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# MASTERARBEIT

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„Profitability of event-driven investment strategies based on share repurchase announcements“


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Iryna Murselovic


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*In memory of my brother*

*(1989 – 2015)*

## Statutory declaration

Hereby, I declare that I have authored this thesis independently, that I have not used other than the declared sources, and that I have explicitly marked all material, which has been quoted either literally or by content from other sources.

This master thesis has not been previously presented as an examination paper in this or any other form in Austria or abroad.

Wien, February 2016

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Iryna Murselovic

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# List of Abbreviations

| | |
|---|---|
| AR | Abnormal return |
| BHAR | Buy-and-hold abnormal returns model |
| CAAR | Cumulative average abnormal return |
| CAPM | Capital Asset Pricing Model |
| CAR | Cumulative abnormal return |
| CRSP | Center for Research in Security Prices |
| CTP | Calendar-time portfolio |
| e.g. | For example |
| EMA | Exponentially smoothed moving average |
| EMH | Efficient Market Hypothesis |
| EPS | Earnings per share |
| ETF | Exchange traded fund |
| Obs. | Number of observations |
| P/E | Price-to-Earnings |
| S&P100 | The Standard & Poor's index consisting of the 100 biggest US companies |
| SEC | Securities and Exchange Commission |
| SMA(20) | Simple moving average calculated over the previous 20 days |
| SMA(200) | Simple moving average calculated over the previous 200 days |
| SMA(50) | Simple moving average calculated over the previous 50 days |
| SPYB | Ticker symbol for the S&P 500 buyback index |

# 1. Introduction

Economists have dedicated a fair amount of papers to the analysis of different corporate events: their origins, motivation of the management and their influence on the price in the short- and long-term time periods. Depending on whether events are positive or negative, the corresponding market reaction is expected. If this reaction is quick and accurate then the price incorporates all already available information and the market is said to be efficient. In this case, no information coming to the market can help the average investor towards earning higher-than-average returns. This is what the theory looks like. Practice shows that financial market participants are not always rational and we can observe over- and underreaction, diverse anomalies and other inefficiencies. Market efficiency is probably the most discussed and never-ending topic in financial literature. Even having evidence of irrational behaviour, researchers are not able to reject the efficiency in general because the analysis is usually performed under particular conditions. Moreover, in recent years the market is supposed to move closer to efficiency thanks to the wide implementation of online trading as well as fully-automated trading systems, which are able to correct the prices very fast.

From the point of view of economical theory, share repurchases deliver positive news to the market about the future firm's prospective. The reason for this is asymmetric information between the insiders and the third parties. As soon as the latter are informed via certain public media sources, they start to update their beliefs about a particular company, which manifests itself in the increasing of the share price.

## *1.1. Motivation and purpose of this thesis*

In recent years, stock buybacks have reached enormous levels, approaching sometimes up to 20% of their own capital authorized for share repurchase programs. Along with that, the largest repurchasing firms rarely mention reasons for the successive repurchase of their stocks. In the most cases the reason is formulated broadly, for instance as the best way of using money and rewarding the shareholders. Due to the fact that previous studies, in most of the cases, investigated share repurchases for undervalued companies, it would be interesting to more deeply analyse the reasons for share buybacks of the most prominent US firms, which are not likely to be undervalued. The main focus is examination of the *informational* *content of the announcements about share repurchase authorizations of the largest US companies*.

Several research papers showed the motivation of the management to repurchase the stock. Some of them included evaluation of the positive price reaction to this kind of news, stated in amount of excessive returns above the market. However, hardly any analysis illustrated to which extent the information about share repurchase is valuable for the common investor. Along with theoretical issues and empirical estimation of abnormal returns as a result of market reaction to stock buyback announcements, this master thesis goes one step further. It attempts to discover potential opportunities of using technical and fundamental analysis tools applied to simple event-driven investment strategies. I am interested in investigating this topic because some even-driven hedge funds claim to outperform the market. Having large amount of assets at their disposal and wishing to show the highest possible performing results, they can afford to take more risk than an individual non-professional investor. Nevertheless, it is all about luck if higher than average returns are only achieved as a reward for taking higher risks. Each individual investor has much more limited resources than the professionals and it is essential for him or her to minimize the risk as much as possible. Therefore, the second question I put in this Master's thesis is: is it possible to yield abnormal returns by trading on news? If yes, how can one decrease the risk exposure?

## *1.2. Study limitations*

This study is subject to several limitations. First of all, the restrictions concern the sample selected for analysis. Only companies ever included into the S&P100 index in the period from January 2005 to December 2014 will be investigated in this thesis. To be included into the sample, a firm must announce the authorization of a repurchase program at least once during the mentioned period. 71% of S&P100 companies fulfill these requirements. The decision to include only repurchasing companies into the sample is driven by specifics of the event study used for estimation of abnormal returns. To investigate abnormal performance the list of event dates has to be constructed. Under the assumption of the event study approach, the returns are normally distributed and the market is efficient.

One more limitation which usually influences the accuracy of results is that no trading costs, e.g. brokerage fees, taxes, were considered in calculation of returns. For this reason it is important to note that even if some strategies based on information about share repurchases are able to provide superior returns, the abnormal performance cannot be ensured in real market conditions.

## *1.3. Thesis disposition*

As already discussed, the following three questions will be addressed: *which* reasons firms may have to select share repurchase as a tool to distribute cash to their shareholders, *how* the market reacts to the announcements about a share repurchase program authorization and *whether it is possible* to utilize the public information about new repurchases to benefit from implementing one of the event-driven strategies.

This thesis is organised as follows:

*Chapter 2*: Provides an overview of the theories and basic information related to stock buybacks and market efficiency.

*Chapter 3*: Introduces the modern portfolio theory as an important concept to understanding the trade-off between the returns and the risk exposure. The optimal portfolio according to the Markowitz Portfolio Theory will not be constructed, however.

*Chapter 4*: Presents the empirical evaluation and results of the firms' performance after the repurchase announcements in the short-term and long-term period relative to the market. Two event study methodologies will be applied for calculation of excessive returns: cumulative abnormal returns and calendar-time portfolio.

*Chapter 5*: Describes the specifics of investment strategies and investment philosophies. Furthermore, here some technical and fundamental techniques are addressed, which are going to be used for the construction of event-driven strategies.

*Chapter 6*: Demonstrates the performance of event-driven strategies.

*Chapter 7*: Includes the conclusion and discussion of the received results.

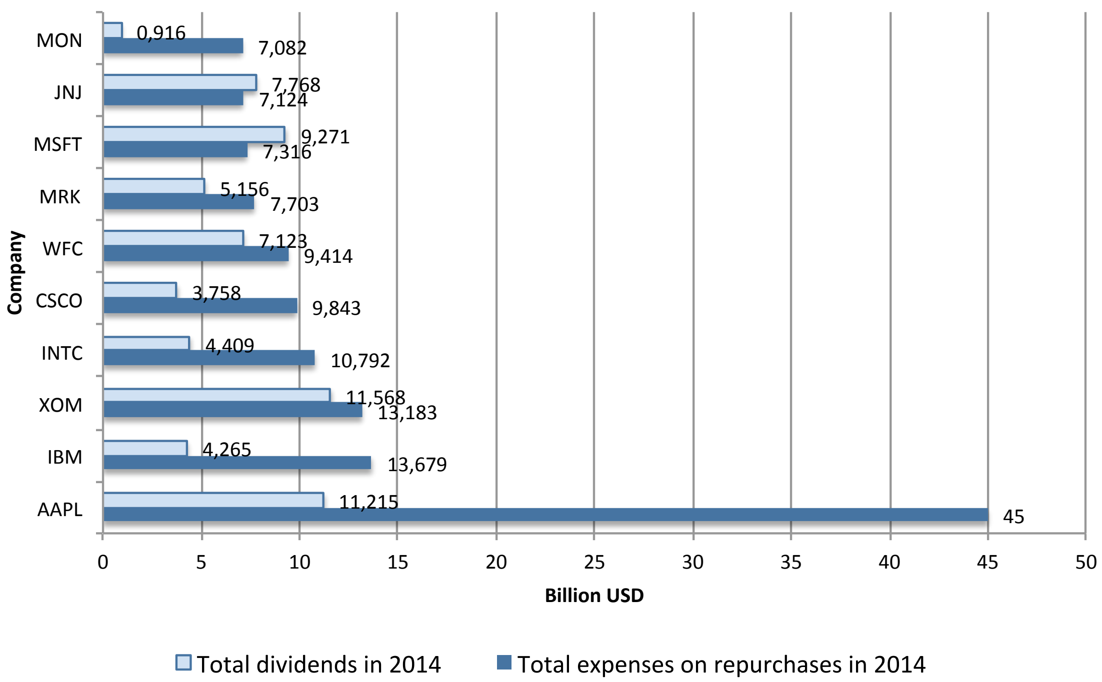
# 2. Theoretical background

This chapter covers issues related to the development of stock buyback activities of the largest US companies as well as the specifics of their corporate payout policy. The second part addresses the managers' incentives to use share repurchases instead of cash dividends to give additional cash back to the shareholders.

## *2.1. Development of stock repurchases*

Historically, dividend pay represented the most common method of awarding shareholders. In the early 1980s, the market value of dividends in the USA was approximately five times greater than the value of repurchases, but in ten years, and then again in the first decade of the 21st century, the situation changed and share repurchases prevailed over dividend payments (Clayman, Fridson and Troughton, 2012). For example, in 2014, among the 10 biggest repurchasing companies on NYSE, NASDAQ and AMEX, only two (Johnson&Johnson and Microsoft) distributed more cash to shareholders via dividend payments, while all other companies kept a higher proportion in stock buybacks.

**Figure 1: The largest actual share repurchases in 2014 in Billion US Dollars**




*Source: based on COMPUSTAT data*

During the last 10 years, the average size of share repurchase programs announced by the largest US companies has at least doubled. According to the information on the companies' websites, giants such as General Electric announced a repurchase program valued at 50 billion US Dollars in April 2015, Apple expanded its repurchase plan to 200 billion US Dollars in April 2014, and Wells Fargo received an improvement from the Federal Reserve to spend 24 billion US Dollars on shares. Noteworthy is not only the size of the repurchasing programs, but also that completion rates for US companies are very high. As estimated by Manconi, Peyer and Vermaelen (2014), during the first year after an announcement, US firms complete the program by 75%, whereas by the $4^{th}$ year this figure reaches the level of 92%. In general, 82.7% of companies from the S&P100 index carried out repurchases in 2014. Along with this, more than half (51.88%) spent more cash on buying back shares than on dividends. In 2013, the proportion of repurchasing firms in this index was equal to 71.7% of the total number, with 47.8% of companies preferring repurchases to dividends. In order to explain the growth in the positive dynamic of stock repurchase program authorizations in the last years, the multivariate regression analysis will be performed in section 4.5.

There are two opposing views on the corporate payout policy of a firm. Miller and Modigliani (1961) claim that change in dividends does not affect a share price and is irrelevant for its valuation as long as the investment strategy is stable. This theory is, however, only applicable to the "perfect" market conditions, without taxes, transaction costs, with free access to information etc. Here arises the first question concerning the validity of this theory: what if dividends and other capital gains are taxed differently? If capital gains, such as stock buybacks, are taxed at a lower rate than dividends, then it should be more cost-efficient not to pay dividends at all or decrease their level as much as possible. But in the real world, companies do not refuse dividend payments because they are indicative of stability and increase the attractiveness of a firm for long-term investors. By adopting the dividend policy, companies basically make a commitment to maintain a sustainable level of dividend pay for a long period of time. For this reason, firms are quite reluctant to increase the dividends, because in the case that payment obligations are not fulfilled, investors treat this as a negative sign, which then has an effect on the share price. In support of this idea, Van Eaton (1999) documented the negative influence of the dividend cuts and omissions on a stock price. According to his study, the one-year abnormal returns for companies listed on the NYSE and AMEX over the estimation period 1971 – 1990 amounted to -11% due to dividend cuts and -17% due to omissions. However, no significant excessive returns have been observed for companies that experienced an increase in dividends (Van Eaton, 1999).

Conversely, the announcement of a stock repurchase gives the management the right but not the obligation to buy back their own stock over the specified period of time and assumes almost no downside risk if the authorized program is not completed. For instance, Mishra, Racine and Schmidt (2009) show that in Canada "424 repurchasing programs (or approximately 20% of the sample) failed to repurchase any shares in the 12 months subsequent to the announcement of the program and only about 14% of sample firms repurchased over 80% of announced shares". Dittmar (2000) points out that share repurchases are preferred because firms have no commitment to repurchase shares and the penalty is reduced in the case that distributions are made on an irregular basis. Moreover, the possibility for the management to buy firms' shares from time to time on the open market, depending on current market conditions, gives repurchasing companies the advantage of profiting from opaque information. Essentially, a company becomes an insider that is allowed to trade its own stocks. It is therefore logical that the buying of shares (repurchase) should take place at the low price when stock is assumed to be undervalued – and the selling at a later time point when the price has increased. In such cases when firms repurchase their own stock with a discount they create shareholder value (Voss, 2012). Translation into action can be challenging though. Managers have to possess perfect analytical skills to repurchase shares at a lower price than their intrinsic value, otherwise a repurchase will have a pernicious effect on the shareholder value. Nonetheless, the freedom of implementing corporate payout policy is not the only reason that explains why companies may prefer repurchase of common stocks to cash dividends. In the following sections, other motives will be considered in more detail.

## *2.2. Share buybacks regulation*

In the US, regulation of share repurchases has been very liberal and still remains quite soft in comparison to other countries. With the aim of eliminating insider trading, preventing price manipulations and enhancing the transparency of repurchases, the Securities and Exchange Commission adopted Rule 10b-18 in 1982. According to this rule, companies were allowed to repurchase their own shares under some conditions (SEC):

- Manner of purchase: using a single broker or dealer per day to buy back shares.

- Timing: the company is not allowed to use the opening and closing exchange hours to bid or repurchase shares.
- Price: specifies the highest price for bid or share buyback
- Volume: allows repurchase of maximum 25% per day of the average daily trading volume.
- It is advisable for a company to make a public announcement about the share repurchase program authorization mentioning the period of time during which the actual buyback may happen, the number of shares (aggregate dollar amount) approved for repurchase, the reason for repurchase, its impact on remaining stocks and the method selected for the repurchase.
- In contrast to the European countries, in the USA a decision about share repurchase may be approved by the Board of Directors and does not require a meeting of the shareholders to be called.

Due to the fact that SEC Rule 10b-18 assumes “safe harbour” framework, compliance with this rule is voluntary. Companies are required to report quarterly repurchase volumes only, which prevents the regulator from monitoring the daily volumes. For this reason it is also not possible to check whether any price manipulations take place.

## *2.3. Motivation of stock buybacks*

Historically, repurchasing companies have demonstrated different motives as to why they prefer to distribute wealth to shareholders via stock buybacks. The most common reasons mentioned in firms’ announcements are improving the capital structure, using excess money in the best interest of shareholders or simply no statement of any reasons. If the firms’ leverage ratio is less than optimal, then managers may make the decision to repurchase the stock and in doing so decrease the number of shares outstanding. Repurchase of the stock may be used for the purpose of a takeover defence as well. Increasing the minimal price available for buying a stock makes the acquisition of a company less attractive for a potential bidder (Dittmar, 2000).

Brigham and Houston (2009) outline the following situations in which share repurchases may take place:

1. Situations in which the firm has cash available and prefers to distribute it to its stockholders by repurchasing shares rather than by paying cash dividends,
2. Situations in which the firm concludes that its capital structure is too heavily weighted with equity and it sells debt and uses the proceeds to buy back its stock and
3. Situations in which the firm has issued options to employees and it uses open market repurchases to obtain stock for use when the options are exercised.

Fifteen years ago, on the 1st of March 2000, in his letter to shareholders, Warren Buffett expressed the following idea regarding share repurchases. "There is only one combination of facts that makes it advisable for a company to repurchase its shares: first, the company has available funds — cash plus sensible borrowing capacity — beyond the near-term needs of the business and, second, finds its stock selling in the market below its intrinsic value, conservatively-calculated. […] Now, repurchases are all the rage, but are all too often made for an unstated and, in our view, ignoble reason: to pump or support the stock price" (Buffett, 2000). Indeed, the attitude and reasons for stock buybacks have changed in the last decades.

Chan, Ikenberry (2010) examined to what extent announcements about the authorization of an open-market share repurchase program may mislead investors. They found that managers may use announcements about stock buybacks on the open market to "create a short-term signalling benefit allowing them to personally benefit from exercising stock options following their announcement" (Chan, Ikenberry et al., 2010). The reason is that stock buybacks allow improvement of EPS as a result of decreasing the denominator (number of shares outstanding) after the repurchase. Grullon and Michaely (2004) find no evidence that repurchasing firms perform better than their peers, and that in some cases they even underperform after the repurchase. Nevertheless, even if some announcements may lack credibility, Peyer and Vermaelen (2007) as well as Chan, Ikenberry and Lee (2007) have documented long-term abnormal returns for firms after the share repurchase announcement. In order to find an answer as to why share buybacks have become so attractive, studies have developed and investigated different hypotheses.

### 2.3.1. Undervaluation hypothesis

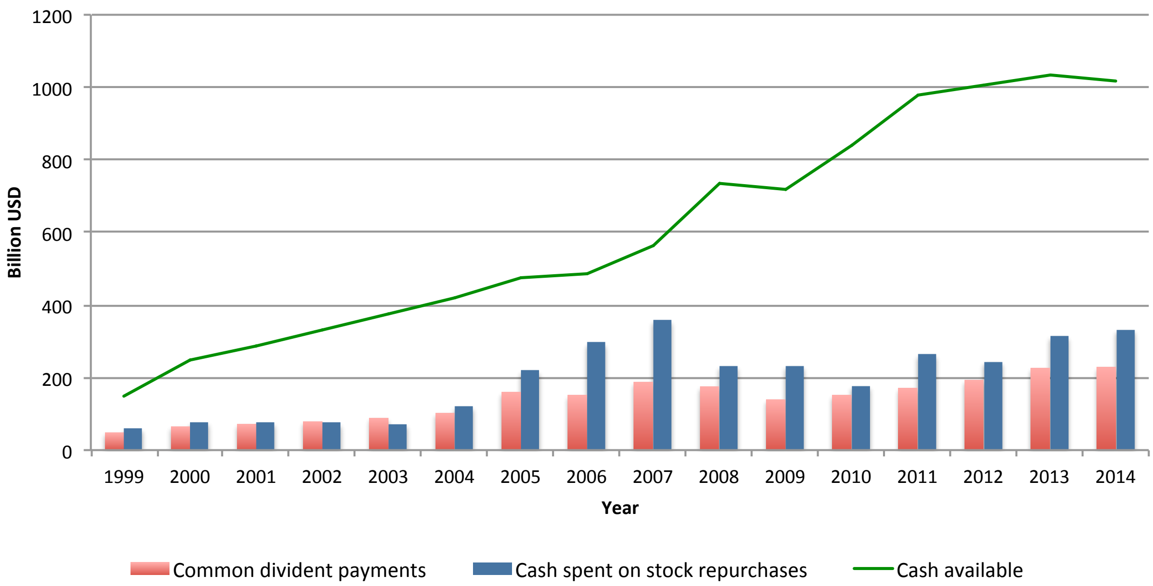
This hypothesis relates to conveying the information from the management that stock is valued below its intrinsic value by the market, which means that the management prospects concerning the future cash flows differ from market expectations. If repurchase is driven by undervaluation, then a repurchasing firm should have a higher book-to-market ratio, which means that the real value of the company is higher than estimated by the market. From the shareholders' point of view, undervaluation is a result of the agency problem and they believe that a positive signal sent to the market should correct the misvaluation (Dittmar, 2000). Many studies have found evidence of return drifts in the period of two years after share repurchase announcements for high book-to-market ratio firms (Ikenberry, Lakonishok and Vermaelen (1995), Peyer and Vermaelen (2009)). On the other hand, Yook, (2010) observes no pattern in the occurrence of positive and significant intercepts when comparing low and high B/M companies listed on the NYSE, AMEX or the NASDAQ.

