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Managerial Timing and the Execution of Share Buybacks at the Stock Exchange of Hong Kong

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PREFACE AND ACKNOWLEDGEMENTS

I would like to thank the people surrounding me who had the patience and believe in me for fulfilling this final process in my study career. I want to thank my parents, brother and sister in particular for their support throughout my whole study career. On a different level but even as important I would like to thank my fellow students whom I consulted throughout the thesis for advice, discussions and tips. A special thanks to my thesis supervisor dr. Sjoerd van den Hauwe, who guided me in every part of the thesis process with comments and suggestions. In addition I want to thank dr. Maurizio Montone for taking time as a co-reader. Last I want to thank my roommates and friends who gave me the room and space in order to successfully write this thesis.

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ABSTRACT

This thesis looks into the managerial timing ability of managers. It is presumed that managers execute share repurchases at the moment their share is undervalued. This thesis measures whether the short and long-term returns are gained after such repurchase, as an adjustment sign for undervaluation. Using daily data of the Stock Exchange of Hong Kong, this thesis show significant short-term gains. Long-term abnormal returns are insignificantly different from zero, indicating no undervaluation on the long-term. Which may imply that small discrepancies may exist but are adjusted for quickly by the market. This paper analyses the sample in further detail, by looking at the undervaluation factors size, book-to-market value and volatility. When sorting companies on these factors the results are strong on the short-term, but do not maintain on the long-term. For testing the different hypotheses this paper uses the market model to predict normal returns for the short-term CAR. The Buy-and-Hold Abnormal Return using investment portfolios and the Calendar-Time Portfolio methods are used to measure the long-term performance of the actual share repurchase. Finally this thesis looks at the execution of share repurchase from the contrarian trading theory perspective. This paper supports the contrarian trading hypotheses, meaning that firms repurchase shares below the average market price, and that buybacks are driven by stock underperformance. In conclusion, this thesis supports both the contrarian trading theory and the timing theory on the short term.

Keywords:

Share Repurchase; Share Repurchase Execution; Managerial Timing Hypothesis; Contrarian-Trading Hypothesis; HKEx; Stock Exchange of Hong Kong

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1 Introduction

In the last few decades the interest for the share buybacks have gained a lot of attention from popular press and scientific papers. However this phenomenon did not come as a surprise as share buybacks have currently become an established form of redistributing value among shareholders. While accounting for 60% of the total cash returns in 2012, it surpassed dividends as main redistributing tool (Floyd, 2015). There exist many different kind of share repurchases, however the open market share repurchases are the most common form of buybacks that represent 90% of all repurchase programs in the U.S. Despite the popularity of the share buybacks there still remains questions regarding the share buyback, one of the topics is what the actual driver is behind the buyback increase. The most frequent documented argument by executives for a share repurchase is an undervalued stock, also referred to as Timing Hypothesis. This motivation for a share buyback seem to have been constant over the last few decades according to Tsestekos et al. (1988); Dittmar (2000); Brav et al. (2005); Graham et al. (2007). Studies that confirm the timing theory show that firms who were actively purchasing shares have outperformed the market in general until 2001. Ever since it was debated that the share buyback anomaly had disappeared (Fu et al., 2002; Obenberger, 2012). Whereas Brockman and Chung (2001); Peyer and Vermaelen (2009); Zhang (2005) among others have showed results in favour for the timing ability. The main question of this thesis is whether managers actually exhibit the skill to time their repurchase when the share price is undervalued is.

The timing hypothesis can only persist when firms operate in markets with information asymmetry, in other words inefficient markets. In addition, a manager has to take advantage of this situation by exploiting uninformed shareholders for a better share price performance, which does not seem in line with the overall shareholders' interest, but can be explained from a long-term shareholders perspective, which in general are blockholders. Regardless of the moral implications, studies after 2001 that researched this theory over time are inconclusively regarding the timing hypothesis and studies in favour of the theory lean more towards small and value firms. Furthermore, most of these studies have focused on the U.S. equity markets, which have their constraints with regard to data availability. The Stock Exchange of Hong Kong (SEHK) however provides a unique set of data, where information regarding actual repurchases is almost immediately available to the public. Benefits beside a detailed dataset are a broader geographical scope. All in all, this would provide a better insight in the effect of actual share repurchases and complimentary to the already extensive literature on measuring share buyback announcements, which was generally done.

A different perspective on the execution of share repurchases that gained popularity is provided by the Contrarian Trading Hypothesis. This theory is an alternative to explain the timing, volume and the ability to repurchase stock below average market price (Obernberger, 2014). The main assumptions

of the contrarian-trading hypothesis[1] predict that repurchases are driven by negative returns and that buybacks; are modelled by a fixed set of variables that restricts a certain price range and dollar amount spent; and are able to buyback below the average market price. Obernberger (2014) accurately displays the theory by the following example: A repurchasing firm wants to buyback without causing an impact on the share price and at the lowest cost possible. Doing so it is going to spend a fixed amount every trading day on repurchasing shares, which will lead to less shares bought at days that the share price increase and vice versa. The results by Obernberger (2014) are strongly in favour of the contrarian-trading hypothesis, moreover he did not find support for the timing hypothesis which although can exist mutually non-exclusive. Multiple articles conclude that firms are able to repurchase shares below the average market price however do not experience abnormal returns afterwards. In contrary Manconi et al. (2014), Peyer and Vermaelen (2009) and Akyol (2013) who argue that the timing hypothesis still exists, as their studies imply that abnormal returns are apparent especially within certain specific markets and firms.

This study will focus on the short and long-term performance of actual share repurchases from March 2003 until April 2014. It builds further on the existing paper of Zhang (2004), Brockman and Chung (2001) and Obernberger (2014), which will further shed light on the Managerial Timing theory, while also testing for the upcoming Contrarian Trading Hypothesis. More specifically this paper measures the daily returns surrounding share buyback executions. Predicting positive cumulative abnormal returns on the short and long-term period. As there are multiple different reasons for repurchasing shares it is worth defining firms who are more likely to execute buybacks in line with the timing theory. Standard indicators of undervaluation are size and book-to-market value (btmv), in addition I will include volatility. The second prediction of this thesis states that the firm characteristics size, book-to-market value and volatility directly influence the magnitude of abnormal returns following a repurchase execution. Recent papers[2] on the other hand favour the direction of the contrarian trading hypothesis. Having the ability to purchase below average market price following relative underperformance. The third prediction of this paper is that firms repurchase stock at a bargain. Another common reason for firms to execute buybacks, as mentioned by Brave et al. (2005), is as a tool to support the price. This is in line with the contrarian trading hypothesis. The fourth prediction is that repurchases are driven by underperformance. Overall these predictions cover in a sense the whole time window surrounding an actual repurchase where the contrarian trading theory explains a repurchase by looking at pre-execution conditions and the timing hypothesis by the post-performance. Noteworthy however is that both theories are mutually non-exclusively. The final prediction in this paper is a combination of

[1] E.g. Stephens and Weisbach (1998), Dittmar (2000) and Obernberger (20014)

[2] E.g. Obernberger (2014); Ginglinger & Hamon (2007)

the two theories, whereas subsequent abnormal returns should positively be related to the bargain. As the repurchase would lead to abnormal returns following the timing theory.

This thesis uses a handpicked dataset consisting of 17.346 actual open market share repurchases made by 440 companies over a time span of 11 years, ranging from March 2003 until April 2014. This relatively large dataset includes the financial crisis, which in many studies is neglected due to the irregular circumstances. However, during such a period the markets are more volatile and thus harder to predict, it is intuitive that misvaluations are more likely to occur (Schwert, 2011). Therefore the sample is divided in three subsamples consisting of a pre-crisis, crisis and a post-crisis period.

The results show significant abnormal returns after the share repurchase lasting for at least two to twenty business days. The abnormal returns increase from 0.29% to 1.69% for small firms and up to 1.42% for value firms. The returns for moderate volatile firms can increase to 1.27%, whereas low volatile firms show insignificant underperformance the highest volatile stock have significant strong underperformance with -1.45%. Overall the results do not hold up for the long-term, one to three years, where results are insignificantly different from zero using the calendar time portfolio method. The BHAR method using investment portfolios based on size and btmv do not give reliable results due to high skewness problems using daily data. In summary the results show support for timing hypotheses, however it does imply that any mispricing is corrected for within the first month after the event. Nonetheless, this paper also shows support for the contrarian trading analysis. Meaning that firms are able to repurchase shares below the average market price, with a bargain up to 1.69%. Furthermore, this paper also supports the second prediction that stock underperformance is driving share repurchases with a significant underperformance of -1.18% and an average raw return of -0.23%. And finally the last prediction is also confirmed as subsequent abnormal returns are positive related to the bargain. Concluding that both theories co-exist on the Hong Kong Stock Exchange.

This thesis consists of six chapters including, including the introduction, in the following chapter the theoretical base is constructed into a theoretical framework to study the relation between returns and actual share repurchases. The third section will explain the methodology, where I present the model for the predictions. Subsequently, I will elaborate on the characteristics and benefits from the unique data set from the Stock Exchange of Honk Kong in comparison to U.S. markets. The results produced by these methods will be examined and interpreted in the fifth section. The last sections consist of a brief discussion and conclusion followed by the appendix.

2 Literature Review

This chapter will discuss relevant papers and form the basis of this study. The first part will focus on prior research in which the perception of share repurchases in general evolves over time, subsequently the two main theories of actual repurchases will be discussed, the timing hypothesis and the contrarian trading hypothesis.

2.1 *Research on actual share repurchases*

The literature is rich with reasons for the repurchase of own shares such as: capital structure adjustment; takeover defence; signalling; excess cash distribution; substitution for cash dividends; wealth expropriation from bondholders and many more. Although many of these motivations may be true the most prevailed driver of repurchases is the undervaluation of the company (Dittmar A. , 2000). Already in 1981 Baker, Gallagher and Morgan held a survey among managers to understand the reasoning behind share buybacks, the most cited reason was that the repurchase of stock was seen as a good investment. Twenty years later Brav et al. (2005) report in a similar survey that managers begin repurchasing when they believe their stock is undervalued. However data was insufficiently available to properly provide support for these statements on actual repurchase of shares. More specifically, it was unable to observe actual share repurchases for a certain period of time nor was it possible to measure the effect afterwards (Stephens & Weisbach, 1998). Main reason for the lack of data regarding actual repurchases lies within the rules by the Securities and Exchange Commission (SEC), because firms in the U.S. were not required to disclose any information regarding their actual purchase programs. Since gross of financial studies is focused on the U.S. market the general research also lacked behind on this topic. This changed after the introduction of the new SEC rulings in 2003[3], which obligated firms to disclose the information of the repurchases, which from then on should be filed in every financial report. It seems that the research has focused on the announcement-effect of the share buyback programs instead, where the performance and the timing of the announcement were the main subjects (Comment and Jarrell, 1991; Dann, 1981; ILV, 1995; Vermaelen, 1981). Although the share buyback announcement is a good measure of the markets' reaction, it has its limitations. As an announcement is not a commitment and is often not fully executed. Stephens and Weisbach (1998) mention in their article that only 74 to 82 percent of the announced buyback is actually acquired. Ikenberry and Vermaelen (1996) add that the announcement is similar to an option which, dependent on the ability of the manager, allow to exchange the market value for the true value of the stock price. Where this option has been recognized when an announcement is made, however the execution of this option was difficult to record as mentioned. For example, it is found by ILV (2000) that monthly repurchases are related to changes in the stock price, however firms regularly

[3] The Securities and Exchange Commission (SEC) adopted rule 10B-18 covering the manner of purchasing, timing, prices and volume of shares repurchased.

execute multiple buybacks within one month time. To measure whether the execution of such an option is effective, actual share repurchase data seems necessary.

