The effects of share repurchase on stock returns

Master thesis in Finance

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Abstract

This study documents the effects and drivers for share repurchase in the short and medium term in China and the U.S. This research reports the differences in cumulative average abnormal returns of share repurchase announcements between China and the U.S. Furthermore, the drivers of motivations for share repurchase in both countries are identified. The data is collected from Zephyr, SDC M&A database and formal express, which spans from 1st of January 2004 until 31st of December 2013. The results show positive abnormal returns both in short term and medium term for both countries. Moreover, this study finds support for signaling hypothesis, capital structure hypothesis and dividend substitution hypothesis in the U.S, while dividend substitution hypothesis and partially free cash flow hypothesis are accepted in China.
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Chapter 1 Introduction

Share repurchase is increasingly becoming an important method for companies to pay out cash to shareholders. Generally, when companies make a profit, they tend to use the excess cash flow for two main purposes. One is to pay dividends to their shareholders and the other is to keep the cash in hand as equity. After evaluating the investment opportunities by technics like NPV, residual income and abnormal earnings growth, the retained earnings can be used to seize further investment opportunities. However, when there are not enough investment opportunities, the retained earnings can also be used to repurchase shares from existing shareholders.

Share repurchase refers to the event that a company buys back shares from its own existing shareholders. According to Stephens and Weisbach (1998), there are three methods in which a company can repurchase its own shares: tender-offer repurchases, Dutch auction repurchases and open-market repurchases [57]. When a company uses tender-offer repurchases, they announce the amount and fixed price of shares for repurchase, and also the duration. The company can change the amount freely and extend the duration. Even though both tender-offer repurchase and Dutch auction repurchase are non-open-market repurchases, Bagwell (1992) points out that the main difference lay in that tender-offer uses fixed price, while Dutch auction repurchase uses a range of prices to repurchase shares [3]. The open-market share repurchase is the most well-known method. However, whether a company will actually repurchase shares depends on market conditions.

Even though in Brealey and Myers’ (1996) textbook, the discussion of payout policy generally suggests that dividends and stock repurchases are more or less equivalent ways of paying out cash, there exist some reasons that companies may prefer share repurchase to dividends payout [11]. Black (1976) focuses on repurchases’ tax advantage relative to dividends since dividends are taxed more heavily [7]. Jagannathan, Stephens and Weisbach (2000) report that much more than taxes can be used to explain differences in how dividends and repurchases are used in practice. Their empirical results show that flexibility inherent in repurchase program is one reason why share repurchase is used instead of dividends [35].
Share repurchases have a long history in the United States, and the research on that has been conducted in the early 1980s. Since then, many research papers focused on US stock market. There are also many papers focusing on other countries and districts like Canada and Europe. These papers dig into the motives of share repurchase and show large amount of empirical results to prove the positive relationship between share repurchases and stock returns. However, things are different in China. Share repurchase was introduced in 1990 and repurchase activities began to appear after the foundation of Shanghai Stock Exchange (SSE) in 1990 and Shenzhen Stock Exchange (SZSE) in 1991. Typical repurchases examples are Lu jia zui in 1994 and Shen neng in 1999. Moreover, due to the strict law and regulations on share repurchase in China, it is still new to Chinese stock market comparing to that in US. However, there has been limited research on share repurchase in developing countries like China. To the best of my knowledge, there is no research on comparison between these two countries. Therefore, this study will focus on share repurchases in US and China, the largest developed and developing countries, to investigate the share repurchase effects and motivation theories, which contributes to the deficiency in the research.

An event study is conducted to find the share repurchase effects on stock price, i.e. the stock prices on announcement day and on the surrounding event period. Both short-term and medium-term event windows will be selected to make a distinction and check the trend materialization. Also, the short-term event window reveals how quickly the market reacts to the announcements while the medium-term event window shows the market timing efficiency. The sample spans from 1st of January 2004 to 31st of December 2013, including all public announced and open-market share repurchases in United States and China.

