff



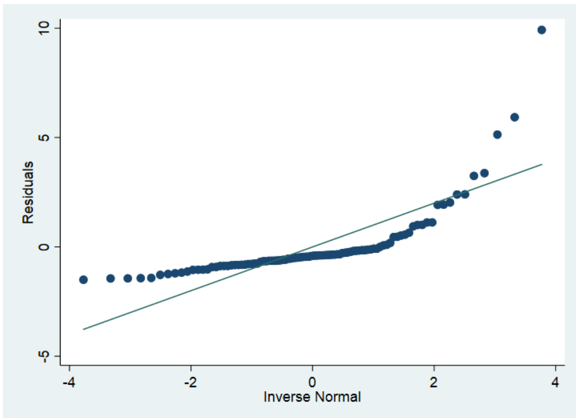
(c) DEB_diff



(d) MarketCap_diff



(e) BookEquity_diff



(f) TotalLiabilities_diff

Figure 27