Although, it is now common for U.S. firms to report repurchase activity in their quarterly or annual reports, the exact timing remains unknown for the U.S. (Obernberger, 2014; Zhang, 2005). Although, the SEC ruling of 2003 provided better insight, the literature regarding the managerial timing ability (2.2) is still a topic of debate. The contrarian-trading hypothesis (2.3) seem to have shed new light on the way firms execute their repurchase.

2.2 *Timing Hypothesis of actual share repurchases*

An outsider may assume that the increase in price after repurchase is just the adjustment to less shares and thus the increase of earnings per share, however this thought is oversimplified as the intrinsic value stays flat after such action (Dobbs, 2005). In line the most predominant part of the academic literature on share repurchases has paid attention to the Timing Hypothesis[4]. The essence of this theory argues that managers have a better ability to value the share of their company, due to information asymmetry. Managers exploit this advantage by looking at shares as a good investment. In line with this theory, the most frequent reported argument among CFO's for a share buyback is an undervaluation of the shares (Brav, 2005).

From an ordinary shareholder perspective this hypothesis seems counterintuitive, as managers are essentially exploiting their shareholders because a repurchase below fundamental value can be regarded as a transfer of wealth from selling to non-selling shareholders (Barclay & Smith, 1988). However managers who are more inclined with the long-term shareholder value would justify it as a rational action. Ikenberry et al. (1995) further suggest that a share repurchase can be seen as a signal of undervaluation; in reaction the new share price would reflect this information and thus less informed long-term shareholders would not be expropriated. To prevent the appearance of making opportunistic repurchases for short-term gains, firms on average limit their trades surrounding an earnings announcement (Cook, 2004). Moreover, at the SEHK it is prohibited to repurchase shares during such periods.

The timing hypothesis can be divided into studies that have focused on the market reaction in effect of a share repurchase announcement, and studies that documented the reaction of the actual repurchases. In this study the actual repurchases are examined where the information surrounding an announcement, disregarding the amount and total value of a program, is the option value that is created by the buyback program (Ikenberry and Vermaelen, 1996). The option that is created entails the

[4] Barclay and Smith (1988), Ikenberry et al. (1995, 2000), Cook et al. (2004), De Cesari et al. (2012), Peyer & Vermaelen (2009) among others have done research on the timing hypothesis and share buybacks.

possibility to buy stock when it is undervalued, thus exchange the market value for its true value. The market reaction to such an announcement is on average 3.5% in the U.S., thus the market recognizes the option value that is created (Ikenberry, 1995).

The option that has been created will contain only value when managers are able to detect the true value of the firm. Ikenberry (1995) argues that it seems unlikely that managers are able to react on average intra-day price movement, on the other hand share repurchase programs can last up to two years and can be extended, and thus reacting on intraday-day price movement is somewhat exaggerated. Zhang (2005) investigated the stock price performance of actual share repurchases at the Stock Exchange of Hong Kong (SEHK). Whereas the SEHK in contrary to the U.S. markets requires full and timely disclosure of repurchase transactions. Zhang (2005) documents that negative stock returns over a period of 20 days are followed by share buybacks, and argues that it is a result of opportunistic behaviour from managers. He reports an initial 3-day market response to the actual repurchase is around 0.43% and on the long-term the abnormal performance disappears. But when certain firm characteristics are considered by sorting on size and book-to-market value, the long-term shareholders can gain up to 20% from the share buyback after a 3 year period (Zhang, 2005). Similar performance were recorded among small sized S&P 500 firms, with a positive CAR of up to three months after the repurchase execution (Ben-Rephael, Oded, and Wohl, 2014). Obernberger, analysed the U.S. market before and after the new SEC rule has been applied, where he does not find prove for the market timing hypothesis surrounding short-term share price performance and did not find significant prove for average long-term returns after repurchase execution. Whereas Ginglinger (2009) did a similar analysis on the French market concludes that, in line with Zhang (2005) and Obernberger (2014), repurchases are executed after share underperformance however that it is not a price supporting tool and neither finds support for abnormal returns following a share repurchase. In addition, Dittmar and Field (2015) report an alpha of 0.3% per month over three to 36 months after repurchase in U.S. market. It may be clear that it remains unclear whether managers use the exchange option in their advantage as Ikenberry (1995) described. This detailed dataset would at least give the returns of the short and long-term an updated insight as extension of Zhang (2005).

2.2.1 **Undervalued firms**

With articles presenting somewhat contradicting results in general, a recurring factor that does seem constant are the different company traits that influence the returns after the event. Brockman and Chung (2001) who found results supporting the timing ability point out that these are significantly related to firm specific attributes and macro-economic conditions. In line with Brockman and Chung, Ben Raphael et al. (2014) argues that big firms are more likely to use share buybacks as a dividend tool whereas small firms rather use it as a good investment. Therefore it is reasonable to look for firms where the undervaluation of shares is more likely the driver of repurchases.

As mentioned several times repurchase programs can be interpreted as options, a logical variable that increases the value of an option is the volatility of its outcome. Therefore this option should be especially valuable to firms who experience high volatility in their stock price, increasing the possibility of undervaluation (Ikenberry & Vermaelen, 1996). Stambaugh et al. (2015) analyse the idiosyncratic volatility and argue it to be similar to risk that deters arbitrage, and therefore leaving the stock with the highest idiosyncratic volatility to be the most undervalued. Vermaelen (2017) analyses the returns after repurchase announcements over different volatility quantiles that show a cumulative abnormal return of 1.54% for the lowest quantile and 38.56% for the highest volatile quantile, measured over a period of 48 months.

Following, Evgeniou and Vermaelen (2016) point out that the buyback anomaly cannot be generalized to an average firm, but applies mostly to beaten up risky high book-to-market firms and that the buyback anomaly is to some extend restricted to small cap firms, as these firms in general earn the largest excess returns. A combination of these factors is translated into an Undervaluation Index, created by Peyer and Vermaelen (2009), who made an attempt to predict the probability that buybacks are driven by undervaluation. The index consists of size, book-to-market value, stated motivation and past performance. Size is used as a factor for undervaluation, as small cap firms experience less market coverage by analysts. Zhang (2005) points out the abnormal returns of over 20% are made by value firms, when looking at a buy and hold period of three years. Manconi et al. (2015) suggest that the buyback anomaly investment strategy, especially applies to markets where buybacks do not trigger a lot of movement in the share price. Evgeniou and Vermaelen (2016) further argue in their working paper that the reason why the anomaly for firms with such characteristics persist is that they do not satisfy the liquidity risk constraints of many funds. Funds who are capable of exploiting market discrepancies and thereby removing market inefficiencies. Besides Zhang (2005) there have been several studies outside the U.S. that have provided support for the negative relationship between size and abnormal returns after a share buyback: Firth & Yeung (2005) in Hong Kong; Koerniadi (2007) in New Zealand; Otchere & Ross (2002) in Australia; Zhang (2002) in Japan; and Isa et al. (2011) in Malaysia.

In order to make a complete analysis of the market timing this thesis will further measure the discussed firm characteristics size, btmv and volatility on repurchase events.

2.3 *Contrarian Trading Hypothesis*

The information that comes with a repurchase announcement would remove the need to continue with the repurchase program, as stock prices would adjust to this information and correct for the misvaluations (Ikenberry, 1995). However, repurchase announcement are not commitments and are not fully executed making it more difficult to discover the true value of such an announcement. Obenberger (2014) adds that the financial markets used to underreact to repurchases announcements, and that the buyback anomaly did exist but has disappeared since 2001. It is further argued that a manager does not

execute a share buyback because of undervaluation, rather the share buyback program aims to repurchase at the lowest possible price, and therefore repurchases are often executed after a period of underperformance.

Research by Stephens and Weisbach (1998) already described that a fixed buyback program controls the execution of share repurchases. Cook et al. (2004) argue that firms make widely use of limited orders for repurchase programs, in order to prevent the urge of providing liquidity by absorbing the sell side pressure and at the same time supporting the share price after negative returns. In line with the previous, the contrarian-trading theory is a good alternative for the Timing Hypothesis, which seems to describe volume and frequency patterns accurately (Obernberger, 2014). This is the second explanation of share repurchase execution as mentioned in this thesis. To describe the contrarian trading theory Obernberger (2014) uses a simplified example: When a company announces to buyback shares, the goal is to prevent a sudden impact in the share price and to buyback at the lowest cost possible. In order to do so it will spread its repurchases over a certain period and will spent a default amount for each execution, each day. In practise more shares will be purchased after negative returns and fewer shares after positive trading days. In summary, the theory predicts that share repurchases are driven by negative returns. Obernberger concludes that the ability of firms to buyback below average market prices can entirely be contributed to the contrarian trading strategy, which has no timing ability ex-ante and thus do not predict abnormal returns afterwards. Suggesting that actual repurchases are not driven by the ability to time repurchases when the stock price is undervalued. Rather, it is pattern of a buying scheme.

2.4 *Population and Time Frame (SEHK)*

This thesis will focus on the Stock Exchange of Hong Kong as extension of Zhang (2005), in addition the most accurate way to measure actual share repurchase performance is to work with daily data, which is available at the SEHK. The main rules concerning share repurchases are described as followed: Before a share buyback can take place at the SEHK, it first has to be approved by the shareholders at the general meeting. Firms at the SEHK cannot repurchase more than 10% of the total shares outstanding, less the shares that may be granted under another scheme (Zhang, 2005). Listed firms are able to buy back shares from the open market at any time, however, it is not allowed to repurchase shares during sensitive periods that influence a companies' stock price, such as an earnings announcement. The volume of shares purchased in a single month may not exceed 25% of the total amount of shares traded during the previous month. After each purchase the company is required to notify the exchange, the information should include the number of shares purchased and the price it paid per share or instead the highest and lowest price. The deadline for this notification to the Exchange is 30 minutes before the earlier of the commencement of the morning trading session or any pre-opening session of the following business

day[5]. The information regarding the repurchase is then publically available at the start of the business day.

The results of Obernberger (2014) indicate that the share buyback anomaly had disappeared after 2001. This research will focus on the daily open market repurchases after 2001, in specific from March 2003 to March 2014. In addition this time frame is also chosen for more practical reasons, first the digital repurchase reports were available since March 2003 and secondly any repurchase made in 2014 would have to be analysed for a holding period until 2017. This time frame includes the global financial crisis, therefore I will split the timeframe into three periods to prevent any false representations of the actual effects during normal circumstances. Effects of a crisis on share repurchases were visible during the 1997 Asian financial crisis, following the crash in October 1997, unusually large amounts of repurchases were recorded. The effects of the crash lasted for a long period (Brockman & Chung, 2001). I include the financial crisis as it is an interesting period for additional analysis, as markets were more difficult to analyse, and perhaps a perfect time for managers to repurchase mispriced shares. I use the beginning of July 2007 as cut off point for the first time period, and the start of the crisis period. As described by the article published by the Research & Corporate Development Department of the SEHK (2010), the trust in financial markets fell dramatically after this point, share prices dropped, in reaction firms set up large share buyback schemes. The abnormal activity seem to have faded after February 2009, which will be the end of the crisis period, this is in line with the same study of the SEHK (2010). The third period or the post-crisis period ends at March 2014. In total this period covers 11 years.

