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Master Thesis

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Trading around ex-dividend day: Utilizing deferred tax on capital gains

Study Programme: MSc in Business, Major in Finance

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1.0 Introduction

In our thesis, we will examine a possible excess return related to a long-term dividend trading strategy to be performed on Oslo Stock Exchange (referred to as OSE from here onwards) via the Norwegian account type "Aksjesparekonto" (referred to as ASK from here onwards). The strategy is limited to ASK as this account offers different taxation on capital gains and dividends due to an equal treatment requirement of Norwegian and foreign EU-shareholders. If trading via this account, an investor receives deferred tax on capital gains, but not on dividends. You will not trigger tax on capital gains until the profit is moved out of the account.

ASK was first introduced upon the presentation of the Norwegian State Budget 2017 (Statsbudsjettet, 2017) and is a supplement to existing Norwegian account types. The account was available to all Norwegians 1st of September 2017 (Regjeringen, 2017).

The dividend trading strategy we will examine is dependent on various factors in order to yield long-term excess returns. The most important, is ex-dividend price movements. A large part of our analysis, will therefore be related to ex-dividend price movements on OSE. To gain deeper insight, these movements will also be linked to different sectors, market capitalization and ownership structure.

At first glance, the dividend trading strategy might appear as a "free lunch" for long term investors, and this caught our attention. According to Modigliani and Miller, in a perfect capital market, there is no such thing as a "free lunch". However, when we introduce taxes, we know that a "free lunch" exists. For instance, interest tax shield is perceived as a "free lunch".

We want to investigate the profitability of this dividend trading strategy and compare it to the profitability of the option of holding the stock and receive the dividends (the option of doing nothing).

2.0 Topic

The general topic in this thesis will mainly consist of theoretical elements within *asset pricing*, *corporate finance* and *investments*.

This because we investigate the profitability of a dividend trading strategy used to defer tax on dividends, and thus how a long-term investor should manage a portfolio of stocks when trading via ASK. In addition, we investigate the ex-dividend price movements on OSE as this is crucial to our investigated dividend trading strategy.
In relations to our main topics, elements within tax issues, shields and regulations, transaction costs and market efficiency will also be discussed.

2.1 Ex-dividend Price Movements

If a market is efficient, stock prices always fully reflect available information (Fama & Malkiel, 1970). Hence, assuming market efficiency, the price of a stock will decrease on the ex-dividend day, as this reflects the company's decreased total assets. Miller and Modigliani (1961) argue that, in the context of perfect markets, with no tax and transaction costs, dividend policy is irrelevant as investors are indifferent between capital gains and dividends. They argue that values are solely determined by real considerations and not "*how the fruits of the earning power are "packed for distribution"".* In the context referred to by Miller and Modigliani (1961), the price of a stock should go down by the full amount of the dividend on the ex-dividend day. This means that in a perfect market, with no tax and transaction costs, an investor could sell his stocks at closing the day before ex-dividend day (referred to as cum-dividend day from here onwards) and buy them back at opening on ex-dividend day to get the dividend in the form of capital gains. Since the latter is what our dividend trading strategy intends to do, we are dependent that the decrease on ex-dividend day do not deviate from the dividend in such an extent that the loss of dividend will be greater than the tax benefits we seek.

However, various research show that the decrease in stock price on ex-dividend day does not always equal the dividend. Elton and Grueber (1970), states that the fall in ex-dividend price is less than the dividend and explains that this is due to a heavier taxation on dividends relative to capital gains. Several studies have both questioned and confirmed this finding. Most research state that the ex-dividend

stock price in general fall by less than the dividend, but argue different to why this is the case, some say it's just an anomaly.
Knowing that the price drop on ex dividend day can continuously differ from the dividend, we need to investigate if and to what extent this is the case on OSE.