It is costly for overvalued firms to announce a share buyback, say Hackerthal and Zdantchouk (2005), because if the price declines to the fair value then the company will face a loss from such a transaction. In addition, making the decision not to buy shares back after the announcement may incur additional reputational costs and suspicions of price manipulation. Therefore, companies that pay attention to and take care of their corporate image will be rather careful when specifying undervaluation as a reason for share repurchase.

### 2.3.2. Free Cash Flow hypothesis

This hypothesis is referred to in the study by Michael C. Jensen, as in 1986 he examined conflicts of interests between managers and shareholders in the question of whether to re-invest free cash or distribute it by means of dividends or share repurchases. Jensen points out that in an absence of projects with positive NPV, managers may still prefer to overinvest but not distribute excess cash to shareholders (Jensen, 1986). Repurchases, however, are more preferable than dividend payments because for the latter, a company undertakes long-term obligations. Omission of or a decrease in the forthcoming dividend payments leads to a negative market reaction and price loss on shares.  For this reason, a company that does not expect permanent cash flow in the future is likely to repurchase its own shares or issue a one-time special dividend (Voss, 2012). Zhuang (2015) shows that firms with perfect market-timing opportunities will be less likely to buy back their shares if their free cash flow is not very high and, controversially, having collected free cash, these firms tend to choose a repurchase even if market conditions are not very favorable. During recent decades, S&P 100 companies have generated such large amounts of cash on their balance sheets that they can easily use it for share repurchases whenever the firm management considers the stock price to be low. The amount of cash accumulated by the S&P100 firms compared to their expenses for share buybacks and dividend payments is shown in Figure 2.

**Figure 2: Share repurchases and dividend payments of S&P100 index firms compared to available cash amounts, in Billion USD**




*Source: own composition, based on COMPUSTAT data*

Conversely, the use of free cash flow for share buybacks seems to be very reasonable if there are no investment opportunities. For example, Yook and Gangopadhyay (2010) find that firms with high free cash flows and low Tobin's Q that announced share repurchase in the period from 1978 to 1990 earned significantly higher abnormal returns in the announcement and post-announcement period than other firms.

### 2.3.3. Increase of EPS hypothesis

One of the hypotheses that explains the motivation of share repurchases is managers' drive to reach the target level of earnings per share, because this parameter is widely used as an important metric for estimating the profitability for shareholders and calculating the P/E ratio. Boosting the EPS ratio via share repurchases is relatively easy because this market action decreases the number of shares outstanding (denominator). If all other conditions are the same after the share repurchase, earnings per share will increase, even if the company has not started outwork to encourage the growth of its earnings and to provide an increase in shareholder wealth. This fact suggests that EPS probably does not provide the best estimate of overall performance. Nevertheless, managers may use all available possibilities to keep EPS within the acceptable limits in order to distract attention from the real earning numbers.

However, share repurchases do not always ensure an increase of earnings per share. In order to produce the increase in EPS, two requirements must be met: first, the earnings-to-price ratio at the time of a buyback must be higher than the after-tax percentage return on cash used for repurchase and second, repurchase must occur at the beginning of the period since it is deducted from the shares outstanding for the full period (Hribar et. al., 2006).

Very often, an increase of popularity in the manager's share-based compensation is associated with their willingness to push up the stock price in quite a short period. For the purpose of increasing the earnings per share without needing to make any effort, company management may authorize a new share repurchase at any time during which share performance parameters must be improved. Exercising stock options leads to the dilution of EPS, which is why reducing the number of shares outstanding via repurchases around the day of expiration may be beneficial for an option's holder but not for investors. The research paper by Kahle (2002) gives a very good overview of this hypothesis. In particular, significant growth of share repurchases in recent years is explained by the influence of commonly used stock option plans, and not by firms' undervaluation or agency problems. With regard to this hypothesis, there are two explanations as to why companies may repurchase their shares: first, with the aim of satisfying the needs of employees, who would wish to exercise their stock options and secondly, the company management may wish to substitute paying more dividends for offering the capital gains from the buyback, such as the current repurchasing price. If the market recognizes that shares are being repurchased as a result of stock options, then the post-announcement return appears to be significantly lower, says Kahle (2002).

### 2.3.4. Capital structure improvement

Many companies may wish to improve their capital structure by decreasing the amount of shareholder equity. The repurchase of shares shifts the proportion towards debt, which is less costly for shareholders because it provides so-called tax shields. At the same time, a significant increase in debt in the capital structure in comparison to their own resources contributes to an increase in a firm's bankruptcy risk. For this reason, the selection of optimal capital structure is always a trade-off and proportions of debt and equity are efficient only to a certain extent. Optimally, capital structure should be chosen in such a way that the value of the company is maximized or the cost of capital is minimized. If the company is over-liquid and under-levered, this provides a great opportunity to improve the capital mix by using its excess cash flows for the stock repurchase, eliminating the necessity of incurring unnecessary additional debt. On the other hand, Bonaime et. al. (2014) point out that under-levered firms must compare the benefits of moving to the optimal capital structure with the costs of repurchase that depend on the current stock value. If costs associated with moving to the target capital mix are too high, then a company may often deviate from the desired capital structure. Nonetheless, higher abnormal returns after the announcement have been documented for under-levered companies compared to over-levered firms (Bonaime et. al., 2014).

## *2.4. Possible explanations of the positive post-announcement effect*

Several theoretical hypotheses aim to shed light on the reasons for the abnormal performance of companies repurchasing their own stock. In the subsequent sections, three of these will be considered, namely the liquidity hypothesis, underreaction, and overreaction to news.

### 2.4.1. Liquidity hypothesis

One of the explanations for repurchasing companies having higher long-term returns may be a liquidity factor. The basic principle of how the financial system functions is the availability of buyers on the one side and sellers on the other. If a stock is easy to buy and sell at each point in time at a reasonable price, then it is considered to be liquid. Most investors prefer to trade liquid financial instruments, assuming that they take less risk. If a security is sensitive to overall liquidity, investors will demand additional return on such an asset (Pástor and Stambaugh, 2003). However, it is still unclear whether repurchasing companies limit or increase liquidity in the period around the repurchase announcement. Understandably, if the price is low then companies will try to increase the liquidity of their shares by buying shares and simultaneously allowing shareholders to sell their stock or employees to realise their stock option plans. If the percentage of shares authorized for repurchase is significant, then a firm is able to cover a great number of orders from sellers on the bid-side, pushing up the stock price. But this cannot last forever, because at some point in time the stock will become too expensive for repurchase. On the other hand, companies may restrict the maximum buying price – and liquidity at the same time – with the help of limit orders.

According to Eberhart and Siddique (2004), buybacks lead to a decrease in the transaction costs from buying or selling the firm's stock in response to greater market depth and liquidity. Moreover, the authors argue that liquidity change is the dominant factor, which explains the positive abnormal performance of firms after repurchase. However, liquidity can only increase if the announcing firm actually repurchases its shares or if its announcement receives a lot of attention from uninformed traders. On the contrary, Miller and McConnell (1995) carried out a study examining the bid-ask spread following share repurchase announcements of companies listed at NYSE. They found no evidence of the effect of an open-market share repurchase announcement on the bid-ask spread or on the market liquidity overall.

### 2.4.2. Underreaction and overreaction hypotheses

Last but not least, the underreaction and overreaction hypotheses attempt to explain the long-term abnormal performance of repurchasing firms. The underreaction hypothesis suggests that the market is sceptical about repurchase announcements and therefore the price adjusts slowly over time and does not correct instantly, as it would in an efficient market (Ikenberry, Lakonishok and Vermaelen, 1995). Underreaction leads to the occurrence of momentum and the possibility to exploit this anomaly for one's own benefit (Grigaliuniene, 2013). The reason for such behaviour by investors is that repurchasing companies are not obliged to buy shares back after the announcement. Consequently, existing asymmetric information between the management of a firm and investors grows even further. Therefore investors are rather cautious about open-market share buyback authorizations. If the market conditions are not favourable for the repurchase, then a firm may postpone it or cancel a program altogether (Yook, 2010, Mishra et al. 2009). The market adjusts the company's price gradually depending on the factual repurchase – after the true intentions are revealed to the public.

On the other hand, the overreaction hypothesis comes from the premise that the market overreacts to the firm's "bad news" such as long-term price decline or due to pessimistic earnings expectations. After the announcement of the open-market share repurchase, excessive long-term returns come up as a result of slow price correction. Moreover, Peyer and Vermaelen (2009) argued that the more a stock has been beaten down in the recent past, the higher the excess returns will be in the long-term perspective. The authors concluded that companies would initiate a repurchase program when there is suspicion of an overly strong market reaction to the negative events. As we can see, the overreaction hypothesis comes close to the undervaluation hypothesis.

All the hypotheses described above have been a subject of discussion in recent years. In trying to explain abnormal long-term returns following the repurchase announcements, many researchers analysed different datasets in various time periods. Further pieces of evidence of overreaction (Manconi, Peyer and Vermaelen, 2014) as well as underreaction (Bhana, 2007) have been found, but can we conclude that the main assumptions of the efficient market hypothesis proposed by Fama do not hold? Fama (1998) assumes that efficiency does not exclude the existence of some market anomalies. Irrational market reactions are supposed to be random, however, they cancel each other out. Thus, any abnormal returns may appear only by chance.

## *2.5. Efficient market hypothesis (EMH)*

Market efficiency as a supplementary topic plays an especially important role when measuring the initial and long-term market reactions to different types of information: past prices and public and insider information. In the context of this master's thesis, the initiation of a new share repurchase program and publication of the announcement by a firm refers to the public information.

The term market efficiency was introduced by Eugene Fama. It describes a market in which prices always fully and correctly reflect available information (Fama, 1970). Depending on the sets of information, three forms of efficiency are to be distinguished:

1. Weak form of efficiency. Here, set of information is represented by historical prices. Should this form of efficiency characterize the market then it is not supposed to be possible to predict and earn excessive returns via charting tools (technical analysis). According to the definition, today's price changes are independent from yesterday's price, meaning that the price moves randomly (random walk). Osborne (1959) showed that stock price movements resemble the random Brownian motion, thus they are independent of each other.

2. Semi-strong form of efficiency. A set of information additionally includes all available public information such as share repurchase announcements, stock splits, dividend payments, mergers and acquisitions, etc. If the market is efficient in this sense then it will not be possible to generate abnormal returns via analyses of the companies' income statements, announcements or using any kind of other public information about an individual company (Malkiel, 1989).

3. Strong form of efficiency. This represents the strongest form of efficiency when it is also not possible to profit from the superior (insider) information.

Consequently, on the efficient market the current price is supposed to already incorporate all available information, and without price information it should not move. Another implication of the EMH is that good news is as likely to appear as bad news and therefore each price change is independent from the next one. But this will work only under the condition that expectations of investors are both unbiased and rational (Damodaran, 2012). In the real world, investors are not necessarily fully rational in making decisions.

Many studies have been conducted in the area of market efficiency attempting to prove or reject the existence of any of these three forms. Technicians believe that by detecting trends and patterns in price movements, abnormal performance can be achieved. The documented patterns such as P/E effects (Basu, 1977), price reversals (Jegadeesh and Titman, 1995), or momentum appeal against the weak market efficiency. However, the paradox is that by detecting particular patterns and trading on this information, the patterns are destroyed and they cannot be profitably exploited any longer (Alexeev and Tapon, 2011).

Tests for the semi-strong efficiency are of particular interest in this master's thesis because I would like to see whether information about share repurchases could be used beneficially in combination with other trading tools. Some studies have reported about such anomalies as the January effect (Rozeff and Kinney, 1976), post-earnings announcement drift (Brandt et. al., 2008), abnormal performance after the share repurchases (Chan, Ikenberry and Lee (2004), Yook (2010)) and the dividend increase (Lee, 1995), which can not be considered a proper reaction of the efficient market.

What is challenging for the strong form of market efficiency is that any manifestation of abnormal performance is associated with insider trading – namely, using information that is not announced to the public. Despite trading based on insider information being prohibited, it is present on the market in indirect ways. There are some findings demonstrating over-average performance of insiders (Jeng et al., 1999). Moreover, it is not forbidden *not* to trade using some superior information about a company, which prevents an insider from losing money.

### 2.5.1. Behavioral implications

A fair number of economic studies in the last few years have been dedicated to behavioral aspects of market participants. Researchers attempt to not only explain the occurrence of market anomalies and the nature of irrational financial decisions made by investors, but also to show that the real financial world is much more complex than what is predicted by theoretical models. On the contrary, behaviorists that focus on investigating practical issues in social science show that financial markets do not function efficiently in some cases and that the majority of investors design their portfolios and investment strategies based on rather psychological characteristics.

The foundations of behavioral finance were already laid in 1896 with the publishing of the book "The Crowd: The Study of the Popular Mind", in which Le Bon characterized the specifics of different kind of crowds as well as their influence on the opinion of individuals. However, the great interest in behavioral studies was awakened in 1979, after Kahneman and Tversky introduced their prospect theory. The authors undertook several experimental studies and documented that peoples' preferences are inconsistent. Individuals tend to overweigh certain outcomes in comparison to those that are merely probable (certainty effect). If individuals have to decide between two outcomes that are not certain but possible, most people tend to choose the game with the larger gain even if the value of this option is less (Kahneman and Tversky, 1979). The prospect theory of Kahneman and Tversky states that people are indeed very sensitive to losses and they have a tendency to be risk-seeking when it comes to losses. Individuals prefer to risk even if they may lose more, rather then accept the smaller but certain loss. Nonetheless, if the same problem is set for gains then individuals behave the other way around: they would prefer a smaller but certain gain to a gamble with higher gain but uncertain outcomes.

Many other studies in the fields of social science and behavioral finance were conducted in order to show how emotions and individual preferences might affect investment decisions. The most familiar biases and heuristics described by Kahneman (2011) are: the anchoring effect, availability heuristic, representativeness, regression to the mean, overconfidence, etc. Some studies focused on herding and information cascades (Hirshleifer and Teih, 2001). Chartists believe that human psychology may significantly impact prices with no regard to new information coming to the market (Damodaran, 2012). For example, chartists using support and resistance lines claim that the price will not fall below or will not rise above these lines due to psychology of the market. They believe that crossing of the line may happen because of the activity of the large institutional investors getting into the game or probably due to some news. Regardless of the reasons why the trend reversal occurs, this generates a signal to close the current position.

# 3. Portfolio Theory and Capital Markets

Hardly any investors deal with only one asset on the market because in this case all his or her outcomes would be fully dependent on this particular security. Portfolio theory says that it is much more intelligent to allocate the resources between different investments. Since in the subsequent parts several portfolios will be constructed and evaluated, it is necessary to touch upon some questions related to the risk and return relationship. This part is mainly dedicated to an overview of the most prominent portfolio theory, which will be used as a vehicle for interpreting the empirical results. Along with this, the CAPM model will be briefly described here. With the help of this model, the prediction of normal returns will be carried out as well as further evaluation of the overall performance.

## *3.1. Modern Portfolio Theory*

Markovitz is treated as the father of the modern portfolio theory. In 1952, in the research paper "Portfolio Selection," he presented the mean-variance approach for a portfolio selection. The main assumptions of the model are: investors are risk-averse, maximize the expected utility and build a portfolio of assets based solely on information about expected return and risk (variance) in order to keep an efficient portfolio. This efficient or optimal portfolio is defined by a combination of expected return and variance in such a way that the portfolio is characterized by minimum risk for a given level of expected return or by maximum expected returns for a given level of risk or less (Markowitz, 1952). Due to the fact that everyone is supposed to be risk averse, have the same assets available, and perform the same calculations, all investors solve the same optimization problem and eventually invest in the same portfolio on the efficient frontier. These assumptions suggest the rationality of investors, which is not necessarily the case according to the empirical findings in the field of behavioral finance. In spite of many restrictions and assumptions this model has great practical importance.

The main idea behind the mean-variance approach is portfolio diversification. Combining different risky assets that are not perfectly correlated allows minimization of the portfolio risk (Guerard, 2010). Moreover, the lower the correlation is between assets, the more diversified the portfolio will be. For example, holding a portfolio that consists of shares from only one country may become highly unprofitable if there is political instability. But if we, for instance, add shares of companies from other countries to the portfolio then risk can be decreased.

According to the Markowitz (1952) mean-variance approach, all investors should solve the same optimization problem to find weights of assets included into a portfolio such that expected utility is maximized:

$$\max E(r_p) - 1/2\ \lambda\ var\ (r_p), \text{ where} \tag{1}$$

$E(r_p)$ is the expected return of a portfolio, var $(r_p)$ is the variance of a portfolio and λ measures the investors' risk aversion.

These two parameters in turn are defined as follows:

$$E(r_p) = \Sigma\ w_i\ E(r_i) \text{ and} \tag{2}$$

$$var\ (r_p) = \Sigma\ \Sigma\ w_i\ w_j\ cov\ (r_i,\ r_j) \tag{3}$$

$w_i$ , $w_j$ represent the weights of an asset *i* or asset *j* in the portfolio, $E(r_i)$ is the expected return of an asset *i* and $cov\ (r_i,\ r_j)$ denotes the covariance between the returns of the assets *i* and *j*.

In order to take transaction costs into account it suffices to subtract them from the utility function (1) (Amenc and Le Sound, 2003). What may be more problematic is the calculation of a risk-aversion coefficient because this parameter is characterized by individual risk attitude. More specifically, the risk-averse investor tries to avoid risk. He or she does not like uncertainty and prefers an investment with a lower return but a certain level of risk to a promising investment with unknown risks. The lower the coefficient, the more risk-loving an individual is. Nevertheless, it is quite hard to measure to what extent an investor is reluctant to accept more risk in order to receive additional returns. In portfolio theory the risk aversion coefficient is calculated by dividing the marginal expected return ($dE(r_p)$) by the additional risk level ($d\sigma$), which is expressed in terms of standard deviation of returns:

$$\lambda = dE(r_p)\ /\ d\sigma \tag{4}$$

Investors who are ready to accept more risk move farther away from the optimally diversified portfolio. Hence on the one hand, portfolio optimization techniques are very helpful for reducing the risk, but on the other hand it also limits investors' opportunities to outperform the market. For instance, Brown et al. (2013) show that the mean-variance optimal portfolio fails to consistently outperform the naïve diversified portfolio, which is characterized by investing in assets equally. They say that naïve diversification increases tail risk measured by skewness and kurtosis. "Fat tails" of distribution are indicative of a higher probability of outperforming the market but also provide higher downside risk. On the other hand, risk exposure declines with the increasing number of assets taken into the portfolio (Brown et. al., 2013). Guerard (2010) emphasized that "the optimal investment proportions corresponding to utility functions with higher levels of risk aversion are closer to the "1=N rule" strategy proportions because they include more assets with nonzero investment proportions and relatively smaller investment proportions allocated to each asset". This evidence shows that higher returns received from naïve diversification merely represent a compensation for higher risk. On the financial market we will hardly be able to find many risk-averse investors, therefore the great popularity of naively diversified portfolios is not surprising. From this point of view, for a high profit-seeking investor the optimizing portfolio strategy seems to be less useful.