[5] For more detailed information, see Hong Kong Exchanges and Clearing Limited

3 Methodology

The methodology presents the relevant theories through which the hypotheses of this thesis will be constructed. The setup of the model will follow directly after each hypothesis in order to properly test the different predictions from the hypotheses. In general the methods have much in common with the methods that were applied by Zhang (2005) and Obernberger (2014), in order to make a reliable comparison of both theories and papers.

3.1 *Managerial Timing Hypothesis*

The results from Zhang (2005) show that repurchases are exercised following price drops and that the share price performance after the event shows a positive reaction for at least one month. Moreover, Peyer & Vermaelen (2009) find results that support long term abnormal performance after share repurchases for recent periods. Of course, there are more reasons to perform a share buyback, however the most common argument for the execution of a share buyback is an undervalued stock (Brav, J. R., & Michaely, 2005), and is constant over time[6]. The market should appropriately correct for this new information and therefore show an increase in the share price performance. In line with these articles I construct the first hypothesis:

H1 *Firms execute share repurchases in reaction to an undervalued share price, followed by Abnormal Returns*

To test the Managerial Timing Hypothesis this paper will examine the good investment hypothesis on actual share repurchases for the short-term and the long-term period. Where the cumulative abnormal returns should significantly differ from zero as an indicator of the timing hypothesis.

3.1.1 Short-term price performance

To measure the timing performance of managers' actual repurchases the initial market reaction is measured. This reaction is generally measured via two models either the Market Model or the Fama-French three factor model, however no real significant differences are found between the results of these methods. In this case I will use the market model to calculate the Cumulative Abnormal Return (CAR) in line with Zhang (2004). The market model is presented in model 1, and are generally accepted in the academic literature when using daily data (Brown & Warner, 1985; Campbell et al. 1997).

[6] The undervaluation argument has been reported by Tsestekos et al. (1988); Dittmar (2000); Brav et al. (2005); Graham et al. (2007).

$$
\begin{aligned}
R_{j,t} &= \alpha_j + \beta_j R_{m,t} + \varepsilon_j \\
\hat{R}_{j,t} &= \hat{\alpha}_j + \hat{\beta}_j R_{m,t} \\
AR_{j,t} = R_{j,t} - \hat{R}_{j,t} &= R_{j,t} - \left(\hat{\alpha}_j + \hat{\beta}_j R_{m,t}\right) \\
CAR_{j,t} &= \sum AR_{j,t}
\end{aligned}
\tag{1}
$$

The abnormal return is simply the difference between the actual return ($R_{j,t}$) and the predicted normal return. The normal return ($\hat{R}_{j,t}$) is calculated through the beta ($\hat{\beta}_j$) estimate from the regression and multiplied by the market premium ($R_{m,t}$) of that day. Where the normal returns are predicted by the use of the Equally Weighted Hang Seng Index, which represents 60% of the total market capitalization at the SEHK and is the most common index for the Hong Kong Stock Exchange. Furthermore, equally weighted stock indexes are preferred, as large value companies would have an undue weighting compared to small companies and this thesis is interested in the whole spectrum of firms. In order to apply the market model I will use an estimation window of 250 business days of return data before the time window [-270, -21], to predict the beta coefficient. Since the degrees of freedom exceed 200, the test can be assumed as unit normal (Brown & Warner, 1985). Finally, the cumulative return is the sum of the returns during a specific event window.

The event window is roughly a month before and after the event, with 20 business days before the event [-20, 0], the event at [0], and 20 business days after the event [0, 20]. Where the event is the actual share repurchase, and the morning after the actual share repurchase on which the SEHK authority publishes the share repurchase activities of the previous day is +1. The time frame is split into three sub-windows to measure the market's reaction surrounding this event. The first part consist of the trading days in advance of the event [-20, -1]. The first frame provides an insight in the performance of the shares before the actual repurchase, indicating whether managers show optimistic behaviour by buying after a price drop. The second part is the initial reaction of the market regarding the actual repurchase [0, +2], and the last part presents the medium-term reaction to the share repurchase [0, +20]. The results are than tested for significance by using a two sided t-test, which measures the statistical difference from zero. As a robustness check I will measure the returns over three different time periods, in order to check whether the results are persistent over time, and in addition I also perform a one event per company analysis to create an ultimately equal weighted sample. Finally, I will use a cross sectional regression to better understand the different drivers and their correlations regarding the abnormal performance, using the following model:

$$
\begin{aligned}
CAR(0,2)_{i,t} = \alpha + \ & \beta_1 CAR[-20,-1] + \beta_2 Size + \beta_3 BTMV + \beta_4 Volatility \\
& + \beta_5 Repurchase\ Intensity + \ \mu_{t,i}
\end{aligned}
\tag{2}
$$

The subsequent CAR will be regressed on the previous performance in line with the opportunistic behaviour of managers. In addition this also contributes to the contrarian trading theory, which implies that the previous underperformance is related to the execution of the repurchase. The Repurchase Intensity is the percentage of outstanding shares that is repurchased during the execution. As it is intuitively that larger executions will give a stronger signal than smaller executions, therefore a positive correlation is expected. The size is the natural logarithm of the market capitalization and is negatively related to the subsequent CAR, whereas the book-to-market value (btmv) and volatility are positive related to the abnormal return. The size, btmv and volatility will be discussed in more depth in section 3.1.3.

3.1.2 **Long-term price performance**

In order to measure the long-term price performance after an actual share buyback the Buy and Hold Return (BHR) method as described by Barber and Lyon (1997) will be used. However, I will measure the BHR on a daily basis, the performance of the actual repurchase will be measured over one, two and three years. The Buy and Hold Abnormal Returns (BHAR) method is able to measure long-run abnormal stock returns, under three benchmarks: Fama-French three factor model; Control firms; reference portfolios (Barber, 1997). I have constructed reference portfolios based on size and book-to-market value. The BHAR may appeal more to investors as it is a close resemblance of an actual investment experience. The BHAR is the difference between the buy-and-hold return of the stock and the control benchmark. Furthermore, for extra robustness I will also apply the BHAR on a monthly basis, as standard errors may as well be compounded and can cause severe measurement problems over a long period. The BHAR is based on the following model:

$$BHAR_{i,t} = \prod_{t=1}^{t}(1 + R_{i,t}) - \prod_{t=1}^{t}(1 + E(R_{i,t})) \quad (3)$$

The return ($R_{i,t}$) is compounded on a daily basis over a specified period, minus the compounded return of an investment portfolio ($E(R_{i,t})$) over the same period. Barber and Lyon (1997) discuss that the best way to measure the performance is through control firms or portfolios. Appropriate portfolios in this case are constructed on size and book-to-market value and are matched on the event date. In order to do so I created size quantiles and book-to-market value quantiles, combined those into a portfolio of similar firms, see appendix B Table 21. Finally, to test whether the results are different from zero an independent two sided t-test was used.

The BHAR method looks in many ways similar to the CAR method however the BHAR uses a geometric return to calculate the overall return of the event period instead of the arithmetic return. Furthermore, it controls for compounding returns where CAR does not. The Buy-and-Hold Returns are measured over three years after a share repurchase. From the market timing perspective a share buyback is a sign of undervaluation, thus the performance should be indiscriminately be calculated throughout

the whole sample, therefore BHAR is also measured relative to the Hang Seng index and using the market model principle with normal returns, as a robustness check. Furthermore I will also apply a cross-sectional regression in line with Zhang (2005), the model is described in appendix A as it similar to the model used for the regression of the short term CAR. Furthermore, the formulas for the t-statistics are shown in Appendix A.

In contrast to the short-term price performance, multiple articles found that long-term measures are actually sensitive to the benchmark and method used (Barber, 1997; Canina et al., 1998; Kothari and warner, 1997). The previous analysis methods have focused on time series event, in addition I will use the Calendar Time Period (CTP). This method is a commonly applied by several articles who measure similar long-term effects[7].

The method will run a time-series regression on a portfolio of returns, and is able to examine the intercept from the regression. The CTP method is used in combination with the Fama-French three factor model. The CTP forms a fluctuating portfolio consisting of all repurchasing companies, the performance of the portfolio is than measured using a rolling window. Thus the stock performance of events that occur during the window are included and after the period ended it automatically is excluded from the portfolio. In general monthly data is used for the portfolio, however, the daily data will provide a more accurate timing of events, increasing the reliability of the tests. Whereas with the BHAR method this might lead to Bad-Model Problems due to compounding errors, as pointed out by Fama (1997) this does not account for the CTP method. Moreover, using daily measurements makes a period precisely *t* days, whereas using monthly data the exact days of an event period varies per event. In this sample, certain events follow quickly after each other, I have set the first repurchase of the month as the only purchase for each company. The calendar time approach weighs every period equally, therefore one event may influence more in one time period with less events than within another time period. To prevent overweighing of certain companies with excessive repurchase activity I also run a robustness test in the case where a firm can only have one event.

$$\left(R_{i,t} - R_{p,t}\right) = a_j + b_j\left(R_{m,t} - R_{f,t}\right) + c_j SMB_t + d_j HML_t + \epsilon_{i,t} \quad (4)$$

The CTP model (4) is the return ($R_{i,t}$) of firm i at day t minus the equally weighted return of the firms that had an event within the rolling window ($R_{p,t}$). The market premium is the difference between the market return and the risk free rate. The SMB is the daily return on the size factor, whereas the HML is the daily return on the book-to-market value factor. The coefficients are daily cross-sectional results for

[7] For example Manconi (2015), Peyer & Vermaelen (2009) and Lei & Zhang (2016)

that day. A two sided t-test is used in order to test the statistical significance of the abnormal return different from zero.

3.1.3 Size, BTMV and Volatility

To test whether the undervaluation argument of CFOs is firm specific, it is worth defining specific undervaluation characteristics. In other words, which firms are most likely to use this strategy when repurchasing shares? In accordance to Dittmar (2000) and Vermaelen (1995) high book to market firms have the tendency to be undervalued and thus should better able to time their repurchase. Furthermore, small size firms are less covered by analysts, therefore the existence of information asymmetry is deemed to be more likely, for which mispricing is an effect and in respect should be better received by the market once performing a share buyback (Brockman & Chung, 2001). A third factor that may indicate the likelihood of mispricing is the volatility of a stock, as this should also be positive related to abnormal returns. This is in line with the option theory that is created with the share buyback announcement as discussed by Vermaelen (1996). Due to a higher probability of mispricing I expect not only the abnormal returns to be higher but also to last longer.

H2 *The magnitude and durability of the Cumulative Abnormal Return are dependent on the Size, BTMV and Volatility.*

The volatility of the stock in general will be used instead of the intra-day volatility. The total volatility will be used to measure a firms' volatility as it is highly correlated to idiosyncratic volatility (Evgeniou, 2016; Stambaugh et al. 2015). To calculate the volatility, the standard deviation of the daily stock returns is measured over six months prior to the event following the example of Evgeniou (2016). The other characteristics are taken from Datastream. The company size is measured as the market capitalization. The book-to-market value is calculated as the reverse of price-to-book value, which is the default on Datastream. The price-to-book value is the share price divided by the book value, whereas the book-to-market value is measured as the book value divided by the market value.

In order to measure the effect of the different characteristics I will construct quartiles for each variable. These quartiles size, book-to-market value and volatility are determined on the event date relative to the sample on the event date.

