Bachelor Thesis in Accounting and Financial Management
Stockholm School of Economics
Spring 2013

Sweden Responds with a Lower Corporate Tax

What are the implications on the stock market?

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Using an event study methodology, this thesis investigates whether Sweden's latest corporate tax cut, valid from January 1st 2013, induced a market wide stock price reaction at Nasdaq OMX Stockholm. Furthermore, this thesis also uses OLS regressions to examine whether a firm's stock price reaction, in conjunction with the news of the lowered corporate tax, can be explained by the reduction's implications in the firm's consolidated financial statements. The thesis does not find any convincing evidence that there was a market wide reaction to the news of the lowered corporate tax, suggesting that investors might not have changed their expectations on future earnings. In addition, using OLS regressions, this study could not identify any connection between a firm's stock return and the tax reduction's effects in the firm's consolidated financial statements, implicating that investors either do not acknowledge the deferred accounts at their reported values and/or that they did not revalue the consolidated financial statements at the time of the government's proposal.

Key Words: Corporate Tax, IAS 12, Valuation, Stock Price

We would like to thank
Tomas Hjelström, Professor Kenth Skogsvik (Department of Accounting)
Timotheos Mavropoulos, Nikita Koptyug (Department of Finance)
Håkan Lyckeborg, Per-Olov Edlund (Center for Economic Statistics)
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1 Introduction

In recent decades there has been a trend among countries to lower their corporate tax rates. This trend is reflected in the average corporate tax rate in Europe, which in the years between 1995 and 2013 have gone from 35.3 % to 23.0 % (Eurostat, EU-27). Some argue that the lowering of corporate taxes is the result of an international tax competition – a competition that Sweden seems to be an active part of.

The Swedish corporate tax rate has since the tax reform in 1990-1991 been reduced two times. On September 13th 2012 the Swedish government once again proposed a new corporate tax cut, this time of 4.3 percentage points, leaving the tax rate at 22 %. The latest tax cut became valid on January 1st 2013 and is in terms of size the largest reduction since the tax reform in 1990-1991. The reduction has been extensively debated in Swedish media and political circles, where critics have argued that it favors some firms more than others.[1] More precisely, the criticism has been that firms with large amounts of deferred tax liabilities have obtained greater benefits from the reduction than those with large amounts of deferred tax assets.

Downs and Tehranian (1988) argue that tax policies can have an extensive impact on stock prices, and that it thus is important to create awareness of the effects that these policies have. There exist a number of studies that investigate the stock price effects of different tax regulations. Regarding corporate tax, changes in regulation have however often only been used in order to examine the pricing of deferred accounts. Hence, few studies have been focused on all tax components that might affect the reaction on the stock market.

The initial objective of this thesis is to examine if there was an effect of Sweden's latest corporate tax cut on the stock market (Nasdaq OMX Stockholm). An investigation of the recent tax reduction is highly relevant since it examines the implications of the apparent global trend towards lowered corporate tax rates on the stock market. Specifically, the first research question addressed is:

Did the corporate tax cut, proposed by the Swedish government on September 13th 2012, induce a market wide stock price reaction at Nasdaq OMX Stockholm?

[1] Stockholm TT (2012), Bolander (2013), Mauritzson (2013), Sprängs (2013).

Furthermore, this thesis also aims to investigate whether it is possible to identify a connection between a firm's stock price reaction following the news of the reduced tax rate and the firms' underlying components affected by the tax cut in the consolidated financial statements. The underlying motivation for this investigation is partly to see whether critics were right – is there a positive relationship between the amount of deferred tax liabilities and the stock return? Is there furthermore a negative relationship between the amount of deferred tax assets and the stock return? This investigation will hopefully also contribute to the ongoing discussion (Graham et al., 2011) of how investors price tax information in the consolidated financial statements. Specifically, the second research question addressed is:

Can a firm's stock price reaction in conjunction with the news of the lower corporate tax rate be explained by the reduction's effects in the firm's consolidated financial statements?

The methodologies used to answer the research questions are the event study approach and the OLS regression framework. The results indicate that there was a stock market reaction in conjunction with the government's proposal of the lower corporate tax rate. However, it is not possible to firmly conclude that this reaction was significantly different from zero. In addition, using OLS regressions, this study does not find any connection between a firm's stock price reaction and the components affected by the tax cut in the firm's consolidated financial statements.

2 Previous Research

A number of studies have examined stock prices' response to changes in tax policies. For example, Amromin et al. (2008) and Auerbash and Hassett (2005) examined the effect of the 2003 dividend tax cut in the US. Auerbash and Hassett found that the change in dividend tax had a significant impact on equity markets, while Amromin et al. found little evidence for an imprint of the tax cut. Further, Amoako-Adu et al. (1992) investigated if two separate changes in the Canadian capital gains tax law had differential effects on stock prices. The study concluded that both changes entailed different effects depending on whether it was a low-dividend yield or a high-dividend yield stock and they thus concluded that changes in capital gain tax laws affect stock prices.

In terms of changes in corporate tax, studies have often been related to AFIT[2] and more precisely equity pricing of information concerning deferred tax assets and deferred tax liabilities, i.e. deferred tax accounts (Graham et al., 2011). For example, Givoly and Hayn (1992) tried to examine whether the Tax Reform Act of 1986, which reduced the US corporate tax rate from 46 % to 34 %, implicated any change in the pricing of the deferred tax liabilities.

Givoly and Hayn's study indicated that investors view deferred tax liabilities as a real liability, but that they discount it to its present value according to the timing and likelihood of realization. Amir et al. (1997) found similar results in their study investigating the market's pricing of deferred accounts under SFAS[3] No. 109. In addition, the study by Givoly and Hayn (1992) found that investors also seem to transform the balance sheet value of the deferred tax liabilities into a market value that is in line with a partial allocation[4].

Chen and Schoderbek (2000) investigated the increase in corporate statutory tax rates from 34 % to 35 % in 1994 in the US. The study aimed to examine whether investors impounded the higher tax rate into their forecasts before the firms released their

[2] Accounting For Income Taxes
[3] Statement of Financial Accounting Standards
[4] A way of recognizing deferred tax accounts, where one group common temporary differences and only report those that will reverse in the near future.

financial reports. They did however not find any evidence that indicated that the investors revalued the deferred accounts.

2.1 Our Study

This thesis relates to previous research, such as studies by Amromin et al. (2008), Auerbash and Hassett (2005) and Amoako-Adu et al. (1992), which use an event study approach in order to identify if changes in tax regulation affect stock prices. Our study does however distinguish itself with regard to the tax regulation of interest – instead of examining changes in dividend and capital gain tax laws, this study focuses on the corporate tax.

This thesis is also associated with AFIT research, such as studies made by Givoly and Hayn (1992), Chen and Schoderbek (2000) and Amir et al (1997), in the sense that it relates to pricing of deferred accounts. Nevertheless, this study is based on Swedish data and does not solely have the intention of examining pricing of the deferred accounts. Instead, this study also regards a tax reduction's effects on the investors' expectations on future residual incomes.

Since this study has been conducted within the frames of a Bachelor thesis, it has been necessary to limit the area of research. To begin with, this thesis only regards the Swedish tax reduction's effects on firms listed on Nasdaq OMX Stockholm. Furthermore, this thesis only regards information given in the consolidated financial statements for 2011 and assumes that the sample firms' fiscal years is in line with the calendar year. Finally, regarding the valuation effects of lowered corporate tax rate, this thesis limits its focus towards the residual income valuation framework.

3 Theoretical Framework

3.1 Tax Regulation in Accounting

All listed firms within the European Union must since 2005 establish their consolidated financial statements in accordance with the standards in International Financial Reporting Standard (IFRS) and the older International Accounting Standards (IAS) (FAR Akademi, 2012). In terms tax regulation, this implies that the firms must report their tax in accordance with IAS 12. A description of the accounting method demanded by IAS 12 follows below.

3.1.1 Current Tax Expense

The income tax expense in the consolidated income statement consists of two different elements: current and deferred tax expense (IAS 12:6). The current tax expense is calculated as the income of the year times the actual tax rate. The actual tax rate is determined by the tax regulation that is valid on the balance sheet day in the countries where the parent and subsidiary companies operate and generate taxable income (IAS 12:46 and IAS 12:48). Current tax expense for the current and previous years shall, to the extent yet unpaid, be recognized as a liability in the consolidated balance sheet. The liability is classified as a current tax liability (IAS 12:12). The extent to which the tax payment instead exceeds the current tax and previous year's tax expense is called a tax claim and shall be recognized as an asset labeled as a current tax asset on the consolidated balance sheet (ibid).

3.1.2 Deferred Tax Expense

The second element of the income tax expense, the deferred tax expense, relates to changes in deferred tax accounts (i.e. deferred tax assets and deferred tax liabilities). The reporting of the deferred tax accounts, and thus also the deferred tax expense, relates to the use of the "liability method" (Kam, 1990). There are however three different ways of reporting deferred taxes: the deferred method, the net of tax method and the liability method (ibid). Nevertheless, the International Accounting Standards Board (IASB) advocates use of the latter method.

3.1.2.1 Liability Method & Comprehensive Approach

The liability method implies that both current and future tax consequences shall be recognized and it is the future tax consequences that give rise to the deferred tax accounts on the balance sheet. The method compares the carrying amount of an asset or a liability with its tax base and any difference is classified as a temporary difference (IAS 12:11). If the carrying amount is higher than the tax base the difference is defined as a taxable temporary difference, a difference which in the future, when the carrying amount of the asset is recovered or the liability is settled, will result in a taxable amount (IAS 12:5 a, IAS 12:16). On the contrary, if the carrying amount is lower than the tax base, the difference is defined as a deductible temporary difference. In the future, when the carrying amount of the asset is recovered or the liability is settled, this will result in a tax deductible (IAS 12:5 b, IAS 12:25). The determination of either deferred tax asset or liability is clarified below.

$$Carrying\ Amount > Tax\ Base = Taxable\ Temporary\ Difference$$
$$Taxable\ Temporary\ Difference * Tax\ Rate = Deferred\ Tax\ Liability$$

$$Carrying\ Amount < Tax\ Base = Deductible\ Temporary\ Difference$$
$$Deductible\ Temporary\ Difference * Tax\ Rate = Deferred\ Tax\ Asset$$

There are two different methods of recognizing deferred tax accounts, either by comprehensive approach or by partial allocation (Kam, 1990). The comprehensive approach includes every single temporary difference, while the partial allocation group common temporary differences and only report those that will reverse in the near future (ibid). IASB demands use of the comprehensive approach, but there are however some critics of the method. Critics argue that the comprehensive approach, which allows recognition of all temporary differences without any consideration of likelihood of realization and timing, provides misleading information that does not reflect the reality and future cash flows (ibid).

3.1.2.2 Deferred Accounts

As previously mentioned, IAS 12 demands the use of the comprehensive approach and a deferred tax liability shall thus be recognized for all taxable temporary differences.[5] Furthermore, for Swedish firms there are some additional possibilities of taxable temporary differences due to the "uncoupled area" [6] between Swedish accounting and tax regulation. The uncoupled area offers possibilities of postponing tax expense by the use of for example tax allocation reserve and accelerated depreciation.[7] The amount of the tax expense reduction is recognized as an untaxed reserve between equity and liabilities.

IFRS has no corresponding regulation with untaxed reserves and Swedish groups must therefore, in the construction of the consolidated financial statements, separate the untaxed reserves between equity and liabilities (FAR Akademi, 2012). The allocation of the untaxed reserve is made using the tax rate that is expected to be current when the liabilities are settled. The untaxed reserve times the tax rate is equal to postponed tax expense and shall be recognized as a deferred tax liability. This implies that for Swedish firms, using favorable tax alternatives, the deferred tax liabilities consist of both general taxable temporary differences and taxable temporary differences associated with the uncoupled area. The other part of the untaxed reserve is recognized as equity.