The structure of the remaining of the paper is as follows. Section 2 reviews previous literature on share repurchase and the related theories. Section 3 clarifies the methodologies applied in the empirical literature. Section 4 collects data and makes data descriptions. Section 5 presents the results and the analysis. Section 6 concludes the paper.
Chapter 2 Literature Review

This chapter concludes the theoretical background of the economic theories about share repurchase. There are numerous papers which study the topic of share repurchase, especially in the United States, while current research based on the Chinese market is still at an early stage, and only in recent years the discussion has begun to appear in China. The following section describes the theoretical framework of share repurchase, and the empirical results are also presented accordingly. Moreover, hypotheses of different motivations are formulated to explain the firms’ willingness or action to enter into a share repurchase program. These hypotheses are signaling hypothesis, free cash flow hypothesis, capital structure hypothesis, dividend substitution hypothesis and tax efficiency hypothesis. In addition, due to the different institutional settings in China and United States, the legal settings in both countries are discussed as well.

2.1 Theoretical background

The first section of literature review describes three important theories which are closely related to share repurchase announcements. First is the Modigliani-Miller theory, which discusses on how share repurchase announcements affect a firm’s capital structure. Second is the efficient market theory, which describes the effect of share repurchase announcements on the share price movements. Finally, the principal agent hypothesis is applied to discuss the information asymmetry between managers and shareholders.

2.1.1 Modigliani-Miller Theory

Miller and Modigliani wrote their influential papers in a series in 1958, 1961 and 1963, and they become the cornerstone of modern corporate finance later on. The basic of Modigliani-Miller theory is the capital structure theory and it is commonly called The Capital Structure Irrelevance Principle. The theory is an irrelevance proposition and provides several conditions under which a firm’s financial decisions do not influence its value \(^{44}\). The main four propositions are as
follows: the first proposition establishes that a firm’s debt to equity ratio does not affect its market value under certain conditions; the second proposition implies that a firm’s leverage has no relation with its weighted average cost of capital (WACC); the third proposition establishes that a firm’s market value is unrelated to its dividend policy; the fourth and last proposition implies that a firm’s shareholders are indifferent about its financial strategies \[45\]. According to them, firm value is not affected by the chosen payout policy due to the following reasons: (1) a well-functioning market with neutral taxes, (2) investors are rational and (3) the events are of complete certainty. They report that a firm’s value is related to the underlying cash flow, while the way of cash flow distribution is not relevant. Therefore, in the context of irrelevance theorem, whether a firm chooses to pay out dividend or repurchase shares does not matter since they are equivalent.

2.1.2 Efficient Market Hypothesis

The Efficient Market Hypothesis (EMH) is constructed by Fama (1965, 1970, and 1991). However, EMH was first given by Paul Samuelson (1965) in his paper ‘Proof that properly anticipated prices fluctuate randomly’. He reports that in an informational efficient market, stock price changes should be unforecastable if they are properly anticipated, that is, if they fully incorporate all the information \[53\]. Fama is the first person to employ modern digital computers to conduct empirical research and the first to use the term ‘efficient markets’ (1965) and he concludes that prices fully reflect all available information \[21\]. According to the efficient market hypothesis, stock prices will immediately adjust to the right level based on the information. This is driven by the active investors who are attempting to profit from the information, that is, to seize the profit opportunities, investors incorporate their information into market prices and quickly eliminate the profit opportunities. It is an ideal world with frictionless markets and costless trading if all this happens at the same time, then prices must always fully reflect all the information. Therefore, it is not possible to earn a higher return than the market return based on the public information. In such a circumstance, the share repurchase program is a zero-sum game without abnormal returns \[22][23\]. Later on, many other researchers extend the efficient market hypothesis to allow for risk-averse investors. Lucas (1978) states that all investors have rational expectations and prices do fully reflect all available information and in mathematical terms marginal-utility-weighted prices follow martingales \[42\]. Also other directions like human capital,
asymmetric information and transaction costs are extended into the efficient market hypothesis. However, some researchers doubt the efficient market hypothesis. For instance, Vermaelen (1981) found that there exist positive abnormal returns following the share repurchases. Some other researchers like Dann (1981) and Stephens and Weisbach (1998) also investigate the effect of share repurchase announcements on stock price changes and find an average of 3.5% increase on the announcement day.