2.2 The Dividend Trading Strategy in Detail

Trading around ex-dividend day and the reasons to do so, is well known in financial literature. Koski and Scruggs (1998) states that security dealers might trade around ex-dividend day because of an expectation of an ex-dividend capital loss different than the dividend. Elton and Grueber (1970) refer to *tax-clientele traders* which trade around ex-dividend for tax reasons.
The strategy this thesis will investigate is to sell on cum-dividend day and buy back at ex-dividend day. However, this strategy is not seeking short term profits due to a deviation between the stock price decrease on ex-dividend day and dividend, it seeks tax benefits. We find it important to emphasize that the strategy we are to test, is a strategy intended for the long-term investor. This because we assume a superior exponential growth if a long-term investor follows this strategy, compared to the option of holding the stocks and receiving continuous dividends (referred to as the hold strategy from here onwards).

The essence of the strategy is to obtain deferred tax on dividends and reinvest the non-taxed dividend amount to gain long-term excess returns.
Shareholders can utilize ASK's deferred tax on capital gains to indirectly obtain deferred tax on dividends as well. As previously discussed, the price of a stock should decrease by the amount of the dividend on the ex-dividend day. Knowing this, the investor sells his/her stocks at closing on cum-dividend day and buy back the same amount of stocks at opening on ex-dividend day. This might provide the investor with excess cash approximately equal to the dividend, but *without* triggering tax since this is defined as capital gains. Finally, the excess cash is reinvested. This strategy is referred to as the sell-buy strategy from here onwards.

During a BI lecture (2017) (See appendix), Ian Cooper demonstrated the deferred tax benefit by comparing an exempt fund with a non-exempt fund. The non-

exempt fund's profit was taxed annually, while the exempt fund's profit was taxed when selling the fund. In Coopers fictional example, the exempt fund outperformed the non-exempt fund with about 10% in three years. Hence, inspired by the benefit of deferred tax, the sell-buy strategy seeks to reinvest the non-taxed excess cash to provide a greater long-term return than what the hold strategy's reinvested post-tax dividend amount can provide.

3.0 Related research

The sell-buy strategy described in this thesis is heavily dependent on the assumption of market efficiency and the actual ex-dividend price movements. We have looked at earlier studies related to market efficiency, which states that in a perfect world the share price should decrease by the same amount as the dividend (Fama & Malkiel, 1970) (Miller and Modigliani (1961).
In the case of no tax or equal tax rate and no transaction cost the equilibrium condition should hold:

$$(M^{cum} - A^{ex})(1 - t_{cg}) = D\,(1 - t_d) \qquad (1)$$

M^{cum} denotes the share market price cum-dividend day, A^{ex} is the share price on ex-dividend day. The tax on capital gains is denoted t_{cg}, while t_d is the tax on dividend D. Surprisingly enough, this equilibrium condition does not hold in real life. On average, the share price drop-off on the ex-dividend day is less than the dividend amount (Campbell and Beranek, 1955).

The first school of thought states that due to the different taxation of capital gains and dividend, the share price drop will deviate from the dividend (Elton and Grueber, 1970). The second school of thought states that this difference is due to market microstructure (Bali and Hite, 1998) (Frank and Jagannathan, 1998). And the third school of thought concluded that the violation of the equilibrium condition is a result of short-term traders trying to exploit arbitrage opportunities around ex-dividend day (Koski and Scruggs, 1998).

According to Koski and Scruggs (1998), there's two types of investors that choose to trade around ex-dividend day. First, they find that security traders with the

same tax rate on dividend and capital gains, but low transaction cost has incentive to trade. If the share price drops with less than dividend, and the difference is greater than the transaction cost, then the security trader may be able to exploit this.
Second, some taxable corporations have strong incentives to capture the dividend income if they pay less taxes on dividend compared to capital gains.

Koski and Scruggs (1998) found indications of abnormal trading volume by security traders around the ex-dividend day, which is positively related to dividend yield and negatively related to transaction costs. Furthermore, they found evidence of corporations trying to dividend-capture trade. The study concludes that short-term traders influence the share price drop to dividend ratio. This is also consistent with the findings of Lakonishok and Vermaelen (1986).