## *3.2. CAPM and Jensen's alpha*

The Capital Asset Pricing Model represents one of the most prominent portfolio theories. Jack Treynor (1961) investigated risk relations and the market's reaction to the riskiness of a project when a company makes an investment decision. He described the rationality of investors in their tendency to select such assets for investments that imply the minimal level of risk for any given level of performance. Based on the portfolio theory and efficient frontier of Markowitz (1952), these assumptions have been refined and further developed by Sharpe (1964) and Lintner (1965).

Analysis or empirical testing of CAPM is not the purpose of this master's thesis. However, this model will be used for the event analysis in subsequent parts. Therefore I would like to highlight the most important assumptions of CAPM and draw a parallel between the model and other theories. The classical CAPM may be described by the following:

1. The model is based on Markowitz's mean-variance approach that assumes that investors are risk averse and that they use a combination of both risk-free assets and risky assets in constructing a portfolio.
2. Investors have homogeneous expectations regarding risk and return of an asset.

3. There are no taxes and no commissions and investors are supposed to borrow at the same level of risk-free rate.
4. If the selected portfolio lies on the efficient frontier, then in comparison to any possible combination of assets in other portfolios giving the same expected return, our efficient portfolio will differ by a minimal level of risk.
5. Excessive stock returns ($E(r_i) - r_f$) are described as a function of market returns $E(r_M)$ and depend on beta, which measures risk that cannot be diversified away – systematic risk.

The CAPM is described by this formula:

$$E(r_i) - r_f = \beta_i(E(r_M) - r_f), \text{ where } \beta_i = cov\ (r_i, r_M) / \sigma^2_{rM} \tag{5}$$

Here, $E(r_i)$ is the expected return of an asset $i$, $r_f$ is the risk-free rate, $E(r_M)$ is the expected market return, $\beta_i$ defines the asset's risk exposure on the market, $cov\ (r_i, r_M)$ denotes the covariance between the returns of the assets $i$ and market returns, $\sigma^2_{rM}$ specifies variance of the market.

In 1967, the CAPM was extended from the single-period to the multi-period model. Jensen (1967) added a non-zero constant – intercept $\alpha_i$ (Jensen's alpha), which is expressed as a difference between the expected excessive asset return and the expected excessive market return multiplied by the beta. This approach assumes that portfolio risk is stationary and measures alpha as value-added, and compares this with the level of risk taken (Amenc and Le Sourd, 2003). The model is presented in the following form:

$$E(r_{it}) - r_{ft} = \alpha_i + \beta_i(E(r_{Mt}) - r_{ft}) + u_{it}, \text{ where} \tag{6}$$

$u_{it}$ – error term, E($u_{it}$) = 0 and should be serially independent.

Performing an empirical test of the CAPM model, Black, Jensen and Scholes (1972) examined ten portfolios consisting of securities listed on NYSE with 35 years of monthly returns, each built in such a way that portfolios had a large spread of the betas. The authors concluded that excessive returns are not strictly proportional to the expected values. The expected excess returns of assets with high beta are less than predicted by the CAPM model ($\alpha_i$ is negative), and for the low-beta assets the expected excess return is higher than predicted

($\alpha_i$ is positive). This suggests that abnormal performance after a repurchase announcement may be estimated by the alpha as well.

Fama and French (1993) made a contribution to the model as they added other explanatory variables such as: SMB (small minus big) – the difference between returns of the small firm portfolio and returns of the portfolio of large firm stocks, HML (high minus low) – the difference between the portfolios of high book-to-market and low book-to-market stocks. Carhart (1997) added momentum to the model as the fourth factor.

When adding other explanatory variables, researchers were able to find evidence of significant abnormal post-announcement performance of small firms (Isa and Lee, 2014) and high book-to-market repurchasing firms (Peyer and Vermaelen, 2007). S&P100 companies are not related to either of those two groups. Now the question is whether CAPM (or any of its more advanced versions) has enough statistical power to explain the performance of the strongest US firms in the post-announcement period.

Risk change hypothesis, proposed by Grullon et al. (2004), explains excessive returns as a positive market reaction to the significant decline of systematic risk and cost of capital firms after the repurchase. The risk factor is not fully captured by the model because investors underestimate the positive changes in a firm's risk profile and for this reason post-announcement drift may persist for the next several years. The reason is that the content of repurchase is revealed by the actual repurchase activities and not by an announcement itself (Wang and Johnson, 2008).

# 4. Empirical analysis of abnormal returns

Evidence of the outperformance following companies' corporate events is well documented. Nevertheless, discussions regarding the proper methodology and bias of the data are still not rare. Very often it is hard to come to a reliable conclusion with respect to one corporate event because of the overlapping of different kinds of announcements or firm-specific events with more wide economic changes, which cannot be fully isolated. The overwhelming majority of empirical studies define abnormal returns by comparing real returns with expected (normal) returns according to the selected model. The most famous for measuring normal returns are the following models: constant mean return model, market model (MacKinay, 1997), CAPM, 3-factor model introduced by Fama and French (1993), as well as 4-factor model with momentum introduced by Carhart (1997) and other multifactor models. Additionally, any portfolio that consists of companies with similar book-to-market, price-to-earnings, size, and other characteristics that did not announce a share repurchase program and did not repurchase any shares during the estimated period can be taken as a benchmark. In this case normal returns are calculated with respect to a benchmark portfolio and then compared with the actual returns. At the end all abnormal returns are cumulated across time and securities.

I did not construct a benchmark portfolio due to several reasons. The dataset used for calculation of abnormal returns is very specific. It consists of S&P100 companies that had announcements about stock buybacks during 10 years – from 2004 to 2014. Suitable benchmark companies should be placed in the US to avoid the estimations being biased by country effects, be as large as S&P100 companies, and should not repurchase their stock during the given time period. For example, among 728 companies ever included into S&P500 between 2004 and 2014 only 36 or 4.9% did not announce about repurchase of their shares more than twice during this period. The majority of the remaining companies carried out announcements about the authorization of a repurchase program approximately 1 time per year. Therefore, there are not enough firms that can be used as benchmarks for my sample.

The widely accepted models for estimation of abnormal performance in a long-term period are the buy-and-hold abnormal returns model (BHAR) as well as the calendar-time portfolio approach (CTP). While BHAR methodology resembles the previously described procedure with a benchmark portfolio, the calendar-time portfolio represents a different approach. According to the classic calendar-time portfolio method, each month companies that declared repurchase in the previous period are included into the equally or value-weighted portfolio and excluded from it one month after the announcement. After calculating the returns of a portfolio in one calendar month, these returns are regressed on Fama and French factors (or other variations of the asset-pricing model) with the purpose of estimating the α that will correspond to the abnormal return.

### *4.1. Selection of a method for the event study*

Event study methodology is used for estimating abnormal returns depending on a particular event. As mentioned above, there are several methods to calculate abnormal returns in the short and long time horizon. For estimation of short-term effects of the share repurchase announcement, I will use the cumulated abnormal returns methodology according to MacKinlay (1997) as well as Ikenberry, Lakonishok and Vermaelen (1995).

In the long run, the choice of a proper model is more difficult because each of the methods applied in empirical studies has some drawbacks by now. When using the BHAR methodology, the portfolio should not be rebalanced each month as returns are compounded through time. However, because of compounding and possible cross-correlation in data, the calculated long-term abnormal returns by the BHAR method tend to be skewed to the right (Brav, 2000). Fama (1998) argues that BHAR is a "bad model" that has little predictive power, and that inaccuracy grows with the increasing of a time horizon. He points out that "systematic errors that arise with imperfect expected return proxies are compounded with long-horizon returns […] because the mean of the CAR increases like N, the number of months summed, but the standard error of the CAR increases like $N^{1/2}$". For this reason statistical significance of excessive returns estimated by using buy-and-hold methodology is not reliable, especially if we have cross-correlations between returns.

An alternative method for estimating excessive returns in the long run is the calendar-time portfolio approach advocated by Fama (1998). Applying the CTP-method and accounting for positive correlations between companies' returns, Mitchell and Stafford (2000) find no evidence of long-term abnormal returns, which are significant according to the BHAR model. The calendar-time portfolio approach is quite popular in a financial analysis but has some disadvantages as well. Despite this, the CTP approach helps to eliminate cross-sectional dependence between the data, say Lyon, Barber and Tsai (1999). They criticize this method as it “yields an abnormal return measure that does not precisely measure investor experience”.

Nevertheless, for a long-term analysis of abnormal returns for the given data sample, the calendar-time approach is preferable to buy-and-hold methodology due to the following reasons:

1. The buy-and-hold approach assumes that individual firms’ returns are not correlated to each other. However, this assumption is absolutely impractical. In order to minimise overlapping of returns as a result of frequent share buybacks announcements made by the same companies, these observations should be picked out of the sample. But even this does not guarantee that all cross-correlations of returns are accounted for. The S&P100 index includes the largest and most powerful U.S. companies, the activities of which may indirectly influence the returns of other companies.
2. According to the BHAR method, the returns of sample firms are compared to the returns of reference companies with similar characteristics that did not make an announcement about open-market share repurchase. This task is challenging considering the reasons described in the previous section. It might be possible to find companies with similar parameters in other countries but there is no guarantee that differences in post-announcement performance do not occur due to the country effect.
3. Long-term investment strategies, the performance of which will be analyzed in the subsequent sections, should be constantly rebalanced. From this point of view, the calendar-time approach is more suitable and better describes the behavior of investors in real life.

The forming of monthly portfolio returns according to CTP procedure automatically accounts for portfolio variance but, because the number of companies varies every time due to rebalancing, the problem of heteroskedasticity arise (Mitchell and Stafford, 2000). Fama (1998) offers to solve this by applying weighting to the least squares procedure instead of ordinary least squares.

## *4.2. Related studies*

Some researchers conducted event analyses for estimating the performance of repurchasing firms and found hardly any evidence to suggest that market reaction on the announcement is positive and statistically significant. The argumentation of researchers about the inconsistency of results is:

- By issuing the stock following the share repurchase, companies stimulate increase of stock liquidity, which explains the positive stock reaction (Eberhart and Siddique, 2004). Analysing 7079 buybacks, Eberhart and Siddique disclosed no evidence that would support popular repurchase hypotheses such as undervaluation, free cash flow and risk change.
- Transparent high book-to-market firms experience much lower short-term abnormal returns and insignificant long-term performance in comparison to opaque firms (Yu, 2012). Transparent companies disclose relevant information permanently and decrease informational asymmetry. Thus, transparency offsets misevaluation even before the share repurchase announcement.
- In the long run, a "poor earning quality" company performance is not significantly different from zero. Such a situation is observable for repurchasing firms that use announcements in order to benefit from the positive price reaction on news, without the intention to buy shares after the announcement (Chan, Ikenberry et al., 2010).
- The market is efficient and there is no share repurchase anomaly (Fama, 1998).
- According to Fu, Huang and Lin (2012), in the last decades the financial market has become more efficient as a consequence of the adoption of algorithmic trading as well as improvement of trading systems, a decrease in trading costs and increase of institutional ownership.

On the other hand, many empirical studies demonstrate that the short-term abnormal returns around open-market share repurchase announcements and in the post-announcement period are positive and significant. The management of a firm possesses inside knowledge about the company's state and future goals, which is unlikely to be incorporated into current prices. As soon as this information becomes public, the market reaction should be prompt and accurate, according to the efficiency hypothesis. However, even if this could explain short-term abnormal returns (0 to +1 day after the announcement), market efficiency fails to capture excessive returns in the long run (from months to several years), which may occur e.g. due to market underreaction to news after the long-term pre-announcement deterioration of returns.

The following table presents the list of empirical studies that have documented positive and significant outperformance of companies after the authorization of the new stock buyback program.

**Table 1: Summary of empirical findings of excessive returns after share repurchase announcements**

| Empirical study | Data period | Data sample | Event window | Cumulative abnormal returns | Important explanatory variables |
|---|---|---|---|---|---|
| | | | *Short-term excessive returns* | | |
| Ikenberry et al. (1995) | 1980-1990 | NYSE, ASE and NASDAQ | -2 to +2 days | 3.54%*** | - |
| Mishra et al. (2009) | 1994-2005 | Canadian stocks | -2 to +2 days | 1.79%*** (average) | Repurchase completion rate, pre-event CAR |
| Råsbrant (2011) | 2000-2010 | Swedish stocks | 0 to +1 days | 1.94%*** | Capital structure, Market cap |
| Bhana (2007) | 2000-2003 | South Africa stocks | -2 to +2 days | 4.38%*** | - |
| Hackethal and Zdantchouk (2006) | 1998-2003 | German stocks | -1 to +1 days | 5.97%*** | Book-to-market, size, past return |
| Isa and Lee (2014) | 1997-2007 | Malaysian stocks | 0 to +1 days | 0.662%*** | Actual repurchase, book-to-market, size |
| | | | *Long-term excessive returns* | | |
| Ikenberry et al. (1995) | 1980-1990 | NYSE, ASE and NASDAQ | 4 years | 45.29%*** | High book-to-market |
| Chan et al. (2004) | 1980-1996 | U.S. stocks | 4 years | 23.56%*** | Leverage, size |
| Yook (2010) | 1994-2007 | NYSE, ASE and NASDAQ | 3 years | 0.46%** (average monthly ret) | Infrequent repurchases |
| Wang et al. (2013) | 2000-2010 | Taiwanese stocks | 3 years | 19.67%*** | Dividend payout ratio, change in return on assets |

*Source: based on research papers mentioned in table*

According to the empirical study of Peyer and Vermaelen (2009), abnormal returns are positive and significant each year until 48 months after the open market repurchase announcement. The researchers used a sample consisting of 3481 announcements and showed that on average, there are excessive monthly returns from 0.52% in the first year to 0.44% in the fourth year after the event. The authors conclude that such a slow reaction to an open market reaction is determined by the timing of an announcement of the repurchase because “the repurchase is essentially a criticism of downgrades by analysts”. Due to the fact that investors may sometimes overestimate analysts’ forecasts, they adjust their own decisions to these recommendations. Analysts, in turn, update their beliefs deliberately; otherwise this would mean incorrect valuation of a company from their side.

All the mentioned research papers represent an insight into share repurchases carried out for different types of companies. The data set examined in this Master’s thesis is specific as it consists of share repurchase announcements made by companies that belong to or have been included into the S&P100 index from 2005 to 2014. Because these companies are characterized by high market value compared to their book value, I expect that reasons for repurchase will differ from the most frequently accepted explanations such as undervaluation.

### *4.3. Collection of empirical data*

The database comprises stocks that were included into the S&P100 index in the period from 1$^{st}$ of January 2005 to 31$^{st}$ of December 2014. The announcement dates have been retrieved from the companies’ news published on their websites about both new, additional share repurchase program authorizations and increase of the previous authorizations. Additionally, the database has been compiled from announcement dates that are available on the LexisNexis University database. Historical prices, monthly and daily returns as well as market and exchange information were collected from the Center for Research in Security Prices (CRSP). And the index constitutes fundamental data such as assets, book-to-market, number of shares repurchased per quarter, dividends per quarter, the average price of repurchase, number of shares issued, all of which have come from the COMPUSTAT dataset.

There are several reasons why I have chosen the S&P100 index as a basis for sample construction:

1. Shares of famous companies are traded much more frequently than unknown firms. High volatility gives additional advantages for short-term traders because their positions are usually opened for limited periods of time – from several minutes to several days. Due to the fact that part of this master’s thesis is dedicated to the testing of investment strategies, one of

which is based on technical rules, high liquidity and trading volume would be an essential prerequisite for its implementation.

2. Better availability of data, especially information provided on the companies' websites.

3. This index consists of the strongest US companies, which usually have good reputations and only in rare cases is there no actual share buyback after the announcement. This is an important issue because companies that did not use share buybacks for their own benefit and sent a credible signal to investors during the previous buyback authorizations received more positive reaction from the market and higher abnormal return (Mishra et al. 2009). Moreover, these companies usually announce a much higher size of buybacks than small capitalization firms. This information will be used for the construction of the fundamental strategy.

The initial sample consisted of 144 companies. After filtering out 61 event dates that took place in the period when a company was not listed in the index, and also 15 companies for which announcement dates about share repurchase were missing, the dataset has been narrowed down to 308 announcements of 100 companies about their intention to repurchase shares on the open market. The price has been corrected by a factor that adjusts for dividends and stock splits, to eliminate the effect of these events on the price. All repurchase announcements are examined regardless of the rate of completion of an announced program. On average, companies had announced authorization of a share repurchase program 2.44 times per year. The increase of new repurchase authorizations in the last two years is noticeable. The number of announced buyback program authorizations increased especially in 2006-2007 because the stock market has been growing constantly during this period before the world financial crisis hit. Because of poor performance 20 companies have been excluded from the S&P100 index in 2007-2008 and new firms have been taken. Table 2 illustrates the descriptive statistics of repurchasing firms included into the S&P100 index.

**Table 2: Descriptive statistics for the repurchase firms in the sample**[1]

| Year | Announcements | Repurchasing firms | Mean fraction of capital announced for repurchase | CAAR [0;+1] | T-Stat |
|---|---|---|---|---|---|
| 2005 | 23 | 22 | 6.79% | - 0.64%** | -2.4996 |
| 2006 | 35 | 30 | 6.58% | 0.58%*** | 2.6195 |
| 2007 | 36 | 33 | 6.91% | 0.31%* | 1.6105 |
| 2008 | 16 | 15 | 7.33% | 1.49%*** | 3.4524 |
| 2009 | 11 | 10 | 5.30% | - 1.85%*** | -3.9901 |
| 2010 | 30 | 27 | 7.49% | 0.67%*** | 2.8108 |
| 2011 | 32 | 28 | 7.02% | 0.65%*** | 3.3533 |
| 2012 | 36 | 33 | 7.33% | 0.74%*** | 4.0069 |
| 2013 | 48 | 43 | 7.02% | 0.75%*** | 4.6247 |
| 2014 | 41 | 37 | 5.51% | 1.09%*** | 5.1536 |
| **All** | 308 | 100 | 6.73% | 0.77%*** | 7.9804 |

*Source: own calculations*

We can see that the short-term cumulative average abnormal returns from the day of announcement to +1 day are significant for all years but are not very high. This may be driven by the fact that companies listed on the S&P100 index are supposed to have low book-to-market ratio and large capitalization. These companies are therefore not undervalued. According to the empirical results of Ikenberry, Lakonishok and Vermaelen (1995) and Peyer and Vermaelen (2009), "value" stocks outperform "glamour" stocks (low book-to-market firms) in the post-announcement period.

### *4.3. Hypotheses development*

Testing of abnormal performance of repurchasing companies will be important in order to see how my results differ from other empirical studies in terms of the significance and time horizon during which excessive returns are observable. When constructing an investment strategy, the results of an event study may be used for more precise determination of the entry and exit signals as well as the holding period of a stock in the portfolio.

[1] This table shows the summarized information of the share repurchase program authorizations announced by firms listed in the S&P100 index from January 2005 to December 2014. Reported are the number of announcements each year, number of repurchasing companies, the average program size expressed in percentage of outstanding shares as well as cumulative average abnormal returns on the day of announcement and one day after. For calculation of CAARs, the market model was used.