3.2 *Contrarian Trading Hypothesis*

The results from Zhang (2005) show minor magnitudes, and Obernberger (2014) argues that the movement is similar to the average bid-ask spread, which questions the economic significance of the managerial timing hypothesis. In addition he discusses that firms have the ability to purchase below the average market value, rather than purchasing an undervalued share. The actual repurchase is rather a consequence of a simple buyback mechanism, which repurchases a default number of shares when the

price maintain constant. The logical prediction is that repurchases are negatively correlated to the share price performance, in line with the contrarian trading theory. Implicating that managers do not time their repurchase when stock is undervalued, but rather are able to purchase below the average market price through repurchase patterns. This ability seems highly plausible, therefore the third hypothesis is:

H3 Firms execute share repurchases below average market price

The difference between the average market price and the repurchase price is defined as the Bargain, as shown in formula (6). The average repurchase price is calculated by dividing the total value paid on the event date by the number of shares bought, as shown in formula (5). A two sided t-test is used to determine whether the bargain is significantly different from zero. The daily data allows to check for the robustness of the bargain within the span of one month time. Obernberger (2014) used monthly prices by the average of the daily ending price, however I will look at the weekly [-5, +5] and monthly [-20, 20] prices. To give a broader perspective to the bargain I also look at the share price behaviour after the event.

$$p_t = \frac{total\ value}{number\ of\ shares\ repurchased} \quad (5)$$

$$B_t = p_t - \bar{p} \quad (6)$$

A firm that spends a fixed amount per day at share buybacks, will lead to a pattern that more shares will be purchased when the share price underperforms compared to the previous trading day, in other words relatively lower priced stock get an above average weight. Making it inevitable that the repurchase price is below the average market price, as it will buy less shares when the price goes up. Therefore the bargain is positively related to the movement of the stock price, thus only in the unlikely case that the stock is constant the bargain is equal to 0, as the average price is equal to the repurchase price. The contrarian trading hypothesis predicts that underperformance is a driver of repurchases. The CAR [-20,-1] can be used to measure the short-term performance surrounding the share price, as discussed in section 3.1.1. However, for this prediction to be true the performance does not necessarily have to be an Abnormal Return, average raw returns will also satisfy this prediction. Therefore, the average returns are also used as a performance measure in the test. To test for significance I use the two sided t-test, to check whether the underperformance is different from zero.

H4 Underperformance is driving share repurchases

3.3 *Combined Hypothesis*

It is important to mention that the contrarian does not predict any after event returns, it is therefore possible that the bargain after a repurchase is negative. The market timing hypothesis, as discussed in the part 3.2, predicts an abnormal return after a share repurchase. When combining this prediction with the bargain, it should result that abnormal returns increase the difference between the repurchase price and the average market price. This is one of the main issues raised by Obernberger (2014) to reject the timing hypothesis, as no significant positive relation is found between the abnormal return and bargain. Nonetheless, under normal conditions we do expect a positive reaction from the market, and in general this should result in a higher subsequent share price.

H5 Abnormal Returns are positive related to the Bargain

In order to analyse this prediction I will use a multivariate regressions model (7) that regresses the subsequent abnormal returns on the Bargain:

$$Bargain_{i,t} = \alpha + \beta_1 RAW[-20,-1] + \beta_2 CAR[0,20] + \beta_3 Repurchase\ Intensity + \beta_4 Size + \beta_5 BTMV + \beta_6 Volatilty + \mu_i + \eta_t + u_{i,t} \quad (7)$$

Bargain is the dependent variable measured as the difference between the average market price and the repurchase price, where the average market price is a monthly measure[-20,20]. This is regressed on pre-event performance as the one month raw average return; post-event performance as the one month abnormal return; Repurchase Intensity reflects the size of the repurchase relative to the outstanding shares; Size of the firm is the natural logarithm of the market capitalization; BTMV as the book-to-market value and Volatility. Finally I also included firm and time fixed effects. Following from the predictions it is expected that β_1 has a negative coefficient as underperformance should drive repurchases and thus the bargain, β_2 has a positive coefficient as implied by H5. Furthermore the repurchase intensity is expected to have a positive relation with the bargain, as a larger repurchase would have more effect than a smaller repurchase. Finally, I expect BTMV and Volatility to have a positive coefficient, and size to have a negative coefficient. This is in line with the predictions that these three characteristics influence the magnitude of the subsequent CAR.

It may occur that both theories are valid and thus can exist non-exclusively. An overview of predictions can be found in Appendix B, Table 1.

4 Data

This thesis focuses on open market repurchases of ordinary shares that are traded at the stock exchange, similar to Obernberger (2014) and Zhang (2005). Using a self-constructed macro I obtained data from the Securities Daily Summary – Share repurchase Report (SRR) regarding the repurchase company; date of repurchase; number of shares repurchased; total shares outstanding and the total value of the repurchase[8]. After gathering all repurchases the first shift is made by excluding preference shares, convertible bonds and warrants. Leaving the dataset with only the ordinary shares and H-shares traded at the SEHK. H-shares are issued by Chinese based companies who are freely traded among investors in contrary to A-Shares. About 130 transactions from the SRR were revised and updated on a later date. As the updated reports consist of relative minor adjustments[9]. Furthermore, I am measuring the market response from the initial repurchase activity information, the adjustments to the purchase on a later date are therefore not analysed. Information regarding stock prices and firm specific information such as market capitalization and book-to-market value are extracted from Datastream. Seven events were dropped in the process for which no price-to-book values were found. Capital changes that effect the stock price such as a stock split, are controlled for by using Total Return Index rather than the stock price. When performing a three year analysis the dataset experiences survivorship bias. As the stock that delisted or went bankrupt will not be included in the final dataset, however the sample remains large enough to make relevant conclusions.

As benchmark Zhang (2004) used the all-ordinaries Index series, which is a value-weighted index made up of all stocks registered at the SEHK. However this index does not longer exist since 2003, therefore I will use the value weighted Hang Seng Index which represents approximately 60% of the market capitalization and is commonly used as a reflection of the SEHK performance[10]. The Hang Seng Index is obtained through Datastream. The Fama French three factors SMB, HML and MKT are extracted from aqr.com, this website publishes articles and provides the dataset that is used. This enabled me to use daily factors for the SEHK. The risk free rate is based upon a 3-month bond yield index downloaded from Bloomberg.

The summary statistics in Table 2 show that the final dataset consists of 16,235 open market share repurchases, for the period March 2003 until April 2014. Table 2 furthermore show that only 3% of all companies is responsible for 25% of the total value repurchased. To prevent biased results by overweighing certain companies with relative many share repurchases I only pick the first buyback per

[8] The Stock Exchange of Hong Kong only publishes daily reports, therefore macros must be used to obtain a large dataset. See: http://www.hkexnews.hk/reports/sharerepur/sbn.asp.

[9] For example: Shangai Zendai reported the purchase of 6.795.000 on 14 September 2004, updated this number to 6.895.000 shares on 18 September 2004.

[10] As advised by the Stock Exchange of Hong Kong. See: FAQ 3.2 of the SEHK website

month as event. An overview of the repurchase activity throughout the years is given in Table 1. Note the peak during the crisis period in 2008, this is in line with the Asian Crisis of 1997 as previously described. Furthermore, the descriptive statistics of the variables is presented in Appendix B, Table 16.

Table 1 - Repurchase events per year

Year	2003*	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014*
Events	*462*	*533*	*756*	*898*	*1,232*	*2,979*	*1,186*	*852*	*2,288*	*1,374*	*536*

*Number of open market repurchase events at the SEHK. * Counted from March 2003 and until April 2014*

Table 2 - Summary Statistics

Initial Sample	
Number of firms	440
Number of daily repurchases	17,346
Total number of shares repurchased	28,923,819,915
Total dollar value repurchased	HKD 76,993,536,763
Average repurchase days per firm (business days)	39.42
After eliminate firms without BTMV	
Number of firms	403
Number of daily repurchases	16,235
Total number of shares repurchased	26,878,261,115
Total dollar value repurchased	HKD 71,724,347,760
Repurchase activity by quartile	
Number of firms within the 1st quartile	305 (75.7%)
Number of firms within the 2nd quartile	61 (15.1%)
Number of firms within the 3rd quartile	25 (6.2%)
Number of firms within the 4th quartile	12 (3.0%)
Average repurchase days per firm (business days)	40.29

Summary statistics of the open market share repurchase activity at the Hong Kong Stock Exchange from March 2003 until April 2013, gathered from Datastream and the HKEx. Each quartile represents 25% of the total repurchases, the percentage shown with brackets is the percentage of the total sample.

5 Results

In this chapter I will present the results to test the predictions that followed from the methodology, I will deal with the subjects in a similar order as I have used in previous sections. The output is summarized in tables with corresponding t-statistics and significance level.

5.1 *Short-Term Abnormal Returns*

Table 3 presents the overall results for the short-term CAR measurements surrounding the repurchase events for the whole sample. The table is divided in three columns that present the three different event windows over which the returns are measured. The results show a significant -1.18% negative CAR in the month before the event. This suggest that managers buy after price drops or relative underperformance, corresponding with the contrarian trading hypothesis as well. The short-term event window [0, +2] show a significant increase of 0.29% within two days after the market is informed. This result show that the market does react positively on an actual share repurchase, although slightly less than the 0.43% from Zhang (2004) which could indicate that the markets have become more efficient nowadays. Furthermore, firms are able to hold on to this positive impulse on the medium-term [0, +20] with a positive CAR of 0.26% but this shows that the abnormal return is made within the first few days. The initial results seem to support the timing hypothesis, although the numbers are not convincing either.

5.1.1 Short-Term Abnormal Returns on Size, BTMV and Volatility

When further analysing the performance over the Size quartiles in Table 3, it shows significant results for the smaller sized firms, with a 0.59% increase on the short-term and a 1.69% increase on the medium-term. Note that the performance in advance of the event is more irrelevant for smaller firms in contrary to larger firms who experience negative abnormal returns of -1.82%. This may imply that smaller firms are not as triggered by prior share price performance and rather repurchase on basis of undervaluation, whereas large firms do react to negative performance. Hence, the existence of information asymmetry is more likely among smaller firms due to less coverage, therefore the use of managerial timing may be more relevant in line with the prediction. However, the second quartile has a medium-term return of -0.68% which is not expected. Besides this one outlier the results show performance measures in line with the size prediction, that the highest returns are gained among the lowest size quartile while the returns diminish when scaling up to larger quartiles. In addition, the underperformance before the event also increases for the larger quartiles.

The BTMV quartiles show results in line with the predictions made in section 2.2.1, where the highest quartile consisting of value firms, experience the largest abnormal returns over the short and medium-term. The value firms have a CAR of 1.42% after one month compared to growth firms with -0.44%. However all quartiles have positive short-term returns, except the first quartile is statistically not different from zero. This suggests that the initial market reaction to actual share repurchases is positive.

When turning to the medium-term performance the positive effects of the buyback fades among the growth quartiles and even show negative abnormal returns. However when analysing the growth stock from a different angle it can be assumed that the whole event window, before and after the event, experienced a relative performance increase of +0.55%. On the other hand it indicates that low book-to-market firms execute share repurchases at times of stock underperformance, in an attempt to break the trend. Although, execution after negative share price performance seem to be consistent over the whole sample.

The volatility quartiles are less straightforward, where the stock that are average volatile (2 and 3) gain the highest returns. The initial reaction is slightly positive whereas the third quartile has the highest short-term CAR of 0.92%. When looking at the medium-term the stock that have the highest volatility are not able to maintain the initial performance and show a significant underperformance of -1.45%, compared to the third quartile with a 1.27% abnormal return during the same period. It may be that the high volatility firms are too unpredictable, even for the managers. The least volatile firms also underperform in the month after the event with -0.19%, and thus continue their negative performance that they experience in advance of the event (-0.55%). Although this last result is not surprising, low volatility is more associated with established large stock who similarly did not show positive abnormal returns. Noteworthy are the most volatile stock that have high abnormal underperformance in advance of the event (-3.05%), this could be influenced returns generated during the crisis period who said to show high volatility and experience sharp declines, including the quite large negative abnormal return on the medium-term of -1.45%.