2.1.3 The Principle-Agent Hypothesis

In 1970s, several papers discuss on the theory of principle-agency in the field of economics. The first paper is written by Spence & Zeckhauser in 1971, which is conducted as a question about insurance between a driver and the insurance company. By 1980, Holmstrom (1979) and Shavell (1979) define the issues and concerns of the principal-agency model in the following core assumptions: agent impact, information asymmetry, asymmetry in preferences, initiative that lies with a unified principle, background introduction based on common knowledge and ultimatum bargaining. Jensen (1986) describes two assumptions based on principle-agent theory: one is the conflict of interest between the principle (shareholder) and the agent (manager); the other is that there exists information asymmetry between the principle and the agent. Furthermore, Jensen states that the principle-agent hypothesis is related to the free cash flow hypothesis since the use of share repurchase is a way of distributing the free cash flow and it may help to reduce the agency problem. By the use of share repurchase announcements, the agent takes responsibility in using the free cash flow in the firm, and it shows that he is acting on the principle’s behalf rather than acting on his own interest. Following the share repurchase programs, the resource under manager’s control is decreased and in the meanwhile his power is decreased. Hence in this way, the agency problem will be reduced and the conflict of interest between the two parties will be decreased, which will result in the positive stock price reaction.

2.2 Distribution ways of excess cash flow to shareholders

Dividends VS share repurchases
Companies can use both dividends payout and share repurchase to distribute the excess cash flow, and both of the methods indicate that cash flow increases in a company. According to the Modigliani-Miller Theory and Efficient Market Hypothesis, dividend payout and share repurchase have the same effect on the firm value in a perfect capital market, since the market incorporates all the available information to the share prices efficiently. However, there are different effects between these two methods when used in practice.

Jaganathan, Stephens and Weisbach (2000) report that dividends and share repurchase are used at different times by different kinds of firms. When they study the US corporations, they find that share repurchase are very pro-cyclical, while dividends increase steadily over time. Also, firms with higher permanent operating cash flows use more dividends while firms with higher temporary, non-operating cash flows use more share repurchase. One important difference between these two payout methods is that firms use share repurchase when their share performance is poor and firms tend to payout dividends following a positive share price performance [35].

Lintner (1956) states in his research that firms are not willing to cut their dividends. But when they decide to cut the dividends, there follows a significant negative stock market reaction [41]. Denis et al (1994) conduct research and agree on this issue. They find that if firms cut dividends, there is on average of 6% share price decline in three days surrounding the announcement day [18]. Nevertheless, Grullon and Michaely (2002) find the contrary trend. They report that share repurchases have not only become an important form of payout for US companies, but also that firms finance their share repurchases with funds that would have been used to pay dividends. Moreover, young firms have a higher propensity to distribute cash through share repurchase than they did in past, while large, established firms have generally not cut their dividends, they also show a higher propensity to repurchase shares [28]. These findings indicate that firms have generally substituted share repurchase for dividends.

When comparing the effects on stock price reaction by these two payout methods, both of them show a positive signal. Abidin et al (2009) report that the announcements of dividend increases lead to a positive abnormal return of 0.53% three days around the announcement day and a positive abnormal return of 1.49% twenty days after the announcement [1]. Other researchers study the share price effects on the share repurchase announcements and also find positive
abnormal returns. US shows approximately CAR +3% (e.g. Stephens and Weisbach(1998) show a result of +2.7% \[^{57}\] and Mitchell and Netter (1989) show a result of +3.5% \[^{48}\].etc.) in the short term and a much higher result ranging from +8.7% (Ikenberry et al ,1995 \[^{32}\]) up to 14.9% (Ikenberry et al ,2000 \[^{33}\]) in the long term. Papers of Ikenberry et al (1995), Dann (1981) and Vermaelen (1981) etc. prove the average abnormal return of 3.5% in the short-term by using different time spans \[^{32}\][\[^{17}\][\[^{58}\]. But things are different in non-US studies. The results show a wider range from +0.3% (Rees, 1996 \[^{52}\]) to +6.0% (Hackethall and Zdantchouk, 2006 \[^{30}\]).

### 2.3 Methods of share repurchase

As discussed above, there are two ways for firms to distribute excess cash flow: dividend payout and share repurchase. As for share repurchase, there are different methods to execute it. The five main share repurchase methods are listed as follows: fixed-price tender offer repurchase, Dutch auction tender offer, open market share repurchase, negotiated repurchase from private investors and repurchase involving derivative (Vermaelen, 2005\[^{59}\]).

#### 2.3.1 Fixed-price tender offer repurchase

According to Vermaelen (2005) research, in the public fixed price tender offer, a company offers to repurchase its shares at a fixed price and for a specific number. Shareholders tender their shares when they are willing to sell the shares to the company. In the case that the number of shares tendered is larger than the specific number, the company can buy any number between the specific and tendered number of share as long as it treats all shareholders equally, while in the case that the tendered number is smaller than the specific number, the company commits itself to repurchase all shares tendered. Some tender offers are used to eliminate odd-lot shareholders since it eliminates the shareholder servicing costs \[^{59}\].