Both the short-term (cumulative abnormal returns) and long-term (calendar-time portfolios) methods test a zero hypothesis, which states that the mean difference between realized returns and returns estimated by a selected model (abnormal returns) are zero. Should the outperformance be systematically observed over the estimation period and be significant according to the statistical tests, then one could trade on information and profit from it. Though this would not mean that market efficiency does not hold if market anomalies disappear fast. What is expected on the efficient market is a prompt price reaction to the announcement and no abnormal returns in the long time period.

I investigate the outperformance of repurchasing firms over the short-term windows (cumulative returns during several days after the announcement) and long-term holding period returns (up to 3 years). Thus, the next two hypotheses should answer the question of in which time intervals excessive returns exist and when they are the highest.

*1^st^ Hypothesis:*
*H0: No abnormal returns are received by repurchase firms in a short event window.*
*H1: The short-term abnormal returns of repurchase companies are positive and significant.*

*2^nd^ Hypothesis:*
*H0: No long-term abnormal returns are received by firms after the repurchase announcement.*
*H1: The long-term abnormal returns of repurchase companies are positive and significant.*

With the help of the event study and the multivariate regression, I would like to examine the possible motives of the management of the sample firms to repurchase the shares. Companies with high book-to-market ratio are supposed to be undervalued and may intend to utilize current low stock price to buy back their shares at a lower price. Accordingly, for testing the undervaluation, the commonly used proxy is the book-to-market ratio (Råsbrant, (2013), Ikenberry, Lakonishok and Vermaelen (1995)). Estimation of cumulative abnormal returns in the period prior to the announcement will show the relationship between the previous returns and market reaction. I assume that the lower the returns are in the previous period, the stronger the market reaction is expected.

The fraction of shares outstanding announced for repurchase differs greatly across companies. It is expected that larger share buyback programs receive more attention from investors and lead to larger abnormal returns (Ikenberry, Lakonishok and Vermaelen, 1995).

One motive for repurchase may be the wish of managers to avoid dilution of shares as a consequence of exercising the stock option plans. If this is true, I expect to see a strong relation between the amounts spent on repurchases and the expenses for share compensation plans on the after-tax basis. When new options are granted, the expenses for share compensation plans are still unreal, but the expected numbers must be disclosed by companies in footnotes in their income statements. The one problem with this variable is that there is no guarantee for accuracy because firms estimate it as an anticipated expense according to the selected method of option-calculation (e.g. Black-Scholes option-pricing model). Nevertheless, per my opinion, this variable, together with the number of outstanding and exercised options at the end of each year, which is available on COMPUSTAT, will be a good proxy for the factual level of employee stock option compensation in a company.

The substitution hypothesis can be tested using the data of actual dividends paid and amount of cash spent on share buybacks during the same time period. Should the management substitute dividends with capital gains from repurchasing shares, a negative relationship between these variables is expected.

Last but not least, I will try to find whether there is evidence supporting the liquidity hypothesis in order to explain abnormal performance of announcing companies in the sample. For this purpose I have included a liquidity variable into the multivariate regression, which is expressed through the daily number of shares traded exceeding the average number of trading volume of the latest month and divided by the total number of shares outstanding.

If abnormal returns are statistically different from zero then H0 should be rejected, and consequently empirical evidence will support the alternative H1 hypothesis.

### 4.3.1. Cumulative abnormal returns in short time intervals

Calculation of abnormal returns begins from preparation of an event list in such a way that the day of announcement for each company is denoted as “0”. Accordingly, the next trading day after the announcement is day “1” and so on.

The next step in the study is to select the estimation and event windows. The estimation window includes daily returns in the non-event period before the announcement. The estimation window should be long enough so as to ensure more accurate calculation of normal returns. However, previous announcements about share repurchase authorization should be excluded from the estimation window because this may confound the results of the analysis. Taking into consideration that sample companies experienced "events" on average 2.4 times per year, expected returns will be estimated over the period from -100 to -21 trading days so as to avoid unnecessary overlapping in returns in estimation windows. In order to see whether the market is already anticipating share repurchases 1 month before the actual announcements, the event window is selected in the time interval from -20 and +20 trading days. Additionally, several sub-event windows were used: [-20,-1], [-10,+10], [-2,-2], [0,+1], [0,+10], [0,+20] trading days to capture the price move around the announcement date more precisely.

Several statistical models may be applied for prediction of expected (normal) returns. Cable and Holland (1999) presented results of statistical model selection for alternative methods of prediction of normal returns in which a market model had proven to be valid everywhere and in 14.3% of cases was preferable to CAPM. For this reason, the market model seems to be a good model for normal returns in the short run. It puts linear relation into individual stock returns and market returns, which means that in the event window from -100 to -21 trading days, the returns of each company in the sample will be regressed on market returns using OLS (ordinary least squares regression method):

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + e_{i,t} \tag{7}$$

$R_{i,t}$ – return of the company i in the period t
$R_{m,t}$ – market return in the period t (of the companies listed on NYSE, ASE and NASDAQ)
$e_{i,t}$ – error term
$\alpha_i$ and $\beta_i$ are estimated using regression coefficients

Next, based on the $\alpha_i$ and $\beta_i$ calculated in each time period by OLS regression, we can estimate normal returns for each company in the event window (from -20 to + 20 days after the event). This can be done by multiplying the actual market return by the estimated $\beta_i$ and adding the estimated $\alpha_i$.

The difference between realized company return ($R_{i,t}$) and expected return ($E(R_{i,t})$) gives the abnormal return ($AR_{i,t}$):

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \tag{8}$$

In the next step, abnormal returns will be aggregated across time and companies. Average abnormal returns (AAR) are defined as the sum of individual abnormal returns ($AR_i$) each day divided by the number of events in the sample. Cumulated average abnormal returns (CAAR) over the period from -20 to +20 trading days are obtained from the aggregation of AAR over the corresponding time frame. CAAR can be interpreted as the cumulative average deviation (Fama et al., 1969) and therefore better accounts for the overall performance results of repurchasing firms after the announcement.

To test the null hypothesis I used the parametric test applied by Binder (1998) as follows:

$$T - Stat = \frac{CAAR_{(t1,t2)}}{\sigma\, CAAR_{(t1,t2)}} \quad (9)$$

where the aggregated standard error of cumulative average abnormal returns ($\sigma\, CAAR_{(t1,t2)}$) over the defined time period (from $t_1$ to $t_2$) is calculated as:

$$\sigma\, CAAR_{(t1,t2)} = \sqrt{\sum_{t1}^{t2} \delta^2\,(AAR_t)} \quad (10)$$

### 4.3.2. Calendar time portfolio in long time intervals

In this section I will describe the chosen methodology for estimation of long-term performance of companies that have authorized a share buyback program. As previously mentioned, the reason I have chosen the calendar-time portfolio approach is attributed mainly to specifics of the given dataset.

As specified in a paper by Fama (1998), the monthly portfolios are formed from companies that experienced an “event” over the specified time period e.g. 12 (or 24 or 36) months prior to the calendar month. Fama (1998) recommends using equally weighted portfolios. It is also possible, however, to assign weights to each asset in the portfolio depending on the company characteristics. I will use equally weighted portfolios in this study. After the end of the considered period, a company is excluded from the portfolio. However, in my opinion, taking new companies into the calendar-time portfolio after 12 (or 24 or 36) months following the announcement makes sense only if the researcher intends to examine abnormal returns that occur after a repurchase program has actually finished. In my case the investigated “event” is not an actual repurchase but merely an announcement about a planned repurchase. In order to capture in an analysis the price changes that can be observed shortly after the repurchase announcements, I prefer to follow the methodology of Ikenberry, Lakonishok and Vermaelen

(1995) and Råsbrant (2013) and buy companies on the 1st day of the month following the month in which an announcement about the authorization of a new share repurchase program was made. The companies then will be kept in the portfolio during 6, 12, 24 and 36 months and rebalanced monthly with the purpose of including new companies and excluding old after the end of the considered time period. A firm will be excluded from the portfolio earlier if it is no longer traded in the S&P100 index.

The portfolio is constructed month by month and the excessive portfolio returns over the monthly risk-free rate are then regressed on the Fama and French 3-factors (1993) and the momentum factor introduced by Carhart (1997) in the regression model:

$$R_{p,t} - r_{ft} = \alpha_p + \beta_p (R_{m,t} - r_{ft}) + \gamma_p SMB_t + \zeta_p HML_t + \eta_p MOM_t + e_{p,t} \qquad (10)$$

$R_{p,t}$ – monthly return of the equally weighted or value-weighted portfolio in the month $t$
$r_{ft}$ – risk free rate (1-month treasury bill rate in the month $t$)
$R_{m,t}$ – monthly market return (return of value-weighted portfolio of companies listed on NYSE, ASE and NASDAQ)
*SMB* – difference between the monthly returns on small-stock and large-stock portfolios
*HML* – difference between the monthly returns on value (high book-to-market) and growth stocks (low book-to-market) portfolios
*MOM* – difference in monthly returns of past winners and past losers (momentum)

Following Fama (1998) and Lyon et al. (1999), I will use the regression weighted least squares (WLS) model instead of ordinary least squares (OLS) because the varying number of companies in the portfolio may lead to the heteroskedasticity of error terms, and consequently noise in estimated abnormal returns. Using the WLS portfolio, returns will be corrected each month by a certain factor, depending on the number of assets included into the portfolio. Alphas received from the regression measure average excess returns per month that cannot be explained by the 4-factor model. Should intercepts from the cross-section regression be economically and statistically significant, this would mean that the constructed calendar-time portfolio outperforms the market.

## *4.4. Empirical results*

This section presents the results of the analysis of the short- and long-term firms' performance around share repurchase announcements according to the procedure described in the previous two sections. Short-term excessive returns are computed for time periods surrounding the day of announcement from -20 to +20 trading days. The market model as in formula (7) is used here for prediction of normal returns.

In order to examine excessive performance in a long run (up to 36 months after the announcement), a portfolio of repurchasing companies has been constructed in calendar time and then regressed on the 4-factor-model parameters as described above.

### 4.4.1. Short-term abnormal returns

At first, the cumulative average abnormal returns were calculated for the whole sample in the main event window and sub windows. As shown in Table 3, there were positive and highly significant average excessive returns in the period from -2 trading days before the announcement and until 10 trading days following the announcement date. On average, sample companies outperformed the market by 0.77% during 2 days after the announcement about the new share repurchase. In the event window [0, +1], 210 companies with positive cumulative abnormal returns and 98 underperforming companies were identified.

**Table 3: Cumulative average abnormal returns in event windows**

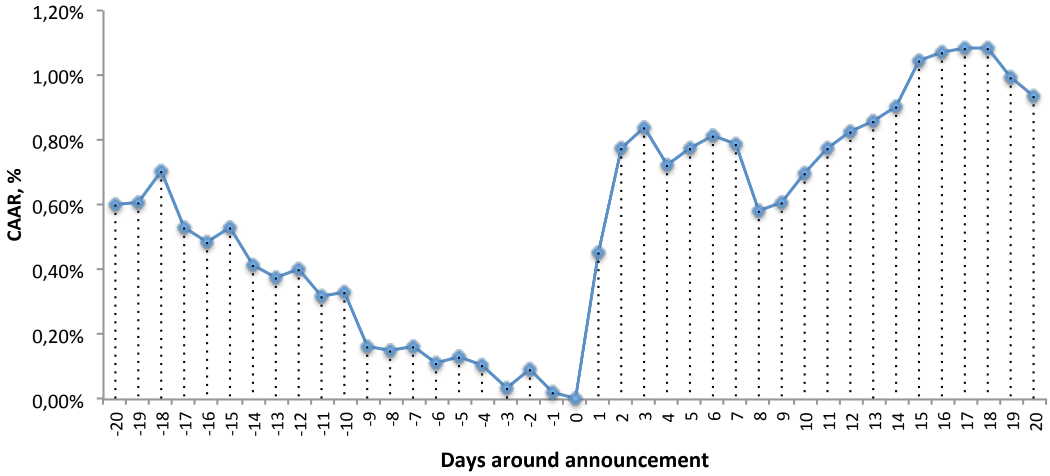
| Trading days around event | CAAR | T-Statistic | Prob. | CAR>0 | CAR<0 |
|---|---|---|---|---|---|
| [-20 to +20] | 0.280% | 0.6353 | 0.5252 | 162 | 146 |
| [-20 to -1] | -0.600% | -1.9511 | 0.0510 | 137 | 171 |
| [-10 to +10] | 0.450% | 1.4167 | 0.1566 | 168 | 140 |
| [-2 to +2] | 0.740%*** | 4.8521 | 0.0000 | 191 | 117 |
| [0] | 0.450%*** | 6.5768 | 0.0000 | 190 | 118 |
| [0 to +1] | 0.770%*** | 7.9804 | 0.0000 | 210 | 98 |
| [0 to +10] | 0.780%*** | 3.4121 | 0.0006 | 180 | 128 |
| [1 to +20] | 0.430% | 1.3901 | 0.1645 | 162 | 146 |

Test is statistically significant at 1% level (***), 5% level (**) or 10% level (*)

*Source: own calculations*

It is noticeable that abnormal returns are almost fully captured by the price increase from the -2 to +2 days, and in the next 20 trading days after the announcement, excess returns become insignificant, even staying positive. This can be clearly seen in figure 3. Negative performance in the period from -20 to -1 trading days prior to the announcement indicates poor performance compared to the market, but statistically the underperformance is not different from the predicted values. Thus, companies in the sample seem to repurchase their shares for a different reason than undervaluation. Considering the average book-to-market ratio of 0.42 with the maximal B/M ratio of 1.8 for the sample companies on the announcement day this result is not surprising.

**Figure 3: CAAR (-20;20) normalized to zero on the day "0"**[2]




Source: based on own calculations

Excessive returns surrounding the announcement day "0" are highly significant. Moreover, companies experience a slight price growth three days before the official announcement of share repurchase authorisation. This may happen due to several reasons. First, market participants already anticipate news and place buy orders on rumours. Second, insiders who are aware of the board's decision may also take advantage of this information. Since the strong and positive price increase persists on the announcement day, securing the abnormal return of 0.45% (significant at 99% level), I presume that there is no delay in publishing news in public media. As we can see, the market reaction to such news almost perfectly proves that the market is efficient in the short term with respect to the S&P100 firms. However, very short-term market inefficiency such as overreaction to repurchase announcements on the first day can still be observed because the price corrects slightly one week after the event.

[2] The CAAR with the confidence interval at the significance level of 0.01 demonstrating the higher and lower bounds between which lies the true value of CAAR is shown in the Appendix 2.

Previous studies have shown that value companies significantly outperform growth firms[3] in the long run (Ikenberry, Lakonishok and Vermaelen, 2000), but in short time intervals there is almost no difference in performance of high and low book-to-market shares after the buyback announcement (Ikenberry, Lakonishok and Vermaelen, 1995). To investigate the effect of book-to-market ratio (B/M) as well as dependence of excessive returns on the authorized fraction of shares outstanding for repurchase and repurchase frequency, the sample has been divided into corresponding groups. The results of the analysis can be seen in Table 4.

Panel A provides information about two groups of sample firms separated according to their book-to-market ratios. S&P100 companies are mostly overvalued which explains insignificant or marginally significant pre-event returns (from -20 to -1 day prior to the announcement). As expected, signalling of undervaluation cannot be considered as the main motivation factor for management of the sample firms. Initial market reaction (during the first two days) tends to be stronger for higher book-to-market (value) firms, but then the price corrects so that in the next two weeks after the announcement, abnormal returns are close to zero.

**Table 4: Short-term CAAR depending on the book-to-market, fraction sought and frequency of an initiated program**

| | **CAAR (-20 to -1)** | | **CAAR (0 to 1)** | | **CAAR (0 to 10)** | |
|---|---|---|---|---|---|---|
| | Coefficient | T-Stat | Coefficient | T-Stat | Coefficient | T-Stat |
| *Panel A: Book-to-Market* | | | | | | |
| Less than 1 (n=290) | -0.69%** | -2.1918 | 0.75%*** | 7.4886 | 0.76%*** | 3.2525 |
| More than 1 (n=18) | 0.86% | 0.6710 | 1.08%*** | 2.6641 | -0.01% | -0.0063 |
| *Panel B: Fraction sought* | | | | | | |
| Less than 5% (n=128) | -0.87% | -1.7798 | -0.08% | -0.7262 | -1.02% | -0.3212 |
| 5 to 10% (n=113) | -0.75% | -1.5086 | 1.24%*** | 7.8442 | 1.12%*** | 3.0215 |
| More than 10% (n=67) | 0.16% | 0.2560 | 1.34%*** | 6.6262 | 1.64%*** | 3.4550 |
| *Panel C: Frequency* | | | | | | |
| Infrequent (n=112) | -0.17% | -0.3101 | 1.29%*** | 7.6171 | 1.16%*** | 2.9080 |
| Frequent (n=196) | -0.85%** | -2.2897 | 0.47%*** | 3.9644 | 0.46%* | 1.6837 |

Test is statistically significant at 1% level (***), 5% level (**) or 10% level (*)

*Source: own calculations*

[3] Value stocks are characterized by higher than median book-to-market ratios, whereas growth firms have lower than average ratios (see Ikenberry et al., 2000).

The announced fraction of shares outstanding for repurchase is shown in Panel B. It seems that a positive relation exists between the fraction sought and short-term cumulative returns. This result is consistent with previous empirical findings of Ikenberry, Lakonishok and Vermaelen (1995), Bhana (2007), and Råsbrant (2013), who determined that the market reacts to announcements of larger share repurchase programs more favourably. Sample companies that announced less than 5% of outstanding shares to be repurchased do not have significantly higher returns than market returns in the short-term period. The repurchase announcements for more than 10% of shares receive a positive response from the market and outperform by 1.34% in the time period from 0 to 1 day.

Panel C shows abnormal returns of the sample companies, separated into two groups by the number of repurchase programs initiated in the period from 2005 to 2014. Companies that announced a new share buyback program a maximum of 3 times during the whole estimated time period and not more than 1 time per year are considered to have infrequent repurchases. All other companies are referred to in the second group. Frequent repurchases of S&P100 are characterised by the statistically negative cumulative abnormal return of -0.85% 20 trading days before the announcement, which may indicate better timing abilities of the companies' management in comparison to firms that infrequently repurchase. Positive market reaction to the infrequent announcements is stronger than for frequent repurchase program authorizations (difference is 0.7% in the event window from 0 to 10 days). De Ridder and Råsbrant (2014) report similar results for 126 announcements by Swedish firms. They find significant outperformance during the 0 and 1 day after the announcement, amounting to 2.77% for infrequent programs compared to 0.99% for frequent programs.

### 4.4.2. Long-term abnormal returns

In this section, cumulative abnormal returns are measured in the long time period – from 6 to 36 months – following the announcement about a new share repurchase authorisation. In order to perform this analysis, the monthly returns for the sample companies have been derived from CRSP. Instead of the date of announcement, here the announcing month designated as "0" month is used. The next 1$^{st}$ month following the announcement is the month in which a stock is taken into the portfolio. Consequently, equally weighted monthly returns of all assets included into the portfolio give us portfolio returns. The portfolio returns excluding the risk-free rate (1-month US treasury bill rate) are regressed on Fama-French factors, where the market return is the equally weighted return of CRSP firms, listed on the

NYSE, NASDAQ and AMEX, in order to see whether or not this model is able to explain returns of the monthly portfolio. The methodology described above of monthly portfolio construction resembles the simplest naïve long-term strategy. An investor buys stocks of all companies from S&P100 that have announced a share repurchase program authorisation in the previous period and rebalances his or her portfolio each month, keeping it equally weighted. The number of observations for this type of analysis is represented by the number of months during which the portfolio is held and not by the number of companies.