A deferred tax asset shall be recognized for all deductible temporary differences, unused tax credits and unused tax losses, but only to the extent that it is probable that there in the future will be a taxable profit against which the deferred tax assets can be utilized (IAS 12:24, IAS 12:27).[8] The carrying amount of the deferred asset shall be revaluated every year at the balance date (IAS 12:37). If it is no longer probable that there will be a taxable profit in the future, the asset shall be reduced and such

[5] From this regulation, there are however exceptions when a recognition of a deferred tax liability not shall be done. Those regard goodwill (IAS 12:15) and some specific cases concerning initial recognition of an asset or liability (IAS 12:15). Furthermore the taxable temporary differences associated with investments in subsidiaries, branches and associates, and interests in joint ventures shall be recognized in accordance with IAS 12:39.
[6] In Swedish "okopplade området".
[7] In Swedish "periodiseringsfond" and "överavskrivning".
[8] From this regulation there is one exception regarding initial recognition of an asset or liability (IAS 12:24). Furthermore the deductible temporary differences associated with investments in subsidiaries, branches and associates, and interests in joint ventures shall be recognized in accordance with IAS 12:44.

reduction shall be reversed if the conditions change and a taxable profit again is probable (ibid).

Deferred tax assets and liabilities refer to future tax consequences and some thus argue that the accounts should be discounted to reflect their time value (Kam, 1990). Those opposed of discounting argue that this procedure makes the calculations of deferred tax accounts more complex than they already are, and furthermore that an accurate determination of discount rates and maturity dates is difficult (ibid). IAS 12 does not allow any discounting of the deferred tax accounts and the deferred accounts must thus be recognized to the nominal amount in the consolidated financial statements.

The tax rate used for determination of the deferred accounts shall be the tax rate expected to be current when the assets are realized or the liabilities are settled (IAS 12:47 and IAS 12:51). The tax rate used for calculating current assets/liabilities might thus not be the same as the tax rate used for valuation of deferred tax assets/liabilities. This difference in tax rates becomes apparent in a change of tax regulation.

3.1.2.3 Effects of a Changed Corporate Tax Rate

A change in tax rate will, when it is believed to be substantially enacted, immediately lead to a revaluation of the deferred tax assets and liabilities (IAS 12:47). Hence, it is the perception of a substantially enactive tax rate that is essential for a revaluation of the deferred accounts and not when the new tax regulation is valid by law. On the contrary, in terms of current tax expense and thus also current tax accounts, it is the moment when the new tax regulation becomes valid by law that it is reflected in the current tax items.

The concept substantially enacted is interpreted by the internal guidelines for audit firms. KPMG has the interpretation that a law is considered as substantially enacted when there are only minor formalities left (2012/2013). Hence, it must be clear that the change in tax rate is going to be enacted – even though the legal process to make the law effective has not yet been completed (ibid). This view is also apparent in an interview with tax consultants from Ernst & Young. Since the Swedish government

does not possess a majority in the Swedish parliament, their proposal cannot be regarded as substantially enacted until the Swedish parliament accepted the proposal.

According to accounting standards, revaluation of the deferred accounts would thus have been made on November 21st 2012, i.e. the day of acceptance in the Swedish Parliament (Gauthier Reberg, 2012). The adjustments of the deferred accounts should then have been included as a deferred tax expense in the consolidated income statement for the year of 2012. However, since the tax rate was not valid until January 1st 2013, the effects on the current items will not be visible in the reports until 2013. One might thus say that a change in corporate tax rate has two effects; an immediate one-time effect on the deferred tax accounts when the new law is substantially enacted and a continuous effect on current tax items when the tax law is valid. A description of the effects follows below:

Consolidated Income Statement 2012	
Income before tax	
Income Taxes	
Current Tax Expense	(26.3 %)
Deferred Tax Expense	(22 %)

Consolidated Financial Statement 31-12-2012	
Current Assets	*Current Liabilities*
Current Tax Assets	Current Tax Liabilities
Non-current Assets	*Non-current Liabilities*
Deferred Tax Assets (-)	Deferred Tax Liabilities (-)

The deferred accounts are revalued (White et al., 2002). Deferred tax assets and liabilities will both decrease and the adjustments will be reflected as a deferred tax expense, which depending on the sizes of the deferred tax assets and liabilities either will be positive or negative (ibid). Assuming that the deferred tax liabilities are greater than the deferred tax assets, the deferred tax expense will be positive since the amount of liabilities decreases. This implies that the one-time effect will give rise to a higher net income (ibid).

Consolidated Income Statement 2013	
Income before tax	
Income Taxes	
Current Tax Expense	(22 %)
Deferred Tax Expense	(22 %)

Consolidated Financial Statement 31-12-2013	
Current Assets	*Current Liabilities*
Current Tax Assets	Current Tax Liabilities
Non-current Assets	*Non-current Liabilities*
Deferred Tax Assets	Deferred Tax Liabilities

The deferred accounts are already adjusted, so assuming no other change of the actual size of the liabilities and assets, there will be no deferred tax expense. Since the tax law now is valid, the current income tax of the year will be based on the new corporate tax rate of 22 %. Because of the relation between current income tax, tax paid, current tax assets and liabilities, these accounts will also be affected by the new tax rate. However, since the accounts are based on the tax rate that is valid on the balance sheet date of every specific year, there will not be a revaluation (IAS 12:46 and IAS 12:48). Instead there will be a continuous effect which will imply that in time, as previous years' taxes are being paid; all current tax assets and liabilities will be based on the tax rate of 22 %.

3.2 Firm Valuation

Residual Income Valuation (RIV) is a valuation framework that strongly relates to the consolidated financial statements (Barker, 2001), and it will thus be used in order to derive the valuation effects of a lower corporate tax rate. The RIV model, also referred to as the abnormal earnings model, determines the value of a firm through a combination of the book value of owners' equity and the present value of expected residual incomes (Skogsvik, 2002):[9]

(1)

$$Value_t = BV_0 + \sum_{t=1}^{\infty} \left(\frac{BV_{t-1} * (ROE_t - \rho_E)}{(1+\rho_E)^t} \right)$$

Book value of owners' equity BV_0

BV_0 equals the book value of owners' equity at the day of the valuation.

[9] The model can be expanded with regard to bankruptcy risk. This study does not incorporate bankruptcy risk, since it is not believed to be substantially affected by the change in corporate tax rate.

Present value of expected future residual income $\sum_{t=1}^{\infty}\left(\frac{BV_{t-1}*(ROE_t-\rho_E)}{(1+\rho_E)^t}\right)$

The present value of future residual incomes equals the book values of owners' equity at the start of the periods (BV_{t-1}) multiplied with the difference between the book return on owners' equity accrued during the periods (ROE_t) and the required rate of return by shareholders (ρ_E).The products are then discounted back to the day of valuation and summed.

3.2.1 Effects of a Changed Corporate Tax Rate

In this study, the structure of Residual Income Valuation (RIV) will be used in order to derive the components that theoretically should implicate a stock price reaction when the corporate tax was reduced. The RIV-model bases its components on the expectations prevailing on the day of valuation (Francis et al., 2000). In order to illustrate how the valuation of a firm would be affected if expectations regarding the future corporate tax rate were changed on September 13th 2012, the components of the RIV-model will be examined one at a time.

Book value of owners' equity at valuation date BV_0

BV_0 equals the opening balance of equity for 2012 and is thus not affected by the new corporate tax rate.

Present value of expected future residual income $\sum_{t=1}^{\infty}\left(\frac{BV_{t-1}*(ROE_t-\rho_E)}{(1+\rho_E)^t}\right)$

The expression of the present value of expected future residual incomes can be rewritten as (White et al., 2002):

(2)

$$\sum_{t=1}^{\infty}\frac{(NI_t-\rho_E*BV_{t-1})}{(1+\rho_E)^t}$$

The first component in this expression, NI_t, equals the expected net income at time *t*. In this study, NI_1 will equal the net income for the year of 2012. This term will not be derived using the new and lower tax rate; it will however contain the expected one-

time effect of the revaluation of the deferred accounts through the deferred tax expense. The one-time effect will, as previously mentioned, either be positive or negative depending on the size of the deferred tax liabilities to the size of the deferred tax assets.

In conjunction with the government's announcement of the new corporate tax rate, it was also announced that the tax rate was going to be legally valid from January 1st 2013 (Arenander, 2012). The expected net incomes from January 1st 2013 and onwards, i.e. $NI_2 - NI_\infty$, would thus be derived using the new and lower corporate tax rate. Assuming positive expected earnings before tax, the investor will make higher projections of the future net incomes than before the news of the new regulation.[10]

The second component in the expression above, $\rho_E * BV_{t-1}$, equals the equity holders required return. The required return is thus dependent on the previous year's book value of equity and the owners required *rate* of return. The shareholders required *rate* of return, ρ, can be derived with the Capital Asset Pricing Model (CAPM) (Fama & French, 2004).

(3)

$$\rho_E = r_f + \beta\big(E[R_M] - r_f\big)$$

CAPM expresses the required rate of return in terms of three components: risk free interest rate (r_f), beta (β) and market risk premium $\big(E[R_M] - r_f\big)$. The beta in CAPM measures the sensitivity of a security to market-wide risk factors (Berk & DeMarzo, 2011). It is possible to argue that a reduction in the corporate tax rate might induce a small shift in a firm's leverage ratio, and that this moderately would affect the firm's beta. This potential effect is however assumed to be so marginal that it is not taken into account. Furthermore, any potential shift in the other CAPM components following the tax cut is also assumed to be so marginal that they are disregarded.

The previous years' book value of equity (BV_{t-1}) will however be affected by the

[10] In case of negative expected earnings before tax, the investor will instead project a decrease in expected loss carry forwards and thus even lower net incomes as a consequence of the lower tax rate.

new tax rate. In addition to the one-time effect from the revaluation of the deferred accounts, there will also be a continuous effect from the revaluation of the future net incomes. The relationship between book value of equity and net income can be illustrated with the use of the clean surplus relation (Skogsvik, 2002):

(4)

$$BV_t = BV_{t-1} + NI_t - D_t + N_t$$

Where D_t equals dividend payment at time t and N_t equals new issue of owners' equity at time *t.*

The total effect

The stock price reaction following changed expectations on the future corporate tax rate would thus, based on the RIV-model, have been dependent on several firm specific factors such as the size of deferred tax assets to deferred tax liabilities and the expectations on future earnings. The total effect of a firm's stock price reaction would thus have consisted of an aggregation of all these individual effects, which in some cases might have counteracted each other.

4 Hypothesis Formulation

Since the study includes two different areas of research, the hypotheses are divided with regard to these.

4.1 Stock Market Reaction

The first area of research investigates if there was a market wide stock price reaction in connection to the Swedish government's proposal on September 13th 2012. With the assumption of an efficient market[11], one could expect that the news of the tax reduction changed shareholders' expectations on future residual incomes and a change in stock prices should thus be identifiable on this day. The first hypothesis that will be tested is whether there was any abnormal reaction on Nasdaq OMX Stockholm on September 13th 2012. This hypothesis will be tested using a two-tailed test.

$$H_0: \overline{CAR} = 0$$
$$H_1: \overline{CAR} \neq 0$$

Rejection Rule 1

Reject H_0 if $\frac{\bar{x}-\mu_0}{\sigma/\sqrt{N}} < -z_{\alpha/2}$ or if $\frac{\bar{x}-\mu_0}{\sigma/\sqrt{N}} > z_{\alpha/2}$

4.2 Reasons for a Firm's Stock Price Reaction

The second area of research aims to investigate if a firm's stock price reaction around the days of the government's proposal can be explained by the firm's components affected by the tax cut in the consolidated financial statements. The components that are affected by the lowered corporate tax rate, and of interest in a firm valuation, are described below. The hypotheses will be tested using one-tailed tests.