The results partially confirm the second hypothesis, as the small and value characteristic are able to gain positive abnormal returns on the short- and medium-term and lower returns are gained among the large and growth quartiles. In other words the magnitude of the return is dependent on size and book-to-market value. This volatility illustrates to be from influence to the abnormal return as well, as the moderate volatile firms outperform the general sample with more than 1.00% on the medium-term. Although, high volatile firms seem to be more related to negative performance.

Table 3 – Short-term Cumalitve Abnormal Returns surrounding the share repurchasess for the total time period (2003-2014) on Size, BTMV and Volatility

			Window		
	N		$t_{[-20,-1]}$	$t_{[0,2]}$	$t_{[0,20]}$
Total	16,235				
CAR			-1.18***	0.29***	0.26**
t-statistic			*-10.03*	*6.79*	*2.38*
Size quartile					
CAR	3,020	1 (small)	-0.32	0.59***	1.69***
t-statistic			*-0.94*	*4.88*	*5.82*
CAR	4,628	2	-0.53***	0.43***	-0.68***
t-statistic			*-4.86*	*5.16*	*-2.60*
CAR	4,012	3	-1.16***	0.17**	0.15
t-statistic			*-5.12*	*2.01*	*0.68*
CAR	4,575	4 (large)	-1.82***	0.06	0.24*
t-statistic			*-10.51*	*0.97*	*1.53*
BTMV quartile					
CAR	2,590	1 (growth)	-0.95***	0.05	-0.44**
t-statistic			*-3.05*	*0.42*	*-1.73*
CAR	3,500	2	-1.17***	0.39***	-0.77***
t-statistic			*-4.36*	*3.96*	*-3.18*
CAR	5,418	3	-1.75***	0.22***	0.25
t-statistic			*-8.39*	*2.91*	*1.25*
CAR	4,727	4 (value)	-0.66***	0.44***	1.42***
t-statistic			*-3.40*	*5.76*	*7.18*
Volatility quartile					
CAR	5,969	1 (low)	-0.50***	0.18***	-0.19
t-statistic			*-3.83*	*3.31*	*-1.31*
CAR	5,108	2	-0.85***	0.39***	0.97***
t-statistic			*-4.54*	*6.07*	*5.59*
CAR	2,900	3	-1.71***	0.42***	1.27***
t-statistic			*-5.47*	*3.85*	*4.49*
CAR	2,258	4 (high)	-3.05***	0.19	-1.45***
t-statistic			*-6.04*	*1.05*	*-3.35*

*The Cumulative Abnormal Returns are calculated using the Market Model, therefore the beta coefficient is estimated from 270 to 21 business days prior to the share repurchase event. Size is measured on market capitalization basis; book-to-market value is represented by BTMV; Volatility is measured on an annual basis using weekly returns. The quartile rankings are calculated by using the whole sample size, consisting of 403 companies, and is determined on the event date. During this period there were in total 16,235 share repurchases. The first numbers represent the CAR, the cursive number below are the t-statistics. The significance levels are indicated by *, ** and *** representing a p-value smaller than 0.10, 0.05, 0.01 respectively.*

5.1.2 **CAR Robustness Check**

The whole sample is divided into three time periods, which provides the ability to check whether the results are persistent over time. This way it is possible to control for extreme periods e.g. financial crisis. The results are displayed in Table 4. March 2003 until July 2007 marks the first period, the results for this period are in line with the previous results, which indicates that managers execute share repurchases

after negative performance and gain positive CAR after the event on short and medium-term. The financial crisis, marking the second period from July 2007 until February 2009, result in negative returns over all three event windows. However, the month following the event performs less worse with -1.14% compared to the month before the event with -4.12%. These results may not be so odd in the light of dropping share prices and a disoriented market. The final period from February 2009 until March 2014 represents the latest period. The month in advance of the repurchase is not significantly different from zero however the following event windows show familiar results, with a relatively significant increase on the first days with 0.54% and a decent return on the medium-term with 0.91%. Thus for the non-crisis era the predictions seem to be consistent. To build further on the returns achieved during the crisis it is perhaps interesting to see whether managers were able to properly value the stock on the long term, and thus simply take the short-term losses for granted.

Table 4- The Cumulative Price Performance of actual share repurchases over different time periods.

		Window		
	n	$t_{[-20,-1]}$	$t_{[0,2]}$	$t_{[0,20]}$
Total	16,235			
CAR		-1.18***	0.29***	0.26**
t-value		*-10.03*	*6.79*	*2.38*
Period 1: 2003/2007	3,182			
CAR		-1.09***	0.36***	0.13
t-value		*-3.89*	*3.97*	*0.55*
Period 2: 2007/2009	3,986			
CAR		-4.12***	-0.33***	-1.14***
t-value		*-14.56*	*-2.79*	*-3.92*
Period 3: 2009/2014	9,067			
CAR		0.08	0.54***	0.91***
t-value		*0.58*	*11.49*	*7.53*

*The primary numbers represent the CAR, the cursive number below are the corresponding t-statistics. The p-value is shown as ***, ** and * indicating the significance level at 1%, 5% and 10%.*

To check whether the sample is biased due to overweighing of certain companies with relatively many events in the sample, I will average the CAR by company. This leads to a sample of 403 companies and events, the results are displayed in the Table 5. The results show similarities with Zhang (2004), where buybacks are executed after underperformance and show significant short-term abnormal returns, although the medium-term has a positive CAR the result is not statistically significant.

Table 5 – Control for companies with multiple events, by averaging the results per company

		Window		
	n	$t_{[-20,-1]}$	$t_{[0,2]}$	$t_{[0,20]}$
Total	403			
CAR		-4.77***	0.79**	0.66
t-value		*-5.65*	*2.48*	*1.16*

*The Cumulative Abnormal Return (CAR) is calculated through the Market Model, with an estimation window of (-270, -21). The CAR is the mean of a firm, with in total 403 firms who executed an open market repurchase between March 2003 and March 2014. The p-value is shown as ***, ** and * indicating a significance level of respectively 0.01, 0.05 and 0.10.*

5.1.3 **Cross Sectional Regression**

In order to gain a better understanding of the intrinsic drivers of the subsequent abnormal returns I also perform a cross-sectional regression, as modelled in formula 2. The short and medium event window will be regressed on firm and transaction specific characteristics, the results are listed in Table 6. The results show a positive relation between the post abnormal return and the pre-performance. Although share buybacks are often executed after underperformance, this result indicates that underperformance is constraining subsequent abnormal returns. Furthermore, the size and book-to-market value are in line with the prediction and show significant relations. Even when controlling for the mean reversion effect as Zhang (2004) describes. As a larger size is negative related to abnormal returns, and value firms have a positive relation. Volatility, however, does not significantly relate to subsequent abnormal returns. Neither, does Repurchase Intensity in contrary to Zhang (2004) who found a significant relation between the initial market response and the repurchase size. Although, that relation does not last up to 20 days. Overall the cross-sectional results presented in table 6 are in line with the univariate analysis of table 3. Furthermore the results are consistent over time compared to the results reported by Zhang (2005), except for repurchase intensity.

The results presented in the previous subchapters show significant abnormal returns after repurchase executions. Moreover, the results are in line with the undervaluation predictions that size and book-to-market value are significantly related to the cumulative abnormal return and relate to the magnitude of the abnormal return. The results for volatility are less convincing, as the lowest and the highest volatile stocks are showing negative returns, and in addition the volatility does not show a significant relation in the cross-sectional analysis. However the volatility may be influenced by the financial crisis, or if the volatile stock are truly undervalued than it may pay off on the long-term.

Table 6 - Cross sectional regression on short-term results

Independent Variables	Dependent variable	
	CAR(0, +2)	CAR(0, +20)
Intercept	0.414***	1.075***
	(2.79)	(2.98)
CAR[-20,-1]	0.010*	0.082***
	(1.52)	(6.14)
Size (ln)	-0.102***	-0.198***
	(-3.58)	*(-2.91)*
Book-to-market value	0.067**	0.629***
	(2.46)	(7.31)
Volatility	-0.077	-0.370
	(-0.23)	(-0.47)
Repurchase Intensity	0.127	0.246
	(0.64)	(0.30)
Adj. R^2	0.001	0.014
F-value	4.29	21.50
	(0.001)	(0.000)

*The Cumulative Abnormal Return (CAR) is calculated through the Market Model, with an estimation window of (-270, -21). The independent variables are measured on the event date. The Size (ln) represents the natural logarithm of the market capitalization; book-to-market value; and volatility is the volatility related to the historic stock price. Repurchase Intensity illustrates the percentage of outstanding shares bought that day. The numbers represent the regression coefficients and the numbers between parentheses represent the t-values. The significance levels indicated by *, ** and *** representing a p-value smaller than 0.10, 0.05, 0.01 respectively.*

5.2 *Long-term Abnormal Returns*

This subchapter looks into the long-term performance, as managers may believe their stock is fundamentally mispriced and that the market needs more time to adjust for this information. In order to make a reliable measurement I use the buy and hold abnormal return (BHAR) to measure the long-term returns, as well as the Calendar-Time Portfolio (CTP) model.

5.2.1 BHAR results

The main results of the BHAR method are presented in Table 7. Analysing the daily results they seem quite off when compared to the results of Obernberger (2009) and Zhang (2004). The BHAR shows negative returns of -3.10% in the first year after holding the stock compared to holding a similar characterized portfolio. For the second year the performance increases to 6.54% and 10.96% in the third year, measured over the whole sample. A possible clarification for the BHAR result is the skewness of the samples' abnormal return measured over a long horizon, this imparts also a skewness bias in test statistics (Barber, 1997) . Especially when operating daily returns the risk of standard errors can grow exponentially fast over time. In order to check for this phenomenon I have applied the t-skewness statistic which confirms the skewness and explain the high significant result, the skewness test is

described in Appendix A, formula 2 t_{skeww}. Fortunately, to test het abnormal performance different from the skewness bias will decline when using a smaller sample size (Barber, 1997; Neyman, 1927). Thus in order to reduce this bad model effect, I have also applied a similar analysis on a monthly return basis, the results are presented in the same Table 7. The returns at least experience less compounding errors when using monthly returns are applied, however the results remain highly significant in the same order. This implies that skewness is still present in this sample. I will further base my analysis on the monthly return basis, instead of the daily compounded returns. Believing that the result still holds value and at least indicate a probable outcome and relation.

Analysing the monthly returns over the three time periods it shows overall positive abnormal returns, except for the crisis period that gives a negative abnormal return of -2.36% after a three year buy-and-hold strategy compared to its portfolio benchmark. Besides, the return in the second year of the first period, the returns are all significant. Compared to results from Zhang (2005) this is at least remarkable, and indicates the skewness bias.