Kalay (1982) states that short-term traders are trying to exploit the difference in share price drop-off and the dividend amount caused by tax differentials. When arbitragers try to profit of this deviation, the deviation closes. Therefore, he indicates that the deviation that still exist is caused by transaction cost, and not the tax differential. The findings of Kalay (1982) is consistent with a similar argument proposed by Miller and Scholes (1982). They both agree that share price drop to dividend ratio is influenced by arbitrage trading.

Rantapuska (2008) did a study on trading around the ex-dividend day in the Finnish market. He found evidence that tax status, low transaction cost and high dividend yield are factors that make investors engage in overnight trading around ex-dividend day. He concludes that non-taxable mutual funds and foreigners that are taxed more heavily on dividend income, sell their stocks on cum-dividend day and buy them back on ex-dividend day. The opposite holds for domestic taxable investors. The data suggest that both trading strategies yield a profitable return, even when transaction costs are considered.

Contrary to Koski and Scruggs (1998), Rantapuska (2008) discovered that a small percentage of the trading volume around ex-dividend day consist of short-term traders. This is because few individual investors are able to see the potential tax

benefits of trading around ex-dividend day. As Rantapuska (2008) suggested, taxes matter in a trading decision around the ex-dividend day. This is also consistent with Michaly and Vila (1995), which found that trading volume decreases when tax heterogeneity decreases. However, the general consensus on the topic states that investor doesn't behave in a tax-optimal way. (Grinblatt, M., Keloharju, M., 2001, 2004) (Barber and Odean, 2003; Graham and Kumar, 2006).

In addition to research on ex-dividend prices, there are also previous research relevant for the sell-buy strategy we are to investigate. Sørensen (2005) presented a framework to compare the present value of the Norwegian shareholder income tax liability (after 2006 reform) to the present value of cash flow tax liability. He proved that the shareholder income tax is equivalent to cash flow tax which is known to be neutral. We can use parts of his framework and develop it to suit ASK and our trading strategies. This will be closer discussed later in this paper.

4.0 Research question

We have a main/overall research question that will define our thesis:
"If trading via "Aksjesparekonto" on Oslo Stock Exchange; will the option of continuously selling owned stocks cum-dividend day and buying them back at ex-dividend day provide a greater long-term net return than the option of holding the stocks and receiving the dividends?"

Because various factors affect the return of the dividend trading strategy, there is not a definite yes or no answer to our research question. Factors like ex-dividend price movements, reinvestment decisions, transaction costs, tax shields and general price development in the assets is all relevant in determining the profitability of the strategy. As a result, we have developed various sub hypotheses.

4.1 Hypothesis

Hypothesis 1 – *"The sell-buy strategy is superior to the hold strategy regardless of how you reinvest the excess cash"*

Hypothesis 2 – *"The sell-buy strategy is superior to the hold strategy only if the price of the asset reinvested in has a positive development."*
Hypothesis 3 – *"The sell-buy strategy is superior to the hold strategy at any tax rate."*

We must model differently to test the hypothesis, but the underlying methodology remains the same.

5.0 Methodology

5.1 Ex dividend price movements

In the case of no transaction costs, the equilibrium share price drop is given by:

$$\frac{M^{cum} - A^{ex}}{D} = \frac{1 - t_d}{1 - t_{cg}} \quad (2)$$

If taxes on dividend is greater than taxes on capital gains, then the share price drop will be less than the dividend amount. The opposite holds when taxes on capital gains is greater than taxes on dividend. In Norway, there is equal tax rate on capital gains and dividends. Because of this, we would expect the equilibrium condition to equal one.

We compute the following statistics based on the data collected from OSE:

$$PC = \frac{M^{cum} - A^{ex}}{D} \quad (3)$$

By computing this statistic for each firm, we can use mean and can check how much the share price dropped relative to the dividend. Hence, if (3) provides us with a number greater than 1, the price drop in ex-dividend day is greater than the dividend and opposite if the number is less than 1.