[11] An efficient market is defined as market where prices always fully incorporate all available information (Fama, 1970).

Deferred tax liabilities

Deferred tax liabilities (DTL) should due to the revaluation generate a positive one-time effect. The first hypothesis within this research area is thus that there is a positive relationship between the amount of a firm's deferred tax liabilities and its stock price reaction at September 13th 2012.

$$H_0: \beta_{DTLM} = 0$$

$$H_1: \beta_{DTLM} > 0$$

Rejection Rule 2

Reject H_0 if $\frac{\bar{x}-\mu_0}{\sigma/\sqrt{N}} > z_\alpha$

Deferred tax assets

Deferred tax assets (DTA) will due to the revaluation generate a negative one-time effect. The second hypothesis within this research area is thus that a firm's deferred tax assets are inversely related to its stock price reaction at September 13th 2012.

$$H_0: \beta_{DTAM} = 0$$

$$H_1: \beta_{DTAM} < 0$$

Rejection Rule 3

Reject H_0 if $\frac{\bar{x}-\mu_0}{\sigma/\sqrt{N}} < -z_\alpha$

Future earnings

Given that future expected earnings in general are positive, the lowering of the corporate tax will lead to a revaluation of future expected net incomes at a more favorable tax rate. Future expected earnings will be estimated using the firms' book-to-market ratio. High book-to-market ratios signals persistent poor earnings and low book-to-market ratio signals strong earnings (Fama & French, 1995). A change in corporate tax regulation should thus have a greater continuous impact for firms with a low book-to-market ratio compared to firm with high book-to-market. The third and

last hypothesis within this research area is thus that a firm's book-to-market is inversely related to its stock price reaction at September 13th 2012.

$$H_0: \beta_{BTM} = 0$$

$$H_1: \beta_{BTM} < 0$$

Rejection Rule 4

Reject H_0 if $\frac{\bar{x}-\mu_0}{\sigma/\sqrt{N}} < -z_\alpha$

5 Methodology

Two different methodologies are used in order to conduct the hypotheses tests: an event study and OLS regressions. The event study methodology is used to test the hypothesis whether there was a market wide stock price reaction in connection to the news of the reduced corporate tax rate, while the OLS regressions are used to test the hypotheses regarding the investigated components influence on a firm's stock price reaction.

5.1 Event Study

An event study uses financial market data in order to measure the impact of a specific event on security prices (MacKinlay, 1997). The event study methodology has many applications and is one of the most widely used empirical research models in finance and accounting (Bowman, 1983). Even though there is no unique structure of an event study, there is a general flow of analysis which follows below.

5.1.1 Defining the Event and the Event Window

The first step in an event study is to identify the event and when it took place (MacKinlay, 1997). In this study, the event of interest is the latest reduction of the Swedish corporate tax rate, which became valid on January 1st 2013. As Henderson points out the issue is not to identify when the event occurred, but when one can assume that the market started to anticipate it (1990).

The speculation of a lower corporate tax rate can be argued to have started on April 16th 2012, when the Swedish Minister of Finance presented a memorandum suggesting a reduction of the corporate tax rate with one percentage point (Lundholm & Norén, 2012). It was however not until September 13th 2012 that the Swedish government presented a proposition containing a lowered corporate tax (Arenander, 2012). This proposition included a tax cut amounting to 4.3 percentage points, which was a considerably larger reduction than what had been mentioned in the memorandum. That the large tax cut came as a surprise on September 13th has been confirmed in several interviews, there among with Claes Norberg.

"With this type of reform, which is quite restrictive, one has to try to ensure that there are no leaks, it would surely be devastating. To answer your question if we anticipated a reduction - No, we were at conference in Helsinki when the news was declared and we were as surprised as the Finnish people so we had no indications."

September 13th 2012 will thus from here on be denoted as the event day or "τ=0". All other days will be expressed relative to τ=0, i.e. the days leading up to the event will be denoted τ=-2, τ=-1 and the days following the event will be denoted τ=+1, τ=+2 and onwards.

Under the assumption that the market is efficient and immediately incorporates all publicly available information, the period of interest in an event study can be argued to be the exact time when news of an event becomes public knowledge. In practice however, the period over which security prices are examined, denoted as the event window, is often expanded to include the day before the event and the day after (MacKinlay, 1997). This study thus include the day before the event (τ =-1) and the day after (τ =+1) in the event window, making it range from τ =-1 to τ =+1.

5.1.2 Estimating Abnormal and Normal Returns

In order to calculate actual stock returns, it is essential to specify the length of the estimation interval. According to MacKinlay (1997), a shorter interval is preferred since it increases the power of the test. In this study, the interval is set to one day:

(5)

$$R_{i\tau} = \frac{(P_{i\tau} - P_{i\tau-1})}{P_{i\tau-1}}$$

Where $P_{i\tau}$ denotes the closing price day τ for stock i and $P_{i\tau-1}$ the closing price day $\tau - 1$ for stock i. The impact of an event is evaluated using the abnormal returns in the event window (ibid). The abnormal returns are calculated over the event window through the subtraction of normal returns, i.e. the expected returns in absence of the event, from the actual returns:

(6)

$$AR_{i\tau} = R_{i\tau} - E(R_{i\tau})$$

$AR_{i\tau}$ denotes the abnormal return for firm i at day τ, $R_{i\tau}$ denotes the actual return for firm i at day τ and $E(R_{i\tau})$ denotes the expected return for firm i at day τ in absence of the event. The period over which the normal returns are estimated is called the estimation window. It is important that the estimation window and the event window do not overlap, since it otherwise is possible that the event returns distort the expected return measure (ibid).

A majority of event studies uses the period before the event as estimation window, even though it is also possible to include the post-event window data in the estimation window (Henderson, 1990). Post event window estimation periods are however only essential if the event is expected to alter firms' sensitivities to the market return (ibid). As previously mentioned, the corporate tax cut is not believed to significantly alter a firm's market sensitivity, and the estimation period in this study thus only includes trading days prior to the event. More precisely, the estimation window has a length of 152 days ranging from τ = -155 to τ =-4. This exceeds the use of 120 estimation days proposed by MacKinlay (1997).

Models for estimating expected returns, i.e. normal returns, can roughly be grouped into two classes – statistical and economic. Statistical models, such as the market model and the constant mean return model, rest on the assumptions that asset returns are jointly multivariate normal and independently and identically distributed (ibid). Economic models on the other hand, such as CAPM and APT, add restrictions about investor behavior to the statistical models (ibid). In practice, the statistical estimation models dominate (ibid). This study will also be based on a statistical estimation model.

In terms of statistical models, Dyckman et al. (1984) found that the market model offers more powerful tests in detecting abnormal returns than the mean-adjusted returns model and market-adjusted returns model. In this study, a version of the market model has thus been used in order to derive normal returns. The market model, illustrated below, regresses each firm's stock return on the market return during the estimation window in order to receive estimates of a_i and β_i. Under

general conditions, the ordinary least squares (OLS) framework is a consistent estimation procedure for the market model (MacKinlay, 1997). Using the OLS framework, estimates of a_i and β_i are in this study received with the use of the broad value-weighted index OMX AFGX as an approximation of the market return. The use of a value-weighted index as market index is based on the suggestion by Brown and Warner's 1980 study (cited in Peterson, 1989, p.50-51), even though an equally weighted index actually is more likely to detect abnormal returns. The market model is defined as:

(7)

$$R_{i\tau} = \alpha_i + \beta_i R_{M\tau} + \varepsilon_{i\tau} \qquad \tau = -155,\ldots,-4$$

With the assumption of:

(8)

$$E(\varepsilon_{i\tau}) = 0 \qquad Var(\varepsilon_{i\tau}) = \sigma_{\varepsilon i}^2$$

Where $R_{i\tau}$ denotes the actual return for firm i at day τ, $R_{M\tau}$ denotes the market return at day τ, $\varepsilon_{i\tau}$ denotes the disturbance term for firm i at day τ and $\alpha_i, \beta_i, \sigma_{\varepsilon i}^2$ are the parameters of the market model. Given the estimates of the market model parameters ($\widehat{\alpha_\iota}$ and $\widehat{\beta_\iota}$), the expected returns can be calculated using the market returns in the event window (Henderson, 1990).

However, since this study suffers from event date clustering (i.e. the event occurs on the same calendar day for all sample firms), and since the OMX AFGX index consists of all sample firms, it is not possible to use the return of the index as a market proxy in the event window. Such an inclusion would remove any possible abnormal return. The market return in the event window ($\bar{M}$) is thus estimated using a 30 trading day average of the index OMX AFGX prior to the event window (01-08-2012 to 11-09-2012). This average equals a daily-predicted return of 0,042 %. The abnormal returns for the sample in the event window can now be estimated in the following way:

(9)

$$\widehat{AR_{\iota\tau}} = R_{i\tau} - \widehat{\alpha_\iota} - \widehat{\beta_\iota} * \bar{M}$$

5.1.3 Aggregation of Abnormal Returns

In order to draw general inferences, the abnormal returns must be aggregated through time and across securities (MacKinlay, 1997). The arithmetic procedure of aggregating the abnormal returns is presented below.

(10)

$$\overline{CAR}(-1,1) = \sum_{\tau=-1}^{1} \overline{AR_\tau}$$

Where $\overline{CAR}$ equals the cumulative average abnormal return in the event window and $\overline{AR_\tau}$ is the average abnormal return on day τ:

(11)

$$\overline{AR_\tau} = \frac{1}{N} \sum_{i=1}^{N} AR_{i\tau}$$

Where N equals the number of firms in the sample and $AR_{i\tau}$ equals the abnormal return of firm i at day τ. The variance of the cumulative average abnormal returns can be written as:

(12)

$$Var\left(\overline{CAR}(-1,1)\right) = \sum_{\tau=-1}^{1} Var(\overline{AR_\tau})$$

Where the variance of $\overline{AR_\tau}$, given a large estimation window (as in this study), is derived as (MacKinlay, 1997).

(13)

$$Var(\overline{AR_\tau}) = \frac{1}{N^2} \sum_{i=1}^{N} \sigma_{\varepsilon i}^2$$

5.1.4 Testing the Results

The last step in an event study is to analyze and draw inferences from the empirical results. In most cases, this is carried out using a classical statistical approach where a null and alternative hypotheses are specified and tested (Corrado, 2011). In this study the first hypothesis is, as earlier mentioned, the following:

$$H_0: \overline{CAR} = 0$$
$$H_1: \overline{CAR} \neq 0$$

There are two categories of hypothesis tests: parametric and non-parametric. Parametric tests rest on the assumption that stock returns are normally distributed, while the non-parametric tests are free from assumptions regarding the distribution of returns. Brown and Warner (1985) found that even though daily stock returns expresses signs of high non-normality, the mean abnormal return in a cross-section of securities converges to normality as the number of sample securities increases. The inclusion of a non-parametric test does however provide a robustness check of the results from parametric tests (MacKinlay, 1997). This study includes both parametric and non-parametric tests.