Table 5 demonstrates that such a strategy would not outperform the market in a long-term perspective.

**Table 5: Long-term performance of monthly portfolio constructed according to calendar-time portfolio approach**

| *Repurchasing firms included into S&P100 on the announcement day* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Fama-French and Carhart factors** | ***Holding period (1, +6)*** | | ***Holding period (1, +12)*** | | ***Holding period (1, +24)*** | | ***Holding period (1, +36)*** | |
| | Coefficient | T-Stat | Coefficient | T-Stat | Coefficient | T-Stat | Coefficient | T-Stat |
| α (intercept) | 0.00013 | 0.6432 | 0.0015 | 0.9731 | 0.0016 | 1.0521 | 0.0023 | 1.6506 |
| MKTRTN | 1.0001*** | 18.074 | 0.9722*** | 22.911 | 0.9874*** | 24.173 | 0.9982*** | 26.877 |
| SMB | -0.2225** | -2.2601 | -0.1636** | -2.1674 | -0.1135 | -0.5803 | -0.0578 | -0.8718 |
| HML | -0.1104 | -1.1719 | 0.029 | 0.4017 | 0.1302* | 1.8931 | 0.1773*** | 2.8042 |
| MOM | -0.0623 | -1.3316 | -0.0766** | -2.1353 | -0.1102*** | -3.2255 | -0.1589*** | -5.0288 |
| R-squared | 0.80 | | 0.87 | | 0.89 | | 0.91 | |
| Obs. | 119 | | 119 | | 119 | | 118 | |

Test is statistically significant at 1% level (***), 5% level (**) or 10% level (*)

*Source: own calculations*

Despite the fact that the alphas – which stand for abnormal (unexpected) returns – are positive for each portfolio, they are not statistically significant. Moreover, in 3 years, holding period returns can be almost fully captured by the Fama-French and momentum factors. For example, positive coefficients, associated with the market return, indicate the beta of the portfolios. The coefficient below 0.5 for SMB proves that sample companies are large caps and negative relation between portfolio returns and momentum shows that with the increase of momentum (past winners outperform past losers) by one percent, our portfolio returns will decrease by the corresponding percentage points. Another conclusion from these results is that there is no market underreaction to the repurchase announcements, which is consistent with Eberhart and Siddique (2004).

Unfortunately, due to several reasons I was unable to also test whether in the long-term perspective the abnormal returns are earned by the non-announcing firms from the S&P100 index. Firstly, both the event analysis as well as the calendar-time portfolio approach use the announcement dates as starting points for further investigation. Therefore it is not possible to construct a calendar-time portfolio of events for non-repurchasing firms. Secondly, less than 20% of the sample companies had more than a 2-year pause between the repurchase announcements. This is not enough for the construction of the necessary portfolio. Even if it were easy to do, there is no guarantee that the long-term abnormal returns are not received as a consequence of the permanent actual repurchases. Nonetheless, it is possible to break the current sample into different portfolios according to the companies' characteristics such as book-to-market, fraction sought and the frequency of an initiated repurchase program in the same manner as for the short-term analysis. After carrying out the analysis, I found no evidence of abnormal returns in a period from 1 to +36 months for any of these groups (Table 6). Only companies that are going to buy back less than 5% of their shares seem to perform better than others during the first year (abnormal return is 4.1% but is significant only at the 90% level). This result may be indicative of some slight underreaction to an announcement of these firms on the first days. On the other hand, such performance may be a result of the permanent repurchasing activity.

**Table 6: Long-run performance of calendar-time portfolio dependent on the book-to-market, fraction sought and frequency of the initiated program**

| | **α (1,+6 months)** | | **α (1,+12 months)** | | **α (1,+24 months)** | | **α (1,+36 months)** | |
|---|---|---|---|---|---|---|---|---|
| | Coef. | T-Stat | Coef. | T-Stat | Coef. | T-Stat | Coef. | T-Stat |
| *Panel A: Book-to-Market* | | | | | | | | |
| Less than 1 (n=290) | 0.0015 | 0.747 | 0.0016 | 1.022 | 0.0014 | 0.931 | 0.0021 | 1.499 |
| More than 1 (n=18) | 0.0026 | 0.305 | 0.0015 | 0.173 | 0.0095 | 0.994 | 0.0097 | 1.119 |
| *Panel B: Fraction sought* | | | | | | | | |
| Less than 5% (n=128) | 0.004 | 1.266 | 0.0041* | 1.890 | 0.0026 | 1.441 | 0.0020 | 1.061 |
| 5 to 10% (n=113) | -0.0003 | -0.107 | -0.0002 | -0.106 | 0.0009 | 0.452 | 0.0024 | 1.413 |
| More than 10% (n=67) | 0.0006 | 0.181 | 0.0004 | 0.145 | 0.001 | 0.423 | 0.0023 | 1.012 |
| *Panel C: Frequency* | | | | | | | | |
| Infrequent (n=112) | 0.0008 | 0.076 | -0.0017 | -0.817 | -0.0012 | -0.696 | 0.0012 | 0.615 |
| Frequent (n=196) | 0.0019 | 0.576 | 0.0033 | 1.595 | 0.003* | 1.672 | 0.0024 | 1.018 |

Test is statistically significant at 10% level (*)

*Source: own calculations*

The results suggest that the official announcements about share repurchase programs, initiated by S&P100 companies, provide no advantage for an investor and will not allow him or her to beat the market in the long run by implementing a naïve event-driven strategy. On the other hand, significant abnormal returns are observed in a short-term interval around the announcement. Thus, information about the intention of the management to buy back its own shares may be exploited not only by insiders but also by day traders, who can make additional profits on information on the first two days. However, even if they are able to receive excessive returns, the market seems to be efficient with respect to the public information.

### 4.4.3. Multivariate Regression Analysis

In order to test how strong the influence of the control variables is on cumulative abnormal returns in the 2-day period (event window [0, +1]) and whether some of these explanatory variables have predictive power for the post-announcement returns, I will run the following multivariate regression:

$$CAR_i\ (0,+1) = \alpha_i + \beta_i\, SIZE + \gamma_i\, BM + \eta_i\, PR\_SIZE + \zeta_i\, PRIOR\_RET + \lambda_i ABTV(-1) + \theta_i ABTV(0) + \upsilon_i ABTV(+1) + \varphi_i REP\_ON\_ANNOUNC + e_i$$

$CAR_i$ (0, +1) – dependent variable – is the abnormal return of a company *i* cumulated through the announcement day and one day after it [4].

*Independent variables are:*

SIZE – log of the market capitalisation calculated at the end of the month prior to the announcement

BM – book-to-market ratio calculated at the end of the month prior to the announcement

PR_SIZE – fraction of shares outstanding intended for the repurchase, stated in the repurchase announcement

PRIOR_RET – cumulative raw return of a company starting from -20 trading days to -1 trading day prior to the announcement

ABTV(-1) – abnormal trading volume – the variable is calculated as the average value of the amount of common shares traded on the day of an announcement and one day after the announcement divided by the average trading volume from the -25 to -6 trading days minus one.

[4] Abnormal returns are defined by the difference between the realized returns of each sample company on the day 0 and the 1st day after the announcement and the predicted returns according to the market model. Then CARs are calculated by aggregation of abnormal returns across these two days.

The following formula has been used:

$$ABTV(-1) = \frac{TV(-1)}{\frac{1}{20}\sum TV(-25,-6)} - 1$$

The next two variables are calculated in the same way. Values close to 0 would indicate that the trading volume around the announcement is not different from the average monthly trading volume.

ABTV(0) – variable calculated as the number of common shares traded on the day "0" divided by the average volume traded from the -25 to -6 trading days.

ABTV(+1) – variable calculated as the number of common shares traded on the first day after the announcement divided by the average volume traded from the -25 to -6 trading days.

REP_ON_ANNOUNC – a dummy variable that takes 1 if the actual repurchase program starts on the day of the announcement or one day after it, and zero otherwise.

The regression results can be found in table 7. The variables SIZE (market capitalization) and BM (book-to-market ratio) are not significantly different from zero, which means that these variables do not explain short-term abnormal returns for the sample companies confirming the previous results. Only for the second group with negative cumulative abnormal returns do smaller companies seem to perform better than bigger firms and increase CAR by 0.57% with 90% significance. Considering that the companies are very similar in terms of size and book-to-market ratios, this result is reasonably expected.

**Table 7: Multivariate regression results for CAR (0, +1)**

| Variables | CAR (0 to +1) | | | | | |
|---|---|---|---|---|---|---|
| | Full sample | | Positive CARs | | Negative CARs | |
| | *Coefficient* | *T-Stat* | *Coefficient* | *T-Stat* | *Coefficient* | *T-Stat* |
| *α (intercept)* | -0.031809 | -1.209 | 0.041661** | 2.288 | -0.081178** | -2.509 |
| *SIZE* | 0.002949 | 1.277 | -0.002786 | -1.768 | 0.005686* | 1.909 |
| *BM* | 0.002888 | 0.452 | 0.003376 | 0.797 | 0.002754 | 0.318 |
| *PR_SIZE* | 0.093025** | 2.513 | 0.020602 | 0.856 | 0.151039** | 2.441 |
| *PRIOR_RET* | -0.077515*** | -2.693 | -0.038341* | -1.833 | -0.089316** | -2.575 |
| *ABTV(-1)* | | | -0.003648 | -1.257 | 0.002854 | 0.482 |
| *ABTV(0)* | | | 0.012567*** | 5.665 | -0.000329 | -0.148 |
| *ABTV(+1)* | | | 0.007905*** | 4.871 | -0.019518*** | -10.19 |
| *REP_ON_ANNOUNC* | | | 0.002455 | 0.754 | -0.001015 | -0.181 |
| R-squared | 0.0486 | | 0.338 | | 0.563 | |
| Obs. | 307 | | 209 | | 98 | |

Test is statistically significant at 1% level (***), 5% level (**) or 10% level (*)

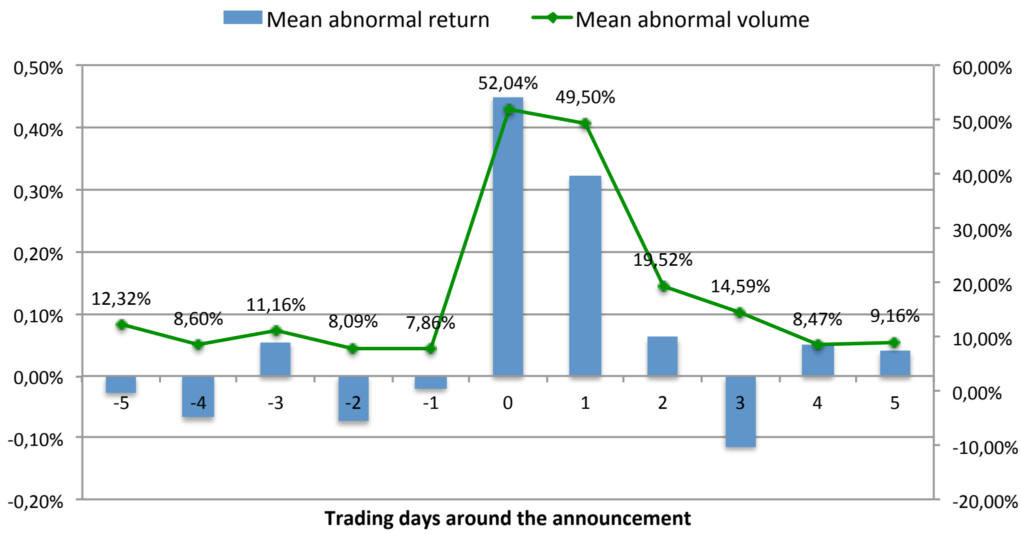
*Source: own calculations*

Variable PR_SIZE, which is responsible for the size of an announced repurchase program, is associated with a positive impact upon the initial market reaction after the announcement. This means that larger repurchase programs are able to generate higher excessive returns during the two days after the announcement. However, after checking the subsamples for the trading volume variables, it is seen that the repurchase size stated in the press release is only able to improve the performance of the companies with negative CARs but does not have any influence on price growth of the outperformers. The negative relation between prior 20-day-return and cumulative abnormal returns exists for the whole sample. Nevertheless, the variable PRIOR_RET also loses its predictive power when checking for the trading volume. Abnormal trading volume one day before the announcement is not significant, but on the day 1 it is strongly (significant at 99%) and positively related to the CAR for both groups. With 1% growth in trading volume, the excessive returns increase by 1.26% for the second group. This relation may be a result of the price reversal that happens on the day of announcement. In the short time period this change is supported by day traders, who try to exploit the possibility of buying the stock at the time when the price has started to rise. The control variable REP_ON_ANNOUNC is also not significant, which confirms the idea that the positive CAR (0,1) is not associated with the actual repurchase on the announcement day.

According to behavioural theory, the increase of participation of noisy traders after the revealing of "positive news" is expected. The regression results and Figure 4 show that this is also true for the S&P100 companies. Despite the high transparency of these firms, events such as share repurchase authorization are still quite unexpected by the market.

According to the results of event study and multivariate analysis, the liquidity expressed in terms of the trading volume on the days 0 and 1 and the fraction sought seem to be key factors in determining abnormal performance in the short time period. The price growth is not driven by a massive stock repurchase on the announcement day, which suggests that traders and arbitrageurs alone incur abnormal returns for the S&P100 companies on the days 0 and 1.

**Figure 4: Abnormal returns and trading volume[5] around the open market repurchase announcements**




*Source: based on own calculations*

With the help of another multivariate regression and using the annual data, I will examine which variables can explain the level of actual repurchases of the S&P100 companies.

$$REPLEVEL = \alpha_i + \beta_i SIZE + \gamma_i INVCAP + \eta_i DIV + \zeta_i CASH\_FLOW + \lambda_i STOCKCOMP + \gamma_i SH\_ISSUE + \theta_i OPT\_EXC + \varphi_i OPT\_OUT + e_i$$

The dependent variable, in this case REPLEVEL, is calculated as the number of yearly US dollars spent on repurchased shares and divided by the firm's market value (at the beginning of the year). The description of the independent variables is provided below:

SIZE – log of the market capitalisation calculated at the end of the financial year prior to the announcement.

DIV – dollar amount spent on dividends in the current year divided by the total assets.

INVCAP – amount of the invested capital (long-term financing) during the current year divided by the total assets.

CASH_FLOW – free cash flow available in the current year and divided by the total assets. According to the Lehn and Poulsen (1989), the following COMPUSTAT data has been used for estimating the free cash flow:

*CASH FLOW = operating income before depreciation – income taxes – interest and related expense – total amount of preferred and common dividends.*

[5] Mean abnormal volume is calculated in the same way as the variable ABTV described above and then aggregated across companies as an average value for each of the trading days around the announcement.

STKCOMP – after-tax stock-based compensation expense recognized in the current year in the income statement and divided by the market value of equity.

SH_ISSUE – the relation between the total number of common shares issued in the current year and the number of shares outstanding minus one.

OPT_OUT – represents the outstanding stock options exchangeable for common shares of a company at the end of the previous year scaled by the number of shares outstanding.

OPT_EXC – represents stock options exercised for common stock during the year scaled by the number of shares outstanding.

According to the substitution hypothesis, management may prefer repurchases to paying dividends. This is true when a negative relation exists between the variables REPLEVEL and DIV in the same year. On the other hand, free cash flow hypothesis predicts that in the absence of investment possibilities firms are likely to spend free cash for repurchases. Should this hypothesis hold, an inverse relation between the amount of invested capital and the value of the actual repurchase as well as between the variable CASH_FLOW and the value of the actual repurchase is expected. If the sample firms repurchase shares for the purpose of avoiding dilution of outstanding shares as a result of exercising the stock options, I expect to observe a positive and significant coefficient near the variable STOCKCOMP and OPT_EXC. Table 8 shows the regression results.

**Table 8: Multivariate regression results for level of actual repurchases (annual data)**

| Variables | REPLEVEL | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | | Model 2 | | Model 3 | |
| | *Coef.* | *T-Stat* | *Coef.* | *T-Stat* | *Coef.* | *T-Stat* |
| *Intercept* | 0.0547** | 2.0616 | 0.4583** | 2.0483 | 0.02061 | 0.9079 |
| *SIZE* | -0.000016 | -0.0097 | 0.00023 | 0.1401 | 0.00153 | 0.7285 |
| *INVCAP* | -0.0467*** | -4.8189 | -0.0339*** | -3.4062 | -0.0379*** | -3.1350 |
| *CASH_FLOW* | 0.06147** | 2.0510 | 0.04116 | 1.3639 | 0.06258 | 1.5212 |
| *DIV* | | | -0.1406*** | -2.7918 | -0.2192*** | -2.8425 |
| *SH_ISSUE* | | | 0.03091*** | 4.8339 | 0.03028*** | 3.9432 |
| *STKCOMP* | | | | | 2.49088*** | 4.7449 |
| *OPT_OUT* | | | | | 0.00979 | 0.1776 |
| *OPT_EXC* | | | | | 0.58719** | 2.5949 |
| R Squared | 0.0227 | | 0.048 | | 0.095 | |

Test is statistically significant at 1% level (***), 5% level (**) or 10% level (*)

*Source: own calculations*

Estimated coefficients near the SIZE variable in each of the regression models indicate that the amounts of the actual repurchases do not depend on the companies' market capitalization – larger companies do not tend to spend more cash to repurchase their shares than smaller companies from the S&P100 index. The results also provide strong evidence in favour of the free cash flow hypothesis because the variable INVCAP is negatively related to the repurchase level. Increase of the long-term investment by 1% in the current year reduces repurchasing possibilities of the sample firms by 3.8% (3rd model). Similarly, dividend payments determine the level of share repurchases. The negative relation between dividends in the same year and dollar amount spent on share repurchases suggests that firms tend to substitute dividends with buybacks.

The level of free cash flow seems to be insignificant when making a decision to buy back certain amount of stocks. This is, in my opinion, due to the fact that S&P100 companies have generated so much cash on their accounts that an additional percent of the fraction sought authorized for the repurchase does not play a major role any more. Companies can spend money on repurchases at each point in time as much as needed, especially if there are no good investment projects available.

A significant and positive relationship exists between the dependent variable and the number of shares issued in the same year. This result lies in line with the findings of Eberhart and Siddique (2004), who argue that companies trade their shares by repurchasing them and then selling again, enhancing the liquidity. For instance, while collecting information about the actual repurchases on an announcement day I found that during 2005-2014, 12.7% of companies in the S&P100 index had issued new shares in the period from one to two weeks after the announcement about a share repurchase.

Regression analysis confirms the earlier assumptions that sample companies are prone to adjusting actual repurchases to the time of execution of stock option plans. In particular, the amount of stock options exercised in the current year and the dollar amount calculated for stock compensation plans determine the level of actual repurchases. No relation between the repurchases and options outstanding, which includes both vested and unvested options, is observed. This can be explained by differences in the vesting time period for the sample companies, because newly granted options can usually only be exchanged into company shares in several years.

### 4.4.4. Summary of empirical evidence

It is obvious that there is not enough statistical evidence to reject all stated null hypotheses. According to the event analysis results, the size of initiated repurchase program, frequency and trading volume are the most relevant variables that positively relate to short-term abnormal returns. In the long run, no abnormal returns were indicated when trading solely on available public information. The price change in the short time period is quite precise and quick and no abnormal performance in the time period until 3 years after the announcement is observed. For this reason, semi-strong market efficiency with respect to the information cannot be rejected for the S&P100 companies.