We follow a similar approach as Borges (2008), Michaely (1991), Graham et al. (2003) and Milonas and Travlos (2001). Our approach differs slightly, since we hope to use closing and opening prices, while the mentioned research is using

closing prices on both cum-dividend day and ex-dividend day. This may be because data on closing prices is more accessible than opening prices. But the use of closing prices can cause statistical bias, since changes in prices between the cum-dividend day and end of ex-dividend day can be a result of changes in market prices or other factors that impacts the firms value. To solve this, they adjust the closing price on ex-dividend day by the expected daily return (4).

$$PC' = \frac{M^{cum} - \frac{A^{ex}}{1+E(R_m)}}{D} \quad (4)$$

We will use model (3), but if we struggle finding data on opening prices on ex-dividend day we will use model (4). $E(R_m)$ is estimated using the mean model, the market model (Graham, 2003) or the OLS market model (Brown and Warner, 1985). Borges (2008) is using the stock market composite index (BVL Geral) as $E(R_m)$. We will most likely use the OSEBX-index.

5.2 The Dividend trading strategy

There are primarily two strategies and two scenarios we need to investigate. We have the hold strategy and we have the sell-buy strategy. The two distinct scenarios are the scenario of not reinvesting the dividends and/or excess cash obtained from trading activities around ex-dividend day and the scenario of reinvesting them.

To find the profitability of the two mentioned strategies, we build on the methodology presented by Sørensen (2005). In particular, we develop Sørensen's (2005) equation for present value of the Norwegian shareholder income tax liability (5) to fit our intended output.

$$PVT^s = \tau\left[\frac{M_s - A_0}{(1+i)^s} + \sum_{t=1}^{s} \frac{D_t - iA_0}{(1+i)^t}\right] \quad (5)$$

PVT^s is the present value of shareholder income tax liability, τ is assumed to be constant and represents the shareholder tax rate. The share is acquired in the end of period 0 at price A_0 and sold at the end of the period (s) at price M_s. The iA_0

represents the Rate-Of-Return-Allowance (referred to as RRA from here onwards) and is deducted from the dividend (denoted D_t) since tax is triggered whenever dividends are received. The RRA is the imputed return which is deducted from taxable shareholder income (Sørensen, 2005). As *i* denotes the after-tax market rate of interest, the RRA is the product of the after-tax market rate of interest and the stepped-up basis. The basis, denoted B, is the original acquisition price on the share plus all unutilized RRA. Hence, the basis can be greater than the original acquisition price if RRA is unutilized within the calendar, since the unutilized RRA will be added to the basis of the following year.

Note that, in (5), Sørensen (2005) assumes that $D_t > B_{t-1}$ throughout the holding period and thus there will be no unutilized RRA to add to the basis. Hence, the basis will equal A_0 in every period.

5.2.1 Assumptions

Like Sørensen (2005), we will for simplicity assume that $D_t > B_{t-1}$ throughout the holding period. We will also assume that the investor has only done *a single* deposit at the end of year 0, before the money is withdrawn from the ASK in year s. In addition, we assume a constant tax rate and a constant after tax market rate of interest.

However, we make an additional assumption that Sørensen (2005) does not need to make. Since we are interested in investors trading via ASK, we assume that when the shares is sold in year s, the investor withdraw the money from the account immediately and thus trigger tax on capital gains.

5.2.2 Scenario 1 – Not reinvesting

5.2.2.1 The hold strategy

For simplicity, we begin without transaction costs.