5.1.4.1 Parametric Test

Student t-test

When the true population variance is unknown, hypothesis tests are conducted using the Student's *t* distribution. However, as the number of observations becomes large, the Student's *t* distribution can be approximated with the normal distribution (Newbold et al., 2010). A large number is defined as 100 observations (ibid). Since this study consists of a sample including 281 different firms, the t-statistic of the average cumulative abnormal return is approximated with a normal distribution:

(14)

$$t = \frac{(\overline{CAR} - 0)}{StdDev(\overline{CAR})} \sim Z$$

Where $\overline{CAR}$ is the average cumulative abnormal return in the event window and $StdDev(\overline{CAR})$ is an estimate of the standard deviation of $\overline{CAR}$. Assuming that returns are jointly normally distributed, $StdDev(\overline{CAR})$ equals the square root of formula (12) (MacKinlay, 1997).

Student t-test adjusted for cross-sectional dependencies

Kolari and Pynnönen (2010) argue that in cases of event date clustering, event studies are exposed to cross-sectional correlation among the abnormal returns. Amromin et al. (2008) also recognizes this problem in their study, investigating the 2003 dividend tax cut in the US. Under this kind of circumstance, a t-statistic cannot assume independence of abnormal returns (Kolari & Pynnönen, 2010). Even in the case of moderate cross-correlations in the residual return, there is a downward bias in the

standard deviation and thus an over-rejection of the null hypothesis in conventional parametric tests (ibid).

In this study, there exists a high possibility of contemporaneous correlations in the data, since the event date and thus the estimation period are the same for all firms. This implies that the normal Student t-test, described above, might be misleading because of a downward bias in the standard deviation. Amromin et al. (2008) adjusted for this problem using a procedure developed by Mandelker (1974) and Jaffe (1974) in order to generate an appropriate standard deviation. This study however uses an adjusted standard deviation advocated by Serra (2002) in order to prevent an over-rejection of the null hypothesis. The adjusted standard deviation is derived using a crude adjustment procedure, which is supposed to control for cross-sectional dependencies (ibid). The standard deviation is derived as:

(15)

$$StdDev(\overline{AR}) = \sqrt{\frac{\sum_{t=1}^{T}\left(\frac{\sum_{i=1}^{N} AR_{it}}{N} - \overline{AR^*}\right)^2}{T-d}}$$

Where T equals the number of days in the estimation window (i.e. 154 days) and d equals 2 in the case where a one factor market model, as in this study, is used to estimate normal returns (Serra, 2002). $\overline{AR^*}$ is furthermore derived as:

(16)

$$\overline{AR^*} = \frac{\sum_{i=1}^{N}\left(\frac{\sum_{t=1}^{T} AR_{it}}{T}\right)}{N}$$

The variance of $\overline{CAR}$ and the t-statistic then becomes:

(17)

$$Var\left(\overline{CAR}(-1,1)\right) = \sum_{\tau=-1}^{1} (StdDev(\overline{AR}))^2$$

(18)

$$t = \frac{(\overline{CAR} - 0)}{StdDev(\overline{CAR})} \sim Z$$

5.1.4.2 Nonparametric Test

As previously mentioned, a non-parametric test offers a robustness check of the parametric test (MacKinlay, 1997). The non-parametric rank test by Corrado and Zivney (1992) is according to Kolari and Pynnönen (2010) one of few tests that has been proven to be to be robust against cross-correlation in the data and this is also the reason for the use of this non-parametric test. This rank test starts of assigning ranks ($K_{i\tau}$) to each stock's abnormal returns during the period in which stock data has been collected:

(19)

$$K_{i\tau} = rank(AR_{i\tau}) \qquad \tau = -155,\ldots,+56$$

In order to allow for missing returns, the ranks are then standardized:

(20)

$$U_{i\tau} = \frac{K_{i\tau}}{(1+M_i)}$$

Where M_i equals the number of non-missing returns in firm *i*'s time series of excess returns. The test statistic for the rank test can then be written as:

(21)

$$t = \frac{1}{\sqrt{N}} * \sum_{i=1}^{N} \frac{\left(U_{i\tau} - \frac{1}{2}\right)}{StdDev(U)}$$

Where $U_{i\tau}$ equals firm *i*'s standardized rank of abnormal return at day τ and $StdDev(U)$ is derived as:

(22)

$$StdDev(U) = \sqrt{\frac{1}{T} \sum_{t=-155}^{+56} \left(\frac{1}{\sqrt{N_t}} \sum_{i=1}^{N_t} \left(U_{it} - \frac{1}{2}\right) \right)^2}$$

T denotes the number of days ranked and N_t equals the number of non-missing returns in the cross-section of N firms on day τ. Corrado and Zivney's rank test have initially been used to test abnormal returns for days τ=-1, τ=0 and τ=1. Furthermore, the test was also performed on the average cumulative abnormal return in the event window. The cumulative test was conducted by allocating τ = -155,…,+1 into groups of three days. Hence, instead of ranking the abnormal returns for each firms during a 157 days long window, the cumulative abnormal returns for 53 time periods were ranked for

each firm. The test was then preformed using formulas (19-22).

5.1.5 Issues in Event Studies

There exist a number of potential issues in connection to an event study (Henderson, 1990). The most concerning problem for this study is the potential existence of confounding events. The event study follows a methodology that is designed to capture the impact of a specific event. If another event occurs at the same time as the event of interest, it can be challenging to single out the true source of change in security prices. According to Bowman (1983), firm specific confounding events are particularly troublesome. This study controls for firm specific events such as stock splits, dividends and new issues by using adjusted stock market data from Nasdaq OMX Nordic. Furthermore, this study uses a relatively small event window which, as expressed by Konchitichki & O'Leary (2011), reduces the probability of confounding events to interfere with stock prices.

5.2 Regression

Multiple regression models use independent variables to explain the variability of a dependent variable (Newbold et al., 2010). In this study, a multiple regression model is used to examine whether a firm's components affected by the tax cut in the consolidated financial statements can explain the firm's stock price reaction around September 13th 2012. A general multiple linear regression model can for the population be specified as (Wooldridge, 2008):

(23)

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_k x_k + u$$

Where β_0 is the intercept and β_1 measures the change in y with respect to x_i, ceteris paribus[12]. β_2 measures the change in y with respect to x_2, ceteris paribus and β_k measures the change in y with respect to x_k ceteris paribus. Finally, u is the error term and contains other factors than $x_1, x_2 \ldots, x_k$ that affects y.

[12] Other factors being equal.

In this study, the dependent variable (y) consists of the cumulative abnormal returns (CAR), since it is a measure of a firm's abnormal stock return in connection to the news of the lowered corporate tax rate. The independent variables ($x_1, x_2 \ldots, x_k$), i.e. the variables that aims to explain the behavior of the CAR, consists of accounting components that according to the RIV-model should influence a firm's value if the investors' expectations, regarding the future corporate tax rate, are changed. As described in the hypothesis section, these components are the size of a firm's deferred tax liabilities, deferred tax assets and the investors' expectations on the firm's future earnings (estimated with the firm's book-to-market ratio).

In the section describing the RIV-model, it was concluded that the *actual* amount of deferred tax assets and deferred tax liabilities affects valuation. Hence, if two companies have the same amount of deferred tax assets and deferred tax liabilities they will both experience the same increase/decrease in value. In terms of stock price returns, the effect will however be dependent on the firm's value before the revaluation. Hence, if two companies have the same amount of deferred tax accounts they will not experience the same stock price return if the value of the firms before the new tax regulation differed. This implies that in terms of returns, the actual amount of deferred tax assets and deferred tax liabilities must be related to the firm's value before the government's proposal.

In this study the market capitalization on day τ=-2 is used as the pre-value of the firms.[13] The market capitalization have been chosen over book value, since book values sometimes can be misleading in terms of true value. The choice of relating the deferred accounts to the market capitalization was also made in the study by Givoly and Hayn (1992). The model will thus be as follows:

(24)

$$CAR_i = \beta_0 + \beta_1 DTLM_i + \beta_2 DTAM_i + \beta_3 BTM_i + \varepsilon_i$$

Where DTLM equals the amount of deferred tax liabilities in relation to market capitalization, DTAM equals the amount of deferred tax assets in relation to market capitalization and BTM equals the book-to-market ratio.

[13] Market capitalization for day -2 is calculated as the number of shares April 11th 2013 times the share price on day -2. The calculation is thus based on the assumption of no change in the number of shares between September 11th 2012 and April 11th 2013.

Control variables

The use of control variables in regressions aims to capture variations in the dependent variable that is not attributed to the explanatory variables. Control variables can thus strengthen the regression results and give a more accurate estimation of the relations between the dependent and independent variables. The control variables used in this study are presented and motivated below.

Degree of Swedish presence

The new tax regulation only concerns firms that are required to pay corporate tax in Sweden. In order to somewhat control for the corporate tax attributed to Sweden, a measure of the group's degree of Swedish presence (DSP) is used as a control variable. The degree of Swedish presence can be estimated in several different ways. In this study, the degree has been estimated using Swedish revenues in relation to total revenues. This is the most common approach to estimate internationalization (Ramaswamy et. al. 1996).

Industry

Control dummy variables for ten different industries were included in the regression. These are: Oil & Gas (IND1), Basic Materials (IND2), Industrials (IND3), Consumer Goods (IND4), Consumer Services (IND5), Health Care (IND6), Telecommunications (IND7), Utilities (IND8), Financials (IND9) and Technology (IND10).[14] Control for industries with dummy variables have been made in research before. For example, the study by Durnev and Kim (2005) use industry dummies to help control for different accounting practices between industries. Furthermore the study by Hartzell and Starks (2003) use industry dummies to control for pay similarities within industries and for any preferences institutional investors have for particular industries. In this study, control dummies for industries are used to control for any possible industry preferences among investors and industry specific events in the event window. Including the control variables the model that will be tested thus becomes:

[14] Based on the sector definitions from Nasdaq OMX Nordic.

(25)

$$CAR_i = \beta_0 + \beta_1 DTLC_i + \beta_2 DTAC_i + BTM_i + DSP_i + IND1_i + IND2_i + IND3_i + IND4_i + IND5_i + IND6_i + IND7_i + IND8_i + IND9_i + IND10_i + \varepsilon_i$$

5.2.1 The OLS Regression

Regressions can be estimated using ordinary least squares (OLS) (MacKinlay, 1997). The OLS regression model is built on the five Gauss-Markov assumptions[15] where the first four establish the unbiasedness of OLS and the fifth derives the usual variance formulas and is used to conclude that OLS is the best linear unbiased.

As with event studies, the regression methodology also have its issues. In this study, the fulfillment of the OLS assumptions is regarded as the most important issue. MacKinlay (1997) questions if the assumption regarding homoskedasticity really is reasonable. The alternative would then be heteroskedasticity where the variance of the error term, given the explanatory variables, is not constant. Under heteroskedasticity, OLS is still unbiased but no longer efficient which implicates that the Gauss-Markov Theorem is no longer valid.[16] Tests indicate that this study might suffer from heteroskedasticity, see Appendix (tables 8-9 and Graph 2).

In the presence of heteroskedasticity, the best linear unbiased estimator (BLUE) is instead Generalized Least Squares (GLS). A GLS is also a way of solving the problem of cross-sectional correlation among abnormal returns due to event clustering (Kolari & Pynnönen, 2010). Nevertheless, a GLS requires an accurate estimation of the covariance matrix of the residual returns. This is normally not possible in finite samples, especially when the number of observation increases (ibid). Furthermore, the Malatesta's 1986 study (cited in Kolari & Pynnönen 2010, p. 3997) concludes that since every covariance constitutes an important role in GLS through matrix inversion, estimation errors in individual covariance introduce more error than they eliminate, thus making the test results even worse. The inappropriate use of a GLS in event

[15] Linear in parameters (MLR 1), Random sampling (MLR 2), No perfect collinearity (MLR3), Zero conditional mean (MLR 4) and Homoskedasticity (MLR 5).
[16] Under assumption MLR 1 through MLR 5, the OLS estimators are the best linear unbiased estimators (BLUEs).

studies is confirmed in Chandra and Balachandran's 1990 study (cited in Kolari & Pynnönen 2010, p. 3997-3998).