Table 7 – Long term Buy and Hold Abnormal Return analysis using size and btmv portfolios as benchmark

		Window					
		Year 1		Year 2		Year 3	
	N	*daily*	*monthly*	*daily*	*monthly*	*daily*	*monthly*
Total	16,202						
BHAR		-3.10***	2.92%***	6.54***	3.24***	10.96***	2.25***
t-statistic		*-5.84*	*18.25*	*6.34*	*20.51*	*8.96*	*12.70*
t-skewness		*-1.20*		*192.91*		*146.38*	
Period 1: 2003/2007	3,153						
BHAR		-4.84***	1.78***	5.72*	-0.31	-12.36***	6.20***
t-statistic		*-3.99*	*5.22*	*1.91*	*-0.72*	*-4.02*	*11.97*
t-skewness		*-1.42*		*268.07*		*36.82*	
Period 2: 2007/2009	3,982						
BHAR		-17.51***	5.40***	-15.54***	8.48***	-0.52	-2.36***
t-statistic		*-13.47*	*12.65*	*-6.41*	*28.71*	*-0.19*	*-9.30*
t-skewness		*-9.79*		*96.37*		*198.42*	
Period 3: 2009/2014	9,009						
BHAR		3.88***	2.23***	16.60***	2.17***	26.07***	3.00***
t-statistic		*6.34*	*12.43*	*15.61*	*11.04*	*18.93*	*13.04*
t-skewness		*11.02*		*51.85*		*69.95*	

*The p-value is shown as ***, ** and * indicating p-values of 0.10, 0.05 and 0.01 respectively. The BHAR is calculated on a daily basis using the matched portfolio model, based on size and btmv, the events are matched at the moment of the event day. The primary number is the BHAR result, the cursive number is the t-value and the number in brackets represent the t-skewness.*

Table 8 – BHAR analysis over Size, Book-to-Market value and Volatility Quartiles using monthly returns

			Window		
	N		Year 1	Year 2	Year 3
Size quartile					
BHAR	2,985	1 (small)	2.77***	1.98***	5.25***
t-statistic			*6.49*	*5.28*	*11.08*
BHAR	4,613	2	3.20***	4.53***	2.75***
t-statistic			*10.17*	*12.87*	*7.59*
BHAR	3,969	3	3.2***	3.98***	1.13***
t-statistic			*9.28*	*13.96*	*3.31*
BHAR	4,574	4 (large)	3.36***	2.43***	0.47*
t-statistic			*13.10*	*12.62*	*1.73*
BTMV quartile					
BHAR	4,699	1 (low)	3.05***	3.23***	0.38
t-statistic			*8.25*	*9.77*	*0.90*
BHAR	5,371	2	3.69***	2.89***	2.57***
t-statistic			*8.50*	*7.87*	*5.60*
BHAR	3,845	3	2.90***	3.43***	2.04***
t-statistic			*10.79*	*12.89*	*6.98*
BHAR	2,383	4 (high)	3.15***	4.17***	3.36***
t-statistic			*-5.42*	*2.10*	*6.87*
Volatility quartile					
BHAR	5,945	1 (low)	-6.50***	-1.03	4.07***
t-statistic			*-9.17*	*-0.93*	*5.70*
BHAR	5,108	2	4.22***	6.47***	5.41***
t-statistic			*4.99*	*1.32*	*1.27*
BHAR	2,900	3	4.23**	3.74***	3.85***
t-statistic			*2.58*	*8.54*	*7.95*
BHAR	2,258	4 (high)	-2.60***	-2.91***	-4.71***
t-statistic			*-7.47*	*-9.55*	*-11.45*

*The Buy-and-Hold Abnormal Return are calculated using a benchmark portfolio. The portfolio are constructed on the event date and are based upon the Size and BTMV. The numbers represent the percentage return of the BHAR. The Size ranking is measured on market capitalization basis; book-to-market value is represented by BTMV; Volatility is measured on an annual basis using weekly returns. The quartile rankings are calculated by using the whole sample size, consisting of 403 companies, and is determined on the event date. During this period there were in total 16,202 share repurchases. The cursive t-statistic is determined through a two sided t-test. The significance levels indicated by *, ** and *** representing a p-value smaller than 0.10, 0.05, 0.01 respectively.*

Similar for the short-term results I also checked for the different size, book-to-market value and volatility quartiles, on a BHAR method basis, the results are presented in Table 8. The size characteristic shows higher returns for larger companies in the first year, although this return declines from 3.36% to 0.47% in the third year. In contrary to the small firms who experience a less abnormal return after one year but see their returns increase after three years from 2.77% to 5.25%.

For the book-to-market value the largest returns are predicted among the value quartiles, this is confirmed for year two and three. In third year after the repurchase the return of the value firm is 3.36% compared to 0.38% of the growth firm. However the abnormal returns generated over the first year after the repurchase do not seem very different from one another.

Analysing the volatility results, the quartiles are in line with the short term result, where the moderate volatile quartiles (two and three) are gaining the highest return. Whereas the high volatile firms are under performing as well as the low volatile firms. The highest volatility quartile has performed the worst compared to all other characteristics, this refutes the statement made in the previous section, whether the high volatile firms could gain a long term abnormal return. Concluding that managers cannot value high volatile stock any better than the market.

5.2.2 BHAR Robustness Check

To control for oversampling particular firms, which is one of the causes of the skewness bias, the average BHAR for each firm is calculated reducing the total to 403 events in which every firm is represented an equal amount of times. The results in Table 9 show weak evidence for long-term results, moreover the results are negative throughout the years. Indicating that the timing ability is not visible on the long-term, and contradicting the results previously showed in Table 7 and 8.

Table 9 - Single event per firm

		BHAR		
	n	Year 1	Year 2	Year 3
Total	403			
CAR		-6.29*	-5.03	-6.09
t-value		*-1.74*	*-0.80*	*-0.84*

*The Buy-and-Hold Abnormal Return (BHAR) is calculated through benchmark portfolio. The BHAR is the average BHAR of a firms' repurchases, with in total 403 firms who executed an open market repurchase between March 2003 and March 2014.The t-value is determined using the two sided t-test. The p-value is shown as ***, ** and * indicating the significance level of respectively 0.01, 0.05 and 0.10.*

Similar to the short-term analysis I also apply a cross sectional regression for which the results are shown in Appendix B, Table 17. The results show similar relations in line with Zhang (2004) and the short term CAR regression of Table 6. In addition I have performed the BHAR analysis using the Hang Seng Index as benchmark, and the BHAR method using normal returns estimated by the market model with an estimation window of 250 business days. It shows that an oversimplified benchmark as the Hang Seng Index does not provide any reliable returns, however the market model shows returns in line with other articles.

Overall, it is important stress out that the results experience severe bad model problems, in particular the right skewness bias. This is reflected in the results compared to other articles. Moreover, this supports the reasoning to apply multiple long-term methods. This topic will be discussed in more detail in chapter 6.

5.2.3 **Calendar Time Portfolio Approach**

The CTP method differs significantly from the BHAR approach as described in the methodology section, however this should not imply significant differences between the results. The first impression of the CTP results Table 10 look more in line with benchmark articles. Overall the results are hardly distinguishable from zero, implying that any short-term gains disappear on the long run, in line with results presented by Zhang (2005). As the largest return is gained with a one year portfolio for period 1, with a 0.12% abnormal return. Furthermore, the overall sample from 2003 until 2014, show significant outperformance of the market but are insignificantly different from zero with a constant abnormal return of 0.02%. This return would be even less when accounted for the transaction costs that come with managing such a portfolio. The results over the remaining periods look quite constant, however, from 2007 to 2014 less significant. Moreover, the relative higher returns for period 1 suggesting that markets increased in efficiency over time.

Table 10 provides in addition a performance analysis of the prior six month towards an event. Subtle differences between the crisis and non-crisis periods are noticeable, such as higher negative returns prior to the event, with -0.07% during the crisis compared to -0.02% after.

The results Zhang (2005) show for the period 1993 until 1997 using the BHAR method are larger but insignificant. Whereas Obernberger (2014) has similar results using the CTP method for 2004 until 2010 with 0.10% compared to the 0.12% for the same period in Table 10, however the results I present are significant. After all, the results do not show support for the long-term persistence of abnormal stock performance.

Table 10 - Calendar-Time Portfolio over three periods and five rolling windows

Rolling window	n	$t_{[-125,0]}$	$t_{[0,125]}$	$t_{[0,250]}$	$t_{[0,500]}$	$t_{[0,750]}$
Overall	16,202					
AR		-0.01	0.00***	0.02**	0.02**	0.02***
t-statistic		*-1.47*	*3.56*	*2.09*	*2.20*	*2.74*
Period 1: 2003/2007	3,149					
AR		0.00	0.02***	0.12**	0.03**	0.03**
t-statistic		*0.51*	*3.47*	*2.04*	*2.00*	*2.13*
Period 2: 2007/2009	3,941					
AR		-0.07***	-0.01	-0.01	0.02	0.02
t-statistic		*-2.62*	*-0.46*	*-0.46*	*1.04*	*1.19*
Period 3: 2009/2014	9,029					
AR		-0.02*	0.02**	0.00	0.01	0.02*
t-statistic		*-1.79*	*2.05*	*0.70*	*0.85*	*1.87*

*The long-term Abnormal Returns calculated with the Calendar Time Portfolio using the Fama French three-factor model. The results are measured over three periods, using five different rolling time-windows. The primary numbers (AR) are the excess alpha (intercept), the cursive numbers show the corresponding t-statistic. Significance levels at 0.01, 0.05 and 0.10 level represented by ***, ** and * respectively.*

Table 11 - Calendar Time Portfolio measured over Size, BTMV and Volatility quartiles with four different rolling windows

			Window				
	N		$t_{[-125,0]}$	$t_{[0,125]}$	$t_{[0,250]}$	$t_{[0,500]}$	$t_{[0,750]}$
Total	16,202						
AR			-0.01	0.00***	0.02**	0.02**	0.02***
t-statistic			-1.47	*3.56*	*2.09*	2.20	2.74
Size quartile							
AR	3,020	1 (small)	-0.00	0.01	0.01	0.00	0.01
t-statistic			*-0.07*	*1.31*	*1.03*	*0.89*	*1.18*
AR	4,628	2	-0.02	0.00	-0.02*	-0.02*	0.01
t-statistic			*-0.87*	*0.44*	*-1.98*	*-1.74*	*-1.44*
AR	4,012	3	0.01	0.01	0.00	0.02*	0.02*
t-statistic			*0.66*	*1.51*	*0.51*	*1.91*	*7.71*
AR	4,575	4 (large)	-0.01	0.08***	0.07***	0.05***	0.06***
t-statistic			*-1.47*	*3.62*	*3.57*	*3.16*	*3.99*
BTMV quartile							
AR	4,727	1 (low)	0.00	0.01	-0.03**	-0.02*	0.02
t-statistic			*0.09*	*-0.71*	*-2.23*	*-2.08*	*-1.53*
AR	5,418	2	-0.02	0.02	0.00	-0.00	0.01
t-statistic			*-0.80*	*1.27*	*-0.08*	*-0.23*	*0.65*
AR	3,500	3	-0.02	0.04**	0.01*	0.02**	0.02**
t-statistic			*-0.75*	*2.24*	*2.03*	*2.45*	*2.20*
AR	2,590	4 (high)	-0.02	0.09***	0.07***	0.06***	0.07***
t-statistic			*-1.30*	*5.28*	*4.55*	*5.20*	*5.86*
Volatility quartile							
CAR	5,969	1 (low)	-0.06*	-0.04	-0.05**	-0.04**	-0.02
t-statistic			*-1.75*	*-1.44*	*-2.56*	*-2.31*	*-1.28*
CAR	5,108	2	-0.02	0.03*	0.02	0.02*	0.03***
t-statistic			*-0.98*	*1.90*	*1.26*	*1.77*	*2.72*
CAR	2,900	3	-0.00	0.02***	0.04***	0.05***	0.04***
t-statistic			*-0.31*	*3.74*	*3.43*	*4.69*	*4.86*
CAR	2,258	4 (high)	0.02	0.05***	0.04***	0.03***	0.02***
t-statistic			*1.58*	*4.17*	*3.84*	*3.25*	*2.73*

The Calendar Time Portfolio are calculated using the Fama French three factor model. Size is measured on market capitalization basis; book-to-market value is represented by BTMV; Volatility is measured on an annual basis using weekly returns. The quartile rankings are calculated by using the whole sample size, consisting of 403 companies, and is determined on the event date. During this period there were in total 16,235 share repurchases. The significance levels indicated by *, ** and *** representing a *p-value* smaller than 0.10, 0.05, 0.01 respectively.