The pre-tax profitability from the end of period 0 to period s is illustrated in (6). The equation is very intuitive as it represents the capital gains plus accumulated dividends.

$$\pi^s_{b/tax} = M_s - A_0 + \sum_{t=1}^{s} D_t \qquad (6)$$

We remove the discounting from (5) to get the shareholder income tax liability (7), denoted T^s. Notice that the only thing that differs (6) from (7), besides multiplying with a tax rate, is that the RRA is included in (7), which reduces the tax liability of the shareholder.

$$T^s = \tau[M_s - A_0 + \sum_{t=1}^{s}(D_t - iA_0)] \quad (7)$$

The after-tax profitability of the hold strategy in Scenario 1 is (6) - (7), which equals (8).

$$\pi_{a/tax}^{s} = M_s - A_0 + \sum_{t=1}^{s} D_t - \tau[M_s - A_0 + \sum_{t=1}^{s}(D_t - iA_0)] \quad (8)$$

Rearranging (8) provides us with equation (9). Notice that this equation is simply the after-tax capital gains plus the accumulated dividends minus what the shareholder's tax liability on those dividends. Again, the tax liability from the dividends is lower than the dividends times the tax rate since the RRA takes away some of the tax burden.

$$\pi_{a/tax}^{s} = (1-\tau)(M_s - A_0) + \sum_{t=1}^{s} D_t - \tau \sum_{t=1}^{s}(D_t - iA_0) \quad (9)$$

Going forward, we include transaction costs, noted as γ. We assume that transaction costs are a fixed percent of the share price. The pre-tax profitability of the holding strategy (6) including transaction costs is represented by equation (10). When including transaction costs, the selling price decreases and the acquisition price increases by an amount equal to transaction cost per share.

$$\pi_{b/tax}^{s} = M_s(1-\gamma) - A_0(1+\gamma) + \sum_{t=1}^{s} D_t \quad (10)$$

The shareholder tax liability (7) including transaction costs is presented in (11). Notice that the tax liability decreases due to transaction costs. This is both due to lower capital gains, but also due to an increased RRA, as transaction costs are included in the base.

$$T^s = \tau[M_s(1-\gamma) - A_0(1+\gamma) + \sum_{t=1}^{s}(D_t - iA_0(1+\gamma))] \quad (11)$$

(10)-(11) and some rewriting provides the after-tax profit, included transaction costs (12). The equation is quite intuitive as it is simply the after tax capital gains minus the transaction costs from buying and selling the shares plus accumulated dividends minus the tax on those accumulated dividends.

$$\pi^s_{a/tax} = (1-\tau)[(M_s - A_0) - \gamma(M_s + A_0)] + \sum_{t=1}^{s} D_t - \sum_{t=1}^{s}(D_t - iA_0(1+\gamma)) \quad (12)$$

5.2.2.2 The sell-buy strategy

Going forward there are primarily two fundamental differences between the sell-buy strategy and the hold strategy. First and foremost, we do not receive dividends, but we receive the difference in price from selling on cum-dividend day at price M_t^{cum} and acquiring them back at ex-dividend day at price A_t^{ex}. Also, the RRA will not be utilized until the end of the investment period since no tax is triggered. Hence, all unutilized RRA will be added to the basis. The basis at s excluded transaction costs is $A_o(1+i)^s = B_s^e$, while the basis at s included transaction costs is $(1+\gamma)A_o(1+i)^s = B_s^i$.

As in the previous section, we begin without transaction costs.
The pre-tax profit achieved if following the sell-buy strategy is illustrated in (13). As oppose to (6) that accumulates dividends, (13) accumulates excess cash from selling at cum-dividend day and buying at ex-dividend day. As previously discussed, since the tax rate of capital gains and dividends is the same in Norway, the price drop on ex-dividend day should equal the dividend and thus (6) and (13) should theoretically generate equal profits (given no transaction costs).

$$\pi^s_{b/tax} = M_s - A_0 + \sum_{t=1}^{s}(M_t^{cum} - A_t^{ex}) \quad (13)$$

The shareholder's tax liability if following the sell-buy strategy (14), differs from the hold strategy (7). In the sell-buy strategy, tax is not triggered until we sell the shares and withdraw them from the ASK. Hence, the RRA will not be triggered

and thus increase each year until the money is withdrawn from the ASK. As visualized in (14), RRA is not deducted yearly, but the initial base/buying price A_0 has increased to $B_s^e = A_0(1+i)^s$.