White's 1980 study (cited in MacKinlay 1997, p. 33) however, proposes an alternative solution in the presence of heteroskedasticity. The method is based on an OLS with heteroskedasticity-consistent standards errors[17]. In the statistical software package STATA, heteroskedasticity-consistent standards errors are accomplished by the robust option.

Regarding linearity, tests have been made to see whether linearity in parameters can be assumed. As can be seen in Appendix, graphs 3-5, the model does not appear to suffer from any substantial linearity problem. In terms of collinearity problems, a multicollinearity test has furthermore been performed. The test did however not indicate any problem (see Appendix, Table 7). In terms of a zero conditional mean, it can only be assumed that no factor contained in the error term is correlated with one or more independent variables. Since the heteroskedasticity has been controlled for, the most concerning assumption is thus the zero conditional mean.[18]

[17] Also referred to as robust standard errors or White standard errors.
[18] All tests on the sample have been conducted in accordance to the guidelines for regression diagnostics given by UCLA (Chen et al. (2003)).

6 Data Collection

In this study, the sample is limited to firms on the Nasdaq OMX Stockholm.[19] The daily closing prices for the period February 1st to November 30th 2012 were, for the entire sample, retrieved from Nasdaq OMX Nordic. In order to control for firm specific corporate actions, such as dividends and stock splits, adjusted stock prices were collected.[20] Closing prices for the index OMX AFGX were also retrieved from Nasdaq OMX Nordic. OMX AFGX is a broad and market capitalized price index that includes all firms listed on Nasdaq OMX Stockholm. It is thus believed to capture the average share price performance in a good way. Closing prices for the indices DAX, S&P 500 and FTSE were collected from Yahoo Finance.

The accounting data was retrieved from the annual reports of 2011. Most annual reports were obtained from the database Retriever but in some cases, when Retriever had no information, the annual reports were collected from the firms' websites. In cases where consolidated financial statements were expressed in another currency than SEK, the exchange rate on December 28th 2011 was retrieved from Sveriges Riksbank in order to transform the amounts into SEK.

6.1 Data Issues

As a consequence of unavailable stock prices for the period of interest, a total of five observations were excluded from the sample that otherwise consisted of all firms listed on Nasdaq OMX Stockholm.[21] This left a number of 281 observations in the sample. Each firm's market capitalization was calculated using the number of shares listed on Nasdaq OMX Stockholm on April 11th 2013. The number of shares for each firm was multiplied with the stock price on day τ=-2 in order to retrieve an estimate of their market capitalization before the event. This estimation assumes that the number of shares did not change between September 2012 and April 2013. The approximation might be rough, but it has been assumed to be reasonable since it is only a short period of deviation.

[19] Based on the stock list available on April 8th 2013

[20] Nasdaq receives the adjustment factors from an internal system and applies them to the existing historical data. All factors are derived from corporate actions such share splits, dividends, rights issues, and mergers and acquisitions. NASDAQ OMX follows best practice when it comes to calculating and applying corporate actions.

[21] Stocks dropped were Alliance Oil pref, Eniro pref, Arcam, Arctic Paper and Epicept.

The estimate of Swedish presence (DSP) was computed through a division of the group's revenues related to the Swedish market with the sum of the group's total revenues. The numbers were retrieved using the geographical segment reporting in the annual reports. However, since all firms did not conduct the geographical reporting for the Swedish market in their consolidated statements, a total of 44 observations were dropped in the regressions that included the DSP-measure.

7 Empirical Results

The empirical results are separated with regard to the two research areas: the event study examining whether there was a market wide stock price reaction to the news of the reduced corporate tax rate and the regressions aiming to investigate if a firm's reaction can be explained by the firm's underlying components.

7.1 Event Study

Actual Returns

Graph 1 illustrates the return of OMX AFGX compared to S&P 500, DAX and FTSE in a window of +/-20 trading days to τ=0 (i.e. 13th September 2012). One can see that OMX AFGX outperformed the other indices in the event window.

Graph 1

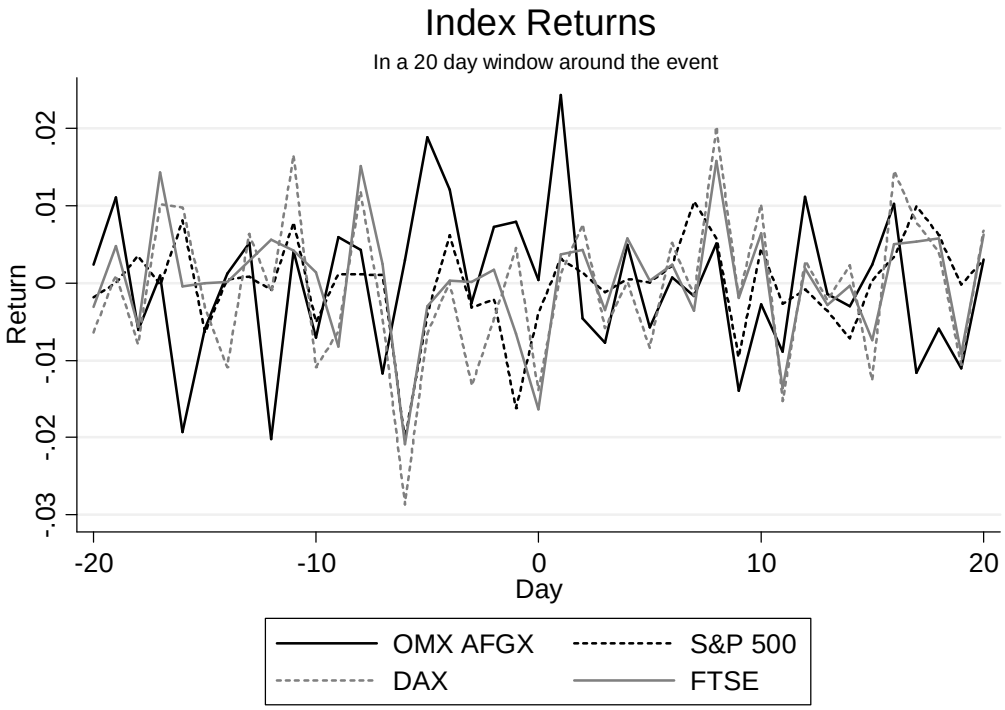


Table 1 presents the sample mean, median, maximum, minimum and standard deviation for actual firm returns +/-5 trading days to τ=0. In the table, it is possible to distinguish positive average firm returns for the days included in the event window (τ=-1 to τ=1). The highest average firm return occurred on day τ=1.

Table 1

Day	Number of Obs	Mean	Median	Max	Min	StdDev
-5	281	0.011	0.009	0.214	-0.158	0.028
-4	281	0.006	0.004	0.081	-0.156	0.024
-3	281	-0.001	0.000	0.096	-0.182	0.025
-2	281	0.003	0.000	0.208	-0.154	0.027
-1	281	0.005	0.002	0.148	-0.081	0.021
0	281	0.001	0.000	0.188	-0.064	0.023
1	281	0.013	0.011	0.101	-0.112	0.025
2	281	-0.002	-0.002	0.275	-0.182	0.028
3	281	-0.006	-0.005	0.336	-0.108	0.027
4	281	0.006	0.002	0.251	-0.052	0.024
5	281	-0.006	-0.004	0.093	-0.118	0.019

Abnormal and Cumulative Returns

Table 2 presents the sample mean, median, maximum, minimum and standard deviation of abnormal returns for the days in the event window. Since the normal return is estimated using a fixed average market return, the average abnormal return is still the highest on day τ=1. One should however note that the average abnormal returns for day τ=1 is *higher* than the average actual returns for the same day (seen in Table 1). The unrounded returns for day τ=-1 and day τ=0 express the same relation.

Table 2

Day	Number of Obs	Mean	Median	Max	Min	StdDev
-1	281	0.005	0.003	0.152	-0.081	0.021
0	281	0.001	0.000	0.189	-0.054	0.023
1	281	0.014	0.012	0.103	-0.112	0.025

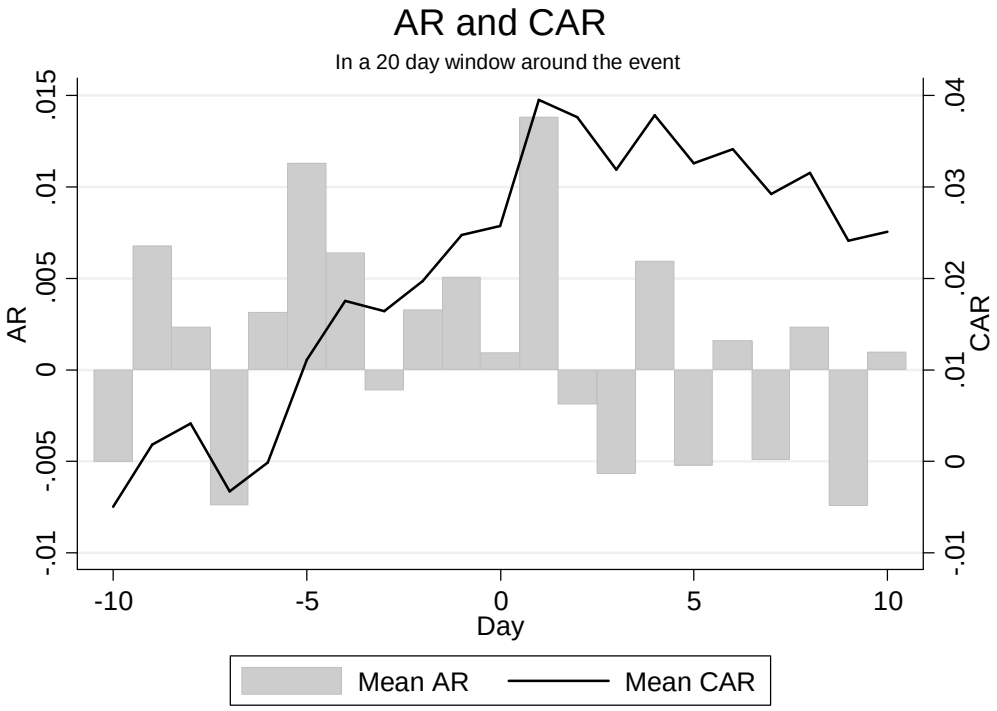
Further, one can in Appendix (Graph 1) see that the abnormal return differed substantially between firms listed on large cap and firms listed on mid and small cap. Table 3 presents the sample mean, median, maximum, minimum and standard deviation for the sample firms' cumulative abnormal returns in the event window.

Table 3

Day	Number of Obs	Mean	Median	Max	Min	StdDev
-1	281	0.005	0.003	0.152	-0.081	0.021
0	281	0.006	0.003	0.191	-0.114	0.032
1	281	0.020	0.017	0.257	-0.112	0.038

Graph 2 illustrates the abnormal returns during a window of +/-10 days around the event and further how the cumulative abnormal return developed during this period. One can see that the highest abnormal return occurred at day τ=1. This abnormal return raised the cumulative abnormal return considerably.