Table 11 shows the CTP results over the different quantiles Size, Book-to-market value and volatility. The results show similar returns as for the total sample. Although, Fama French three-factor adjusts for the book-to-market factor, it still shows similar results in line with short-term results. Where the value firms have larger and significant abnormal returns of 0.07% compared to growth firms with 0.01%, although insignificantly different from zero. The one characteristic which is not adjusted for is

volatility, the results are negative for the least volatile firms and slightly positive for the moderate quantiles but significant. In this analysis, higher volatility is associated with larger abnormal returns, however the returns are almost indistinguishable from zero. In addition I have robust tested for overrepresentation, allowing one firm to have one event, which is randomly picked to prevent clustering. The results are shown in Appendix B, Table 18, and are in line with the general results displayed in this section and do not merit any further discussion.

In summary, the long-term measurements through the BHAR and CTP method resulted in a variety of results. Where the BHAR shows strong significant long-term results the CTP showed results small and insignificantly different from zero. The large difference can be explained by the high skewness of the BHAR method, and the proposition of the matching benchmark. Therefore it is unable to draw conclusions on the results produced by the BHAR methodology. However the CTP did provide reliable results and it must be concluded that the abnormal return is not persistent over a longer period of time.

5.3 *Contrarian Trading Theory*

This section analyses the bargain at which firm repurchase, as well as the share price performance in advance of actual repurchases. In addition this time window includes the short-term subsequent price performance for an overall analysis surrounding the event. The first results presented in Table 12 support the both predictions. First, the bargain is significantly larger than zero with 1.69% at [-20,0] and 0.61% at [-5,-1], which is in line with the prediction. The second prediction is confirmed with an underperformance of -0.23% at [-20,0] and -0.32% at [-5,-1]. This is in line with the CAR measurements of section 3.1, as the CAR[-20,0] show a negative return of -1.18% in advance of the event.

Table 12 - Bargains and Average Raw Returns surrounding actual repurchases

		Window				Overall	
	n	[-20,-1]	[-5,-1]	[1,5]	[1,20]	[-20,20]	[-5,5]
Total	16.189						
Bargain		1.69%***	0.61%***	0.19%***	-0.03%	0.83%	0.40%
t-value		*23.38*	*15.73*	*4.99*	*-0.36*		
Avg. raw Return		-0.23%***	-0.32***	-0.01	-0.06***	-0.15%	-0.16%
t-value		*-33.14*	*-23.53*	*-0.83*	*-10.62*		
Rob.Check	2,935						
Bargain		2.60%***	1.00%***	0.71%***	0.81%	1.71%	0.86%
t-value		*14.01*	*9.31*	*7.45*	*4.75*		
Avg. raw Return		-0.30%***	-0.52%***	0.12%***	-0.02%	-0.16%	-0.22%
t-value		*-17.86*	*-13.85*	*3.74*	*-1.17*		

The bargain is the percentage difference between the repurchase price and the average market price. Avg raw Return is the average return over the specific time windows. The Robustness Check measures a maximum of one event per month for each company. The overall column is simply the average of the combined windows. The significance levels indicated by *, ** and *** representing a *p-value* smaller than 0.10, 0.05, 0.01 respectively.

A simple robustness check for oversampling shows similar results, in line with the contrarian trading hypothesis. Note that the subsequent returns are insignificantly different from zero, however this is irrelevant for the contrarian trading theory to be true, as it only explains the performance ex ante.

For further robustness and consistency I also measure the bargain and raw average return over different time periods, the results vary remarkably over time. The first period shows small negative bargains, indicating that firms did not significantly buy below average market price. On the other hand, when analysing the overall bargain for the event windows [-20,20] and [-5,5] the bargain is positive, consistent over all periods. The largest bargain of 6.18% was generated during the crisis compared to the average market price in the month before the event, the returns after the repurchase however continue to decline. This leading to negative bargains subsequent to the event. Although, the average bargain over the whole period is still positive, with a bargain of 6.18% in the month preceding the event and a -3.23% bargain subsequently. This may indicate that the repurchase was used as a tool to counter the momentum. One may also question whether the bargain is real, when subsequent market prices are lower resulting into negative subsequent bargains as can be seen in Table 13.

The most recent period from 2009 until 2014 shows positive bargains which translates to a 0.42% discount compared to the average price paid in the previous month, supported by negative raw returns. After the event prices increased again.

Overall, the results are consistent with the contrarian trading hypothesis, in that regardless of the returns the bargain remains positive with an acceptable exception for the subsequent bargain during the crisis period. Thus it shows that firms are capable of buying below average market price. This shows support of the third hypothesis, that the Bargain is significantly different from zero. Moreover, the bargain seem to hold when expanding the bargain window by including the post event returns. The fourth statement is confirmed as well, as every analysis indicated a repurchase was accompanied with share price underperformance, this however will be further analysed in the following section.

Table 13 – Bargain and Avg. Raw Return over different time periods

		Window				Overall	
	n	[-20,-1]	[-5,-1]	[1,5]	[1,20]	[-20,20]	[-5,5]
Period 1	3,136						
Bargain		-0.32%**	-0.05%	0.73%***	1.63%***	0.66%	0.34%
t-value		*-2.37*	*-0.68*	*10.02*	*12.13*		
Avg. raw Return		-0.02%	-0.06%**	0.19%***	0.11%***	0.05%	0.07%
t-value		*-1.44*	*-2.71*	*8.01*	*10.31*		
Period 2	3,986						
Bargain		6.18%***	2.27%***	-0.86%***	-3.23%***	1.48%	0.71%
t-value		*33.68*	*22.31*	*-8.00*	*-15.95*		
Avg. raw Return		-0.65%***	-0.92%***	-0.38%***	-0.39%***	-0.52%	-0.66%
t-value		*-37.90*	*-25.48*	*-10.36*	*-23.12*		
Period 3	*9,067*						
Bargain		0.42%***	0.11%**	0.47%***	*0.81%***	*0.62%*	*0.29%*
t-value		*5.05*	*2.38*	*11.41*	*11.04*		
Avg. raw Return		-0.11%***	-0.14%***	0.08%	0.02%***	-0.05%	-0.03%
t-value		*-14.37*	*-4.55*	*5.88*	*3.09*		

The bargain is the percentage difference between the repurchase price and the average market price. Avg raw Return is the average return over the specific time windows. The significance levels indicated by *, ** and *** representing a *p-value* smaller than 0.10, 0.05, 0.01 respectively.

5.4 *Cross sectional Regression of the Bargain*

The final hypothesis is that the bargain is positive related to the subsequent abnormal return. A cross sectional regression is used to test this prediction, the results are presented in Table 14. The most interesting result is that the CAR[0, 20] does have a positive correlation with the bargain[-20, 0], supporting the hypothesis however contradicting the findings by Obernberger (2014). The size, as the natural logarithm of market value, shows a negative coefficient which is in line with the predictions as well. The prediction that does not seem to fit is that the book-to-market value coefficient is negative. Therefore value firms do not buy below average market price, whereas large firms do. Furthermore, value firms do not necessarily buy after underperformance whereas large firms do as illustrated in section 5.1.1, Table 3. The volatility also shows a negative relation, in contrary to the prediction. Which indicate that it is more difficult for volatile companies to repurchase below the average market price. Finally, the repurchase intensity has a negative coefficient, implying that a larger repurchase relative to the company outstanding shares is resulting in a lower bargain. Although unlikely, it could be that companies do not want to get the impression of taking advantage of the market by intensifying the repurchase below market price. However once firm and time fixed-effects are included all relations fade, and only the average raw return preceding the event remains significant, confirming the fourth hypothesis that share repurchases are driven by underperformance.

Table 14 - Cross Sectional Regression of the Bargain regarding Timing Hypothesis

Independent Variables	Dependent variable Bargain	
Intercept	45.139***	-
	(4.62)	-
Raw avg. return [-20,0]	-0.638***	-22.326***
	(-15.33)	(-2.63)
CAR[0, 20]	0.017***	0.003
	(7.14)	(0.98)
Size (ln)	0.234***	0.158
	(19.27)	(0.84)
BTMV	-0.063***	-0.317**
	(-4.18)	(-1.51)
Volatility	-1.140***	-0.809
	(-8.86)	(-0.41)
Repurchase Intensity	-0.210	-0.126
	-1.21	(-1.11)
Adj. R^2	0.018	0.910
F-value	50.85	2.17
	(0.000)	0.0456
Firm FE	N	Y
Time FE	N	Y

The Buy-and-Hold Abnormal Return is regressed on size which is the natural logarithm of the market capitalization, book-to-market value, volatility, number of shares bought, total value of shares bought, and value as percentage of the market value. The main numbers are the regression coefficients, the number in brackets is the t-value. The significance levels indicated by *, ** and *** representing a *p-value* smaller than 0.10, 0.05, 0.01 respectively.

The fifth hypothesis does seem to be true, however, once firm and time fixed effects are included the results do not hold up. And the fifth hypothesis cannot be confirmed, which in the case of Obernberger (2014) would lead to the rejection of the timing hypothesis. This will be further discussed in the following section.

6 Discussion

This thesis contributed to the existing literature on different levels. It updated the results of Zhang (2004) on managerial timing by extending and applying additional methodologies in more detail, and analysing the effects in different circumstances such as the financial crisis. This thesis also applied the contrarian trading methodology form Obernberger (2014) in an environment with daily data, allowing for more detailed insight, which was only done by Ginglinger & Hamon (2009) so far. Moreover, the appliance of the contrarian trading theory in a different market is adding to the robustness of the theory. Finally, I analysed the volatility factor in relation to the actual share repurchase performance, which to my knowledge is not done before. The overall results are robust for the short-term abnormal return and the contrarian trading hypothesis. Appendix B, Table 23 gives an overview of the results compared to the benchmark papers of Zhang (2004) and Obernberger (2014).

Although the results are already discussed throughout the previous section, there are still some points of discussion. The BHAR method used in this thesis experienced skewness bias. This could be attributed to the lack of independence which is caused by overlapping long-horizons, in addition the skewness is a by-product of the cross-correlated data (Mitchell & Stafford, 2000). Therefore it cannot entirely be contributed to skewed returns of the BHAR. Lyon, Barber and Tsai (1999) suggest that when a similar analysis is performed the bootstrapped version of the skewness-adjusted t-test is preferred. Another alternative for the long-term return measurements might be to the Ibbitson's Return Across Time and Securities (IRATS) methodology, which adjusts for changing risk factors.

The fifth hypothesis does not show a significant positive relation between bargain and subsequent abnormal performance, which in the case of Obernberger (2014) would lead to the rejection of the timing hypothesis. The long-term performance analysis in this study also supports this statement. However the long term analysis relies only on the calendar time portfolio measures, and in addition the abnormal returns do persist on the short term. Therefore, rejecting the Market Timing Hypothesis might be too short sighted. One might also question the robustness of the statement that bargain and subsequent abnormal performance is positive. To gain an abnormal return it is not necessarily needed to have a change in the share price, as it is relative to the benchmark. Furthermore, it may be argued that the bargain as represented by the contrarian trading theory is a subjective measure of repurchasing below average market value, as the subsequent share price performance are not included and therefore could be negative.