With the help of the multivariate regression I could see that an increase in trading volume on the day of announcement and on the first trading day after it leads to an improvement of the short-term post-announcement returns. An increase in trading volume on the announcement day is consistent with some behavioural implications, such as investor sentiment and herding behaviour. Broadly speaking, uninformed investors on the market are surprised to hear good news after a certain period during which a company has previously experienced negative prior returns. Another explanation I could imagine is that hedge funds practicing different event-driven strategies, even by means of algorithmic trading, may actively participate in buying shares on the announcement day. We can see that even several days before an announcement, the daily trading volume is higher than the average volume of the shares traded in the previous month. This finding might be indicative of the insider trading activity which is expressed by traders buying the stock at the lowest possible price.

Furthermore, multivariate regression results clarify possible motives of the management for share repurchases. Hence, empirical evidence shows that the sample firms tend to repurchase more shares if there are no good investment possibilities available or if a firm's management prefers substitution of the dividend pay with stock buybacks. One of the main incentives for management of the S&P100 companies to repurchase the stock seems to be their willingness to eliminate dilution of shares when the stock options are exercised. Table 9 presents the main empirical results.

**Table 9: Summary of statistical testing results**

| Hypothesis | Period | Reject | Sign. level |
|---|---|---|---|
| *1. No abnormal returns are received by repurchase firms in a short event window* | Short-term | Yes | 99% |
| *2. No long-term abnormal returns are received by repurchase firms* | Long-term | No | - |
| *3. The abnormal returns do not depend on the book-to-market ratio* | Short-term | Yes/no[6] | 99% |
| | Long-term | No | - |
| *4. The fraction of shares sought for repurchase has no impact on abnormal returns of a firm* | Short-term | Yes | 99% |
| | Long-term | No | - |
| *5. There is no relation between the actual repurchase and stock option expenses* | - | Yes | 99% |
| *6. Companies do not substitute dividends with share repurchases* | - | Yes | 99% |
| *7. Firms do not repurchase more shares in the absence of investing possibilities* | - | Yes | 99% |
| *8. There is no relation between the trading volume and abnormal returns* | Short-term | Yes | 99% |
| *9. Firms do not tend to increase liquidity by the shares issued following the repurchases* | - | Yes | 99% |

[6] Despite CAR (0,+1) being higher for the sample group with larger than one book-to-market ratio, the 3rd hypothesis cannot be fully rejected for short-term intervals because results may suffer from the representative bias. This group includes only 18 announcements and consists of 10 firms (10% of the sample).

# 5. Investment strategies and investing philosophy

The purpose of this section is to either confirm the uselessness of public information for individual investors in the long term prospective, or to prove that it could be possible to improve the naïve investing strategy by supplementing it with tools from the technical or fundamental analysis. Supplementary to the portfolio theory, some knowledge about the portfolio construction possibilities and investing style might be needed if one would wish to beat the market. Without sticking to a particular strategy is not possible to show how it is performing and which advantages or drawbacks it has.

We all know – opinions differ. In the financial world this is exactly the same. Even assuming that all financial agents have the same securities available and are all rational in the same way when taking decisions, we can hardly ever find two identical investment strategies and philosophies. Investment philosophy is a broader term that demonstrates the beliefs of an investor with regard to how the whole market is functioning. It is important to adopt such an investment philosophy that embodies its own personality. Otherwise, the investment strategies may be inconsistent and even adverse to the investor's individuality resulting in higher transaction costs and underperformance. However, not only personal psychological characteristics, but also access to particular markets and financial instruments, taxes, age, time horizon, size of trading account etc. may define an investment philosophy.

Damodaran (2012) presents several categories of investment philosophies:

- Market timing vs. asset selection
- Active vs. passive investing
- Investment philosophies differ by time horizon
- Contradictory strategies coexist on the market.

Once the investment philosophy is specified, it is time to develop the tactical investment strategy. Considering the high fluctuations on financial markets, development of an effective individual investment strategy is a long and challenging process. The Financial Times gives the following definition of an *investment strategy*: "the decisions investors and fund managers make on how to allocate funds between different asset classes - to achieve returns according to their investment philosophy or style".

The words “investor” and “investing” should be used carefully because not every participant on the financial market can be considered an investor. In the book “The intelligent investor”, the differences between investing and speculative activities are clarified. “An investment operation is one which, upon thorough analysis promises safety of principal and an adequate return. Operations not meeting these requirements are speculative” (Graham, 1973). From this point of view only the buy-and-hold strategy can be considered investing and all other trading activities on the financial market are speculations. He makes the point that no one can expect to earn more than average returns when buying “hot issues of any sort” in short time horizons, but this is possible in the long run. “People who invest make money for themselves; people who speculate make money for their brokers”, so Graham. Nowadays, due to the higher competition between brokers, trading costs have decreased significantly but even if trading conditions became more favourable there is no guarantee for success.

When developing a trading strategy it is essential to define the following:

- *Time interval*. Strategies may be run within an extra-short time interval, even during several milliseconds (e.g. high frequency trading), in medium time frames (hours, days) or long-time strategies (years).
- *Entry*. Independently from the investing (trading) horizon, each (technical as well as fundamental) analyst performs analyses in order to find out if it is the right time to buy or sell a security. However, market timing is very difficult to implement in practice.
- *Exit*. The exit strategy has the highest priority for short-term investment strategies, because they are usually run in shorter time frames, in which prices are much more noisy than in longer intervals. This leads to frequent changes in trends and corrections. Without a proper and timely exit point, a strategy may generate severe losses.
- *Taken risk*. This allows the performance of risk management with the purpose of keeping the discipline and limiting the amount of risk that investor is prepared to take. Otherwise, requiring higher returns, an investor may face too high of a risk of generating losses. With the development of online trading and sophisticated trading platforms at least minimal risk control techniques may be applied to a strategy. For example, some trading platforms provide the possibility to set risk (e.g. expressed in terms of the maximum allowed position size) as a percentage of a trading account or in absolute value and then make sure that these settings are not violated.

- *Position size*. The size of a new position depends on the risk assessments, specifics of the portfolio construction and the size of a trading account.

Each investment strategy has to be back-tested because very often investors do not take trading costs and taxes into account or build a strategy that is very difficult to implement. Strategy back-testing allows investors to observe on historical charts how a strategy would perform in real market conditions. Moreover, it is necessary to conduct a back-test on multiple markets with different volatility. If possible, at least approximate trading fees as well as slippage parameters should be taken into consideration when calculating the returns.

Depending on the investing goals and time horizon, opposite investment strategies can be broken down into several broad categories:

**Figure 5: Categorization of investment strategies**

| | |
|---|---|
| Long-term (buy-and-hold) or market timing strategies | •Buy-and-hold strategies are intended for investors with long investing horizons and a passive approach<br>•Market timing refers to the search for the most "favourable" moment to buy or sell securities based on the analysis of the market conditions |
| Strategies that need to be rebalanced within certain time intervals or strategies that do not require rebalancing | •Rebalancing strategies are applicable for portfolios, for which a certain amount of risk should be kept. Rebalancing assumes that an investor revises the current portfolio composition and brings it to the former state. |
| Fundamental or technical investment strategies | •Fundamental strategies are based on empirical estimations and analyses of economic indicators, balance sheets etc. in order to predict the price movements<br>•Technical strategies refer to past prices and trend analyses |
| Contrarian or momentum strategies | •Contrarian or counter-trend strategies focus on opening a position opposite to the market current trend<br>•Momentum strategies, on the contrary, attempt to find past winners to invest in and past losers for short selling |

*Source: own composing*

In total, eight event-driven investment strategies including those mentioned in the empirical part will be investigated in this Master's Thesis. Their description can be found in Appendix 4.

## 5.1. Technical Analysis

Technical analysis is also often known as chartism or charting and uses historical prices for the prediction of future price movements. This is a visual and quite intuitive method because it is based on the algorithm of recognizing the typical price patterns and trends. As far as this algorithm is developed, is can be applied to various financial instruments to determine the efficacy of different trading indicators (Lo, Mamaysky and Wang, 2000).

Murphy (1999) defines technical analysis as "the study of market action, primarily through the use of charts, for the purpose of forecasting future price trends" whereas market action includes three "sources of information: price, volume and open interest". All information that is necessary for making predictions is supposed to be shown on the chart via supply and demand, which determine the price move.

Recent evidence regarding the performance of technical strategies is mixed. Hartono and Sulistiawan (2015) show that technical strategies realize higher returns in bearish markets than buy-and-hold strategies, but perform worse in an uptrend market. Investigation of technical and fundamental recommendations towards buying or selling a comprehensive list of assets during November 2011 to December 2014 was carried out by Avramov, Kaplanski and Levy (2015). The results demonstrated that a higher proportion of technical recommendations are correct and also generate larger CAR, whereas incorrect recommendations lead to lower losses than incorrect recommendations of fundamentalists. On the other hand, Kuang et al. (2014) say that profitability of technical trading is biased by data snooping[7]. They examined 25,988 trading strategies for emerging foreign exchange markets and came to the conclusion that almost all profits become insignificant if they are free of data-snooping bias.

Due to the fact that technical trading rules exclude any analysis or day-to-day monitoring of corporate news, it is not possible to construct a pure technical trading strategy pertaining to share repurchase announcements. Alternatively, separate tools from technical analysis such as a moving average indicator or the Dow Jones Theory may be applied to a combined trading strategy with rebalancing.

[7] Data snooping or data mining bias arises when there are pseudo-significant relationships between variables, which are not plausible in economic terms.

### 5.1.1. Moving-average rules

In technical analysis, moving average indicators are very popular. With their help, chartists track the price development through time, especially on daily charts. Prices in smaller time intervals (e.g. minutes or hours) are usually too fluctuating, which limits usage and proper interpretation of these indicators.

There are two main groups of moving averages (Murphy, 1999):

1. The simple moving average (SMA) – at each point in time, this shows the arithmetic mean of a security price calculated over the given time period in the past. The commonly used moving averages in charting are SMA (20), SMA (50) and SMA (200), where the numbers in brackets indicate the number of days prior to the current day. However, moving averages can be calculated for any desired time period. Each daily price is weighted equally in this case.
2. The exponentially smoothed moving average (EMA) – assigns more weight to the latest prices and underestimates the impact of prices at the beginning of the period of calculation.

Moving averages smooth prices over time and allow traders to identify trends on a chart. Moving average rules are very simple: if the price moves above/below an indicator (SMA or EMA) this generates a buy/sell signal. It should be noted that SMA (20) will move much closer to the chart than SMA (50) or SMA (200) and each price deviation may generate a buy or sell signal. Therefore following this rule in short time intervals may be dangerous because crossing of the indicator occurs as a result of high price fluctuations and not because the trend is changing its direction. Moving average indicators are demonstrated in Figure 6 below.

**Figure 6: Example of SMA(20), SMA(50) and SMA(200) on a chart**


*Source: made via the trading platform "AgenaTrader"*

Many chartists utilize information given by two or three different SMA or EMA indicators simultaneously. Murphy (1999) calls this method "double crossover": if a shorter average crosses a longer moving average from below/above, then a buy/sell signal is generated. The triple crossover method can be applied in an analogous way. Longer moving averages can help to detect long-lasting trends associated mostly with business cycles.

### 5.1.2. Following the trends

The existence of positive autocorrelation in prices during some periods leads to the development of the up- and downtrends. An uptrend occurs when each subsequent period of growing prices closes higher than the previous high, and the period of falling prices also closes higher than the previous low and vice versa for a downtrend (Murphy, 1999). In technical analysis, identification of trends is absolutely essential in order to understand how the financial market works. Technical analysts do not care about how the market incorporates available information and do not try to investigate why a trend is moving in one direction or the other. Looking at the past information, analyzing the chart patterns or trends, traders expect to observe similar price behaviour in the market. The main challenge, however, is not the market itself but traders, who are responsible for price movements. Market participants are not rational, or to put it better – they all think they are rational in their own way. Short-term trends may occur even with no apparent reason but due to the subjective decisions of millions of traders every day.

Charles Dow made a significant contribution to technical analysis of the market. The basic tenets of the Dow Theory are described by Murphy (1999):

1. *The averages discount everything*. In other words averages (Industrial and Rail averages) have already discounted for all information and there is no reason to search for any misvaluations. In the case of unexpected events the price corrects immediately.

2. *The market is characterized by three trends*: the primary, secondary and minor trend. Minor trends are the smallest; they build up the secondary trends, which in turn represent corrections in the primary trends. There are references regarding how long each trend approximately lasts, e.g. maximum three weeks for minor trends, but each trader is influenced by his or her own considerations when determining a trend.

3. *Primary trends have three phases*: an accumulation, a public participation and a distribution phase. In the example of an uptrend, the first phase begins with the buy orders by informal traders (e.g. insiders). However, the prominent institutional traders, who are able to recognize the most favourable price, can also actively participate in the accumulation phase. It continues with increasing participation of other traders in the trend. The behaviour in the public participation phase resembles herding because uninformed traders start to follow a trend by placing the buy (or sell) orders as the majority did before them. When public participation and speculation volume increase, informed traders begin placing orders in the opposite direction earlier than all others do. Should this process start in the uptrend, for example, and if there are no longer any traders who wish to buy, the price inevitably goes down. For this reason, the major task of each trader is to enter and exit the market as early as possible.

4. *The averages must confirm each other*. The change in trend direction is not confirmed unless both averages deliver the same signal. This means that the averages should rise above the previous high or fall lower than the previous low together (not necessarily at the same moment) to indicate the beginning of the bull or bear market.

5. *Volume must confirm a trend*. The more advanced the stage of a trend, the more it should be supported by increased trading volumes. In other words, on bullish markets larger long positions are expected and on bearish markets – larger short positions.

6. *A trend is effective until the reversing signal occurs*. Reversal in the trend occurs if there is a new closing price that is lower than the previous lowest trough (valid for an uptrend reversal) or higher than the previous peak (valid for an downtrend reversal). Until this

moment, a trend is still not broken and a price move in the opposite direction is just a correction.

Often when making a decision to go long or short, traders rely on the human psychology, hoping that someone else buys or sells after their position has been opened. Then a trend must persist long enough in order for a technical strategy to at least allow the trading costs to be covered. Therefore, trading based on trends is very hard because you never know when the next reversal will occur.

## *5.2. Fundamental Analysis*

Fundamental analysts use statistical or economic calculations in order to find out where the market currently is and what its intrinsic value is. It is about searching for future prospects relying on the current economical state of a company. Analysts attempt to understand what forces prices to move and they put much work into analysis. Fundamentalists are able to focus only on a limited amount of securities at each point in time because a high level of accuracy, competence in finance and time are required to carry out fundamental analysis. Along with the calculation of various ratios and elaboration of the balance sheets, cash flow statements and other related financial reports of different firms as a part of fundamental analysis may also be the development of various mathematical models for analysis of the effects of managerial structure, corporate policy, companies' events, industry or regulation.

In recent years the internet has become overloaded with different analysts' recommendations of whether to buy, sell or hold a security, but they often "provide no investment value", say Avramov, Kaplinski and Levy (2015). In comparison to technical analysis, which is basically referred to as on-the-spot decisions, fundamental analysts' recommendations are more or less applicable for making long-term investments. One of the reasons is that financial information from companies' reports is already outdated when the evaluation starts.

The basic concepts of fundamental analysis are value and growth investments. They represent different sides of the same coin, namely two alternative approaches of asset selection based on the same accounting information and forming the corresponding portfolios. While a goal of value investing is to recognize underpriced securities on the market – commonly by the low price-to-earnings, market-to-book ratios etc., growth investing focuses on outperforming in the last period assets, which are supposed to deliver better-than-average results in the next time period. The opinions about performance of these types of strategies are mixing. Chan and Lakonishok (2004) compared value and growth strategies between 1979 and 2001 and came to the conclusion that value stocks earn higher returns than growth stocks. The authors deny arguments that higher returns might occur as the reward for increasing risk exposure. As the contributing factor to such performance they consider behaviour of professional asset managers, who tend to overinvest in value stocks, which makes them overpriced in comparison to the growth stocks.

As an additional source of information along with accounting, financial, and industry data, common investors quite often use public news or even rumours. However, this falls within a separate category, which only indirectly pertains to fundamental analysis.

### *5.3. Active and passive portfolio management*

An *active portfolio strategy* uses available information and forecasting techniques to seek a better performance than a portfolio that is simply diversified broadly (Fabozzi and Markowitz, 2002). Active managers construct their investment portfolio by themselves by picking up the necessary stocks or other financial instruments.

Active strategies are an attempt to outperform the market by doing one of the following (Fabozzi and Markowitz, 2011):

1) Timing market transactions, e.g. in technical analysis.
2) Identifying undervalued or overvalued stocks with the help of fundamental analysis.
3) Selecting the stocks with regard to one of the market anomalies.

Active strategies are selected by managers, who believe that inefficiencies in pricing are not rare and that they can systematically beat the market. The problem with active strategies is that they must be revised more often than passive strategies, incurring additional costs.

Passive portfolio construction is based on tracking the market without attempting to investigate the past prices or carrying out an analysis of securities (Amenc and Le Sourd, 2003). Managers who implement a passive strategy believe that the market is more or less efficient, therefore active investing is not able to systematically yield higher-than-average profits. The aim of such a strategy is not to beat the market but rather to receive the highest return for level of risk taken. One example of such a strategy is buying an asset and holding it for a long time period. Replication of a market index by investing in given proportions of securities forming such an index refers to a passive strategy as well. This approach follows the diversification principle, which allows decreasing of the specific portfolio risk. One challenge of such portfolio construction is the difficulty of replicating of a benchmark index. Moreover, there is no possibility for an investor to respond to changes in market conditions, except by selling the index. Development of passive strategies gave rise to index funds and exchange-traded funds. According to some studies (Ojih (2014), Frino and Gallagher (2001)), on average, passive mutual funds perform better then actively managed funds.

In practice, however, there are investors who pursue different degrees of active management and different degrees of passive management (Fabozzi and Markowitz, 2011).

# 6. Implementation of event-driven strategies

I do not intend to find the most profitable investment strategy in this Master's Thesis. The objective is to demonstrate the performance of different event-driven strategies in order to see to which extent the information about share repurchases may be valuable for an average investor or a trader. Moreover I would like to see whether it is possible to outperform the S&P100 index without increasing the risk level.

Statistical evaluation also showed that any of the naïve strategies (portfolios constructed in calendar time) would outperform the market. The main problem of these strategies is that the investor does not check whether firms really repurchase their stock or if an announcement has been used as a tool for very short-term stimulation of price growth. According to the empirical results, the announcements about a new share repurchase program authorization only produces a positive effect during the first two days. Then one week later, the prices correct, offsetting the previous increase in returns. On the other hand, managers will not continuously repurchase companies' stock if they think that the price is too high, otherwise this would harm the shareholder value. Therefore, for a long-term investor who does not track the news, the information about actual repurchases could be much more beneficial.

In the subsequent sections, the performance of two more portfolios will be evaluated. The first is constructed according to the technical rules and the second will take into account the actual quarterly repurchases of the sample companies.

## *6.1. Technical event-driven strategy*

The technical portfolio is designed for day traders and requires rebalancing. Share repurchase announcements will be used as entry signals in the same way as in the naïve long-term strategy. The difference is that not all stocks of announcing companies will be traded. Should the closing price of the last bar before the announcement day lie below the SMA200 indicator then the information about the intention to buy back stock will be ignored, otherwise a long position will be opened. In this way, 231 announcements of 308 have been traded from the beginning of 2005 to the end of 2014. The remaining stock did not fulfil the requirement for the entry stated above. The stock is kept in a portfolio until the exit signal – according to the technical rules – would close a trade. A signal for closing a long position occurs if the current price crosses the SMA50 indicator from above. Hence, the time period for a trade is not defined beforehand. The stock may be even sold several hours after opening the position, or stay in the portfolio for several months. Part sells are required to keep the portfolio equally weighted at each point in time. Figure 7 below demonstrates an example of opening and closing of a long position according to the technical strategy rules.