Graph 2



Test Results

The following hypothesis tests are evaluated based on the normal distribution. For a two-tailed hypothesis test the critical values are:

Table 4

Significance Level	$z_{\alpha/2}$	$-z_{\alpha/2}$
10 %	1.64	-1.64
5 %	1.96	-1.96
1 %	2.58	-2.58

Parametric Hypothesis Test

Figure 1 illustrates the calculation of the t-statistic for the two sided hypothesis test, in accordance with formulas (12-14), using the unadjusted standard deviation. The average cumulative abnormal return ($\overline{CAR}$) in the event window equals 0,020, while

the unadjusted standard deviation for $\overline{CAR}$ equals 0,0030. The t-statistic of 6.826 implies that the null hypothesis can be rejected at the 1 % significance level.

Figure 1

$$t = \frac{(0.020 - 0)}{0.0030} = 6.826$$

Figure 2 illustrates the calculation of the t-statistic using the adjusted standard deviation, calculated following formulas (15-18), for $\overline{CAR}$. The t-statistic is now reduced to 1,414, which implies that the null hypothesis fails to be rejected at a 10 % significance level.

Figure 2

$$t = \frac{(0.020 - 0)}{0.014} = 1.414$$

Non-parametric Hypothesis Test

Figure 3 illustrates the calculation of the t-statistic for the non-parametric rank test illustrated in formulas (19-22). The t-statistic of 1,434 implies that the null hypothesis fails to be rejected at a 10 % significance level. The results from the rank test of daily abnormal returns can be found in Appendix, Figure 1-3.

Figure 3

$$t = \frac{1}{\sqrt{281}} * \sum_{i=1}^{281} \frac{\left(U_{i0} - \frac{1}{2}\right)}{1.961} = 1.434$$

7.2 Regression

The following tables illustrate the results from the OLS regressions conducted in STATA. One should note that the output tables first display the coefficient estimate, and then the estimates t-statistic within brackets. Furthermore, STATA also displays whether or not the coefficient estimate is significantly different from zero at a 5 % and 1 % significance level. However, since this study conducts one-tailed tests on the variables DTLM, DTAM and BTM, it is only their t-statistics and the following critical values that are of interest in the hypothesis tests.

Table 5

Significance Level	z_α	z_α
10 %	1.28	-1.28
5 %	1.64	-1.64
1 %	2.33	-2.33

The result from the OLS regression with robust option and no control variables is illustrated in Table 6.

Table 6

	CAR
DTLM	-0.010
	(0.80)
DTAM	0.009
	(0.36)
BTM	0.001
	(0.52)
_cons	0.019
	(6.47)**
R^2	0.00
N	281

* $p<0.05$; ** $p<0.01$

As one can see, the R^2 is zero, implying that the model does not explain any of the variation of cumulative abnormal return (CAR). Furthermore, based on the t-statistics, one can conclude that all the null hypotheses regarding the coefficients for the explanatory variables fails to be rejected at a significance level of 10 %. Table 7 shows the results for the same regression with the inclusion of a control variable for the degree of Swedish presence (DSP).

Table 7

	CAR
DTLM	-0.015
	(0.89)
DTAM	0.000
	(0.02)
BTM	0.003
	(2.80)**
DSP	-0.018
	(2.76)**
_cons	0.027
	(5.74)**
R^2	0.04
N	237

* $p<0.05$; ** $p<0.01$

In Table 7, one can see that the inclusion of the DSP-measure raises the R^2 to 4 %. The inclusion of the control variable reduces the number of observations due to missing values in the calculation of the degree of Swedish presence. The null hypotheses concerning the coefficients for the independent variables still fails to be rejected at a significance level of 10 %. Regarding the control variable DSP, it is significant at a 1 % significance level. Further, Table 8 presents the results from the regression including the control variable DSP as well as the dummy variables for industries.

Table 8

	CAR
DTLM	-0.020
	(1.05)
DTAM	-0.004
	(0.15)
BTM	0.003
	(2.43)*
DSP	-0.017
	(2.52)*
Industry2	0.023
	(1.28)
Industry3	0.019
	(1.05)
Industry4	0.015
	(0.86)
Industry5	0.016
	(0.85)
Industry6	0.007
	(0.36)
Industry7	0.009
	(0.34)
Industry8	0.024
	(1.31)
Industry9	0.016
	(0.92)
Industry10	0.016
	(0.85)
_cons	0.012
	(0.72)
R^2	0.05
N	237

* $p<0.05$; ** $p<0.01$

Studying Table 8 it is once again, based on the t-values, clear that none of the null hypotheses regarding the coefficients of the independent variables can be rejected at a 10 % significance level. The control variable DSP is once again significant, but this

time on a significance level of 5 %. None of the dummy variables for industry are significant at a 10 % significance level. Note that IND1 is omitted.

8 Analysis

8.1 Event Study

Based on the development of the OMX AFGX index in comparison to the international indices (Graph 1), it is possible to distinguish that the Swedish stock market did outperform other stock markets in the event window. This might indicate that something special occurred, generating a positive market wide reaction at Nasdaq OMX Stockholm, in connection with the proposal of a lower corporate tax rate.

Examining Table 1 it is also possible to see that the average firm returns were positive in the event window. However, even though the average firm returns were positive, one can question whether the returns were higher than normal, i.e. abnormal. Examining Table 2, it is possible to conclude that the returns were in fact above normal, and thus that there existed an average cumulative abnormal return in the event window (Table 3). This once again suggests that there was some kind of market wide reaction at Nasdaq OMX Stockholm in connection to the government's proposal. Furthermore, it is also worth noticing that day $\tau=1$ exhibits a considerably higher average abnormal return than the other days included in the event window (Graph 2). This could suggest that the market had a lagging reaction to the news and that the hypothesis tests only should have been conducted on this day.

It is however interesting that the average abnormal returns in the event window are higher than the average actual returns. This must in some way be related to the estimation of normal returns. Examining Table 1 in Appendix, it is possible to see that the average alpha for the sample firms is negative. Since beta on average is positive, the peculiar deviation between actual and abnormal returns is explained by the negative average alpha. The alpha is the intercept in the market model, and a negative alpha implies that a stock has a negative return when the market has a return of zero. It is however quite striking that so many firms yield negative returns in the case of a zero market return. This brings the question whether the estimation window really gives the accurate picture.

Nonetheless, even though the average cumulative abnormal return was different from zero in the event window, it is important to see whether or not it can be determined to be *significantly* different from zero. The unadjusted t-test concludes that the average cumulative abnormal return is significantly different from zero at a 1 % significance level (Figure 1). Nonetheless, the t-test with the adjusted standard deviation gives a different picture. Conducting this test, it is not possible to reject the null hypothesis that the average cumulative return is different from zero at 10 % significance level (Figure 2). The same result is observed with the non-parametric rank test (Figure 3). This raises the question of which test that gives the most accurate picture.

Many event study researchers, such as Kolari and Pynnönen (2010), argue that event date clustering causes an underestimation of the standard deviation and thus an over rejection of the null hypothesis using a normal t-test. This speaks in favor of the adjusted t-test and rank test and thus that the corporate tax cut did not induce any significant market wide reaction at Nasdaq OMX Stockholm. One could however at the same time question whether the adjusted t-test and rank test actually derive the correct standard deviations for the sample. It might be the case that the adjustments over-adjust the estimates of the standard deviations. Hence, it cannot be confirmed whether or not the latest corporate tax cut actually induced a significant market wide reaction on Nasdaq OMX Stockholm.

8.2 Regression

The regressions aiming to investigate if a firm's stock price reaction can be explained by the corporate tax reduction's effects in the firm's consolidated financial statements did not provide any significant results. In Table 6, one can see that the regression (with robust option) without any control variables have a R^2 of zero, meaning that the underlying model does not explain any variation in the dependent variable. Furthermore, none of coefficients of the independent variables are significant at a 10 % level and it is thus not possible to reject any of the null hypotheses.

Tables 7 and 8 display the regression results including control variables. The inclusion of the control variables raises the R^2 marginally, which is logical since there are fewer observations and more variables included. DSP is in both regressions

significantly different from zero at a 5 % significance level, suggesting that it is an appropriate control variable. The negative sign of the coefficient is however somewhat surprising, since one would expect a positive relation between the degree of Swedish presence and cumulative abnormal returns following the Swedish corporate tax cut.

None of the dummy variables for industry are significantly different from zero at a 5% significance level (Table 8). One of the dummy variables was omitted in the regression due to missing data. Regarding the independent variables of interest, none of the null hypotheses can be rejected at a 10 % significance level. It thus appears as if a firm's stock price reaction in the event window cannot be explained by the components affected by the reduced corporate tax rate in the firm's consolidated financial statements. It is however still interesting to analyze potential explanations for the results.

For example, the event study could not conclude that there was a significant market wide reaction following the news of the corporate tax rate reduction. Hence, it can be questioned whether the firms in the sample actually generated any abnormal returns during these says – i.e. if there exist something to explain.

Further, it might be possible that the regression model does not reflect the true relationship between accounting, valuation and stock prices. Specifically, the variables regarding the deferred items are troublesome, mainly because the variables, based on opening balances for 2012, do not reflect the part of the total deferred items that actually relates to Swedish tax. The variable (DSP) which is used to control for Swedish presence does not appear to take care of the issue.

As in Givoly and Hayn's (1992) study, it might have been more preferable to use the actual gain or loss due to the revaluation instead of the opening balances of the deferred accounts for 2012. A use of the actual gain or loss would also have controlled for the Swedish part of the total deferred tax accounts and would thus have given a more accurate relation between the deferred tax accounts and the cumulative abnormal returns. This procedure was however not possible since the consolidated

financial statements for 2012 had not been released for all firms at the time of this study.

One could however question if an approach in line with Givoly and Hayn's (1992) really would have specified the true relation between the revaluation of the deferred accounts and the stock reaction in the event window. As Givoly and Hayn (1992) found, there are indications that investors do not value the deferred accounts in accordance with accounting regulation. The investors valuation have appeared to be more in line with a partial allocation, which implies that they only recognize the part of the deferred accounts on the balance sheet that is believed to be realized in the near future. The results from the regressions however seems to be more in line with the results from Chen and Schoderbek (2000). Hence, this study's results could suggest that the investors do not impound the lower corporate tax rate until the consolidated financial statements for 2012 are released.

Aside from the question of partial allocation there are those, such as Amir et al. (1997), who mean that the deferred items are discounted by the market to reflect their timing of realization. This view implies that the investors, in contrast to the consolidated financial statements, only recognize the present value of the deferred items. There are thus two reasons why investors might not value a firm based on the actual information in the consolidated financial statements: partial allocation and discounting. These two reasons could have influenced the results.

Furthermore, it could also be the case that investors, like the accountants, waited until the new corporate tax rate was substantially enacted before they impounded the effects in their expectations. If this was the case it could explain not only why the deferred accounts do not seem to be related to the cumulative abnormal return, but also why the null hypothesis regarding the future expectations on earnings cannot be rejected. However, in terms of expectations on future earnings, the lack of results could also be a consequence of using the book to market ratio as a proxy.

To summarize, it appears as if it is not possible to find any relation between a firm's stock price reaction in connection with the government's proposal and the reduction's effect in the firm's consolidated financial statements. However as earlier mentioned,

the lack of results could potentially be due to the regression methodology. Disregarding the regression methodology and instead observing the actual data it appears as if some relation actually can be identified.