Finally, it is the question whether a portfolio of repurchasing companies are a good investment for a general investor. The results from this study would imply that returns can be made on the short term, especially if sorted on size, book-to-market value and volatility. However managing such a portfolio is costly, especially with 'undervalued' stock being in general less liquid, thus any profit made during the period probably evaporates.

7 Conclusion

This study has focused on the performance and execution of actual share repurchases at the Hong Kong Stock Exchange. Measuring in detail the daily performance over the short and long-term, while taking a certain set of firm characteristics in regard. The origin of this thesis is whether the managers exhibit the ability to time their repurchase at the moment that is most lucrative, in terms of investment return. The results I present in this thesis show favourable indications that managers do have that ability, at least for the short-term. This is especially true when focussing on the value and small firms. Volatile stock do also outperform the market, however this is restricted to the moderate volatility. While the highest volatile firms likely use the repurchase as a last resort to restore the markets' trust, however unsuccessfully.

The positive abnormal returns on the short-term do not persist over time however, and this accounts for all the stock analysed. Although minor differences are notable the probability of making a positive return on such investment after accounting for transaction costs is unlikely. The results further implicate that the short-term abnormal returns fully adjust for any information asymmetry.

In addition, this thesis analysed the contrarian trading theory that repurchases are purchased at a bargain and driven by underperformance, rather than timing. The presented results in this thesis support the contrarian trading hypothesis. Which implicates that firms are able to buy shares below average market price, this is true while using daily data and different time windows. Furthermore this thesis support the prediction that share repurchases are driven by share underperformance.

The last hypothesis analyses whether the bargain is positive related to the subsequent abnormal return, combining the contrarian trading theory and the market timing theory. This relation does seem to be true however, once firm and time fixed effects are included the results fade. Therefore the fifth hypothesis cannot be confirmed.

By applying a more detailed view on the repurchases execution through different characteristics, it highlights that actual repurchases are not as homogeneous as is suggested. The thesis shows that value firms gain higher abnormal returns, whereas large firms buy at larger bargains. Suggesting that a part of the sample is more likely to execute using a contrarian trading strategy, whereas the other part is more inclined with the managerial timing hypothesis.

Overall the results show that short-term abnormal returns still exist in support of the Managerial timing hypothesis, and that the magnitude of the abnormal return does depend on size, book-to-market value and volatility. However markets have become more efficient on the long-term. The contrarian trading hypotheses co-exist in this case among the managerial timing hypothesis, and where the timing hypothesis does not explain prior performance the contrarian trading hypothesis successfully does and vice versa.

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Appendix A – Formulas

Formulas and models used in this thesis:

1) CAR under Market Model		$\hat{R}_{j,t} = \hat{\alpha}_j + \hat{\beta}_j R_{m,t} + \varepsilon_j$ $AR_{j,t} = R_{j,t} - \hat{R}_{j,t} = R_{j,t} - \left(\hat{\alpha}_j + \hat{\beta}_j R_{m,t}\right) + \varepsilon_j$ $CAR_{j,t} = \sum AR_{j,t}$
2) BHAR	$BHAR$	$BHAR_{i,t} = \prod_{t=1}^{t}(1 + R_{i,t}) - \prod_{t=1}^{t}(1 + E(R_{i,t}))$ $R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_j$
	t_{bhar}	$t_{bhar} = \frac{\overline{BHAR_{i,t}}}{(\frac{\sigma_{BHAR}}{\sqrt{n}})}$
	t_{skew}	$S^2_{\overline{BHAR}} = \frac{1}{N-1}\sum_{i=1}^{N}(BHAR_i - \overline{BHAR})^2.$ $\gamma = \frac{N}{(N-1)(N-2)}\sum_{i=1}^{N}(BHAR_i - \overline{BHAR})^3 S^{-3}$ $S = \frac{\overline{BHAR}}{S_{\overline{BHAR}}}$ $t_{skew} = \sqrt{N}(S + \frac{1}{3}\gamma S^2 + \frac{1}{27}\gamma^3 S^3 + \frac{1}{6N}\gamma)$
	$BHAR$ $Regression$	$BHAR_{i,t} = \alpha + \beta_1 CAR[-20,-1] + \beta_2 Size + \beta_3 BTMV +$ $\beta_4 Volatility + \beta_5 Repurchase\ Intensity + \mu_{t,i}$
3) CTP		$\left(R_{i,t} - R_{f,t}\right) = a_j + b_j\left(R_{m,t} - R_{f,t}\right) + c_j SMB_t + d_j HML_t + \epsilon_{i,t}$
4) Bargain		$p_t = \frac{total\ value}{number\ of\ shares\ repurchased}$ $B_t = p_t - \bar{p}$

4)	Volatility	$40 * \frac{\sqrt{\sum_{i=1}^{n} \frac{(x_i - \bar{x})^2}{n-1}}}{\bar{x}}$
5)	$BHAR$ $Regression$	$BHAR_{i,t} = \alpha + \beta_1 CAR[-20,-1] + \beta_2 Size + \beta_3 BTMV + \beta_4 Volatility + \beta_5 Repurchase\ Intensity + \mu_{t,i}$
6)	CTP $Regression$	$CTP_{i,t} = \alpha + \beta_1 CAR[-20,-1] + \beta_2 Size + \beta_3 BTMV + \beta_4 Volatility + \beta_5 Repurchase\ Intensity + \mu_{t,i}$

Appendix B - Tables

Table 15 – Hypotheses overview with corresponding predictions

Hypothesis	t_{-1}	t_{+1}
TH – H1	No prediction	CAR>0
TH – H2	No prediction	Cov(Size, AR) < 0 Cov(Btmv, AR) > 0 Cov(Volatility, AR) > 0
CTH – H3	B > 0	No prediction
CTH – H4	Cov(R, q) < 0	No prediction
TH – H5	No Prediction	Cov(AR, B) > 0

Overview of the hypotheses and predictions. Where t represents the repurchase event, t_{-1} the period before the repurchase and t_{+1} is the period after the event. TH is the Timing Hypothesis and CTH the Contrarian Trading Hypothesis. B is the bargain, the difference the average market price and repurchase price. The R is the stock return, and q is the repurchase volume.

Table 16 - Descriptive statistics of the variables used in this research from March 2003 until April 2014

Variable	N	Mean	Min	Median	Max
Price	625,538	1,395.98	0.121	133.14	228,498.9
Total Return Index	622,660	1,097.04	0.34	120.25	228,498.9
Market Cap. (*10^6)	625,538	12,930.74	16.32	2,230.80	2,065,576
Price-to-book value	622,660	1.49	0.20	0.92	75.46
Volatility	622.660	0.51	0.01	0.48	1.83
Number of shares purchased	16.202	1,651,422	34	317,000	96.421.000
Purchased Value	16.202	4,426,259	790	592,200	75,500,000

All financial figures are in Hong Kong Dollars. Total return index is a price proxy adjusted for capital changes. Price-to-book value is the market value per share divided by the book value per share. Purchased value is the total amount paid on the event date. The volatility as the standard deviation of the stock over the last six months. The numbers of shares purchased during an actual share buyback as well as the total value spend in HKD.

Table 17 – BHAR 3 year Cross Sectional Regression

Independent Variables	
Intercept	0.352 ***
CAR(-20,0)	0.158 ***
Size (ln)	0.001 *
BTMV	0.016 ***
Volatility	-0.568 ***
Repurchase Intensity	-0.018
Adj. R^2	0.006
F-value	18.63
	(0.000)

*The three year Buy-and-Hold Abnormal Return is the dependent variable. Size is the natural logarithm of the market value, book-to-market value, volatility and repurchase intensity as the number the percentage bought of outstanding shares. The significance levels indicated by *, ** and *** representing significance levels at 10%, 5% and 1% respectively.*

Table 18 - Robustness test Calendar Time Period, one event per firm

Rolling	N	$t_{[-125,0]}$	$t_{[0,125]}$	$t_{[0,250]}$	$t_{[0,500]}$	$t_{[0,500]}$
Overall						
AR	403	-0.05**	0.02	0.02	-0.00	0.01
t-statistic		-2.31	0.90	1.31	-0.59	0.73

*Robustness test of the Calendar Time Portfolio method, allowing only one event per company. The portfolios are based on rolling windows of 125 days before the event and 125, 250 and 500 days after the event. Between March 2003 and April 2014. The significance levels indicated by *, ** and *** representing significance levels at 10%, 5% and 1% respectively.*

Table 19 - Cross Sectional Regression of the returns generated through the CTP method

Independent Variables	AR(0, +125)	AR(0, +250)
Intercept	-0.004	-0.001
CAR[-20,-1]	0.011*	0.087***
Size (ln)	0.008*	0.004
Book-to-market value	0.056***	0.030***
Volatility	-0.094	-0.231
Repurchase Intensity	$4.33*10^{-9}$	$-1.96*10^{-9}$
Adj. R^2	0.002	0.012
F-value	5.02	32.83
	(0.000)	(0.000)

*The cross sectional regression of the subsequent event returns, using CTP method. The Fama French three-factors are left out in this table, however control for the largest part of the correlation. It is regressed on CAR[-20,-1] representing the underperformance, Size is the natural logarithm of the market value, book-to-market value, volatility and repurchase intensity as the number the percentage bought of outstanding shares. The significance levels indicated by *, ** and *** representing significance levels at 10%, 5% and 1% respectively.*

Table 20 - Sample analysis of the Buy and Hold Abnormal Return measured over one, two and three years

		Window		
	n	Year 1	Year 2	Year 3
Markert Model	16,202			
BHAR		-12.38***	0.29***	0.26**
t-value		*-3.69*	*6.79*	*2.38*
BHAR - HSI index	16,202			
BHAR		12.61***	36.58***	46.80***
t-value		*24.33*	*34.32*	*38.16*

*Long term abnormal returns are the main numbers, the t-values are calculated through a two sided t-test. The market model is based using a normal return with an estimation period of 250 trading days. The BHAR analysis is used with the HSI index as benchmark. The significance levels indicated by *, ** and *** representing significance levels at 10%, 5% and 1% respectively.*

Table 21 - Constructing BHR Portfolios

Portfolio	Size Quantile	Btmv Quantile	Combined
A	1	1	11
B	1	2	12
C	1	3	13
D	2	1	21
…	…	…	…
K	3	3	33

Firms are divided into Size and book-to-market value quantiles on a value weighted basis. This translates into a particular portfolio combinations, which will be matched to sample firm on the event date.

Table 22 – Benchmark Articles Analysis

		Short-term (daily)			Long-term			
Author	Period	(-20, 0)	(0,2)	(0,20)	Method	1-year	2-year	3-year
Wolfshaar (2017)	2003-2014	-1.18%	0.29%	0.26%	CTP	0.02***	0.02***	0.02***
					BHAR	-3.10	6.54	10.96
Zhang (2005)	1993-1997	-1.844***	0.429***	0.688	BHAR	1.13	-0.39	-1.10
Obernberger(2014)	1991-2001				CTP	0.37**	0.44***	0.34***
	2004-2010				CTP	0.10	0.12	0.11

*The results of this thesis is compared to the benchmark papers used. The short-term return is calculated through the market model, in case of Zhang (2004) with an estimation window of 200 trading days. The significance levels indicated by *, ** and *** representing significance levels at 10%, 5% and 1% respectively.*