**Figure 7: Entry and exit signal of the technical strategy shown on a chart**


*Source: made via the trading platform "AgenaTrader"*

Many companies from the S&P100 sample do not announce new share repurchases when a price is at its lowest. They often adjust a day of announcement to the accounting reference period (e.g. at the end of a quarter or a fiscal year) and time for exercising the stock options. For this reason, the best price for buying a stock is not always offered on the event day. This leads to some trades having to be closed with a loss. On the other hand, if the announcement takes place at the beginning of a long-term downtrend then sticking to the technical strategy in some cases results in losing the profitable possibilities. The reason is that the closing price of the latest bar is placed under the 200-moving average line and the stock is therefore not taken into the portfolio. Simultaneously, the SMA200 rule allows losses to be avoided because traders will not buy a stock in a downtrend, as is the case with the naïve strategy.

## *6.2. Fundamental event-driven strategy*

Basically, all stocks from the sample are categorized as glamour stocks because they are chosen to be in the S&P100 only under fulfilment of particular criteria, e.g. large market capitalization. Thereby the development of value strategies based on identification of underpriced firms makes no sense. Growth investing strategies are very resource- and time-consuming. For this type of analysis it is not enough to solely examine the financial ratios. It is advisable to carry out an industry analysis, keep up on companies' public news, plans for the future and other company-related information to estimate the real opportunities for firms' further development. Moreover, the over-average past performance does not automatically guarantee that the next time period will be even more successful because growth cannot last forever.

As we saw before, the classical performance measures such as size and book-to-market ratio do not define returns of these firms in the post-announcement period. From this point of view it makes no sense to apply the mentioned variables for the selection of stocks that are going to be included into a portfolio. For these reasons I decided to use a buyback ratio as a decision variable in the fundamental strategy. Only companies with the highest buyback ratio will form a portfolio – so-called buyback index by analogy with the methodology of Standard&Poors (see S&P Dow Jones Indices, 2015).

By selecting such a strategy, I assume that by contrast with announcements about a planned share repurchase, which essentially serves very short-term price movements, in the long run the S&P100 firms are disposed to actually purchase their stock back at the lowest possible price. Otherwise this would be unreasonable for the management. Even if many repurchases fall in the same time interval as the exercising of stock options, the massive expenses of repurchasing the stock may reveal some insider information about the growth expectations. Buying a stock of the companies with the highest buyback ratio allows one to resemble the behaviour of insiders in a long run without a need to investigate which company has the best chances to grow in the near future.

### 6.2.1. Investing in buyback index

The S&P 500 buyback index, composed by S&P Dow Jones Indices LLC, "measures the performance of the top 100 companies with the highest buyback ratio in the S&P 500" (S&P

Dow Jones Indices, 2015). According to the back-testing results of the S&P Dow Jones Indices, the S&P 500 buyback index claims to significantly outperform the S&P 500.

**Figure 8: Performance of the S&P500 Buyback Index in 2006 – 2016**


*Source: S&P Dow Jones Indices LLC*

If investors wish to replicate the index they would need to buy ETF (e.g. SPYB on NYSE) or try to reproduce it on their own, following the methodology of S&P Dow Jones Indices LLC:

1. Collect data on the actual share repurchases of the companies included into the S&P 500 during the trailing period of 12 months, ending one quarter before the reference date.
2. Define rebalancing dates for the portfolio on the last trading day of March, June, September and December.
3. After each rebalancing date, calculate the buyback ratio for each company as the monetary amount of cash spent for share repurchases in the last 4 calendar quarters divided by its market capitalization prior to the beginning of the 12-month period.
4. Select the 100 companies with the highest buyback ratio and include them into the equally weighted portfolio, keeping them until the next quarter when the portfolio is rebalanced.

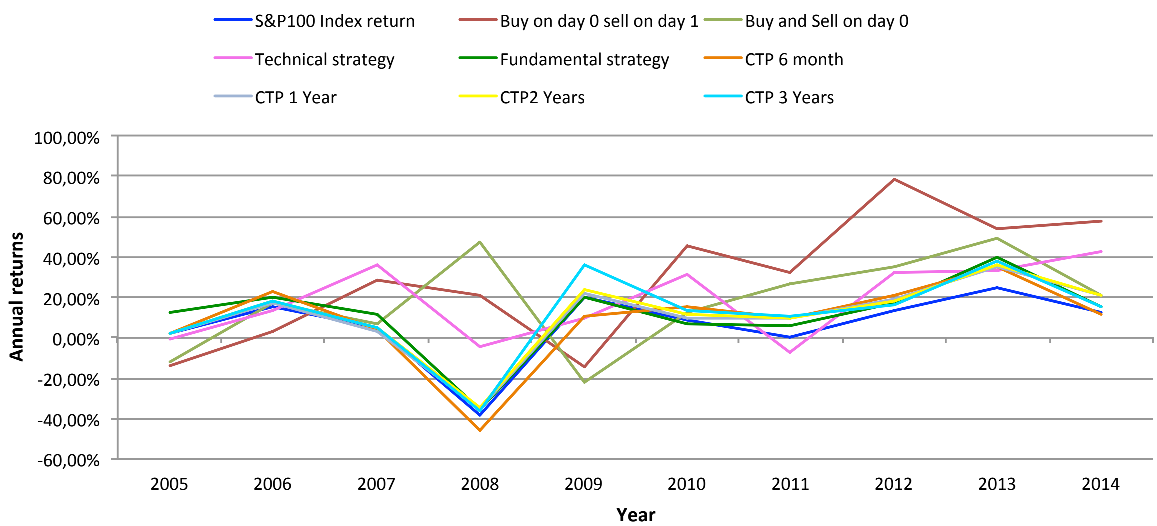
Due to the fact that no ETF based on S&P 100 buyback information exists, I will need to stick to the methodology described above. The only difference is that instead of 100 companies each quarter, I select 20 firms with the highest buyback ratio. This number will correspond to the 20% of the sample as in the design of the S&P Dow Jones Indices LLC.

### *6.3. Performance of the event-driven strategies*

As discussed in the former sections, performance of the eight portfolios is estimated relative to the benchmark, which in this case is represented by the S&P100 index. The description of all investment strategies can be found in Appendix 4.

A strong positive correlation exists between the S&P100 index monthly returns and returns of the long-term strategies, such as calendar-time portfolios held during 6 months (84.8%), 1, 2 and 3 years (86.3%, 85.7% and 86.2% respectively), the fundamental (87.8%) and the technical strategy (49.2%). By contrast, the returns of both short-term strategies – buying on the announcement day and holding a stock during one day or two days – are negatively correlated (-0.03% and -0.16%). The explanation of this result might be that the most positive market reaction to the repurchase announcements is observed during the downturn periods. Hence, these two strategies managed to avoid losses in 2008 when the market was in recession due to the financial crisis, but proved to be ineffective in 2005 and 2009.

**Figure 9: Annual portfolio returns in the period 2005-2014**




*Source: based on own calculations*

Figure 9 above illustrates the annual returns of all portfolios. It can be clearly seen that all calendar-time portfolios and the fundamental strategy almost replicate the performance of the S&P100 index on a yearly basis. At the same time, the short-term strategies demonstrate much better annual returns in some years, and underperformance in other. That is to say that better performing strategies are characterized by a higher standard deviation of returns and therefore exposed to greater risk. The most volatile are returns of the strategy – to buy a stock on an announcement day and sell on the next trading day. The largest loss of -14.43% of the portfolio cumulated in 2009, but after the crisis the portfolio was steadily outperforming all other portfolios. However, we can see that the market overreaction on the day 1 after the announcement is not stable with the peaks in years 2010, 2012 and 2014.

The annual returns of the portfolio built in line with the technical rules are also quite volatile, but the advantage of this strategy is that the divergence in returns is mainly driven by unexpected profits rather than losses. The technical strategy limits downside risk by early exit when the market reaction is not as positive as expected or not opening a long position if a stock is already in a downtrend.

Statistical characteristics of the investing strategies are presented in Table 10.

**Table 10: Overview of the portfolios' monthly performance**

| Strategy | S&P100 Index | Buy on day 0 & Sell on day 1 | Buy & Sell on day 0 | Technical strategy | Funda-mental strategy | CTP 6M | CTP 1Y | CTP 2Y | CTP 3Y |
|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 0.00484 | 0.02093 | 0.01359 | 0.01410 | 0.00889 | 0.00605 | 0.00804 | 0.00862 | 0.00923 |
| **Median** | 0.00886 | 0.01580 | 0.00922 | 0.00431 | 0.01745 | 0.01003 | 0.01228 | 0.01361 | 0.01150 |
| **Maximum** | 0.08108 | 0.19467 | 0.16833 | 0.14060 | 0.12444 | 0.09054 | 0.14425 | 0.15917 | 0.18607 |
| **Minimum** | -0.18207 | -0.18232 | -0.21765 | -0.08124 | -0.20748 | -0.27217 | -0.21886 | -0.20247 | -0.20923 |
| **Std. Dev.** | 0.04018 | 0.05825 | 0.04775 | 0.03855 | 0.04835 | 0.04793 | 0.04614 | 0.04724 | 0.04914 |
| **Skewness** | -1.29497 | 0.05408 | -0.42320 | 0.45656 | -1.20952 | -1.98557 | -1.23309 | -1.05913 | -0.78526 |
| **Kurtosis** | 3.96776 | 1.98919 | 5.95207 | 1.42296 | 3.86232 | 9.34380 | 5.25441 | 4.36687 | 4.48453 |
| | | | | | | | | | |
| **Sharpe Ratio (monthly)** | 0.091 | **0.338*****| **0.259**** | **0.335***** | 0.159* | 0.101 | 0.148 | 0.157* | 0.162* |
| **Sharpe Ratio (annualized)** | 0.315 | **1.170***** | **0.899**** | **1.159***** | 0.552* | 0.351 | 0.514 | 0.544* | 0.563* |
| **T-Stat** | 0.997 | 3.700 | 2.842 | 3.664 | 1.745 | 1.111 | 1.625 | 1.721 | 1.780 |
| **Alpha** | -0.0018 | **0.019***** | **0.013***** | **0.010***** | 0.001 | 0.0001 | 0.0015 | 0.0016 | 0.0023 |
| **T-Stat** | -1.244 | 3.521 | 2.938 | 3.211 | 0.937 | 0.643 | 0.973 | 1.052 | 1.651 |

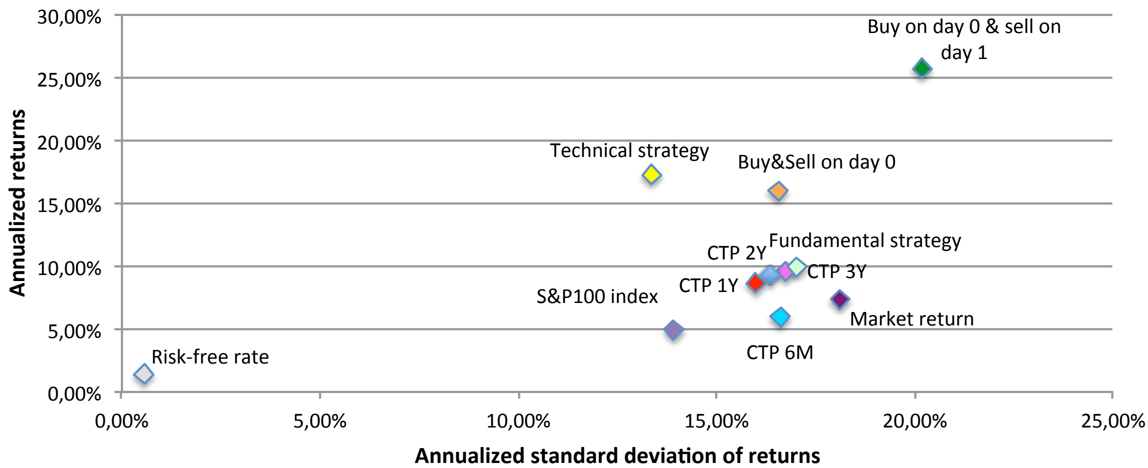
Test is statistically significant at 1% level (***), 5% level (**) or 10% level (*)

*Source: based on own calculations*

In terms of monthly deviation of returns all portfolios are quite similar, however, the technical strategy seems to be the safest – the monthly returns are skewed to the right, the standard deviation of 3.8% is the smallest and the average monthly returns are 1.4%. It may be profitable for a trader to buy a stock on the announcement day and sell on the next day, but the variation in returns is the highest as well. To measure risk-adjusted performance of each portfolio the Sharpe ratios have been calculated. This ratio shows how much return gives a particular strategy per unit of risk (volatility). Again, the two strategies discussed above provide the highest return with 95% of significance.

As raw data for all strategies, the monthly returns were used. In order to receive annualized returns I multiplied the monthly estimations of returns and standard deviations by the square root of 12. Figure 10 illustrates the portfolios scattered according to their returns and risk parameters. By selecting a strategy that offers higher return, investors must understand that both higher returns but also unexpected losses might happen, meaning that outperformance is nothing else than a reward for accepting more risk. Such an example would be the strategy to hold a stock until the end of the first day after an announcement. The strategy to buy a stock and sell it on the announcement day and the calendar-time rolling portfolio with the 6-month holding period for each stock basically involves the same level of risk, but the difference in annualized ex-post returns is 10.06%.

**Figure 10: Risk/Return profile of the portfolios**




*Source: based on own calculations*

Because of the low downside risk, the technical portfolio seems to surely outperform the S&P100 index. However, no trading costs, taxes and other fees have been considered in calculation of the returns. The short-term portfolios require frequent rebalancing so that securities are equally weighted at all times, otherwise these strategies would become too risky. Based on approximate buying and selling frequency of shares I expect the costs of rebalancing the technical strategy to be at least 3-4 times higher than those of replicating the S&P100 index. One more important note is that the entry into each of the short-term strategies occurs at the market opening on the day of the repurchase announcement. Should the public be notified about this at a later point in time, then the investor might lose a part of the returns, bearing the additional opportunity costs. For this reason I suppose that in a long-term perspective, in real market conditions, the distinction in returns of the portfolios will not be that large.

The higher risk of the fundamental strategy, on the other side, is mainly determined by lower amount and diversification of assets included into the portfolio. Nevertheless, risk can be decreased by the addition of the repurchasing companies. In general, the not very high profitability of this strategy confirms the preceding evidence that the S&P100 companies combine actual share buybacks with the permanent share issues as well as cancellation of the exercised stock option plans.

# 7. Conclusion

The evidence obtained in this Master's Thesis should be considered from different angles. First, the share repurchase announcements made by the most powerful US companies were examined. These announcements are treated positively by market participants, in a similar way to the repurchases of smaller and more opaque firms. However, the informational content is different. The evidence shows that companies included into the S&P100 index use repurchase announcements mostly for reducing the negative impact of exercising the stock option plans. Share repurchases are also considered to be a good alternative to bad investment opportunities. More than 60% of companies in the sample do not pay too much attention to the market timing, therefore many announcements are made when the stock price is not the lowest.

Secondly, according to the empirical results, the market reaction to the share repurchase announcements is prompt on the day 0 with the overreaction on the day 1. After the financial crisis, the short-term post-announcement inefficiencies lead by overreaction become more visible. Because of this overreaction, trading on the first two days proved to be very profitable during the investigated period, except in 2009. Nevertheless, the price correction occurs during the first week so that it almost reaches the level on the announcement day. A driving factor for decrease in price might be, however, stock issues conducted by the repurchasing companies. At the same time, the initial market reaction does not define the future price growth, therefore holding a stock after the announcement provides no possibilities for outperformance in a long run.

Thirdly, the investigation of different investment strategies shows that it may be possible to beat the market by combining several approaches, which allows elimination of the downside risk and simultaneously creates possibilities to increase the profits. Only three strategies were able to avoid the large losses in 2008 – to buy and sell on the day 0, to buy on the day 0 and sell on the day 1 as well as the technical strategy. The first two portfolios are limited only by daily returns occurring on the day zero or the first two days. Incurring high losses in 2005 and 2009, they prove that the market was not always favourable to the repurchase announcements. The technical strategy is constructed in such a way as to pick up stock only in an uptrend and hold it until it is not broken. I did not consider trading costs for this analysis which is why the results should be regarded cautiously. There is no guarantee that the abovementioned portfolios would outperform the S&P100 index in real market conditions.

Besides, it remains to be proven whether these strategies will show similar results in the future.

According to Bodenkamp (2010), the successful trading strategies only indicate the stock market inefficiency but cannot prove it. The reason lies within the difficulty to determine whether returns are expected or abnormal. Consequently, any abnormal return can be captured by higher risk, which is not properly included into the applied trading technique.