$$T^s = \tau\left[M_s + \sum_{t=1}^{s}(M_t^{inc} - A_t^{ex}) - B_s^e\right] \quad (14)$$

The after-tax profit from the sell-buy strategy (15) is achieved from subtracting (14) from (13).

$$\pi_{a/tax}^s = M_s - A_0 - \tau(M_s - B_s^e) + (1-\tau)\sum_{t=1}^{s}(M_t^{inc} - A_t^{ex}) \quad (15)$$

Now, we include transaction costs. Transaction costs is one of the main arguments against the sell-buy strategy. As seen in (16), the accumulated excess cash decreases with transaction costs and thus must be lower than the hold strategy's accumulated dividends (given that the dividend and the price drop at ex-dividend day are equal).

$$\pi_{b/tax}^s = M_s(1-\gamma) - A_0(1+\gamma) + \sum_{t=1}^{s}(M_t^{inc}(1-\gamma) - A_t^{ex}(1+\gamma)) \quad (16)$$

The tax liability related to the sell-buy strategy, is illustrated in (17). Notice that the base B_s^i now includes transaction costs.

$$T^s = \tau\left[M_s(1-\gamma) + \sum_{t=1}^{s}(M_t^{inc}(1-\gamma) - A_t^{ex}(1+\gamma)) - B_s^i\right] \quad (17)$$

The after-tax profitability from the sell-buy strategy, including transaction costs (18) is, as previously, found by subtracting the shareholder's tax liability (17) from the pre-tax profit (16).

$$\pi_{a/tax}^s = [M_s(1-\gamma) - A_0(1+\gamma)] - \tau\left[M_s(1-\gamma) - B_s^i\right] + (1-\tau)\left[\sum_{t=1}^{s}(M_t^{inc}(1-\gamma) - A_t^{ex}(1+\gamma))\right] \quad (18)$$

The equation above might look a bit fuzzy at first glance, but the equation is quite intuitive. It is simply a product of the capital gains from the initial buying and the

selling price, minus the tax liability on that gain, including transaction costs. In addition is the accumulated after-tax excess cash minus the accumulated transaction costs from selling at cum-dividend day and buying at ex-dividend day.

5.2.3 Scenario 2 – Reinvesting

In scenario 2, the excess cash from either dividends or trading activity around ex-dividend is reinvested. This is thus the most relevant scenario, as we seek long term excess return by reinvesting a non-taxed amount.

The methodology in Scenario 2, needs a more thorough modelling and will thus not be explained in the same detail as in Scenario 1. However, the profitability in Scenario 2 will build on the same equations and logic as in Scenario 1.

The main difference between the equations listed in Scenario 1 and the equations in Scenario 2, is that in Scenario 2 the excess cash from dividends or trading activities around ex-dividend day will be divided on the market price at a given period and multiplied with the price of the share at withdrawal date, M_s. This is illustrated in (19), which is the pre-tax profitability of the hold strategy in Scenario 2, excluded transaction costs. In (19), number of new shares due to reinvesting is accumulated and sold at price M_s in period s.

$$\pi^s_{b/tax} = M_s - A_0 + \left[\sum_{t=1}^{s} \frac{D_t}{A_t^{ex}}\right](M_s) \tag{19}$$

The logic is the same with the sell-buy strategy. The pre-tax profitability of the sell-buy strategy in Scenario 2, excluded transaction costs is illustrated beneath.

$$\pi^s_{b/tax} = M_s - A_0 + \left[\sum_{t=1}^{s} \frac{(M_t^{cum} - A_t^{ex})}{A_t^{ex}}\right](M_s) \tag{20}$$

Notice that in (19) and (20), we assume that the dividend is reinvested in the same share. If we were to reinvest in a different asset, we would simply have to change the price the accumulated capital is divided by and the price it is multiplied with (sold at), to reflect the price of the asset reinvested in.