In Appendix (Graph 1) one can see that the firms listed on large cap considerably outperformed firms listed on mid and small on day $\tau=1$. Studying tables 3-5 in Appendix, one can furthermore see that the large cap firms had the highest average DTLM and the lowest average DTAM. One could argue that this supports the theoretical reasoning that firms with higher deferred tax liabilities in relation to market capitalization, and lower deferred tax assets in relation to market capitalization, benefit more from the news of the lower corporate tax. The average book-to-market (BTM) is however for the firms listed on large cap higher than for the firms listed on mid and small cap, suggesting that the firms listed on mid and small cap should have benefited more. The BTM is however only a proxy for future expected earnings and one can thus question the validity of the measure. Hence, only regarding the deferred accounts it appears, in contrast to the regression results, as if a relation can be found.

9 Conclusion

This thesis has investigated the latest Swedish corporate tax cut and its implications in the consolidated financial statements as well as on the stock market. The event study indicates that there was a market wide reaction in connection to the news of the lowered corporate tax. It could however not be firmly concluded that this reaction was significantly different from zero, suggesting that investors actually did not change their expectations on future earnings.

The study of tax components in the consolidated financial statements indicated that the opening balances of the deferred tax accounts for 2012, as well the market's expectations on future tax expenses, theoretically should explain a firm's stock price reaction to the news of a lower corporate tax. Nevertheless, using OLS regressions it appears as if a firm's stock price reaction, in connection with the government's proposal, cannot be explained by the tax reduction's effects in the firm's consolidated financial statements.

10 Discussion and Further Research

The research approach in this study has built on the assumption that the Swedish government's proposal of a lower corporate tax changed the investors' expectations of future residual incomes. From a theoretical perspective, the news of the lowered corporate tax should have implied a reaction on the stock market. The empirical results in this study do however not confirm this theoretical picture. One might wonder what the explanation for this deviation could be. Could it be possible that the Swedish government does not have the markets confidence? After all, the Swedish government did and does not possess a majority in the parliament and their proposal could thus have been outvoted. It might be the case that investors demand a stronger government in order to change their expectations on the day of a new proposal.

It would be interesting to conduct further research and investigate the relation between the government's influence in the parliament and changed expectations. To begin with, it would be interesting to examine whether there was a more visible stock market reaction on the day of the parliaments acceptance of the proposal, i.e. to investigate if investors like accountants demand the regulation to be substantially enacted before impounding the effect. Furthermore, it would also be interesting to conduct studies on previous corporate tax cuts, in order to see if the market reacted differently when governments with a majority proposed corporate tax reductions.

Moreover it would be interesting to further investigate the deviations between accountants' and investors' pricing of deferred accounts. If it is the case that investors discount and/or use a partial allocation in the valuation of the deferred accounts, it might suggest that a change in accounting regulation is needed. One of the most important principles within accounting is after all that the financial statements should give a true and fair view of the firm.

11 Critical Reflection

This study is not built on a replication of a previous research that has been empirically verified and acknowledged by academics. Furthermore, the study has been conducted within the frames of a Bachelor thesis and has thus been subject of several simplifications which can be criticized.

To begin with, it can be questioned whether it is reasonable to assume that the market's reaction to the new corporate tax rate occurred in conjunction with the Swedish government's proposal. Amromin et al. (2008) included two separate event windows in their study of dividend tax cut in the US. This study might very well have benefited from an inclusion of additional event windows, such as the day of Swedish Minister of Finance's declaration of his wishes to lower the corporate tax on April 16th, or the day of the Swedish parliament's acceptance of the new law on November 21st.

One could furthermore question the use of an historical index average as a proxy for the market return in the event window, since it implicates that confounding events are disregarded in the calculation of normal returns. Hence, the actual cumulative abnormal return could actually be higher or lower than estimated. An alternative method of estimating the market return in the event window, which has been considered, is the use of an index replicating another stock market than Nasdaq OMX Stockholm.

For example, the market model approach to estimating normal returns could have been conducted using a market index covering Nasdaq OMX Helsinki. Nonetheless, this approach also has sources of error. For example, the method then builds on the assumption that there is a close relationship between Swedish stock returns and the Helsinki index. Furthermore, the method would also have required a thorough investigation of potential confounding events occurring on the Finnish market that should not have affected the Swedish stock market.

In terms of the regressions, the choice of explanatory variables can also be subject to questioning. For example, the use of the book-to-market ratio as a measure of future

expected earnings might not be an optimal estimate. It could have been better to use an estimate of future incomes before tax based on historical data. In addition, the use of Swedish revenues in relation to total revenues might not be a representative estimate of the ratio of tax that is related to Sweden. It is possible that Swedish assets in relation to total assets would have been a better estimate. Furthermore, one could also question the choice of dividing firms into industries based on Nasdaq OMX Stockholm's sector classification. Nasdaq's classification is very broad and might thus not capture industry specific characteristics. It could also be the case that the regressions might have benefited from the inclusion of additional control variables.

Finally, the actual use of regressions as a methodology can also be questioned. As discussed in the analysis section, it appears as if the differences in the average abnormal returns between the different caps can be explained with the amount of the deferred accounts in relation to market capitalizations. This connection, only visible in raw data, could suggest that another method than OLS regressions is needed to further investigate if a relation between a firm's consolidated financial statements and its stock price return in conjunction with a change in corporate tax regulation truly exists.

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JOHANNA WIKLUND, Manager Business Tax Services, Ernst and Young.

JÖRGEN NILSSON, Director and Accounting Expert, KPMG.

MATTIAS FAGERSTRÖM, Tax Senior, Ernst and Young.

PETER MALMQVIST, Malmqvist EQR.

PETER MELZ, Professor of Fiscal Law, Head of Department of Law, Stockholm University.

13 Appendix

Variable	Description
DTA	Deferred Tax Assets
DTL	Deferred Tax Liabilities
BTM	Book-to-Market
DSP	Degree of Swedish Presence
DTAM	Deferred Tax Assets to Market Capitalization
DTLM	Deferred Tax Liabilities to Market Capitalization

Table 1

Parameter	Number of Obs	Mean	Median	Max	Min	StdDev
α	281	-0.001	0.000	0.005	-0.012	0.002
β	281	0.593	0.547	1.638	-0.445	0.416

Table 1 displays the descriptive statistics of the parameters α and β which are used to derive the normal and thus also abnormal returns.

Table 2

Variable	Number of Obs	Mean	Median	StdDev
DTA	281	483	24	1764
DTL	281	945	43	2410
BTM	281	0.995	0.650	1.417
DSP	237	0.448	0.375	0.371
DTAM	281	0.043	0.010	0.091
DTLM	281	0.064	0.025	0.122

Table 2 displays the descriptive statistics of the variables DTA, DTL, BTM, DSP, DTAM and DTLM.

Table 3

Variable	Number of Obs	Mean	Median	StdDev
DTA	82	1536	687	3023
DTL	82	2988	1365	3713
BTM	82	1.111	0.700	1.824
DSP	67	0.316	0.238	0.320
DTAM	82	0.024	0.013	0.032
DTLM	82	0.093	0.036	0.134

Table 3 displays the descriptive statistics of the variables DTA, DTL, BTM, DSP, DTAM and DTLM for Large Cap firms.

Table 4

Variable	Number of Obs	Mean	Median	StdDev
DTA	73	97	17	190
DTL	73	246	74	577
BTM	73	0.759	0.470	0.760
DSP	55	0.501	0.468	0.339
DTAM	73	0.035	0.005	0.076
DTLM	73	0.070	0.022	0.168

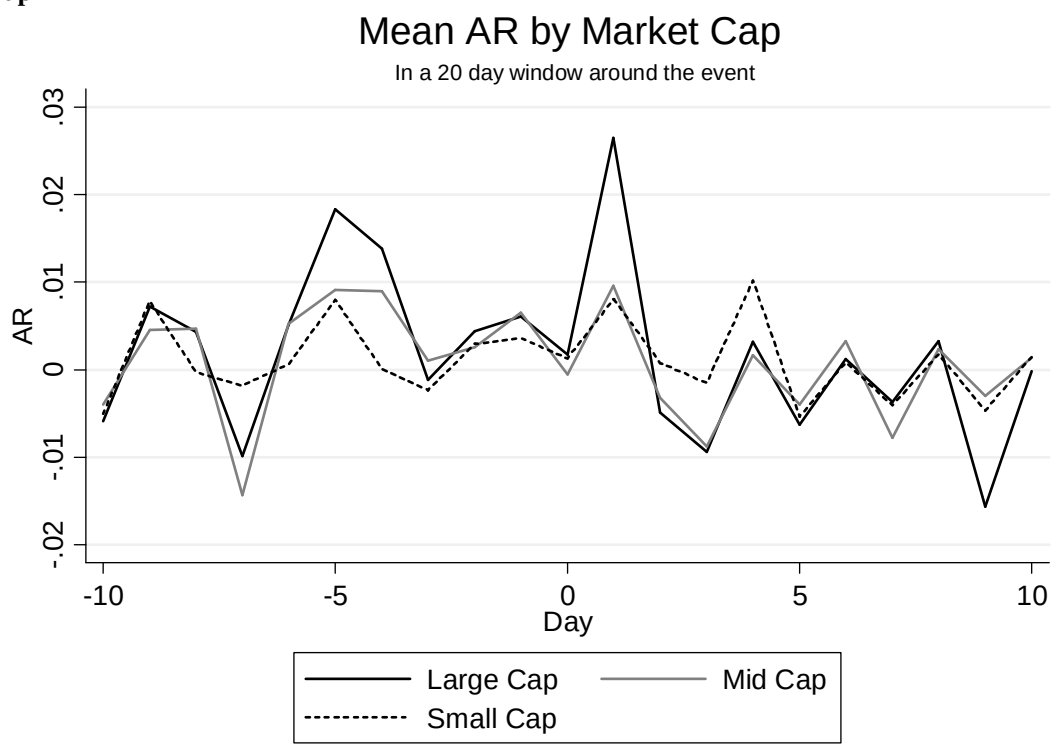
Table 4 displays the descriptive statistics of the variables DTA, DTL, BTM, DSP, DTAM and DTLM for Mid Cap firms.

Table 5

Variable	Number of Obs	Mean	Median	StdDev
DTA	126	21	5	32
DTL	126	21	4	43
BTM	126	1.056	0.700	1.402
DSP	115	0.499	0.513	0.397
DTAM	126	0.060	0.011	0.119
DTLM	126	0.042	0.010	0.068

Table 5 displays the descriptive statistics of the variables DTA, DTL, BTM, DSP, DTAM and DTLM for Small Cap firms.

Graph 1



Graph 1 illustrates the mean abnormal return in a 20 day window around the event, separated on market capitalization.

Figure 1

$$t = \frac{1}{\sqrt{281}} * \sum_{i=1}^{281} \frac{\left(U_{i0} - \frac{1}{2}\right)}{1.817} = 0.857$$

Figure 1 displays t-statistic of the non-parametric rank test of day τ = -1. The abnormal return on day τ = -1 cannot be determined to be significantly different from zero at a 5 % significance level.

Figure 2

$$t = \frac{1}{\sqrt{281}} * \sum_{i=1}^{281} \frac{\left(U_{i0} - \frac{1}{2}\right)}{1.817} = 0.0671$$

Figure 2 displays t-statistic of the non-parametric rank test of day τ = 0. The abnormal return on day τ = 0 cannot be determined to be significantly different from zero at a 5 % significance level.

Figure 3

$$t = \frac{1}{\sqrt{281}} * \sum_{i=1}^{281} \frac{\left(U_{i0} - \frac{1}{2}\right)}{1.817} = 1.689$$

Figure 3 displays t-statistic of the non-parametric rank test of day τ = 1. The abnormal return on day τ = 1 cannot be determined to be significantly different from zero on a 5 % significance level, but on a 10 % significance level.