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## Internet resources

Financial Times Lexicon: http://lexicon.ft.com/Term?term=investment-strategy

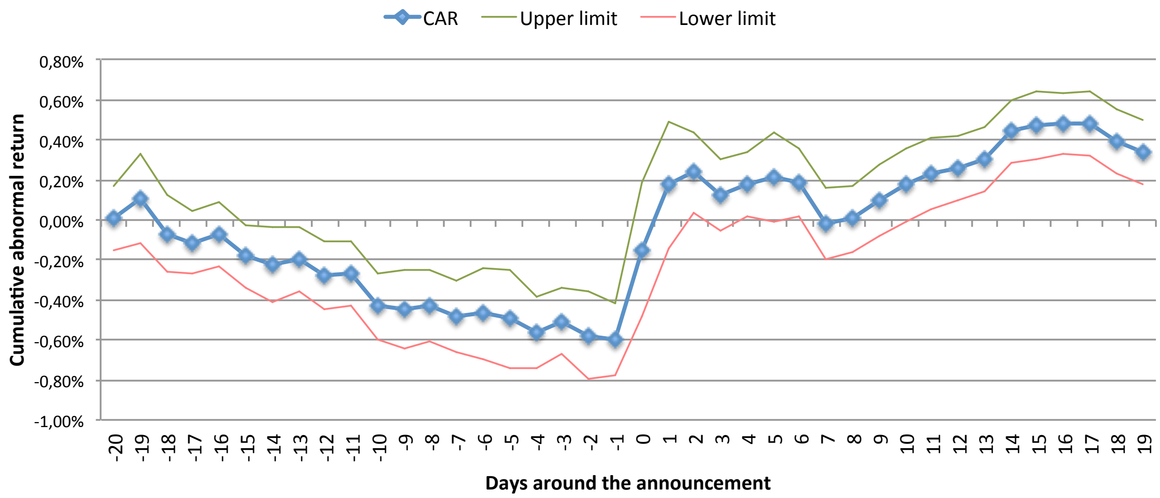
# Appendixes

## Appendix 1. Daily abnormal returns and cumulative abnormal returns over the event window (-20;20) days

| Day relative to an event | AR | T-Stat | Day range | CAR | T-Stat |
|---|---|---|---|---|---|
| *-20* | 0.03% | 0.146 | *-20* | 0.03% | 0.146 |
| *-19* | 0.29% | 1.394 | *-20 to -19* | 0.33% | 1.088 |
| *-18* | **-0.54%**** | -2.532 | *-20 to -18* | -0.21% | -0.573 |
| *-17* | -0.14% | -0.686 | *-20 to -17* | -0.35% | -0.839 |
| *-16* | 0.14% | 0.666 | *-20 to -16* | -0.21% | -0.453 |
| *-15* | -0.35% | -1.640 | *-20 to -15* | -0.56% | -1.083 |
| *-14* | -0.12% | -0.562 | *-20 to -14* | -0.68% | -1.215 |
| *-13* | 0.08% | 0.446 | *-20 to -13* | -0.60% | -1.009 |
| *-12* | -0.25% | -1.104 | *-20 to -12* | -0.86% | -1.351 |
| *-11* | 0.03% | 1.180 | *-20 to -11* | -0.82% | -1.234 |
| *-10* | **-0.51%**** | -2.460 | *-20 to -10* | -1.33%* | -1.902 |
| *-9* | -0.04% | -0.074 | *-20 to -9* | -1.38%* | -1.879 |
| *-8* | 0.05% | 0.221 | *-20 to -8* | -1.33%* | -1.745 |
| *-7* | -0.17% | -0.781 | *-20 to -7* | -1.50%* | -1.893 |
| *-6* | 0.06% | 0.291 | *-20 to -6* | -1.44%* | -1.759 |
| *-5* | -0.08% | -0.255 | *-20 to -5* | -1.52%* | -1.801 |
| *-4* | -0.21% | -0.909 | *-20 to -4* | -1.73%* | -1.985 |
| *-3* | 0.17% | 0.907 | *-20 to -3* | -1.56%** | -1.738 |
| *-2* | -0.22% | -0.976 | *-20 to -2* | -1.78%* | -1.935 |
| *-1* | -0.06% | -0.228 | *-20 to -1* | -1.84%* | -1.951 |
| ***0*** | **1.39%***** | 6.706 | *-20 to 0* | -0.45%* | -0.469 |
| *1* | **0.99%***** | 4.707 | *-20 to 1* | 0.54% | 0.546 |
| *2* | 0.19% | 1.041 | *-20 to 2* | 0.73% | 0.725 |
| *3* | -0.35%* | -1.724 | *-20 to 3* | 0.39% | 0.373 |
| *4* | 0.16% | 0.925 | *-20 to 4* | 0.54% | 0.515 |
| *5* | 0.13% | 0.659 | *-20 to 5* | 0.67% | 0.622 |
| *6* | -0.09% | -0.282 | *-20 to 6* | 0.57% | 0.524 |
| *7* | **-0.63%***** | -2.965 | *-20 to 7* | -0.06% | -0.053 |
| *8* | 0.08% | 0.515 | *-20 to 8* | 0.02% | 0.017 |
| *9* | 0.29% | 1.338 | *-20 to 9* | 0.31% | 0.264 |
| *10* | 0.24% | 1.148 | *-20 to 10* | 0.55% | 0.465 |
| *11* | 0.16% | 0.743 | *-20 to 11* | 0.70% | 0.589 |
| *12* | 0.10% | 0.566 | *-20 to 12* | 0.81% | 0.663 |
| *13* | 0.13% | 0.513 | *-20 to 13* | 0.94% | 0.761 |
| *14* | 0.43%* | 2.061 | *-20 to 14* | 1.37% | 1.094 |
| *15* | 0.09% | 0.592 | *-20 to 15* | 1.46% | 1.151 |
| *16* | 0.03% | 0.182 | *-20 to 16* | 1.49% | 1.161 |
| *17* | 0.00% | 0,012 | *-20 to 17* | 1.49% | 1.144 |
| *18* | -0.28% | -1.288 | *-20 to 18* | 1.21% | 0.917 |
| *19* | -0.16% | -0.656 | *-20 to 19* | 1.05% | 0.785 |
| *20* | -0.19% | -0.803 | *-20 to 20* | 0.86% | 0.635 |

Test is statistically significant at 1% level (***), 5% level (**) or 10% level (*)

## Appendix 2. CAR from -20 to +20 trading days around share repurchase announcements




Cumulative abnormal returns (CAR) are calculated as a sum of abnormal returns on each trading day for each company within the event window (-20, +20). The X-axis displays trading days around the day of announcement "zero". This part of the graph, which lies under the zero line of the Y-axis, shows that on average sample companies experience less returns than expected and CAR above the zero line indicate outperformance. The area between the green (upper) and the red (lower) lines shows the 99%-confidence interval (CI), calculated as: sample mean ± std.error.

*Source: based on own calculations*

## Appendix 3. Correlation coefficients between independent variables used for multivariate regressions

| | BM | SIZE | PR_SIZE | PRIOR_RET | ABTV(0) | ABTV(+1) | ABTV(-1) |
|---|---|---|---|---|---|---|---|
| BM | 1,0000 | | | | | | |
| SIZE | -0,1432 | 1,0000 | | | | | |
| PR_SIZE | -0,1275 | -0,0457 | 1,0000 | | | | |
| PRIOR_RET | 0,1295 | -0,0585 | -0,0286 | 1,0000 | | | |
| ABTV(0) | -0,0073 | 0,1089 | 0,1866 | -0,0900 | 1,0000 | | |
| ABTV(+1) | 0,0334 | 0,0650 | 0,1575 | -0,0777 | 0,3500 | 1,0000 | |
| ABTV(-1) | -0,0610 | 0,0125 | -0,0151 | -0,2756 | 0,3226 | 0,2141 | 1,0000 |

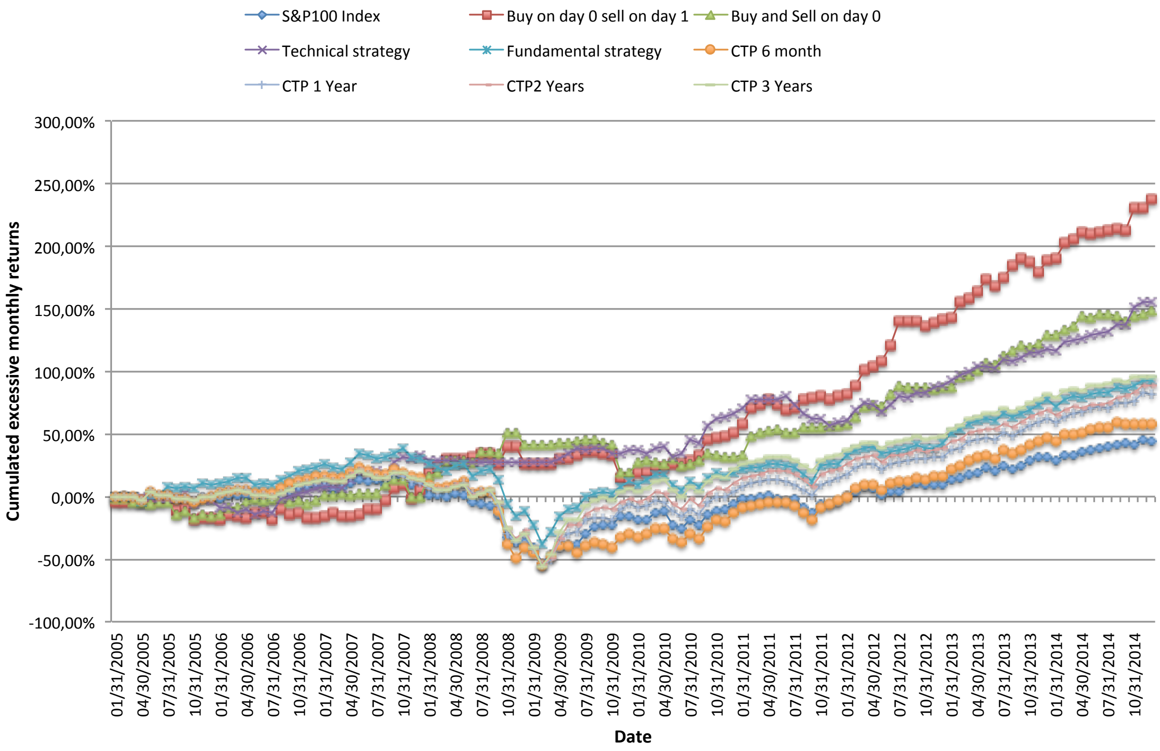
| | SH_ISSUE | SIZE | INVCAP | CASH | DIV | OPT_EXC | OPT_OUT | STK COMP |
|---|---|---|---|---|---|---|---|---|
| SH_ISSUE | 1,0000 | | | | | | | |
| SIZE | 0,0451 | 1,0000 | | | | | | |
| INVCAP | -0,1512 | 0,1807 | 1,0000 | | | | | |
| CASH | -0,0446 | 0,2092 | 0,4958 | 1,0000 | | | | |
| DIV | 0,2751 | 0,2523 | 0,1731 | 0,0604 | 1,0000 | | | |
| OPT_EXC | 0,0168 | 0,0774 | 0,0841 | 0,2194 | -0,0800 | 1,0000 | | |
| OPT_OUT | 0,0161 | 0,0301 | 0,1067 | 0,1600 | -0,0369 | 0,4033 | 1,0000 | |
| STKCOMP | -0,0987 | -0,2242 | -0,1217 | -0,1088 | -0,1998 | -0,0182 | 0,1147 | 1,0000 |

## Appendix 4. Description of the investing strategies

| Strategy | Portfolio formation | Rebalancing |
|---|---|---|
| ***Buy and Sell on the day 0*** | As far as a company, currently included into the S&P100 index, has announced via public media sources (such as a website, online magazines) about its intention to buy back its stock on the open market or increase the already authorized repurchase program, this stock is included into the portfolio. It is held in the portfolio for *one day* and the position is closed when the market is closed. | Not necessary, but if there are several announcements made on the same day then the portfolio is rebalanced to keep it equally weighted. |
| ***Buy on the day 0 and Sell on the day 1*** | As far as a company, currently included into the S&P100 index, has announced via public media sources (such as a website, online magazines) about its intention to buy back its stock on the open market or increase the already authorized repurchase program, this stock is included into the portfolio. It is held in the portfolio for *two days* and the position is closed when the market is closed. | Not necessary, but if there are several announcements made on the same day or an announcement coincides with the day 1 for any of the stocks in the portfolio then the portfolio is rebalanced to keep it equally weighted. |
| ***Fundamental strategy*** | The quarterly data about actual buybacks is collected and the buyback ratio for the trailing 12 months is calculated according to the methodology of the S&P Dow Jones Indices LLC. Then all companies are sorted by their buyback ratio and the top 20 are selected for each quarter. The stock may be excluded from the portfolio in one of the following cases: if it is excluded from the S&P100 or if its buyback ratio is not in the top 20 any longer. | Quarterly rebalancing. The portfolio is equally weighted. |
| ***Technical Strategy*** | As far as a company, currently included into the S&P100 index, has announced via public media sources (such as a website, online magazines) about its intention to buy back its stock on the open market or increase the already authorized repurchase program, this stock may be included into the portfolio. The entry signal in this case is the situation when the closing price of the latest bar is above the indicator SMA(200), otherwise the announcement is ignored and no position is opened. A stock is held in the portfolio until the current closing price crosses the SMA(50) from above. | Not necessary, but if more than one position per day must be opened then the portfolio is rebalanced to keep it equally weighted. |
| ***CTP 6M*** | As far as a company, currently included into the S&P100 index, has announced via public media sources (such as a website, online magazines) about its intention to buy back its stock on the open market or increase the already authorized repurchase program, this stock is included into the portfolio. This is a rolling portfolio constructed in calendar time, which includes the returns of the firms during *6 months after an announcement*. | Monthly rebalancing. The portfolio is equally weighted. |

| | | |
|---|---|---|
| ***CTP 1Y*** | As far as a company, currently included into the S&P100 index, has announced via public media sources (such as a website, online magazines) about its intention to buy back its stock on the open market or increase the already authorized repurchase program, this stock is included into the portfolio. This is a rolling portfolio constructed in calendar time, which includes the returns of the firms during *1 year after an announcement*. | Monthly rebalancing. The portfolio is equally weighted. |
| ***CTP 2Y*** | As far as a company, currently included into the S&P100 index, has announced via public media sources (such as a website, online magazines) about its intention to buy back its stock on the open market or increase the already authorized repurchase program, this stock is included into the portfolio. This is a rolling portfolio constructed in calendar time, which includes the returns of the firms during *2 years after an announcement*. | Monthly rebalancing. The portfolio is equally weighted. |
| ***CTP 3Y*** | As far as a company, currently included into the S&P100 index, has announced via public media sources (such as a website, online magazines) about its intention to buy back its stock on the open market or increase the already authorized repurchase program, this stock is included into the portfolio. This is a rolling portfolio constructed in calendar time, which includes the returns of the firms during *3 years after an announcement*. | Monthly rebalancing. The portfolio is equally weighted. |

## Appendix 5. Monthly cumulative returns over the risk-free rate



## Abstract in English

Previous studies, in most cases, investigated share repurchases for undervalued companies. This Thesis is dedicated to a deeper analysis of the reasons for share buybacks of the most prominent US firms, which are not likely to be undervalued. Hence, empirical evidence shows that the sample firms tend to repurchase more shares if there are no good investment possibilities available or as a vehicle for eliminating shares dilution when the stock options are exercised.

Investigating 308 announcements of 100 companies ever included into the S&P100 index between 2005 and 2014, I observed positive and significant short-term cumulative abnormal returns after the companies had published information about the share repurchase program authorization in all years except 2009. Empirical results show that on average, sample companies outperform the market by 0,77% in the two-day interval [0;+1], where 0 indicates the day of announcement. In the long-term perspective, share repurchase announcements made by the S&P100 companies do not contribute to them receiving higher-than-expected returns. Thus, information about the intention of the management to buy back its own shares may be exploited only in very short time intervals.

In order to show how valuable announcements about planned share repurchases might be for market participants, eight event-driven investment strategies are constructed and evaluated in this Master's Thesis. I considered naïve strategies constructed in calendar time, short-term strategies that attempt to take advantage of the immediate positive reaction to the repurchase announcement, as well as technical and fundamental strategies that work according to certain trading methodologies. Without regard to taxes, commissions and other trading costs, almost all strategies demonstrate better performance than the S&P100 index. However, only for the technical strategy are higher annualized returns not accompanied by an increased standard deviation. These empirical results suggest that it might be possible to beat the market by using public information in combination with some trading rules. Nevertheless, in the case of their implementation in real market conditions, all the strategies must be back-tested because performance may differ greatly from that observed in this Thesis.


**Keywords:** share repurchase, event analysis, market efficiency, abnormal returns, outperformance, investment strategy.

# Abstract in German

Vorhandene Studien untersuchten in den meisten Fällen Aktienrückkäufe von unterbewerteten Unternehmen. Diese Arbeit ist der Analyse für Aktienrückkäufe der prominentesten und nicht unterbewerteten US-Firmen gewidmet. Daher zeigen empirische Ergebnisse, dass die Probeunternehmen dazu neigen, mehr Aktien zurückzukaufen, wenn keine guten Investitionsmöglichkeiten zur Verfügung stehen oder wenn Aktienoptionen ausgeübt werden. In diesem Fall sind Aktienrückkäufe als das Mittel für die Beseitigung von Aktienverdünnung verwendet.

In dieser Arbeit sind 308 Ankündigungen von 100 Unternehmen untersucht, die im S&P100-Index zwischen 2005 und 2014 inkludiert waren. Empirische Ergebnisse zeigen, dass positive und statistisch signifikanten kurzfristigen kumulierten abnormalen Renditen nach der Veröffentlichung der Informationen über Aktienrückkaufprogramme in allen Jahren mit Ausnahme des Jahres 2009 beobachtet wurden. Im Durchschnitt haben Unternehmen die im Index des S&P100 in eine Intervall von 2 Tagen [0; +1] den Markt um 0,77% geschlagen haben. In der langfristigen Perspektive ergeben die Ankündigungen über Aktienrückkaufe keine höheren als erwarteten Renditen. So können Informationen über die Absicht des Managements, eigene Aktien zurückzukaufen, nur in sehr kurzen Zeitabständen ausgenutzt werden. Um zu zeigen, wie wertvoll für die Marktteilnehmer die Meldungen über die geplanten Aktienrückkäufe sein können, werden acht ereignisgesteuerte Anlagestrategien aufgebaut und in dieser Masterarbeit ausgewertet. Ich betrachte einige naive Strategien, welche in Kalenderzeit konstruiert wurden; die kurzfristigen Strategien, welche sich auf die unmittelbaren positiven Reaktion auf eine Rückkauf-Mitteilung ausrichten sowie technische und fundamentale Strategien, die in Übereinstimmung mit einigen Handelsmethoden funktionieren. Ohne Rücksicht auf Steuern, Provisionen und andere Transaktionskosten weisen fast alle Strategien bessere Performance als der S&P100-Index auf. Jedoch wird bei der technischen Strategie die höheren annualisierten Renditen nicht von erhöhter Standardabweichung begleitet. Diese empirischen Ergebnisse zeigen, dass es möglich sein kann, den Markt mit öffentlichen Informationen in Kombination mit einigen Handelsregeln zu schlagen. Dennoch, müssen alle Strategien back-getestet werden im Fall ihrer Umsetzung in realen Marktbedingungen, da die Performance wesentlich von in dieser Thesis beobachteten Ergebnissen abweichen kann.

**Stichwörter:** Aktienrückkauf, Ereignisanalyse, Markteffizienz, abnormale Renditen, Outperformance, Anlagestrategie.

# Curriculum Vitae

**Name:** Murselovic Iryna

**Date of birth:** 19.07.1986

**Nationality:** Ukrainian

**E-Mail:** murselovic.iryna@gmx.at

## Working Experience

| | |
|---|---|
| April 2014 – present | **Include IT GmbH**<br>Marketing and PR-Manager |
| November 2010 – September 2012 | **"Energy" GmbH** (Kiev, Ukraine)<br>Head of investment department |
| June 2008 – October 2010 | **"Pid-Kluch" GmbH** (Kiev, Ukraine)<br>Investment manager |
| October 2007 – May 2008 | **"Pid-Kluch" GmbH** (Kiev, Ukraine)<br>Fulltime internship in Planning and Economic department |

## Education

| | |
|---|---|
| September 2012 – present | **University of Vienna**<br>MSc in Business Administration<br>Specialization: Financial Markets and Industrial Management |
| September 2007 – June 2008 | **Kiev National Economic University**<br>MSc in Banking (with honours)<br>Specialization: Financing of investment projects |
| September 2003 – June 2007 | **Kiev National Economic University**<br>Bachelor degree in Banking (with honours) |
| September 1993 – June 2003 | **Secondary general school (Ukraine)** |

## Additional Education

| | |
|---|---|
| 08.07.2013 – 12.07.2013 | **University of applied sciences BFI Vienna**<br>Crash course “Project Managament” |
| April 2011 – June 2011 | **Training Centre “Success”** (Kiev, Ukraine)<br>Project Management Course – PMBOK |
| July 2009 – September 2009 | **Regional economics and law Centre for bankruptcy** (Kiev, Ukraine)<br>Training “Arbitration Manager”<br>Content: Administration of assets, financial rehabilitation and liquidation |

## Languages

| | |
|---|---|
| Ukrainian | Native |
| Russian | Native |
| English | Advanced |
| German | Upper-intermediate |

## Soft skills

| | |
|---|---|
| Computer programs | Proficient in using MS Office including MS Word, MS Excel, MS Outlook, MS Power Point, MS Project, SAP, Eviews, SPSS. |
| Personal skills | Responsibility, accuracy, motivation for learning. |
| Professional skills | Analytical thinking, business plan development, statistical data evaluation, strategic planning and organization, time management. |

## Interests

Travelling, singing, cooking, collecting of coins, photography.