5.2.4 The superior strategy

Using the equations listed in Scenario 1 and soon to be listed in Scenario 2 combined with our analysis of ex-dividend price movements on OSE, we believe we will be able to answer our research question as well as all our hypothesis. What is important is that we compare apples to apples.
For instance, if we were to answer which strategy that is after-tax superior if not reinvesting, including transaction costs, we compare (18) to (12). We will also assume that the different strategies investigated both invest and reinvest in the same asset.

We answer the research question based on our data sample (2006-2016). Hence, given that the market continue to behave in the same way as in our sample, we might be able to conclude what strategy that is the most beneficial.
However, we will also try to simulate the future by the use of a Monte Carlo simulation that will provide us with a probability distribution. This because variables such as after-tax market rate of interest, tax rate, ex-dividend movements and transaction costs is not fixed. Hence, using a Monte Carlo approach, we can conclude *how likely* it is that the sell-buy strategy will be profitable in the future. The Monte Carlo approach might be challenging since detailed data on the variables is needed.

6.0 Data collection

In relations to our analysis of ex-dividend price movements, our data will be based on listed firms on the OSE that has a historical track record of dividend payments. For this analysis, we will primarily need three types of data, cum-dividend share prices at closing, ex-dividend share prices at opening and the dividend amount. We believe the data is easy to find, but it will require some effort in terms of structuring and collecting the data.

In 2006 there was implemented a tax reform in Norway. Since no major reform has been implemented since 2006, we find it reasonable to use a data sample of

historical dividends and ex-dividend price-movements ranging from 2006 to 2016 on OSE .

The first step is to screen the listed firms on OSE that has a good track record on dividend payments. The data we need is possible to extract from Yahoo Finance. Other sources we have the option to use is the database Compustat Global and NewsWeb. On these databases we can gather dividend dates for firms on the OSE. This will be useful if we struggle to find data on Yahoo Finance or if we find Yahoo Finance a non-trustworthy source.

We will organize the data in an excel sheet and plan to categorize firms after sectors, size and ownership. Then we will attach the cum-dividend closing price, ex-dividend opening price and the dividend to each firm. When we organize our data, we will see if the share price drop to dividend ratio is different across sectors, firm size and ownership structure. Varying results may be interesting to investigate further.

If we find it reasonable to execute a Monte Carlo simulation, we would, in addition to the ex-dividend price movements, need historical data on the after-tax market rate of interest, share prices, shareholder income tax rate and transaction costs.
After-tax market rate of interest changes annually and is defined in the beginning of each calendar year. On the government's web pages there are historical data on both the after-tax market rate of interest and the tax rate, stretching back to 2006. Historical transaction cost rates might be challenging to locate, but through an acquittance in Nordnet, a bank known for low transaction costs, we might be provided with the necessary historical data.

7.0 Going forward

Our further progress and scheduled plan looks like the following:

February 15th: Finalize the data collection

By this date we will have all the necessary data organized in an excel spreadsheet. Once all the data is collected we should be ready to start our computations.

March 30th: Tests computed, and conclusions gathered

We have computed all necessary calculations, and have a conclusion on the different hypothesis.

May 30th: 1st draft of the Master Thesis

We should have the 1st draft of the Master Thesis ready by this time. We will forward the draft to our supervisor for feedback.

June: Go through our thesis thoroughly and finalize it

We will finalize the thesis and modify it based on the feedback from our supervisor.

July 1st: Deliver the final version of our Master Thesis

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Appendix

Tax considerations in long term investment - example

Year	Return on asset	Market value of assets	Exempt fund	Non-exempt fund
0	-	$100	$100	$100
1	100%	$200	$200	$100+100*0.7=$170
2	50%	$300	$300	$170+85*0.7=$229.5
3	50%	$450	$450	$229.5+114.75*0.7=309.83

At the end of the third year we take out the money.
From the exempt fund we receive: 100 + 350*0.7 = 345
From the non-exempt fund we receive: 309.83 (about 10% less)

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