Table 6

	CAR
DTLC	-0.010
	(0.52)
DTAC	0.009
	(0.34)
BTM	0.001
	(0.46)
_cons	0.019
	(6.56)**
R^2	0.00
N	281

* p<0.05; ** p<0.01

Table 6 displays the results from the non-robust regression with the variables DTAC, DTLC and BTM. None of the independent variables are significantly different from zero. All tests below are based on this regression.

Table 7

Variable	**VIF**	**1/VIF**
BTM	1.13	0.887665
DTLC	1.09	0.918635
DTAC	1.06	0.940944
Mean VIF	1.09	

Table 7 displays the results from the test of multicollinearity. Since the VIF value for all variables are lower than 10, it can be concluded that the model does not suffer from any multicollinearity problem.

Table 8

Breusch-Pagan/Cook-Weisberg test	
Chi2	2.86
P-value	0.091

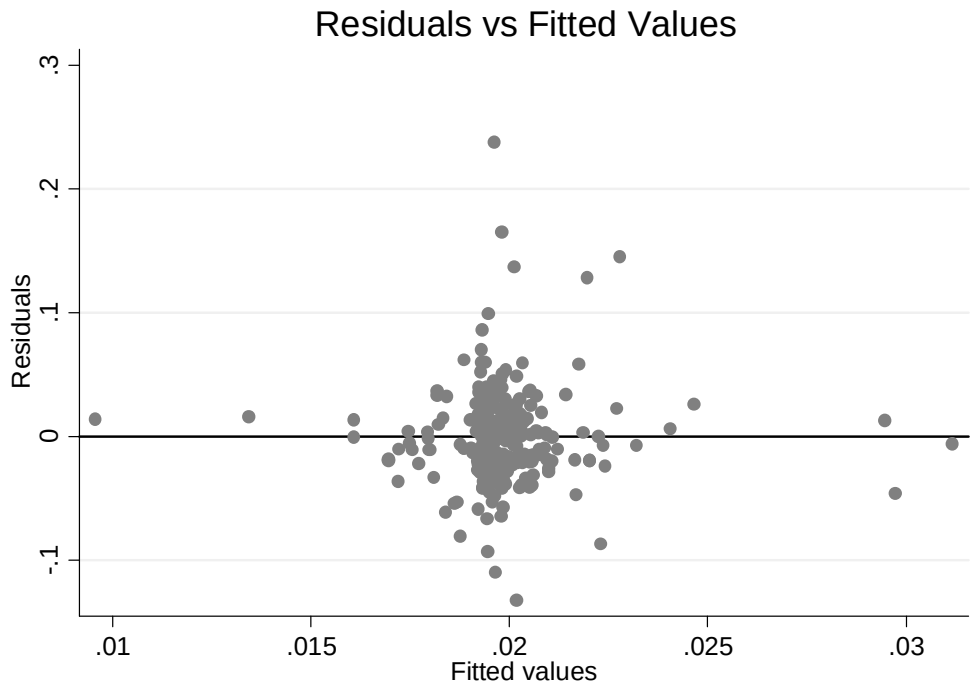
Table 8 displays the results from the Breusch-Pagan/Cook-Weisberg test of heteroskedasticity. Since the p-value is very small, the null hypothesis that the variance of residuals is homogenous can be rejected. Hence, the test suggests that the model suffers from heteroskedasticity problems.

Table 9

Cameron & Trivedi's Decomposition of IM-test	
Chi2	3.18
P-value	0.9567

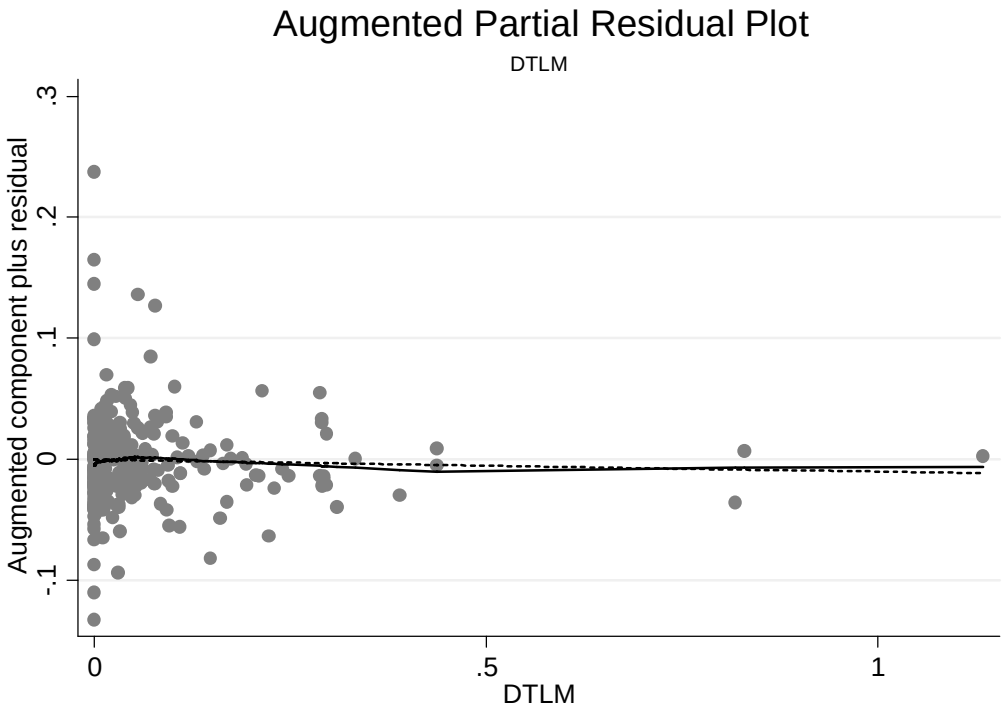
Table 9 displays the results from White´s test of heteroskedasticity In comparison to the Breusch-Pagan/Cook-Weisberg test, this test does not necessarily imply that the model suffers from heteroskedasticity problems. Both tests are however very sensitive to the model assumptions, such as normality, and the tests are thus complemented by a plot to whether any correction for heteroskedasticity is needed.

Graph 2



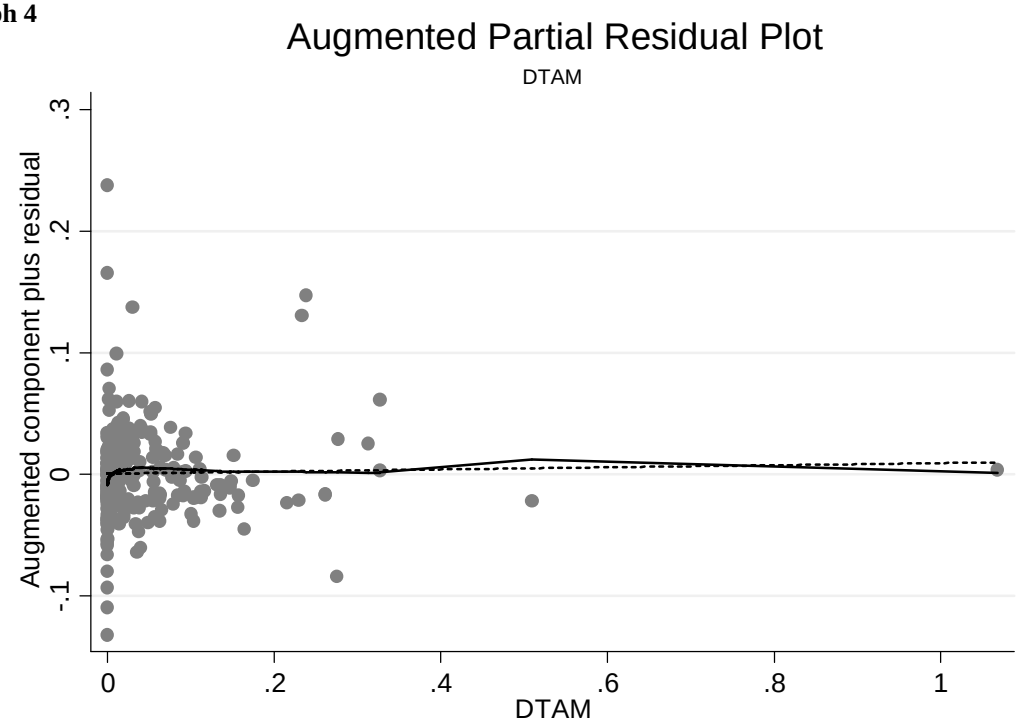
Graph 2 illustrates the residuals versus the fitted values. As can be seen in the graph, the deviations from the line differ suggesting a problem of heteroskedasticity. Combining the graph with the White´s and Breusch-Pagan/Cook-Weisberg's tests, the regression model used in this study would benefit from a lighter correction of heteroskedasticity.

Graph 3



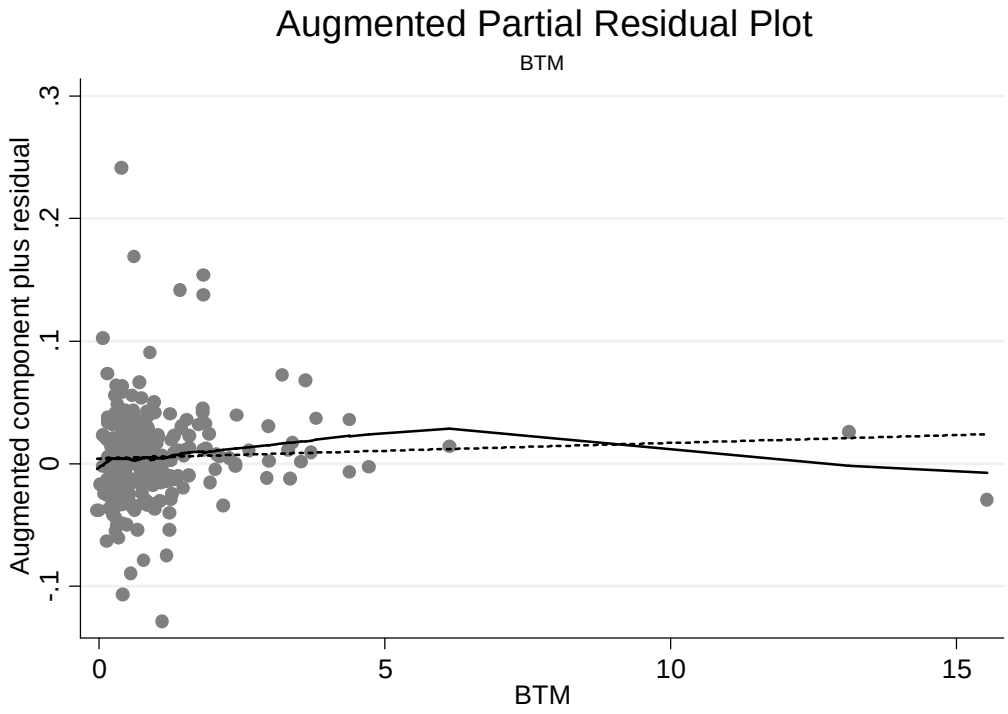
Graph 3 illustrates an augmented partial residual plot for the variable DTLM. As can be seen, the lines are very close to each other suggesting that there is linearity.

Graph 4



Graph 4 illustrates an augmented partial residual plot for the variable DTAM. As can be seen, the lines are very close to each other suggesting that there is linearity.

Graph 5



Graph 5 illustrates an augmented partial residual plot for the variable BTM. In contrast to graph 3 and 4, this plot suggests that there might be some non-linearity which would imply problems with the linearity assumption for an OLS regression. Nonetheless, the deviations are not that sufficient to imply the use of another regression.