#### 2.3.2 Dutch auction tender offer

Even though both fixed-price tender offer repurchase and Dutch auction repurchase are non-open-market repurchases, Bagwell (1992) points out that the main difference lay in that tender-offer uses fixed price, while Dutch auction repurchase uses a range of prices to repurchase
shares where tendering shareholders can choose his minimum acceptable selling price \[^3\]. Then the company pays the shareholders with the lowest price which fetch the specific number of shares they sought and those shareholders who tender at a higher price will be excluded from the deal. The Dutch auction tender offer has some advantages over fixed-price tender offer in following ways: first it is cheaper to buy back the shares, second it does not have to treat all shareholders the same and that lowers the reservation price, last it provides a better hedge against stock market crashes since the exercise price changes with the stock market (Vermaelen, 2005\[^{59}\]).

2.3.3 Open market share repurchase

According to Grullon and Ikenberry (2000), open market share repurchase accounts for 95% of the total share repurchases in the U.S. It is the most commonly used method to repurchase shares \[^{27}\]. When using the open market share repurchase method, companies can choose either buying back directly in open market or through a broker. As for the share repurchase procedure, US has no explicit legal framework when comparing to other countries like China, where only under strict legal rules can the companies buy back shares. In US, once the companies’ boards agree on the share repurchase decision, the repurchase can be officially announced to the public. There is no requirement for registration or formal disclosure of the share repurchase procedure, and the size and duration are decided by each company. Also companies do not have to execute share repurchase even if they make share repurchase announcements.

2.3.4 Negotiated repurchase from private investors

In a case of negotiated repurchase from private investors, a company can decide to buy back its own shares from a large investor. Peyer and Vermealen (2005) list four types of private transactions. First is the greenmail, where a company can repurchase from a potential raider at a premium above the market price. Second is a method without premium paid, where insiders and employees could act as sellers after restrictions on stocks are taken off or after the exercise of executive stock options. Third is a method with premium, not from a hostile bidder, but from the belief of the undervaluation on the company. And the last way is to take private repurchase at a
discount. This discount is driven by the investors’ desire to exit and which leads them to stay at a poor position in negotiation \[^{[50]}\].

### 2.3.5 Repurchase involving derivatives

Another less commonly used repurchase method is using derivatives. In general, there are three types to be distinguished: 1) writing put options, 2) buying collars and 3) buying forward contracts. Investment banks act as counterparties to hedge the risk. These methods have the advantage over other types of share repurchases in that they allow a company to benefit from an undervalued stock price without using cash. When a company uses put options, it commits to buy back a specific number of shares if the share price is below the exercise price at expiration date. In this case, if the share price is undervalued, the company can earn a premium. When a forward contract is used, no cash is paid at initiation and if the company made the right bet, they will receive cash. Finally, when a company buys a collar, the exercise price of the contracts will be set so that no cash is paid or received at the time of contract. (Vermaelen, 2005 \[^{[59]}\])

### 2.4 Motives for share repurchase

This section describes the motives which explain why firms enter into a share repurchase program. The main motives are constructed as follows: signaling hypothesis, free cash flow hypothesis, capital structure hypothesis, dividend substitution hypothesis and tax efficiency hypothesis.

#### 2.4.1 Signaling hypothesis

Signaling hypothesis is a predominant motivation for companies to repurchase shares. It is based on two assumptions: information asymmetry and undervaluation (Vermaelen, 1981\[^{[58]}\]). Information asymmetry assumes that managers are better informed than outside investors of company inside information, like firm value and other prospects. Therefore, managers can use share repurchase as a signal to the less informed outside investors if they disagree on the current share price or express their expectations on future earnings and firm performance. While undervaluation implies that based on the premise of information asymmetry between insiders and
outsiders, a firm may be misvalued (Dittmar, 2000[19]). On condition that the inside managers believe that the stock is undervalued, the firm may take action to repurchase shares as a signal to the outside market or to invest in its own mispriced shares. Then the market interprets the firm’s action as a signal that the stock is undervalued. Furthermore, the positive share price reaction around the announcement date should correct the mispriced stock (Vermaelen, 1981[58], Dann, 1981[17]).

To test the signaling hypothesis, Bhattacharya (1979) and Miller and Rock (1985) start at an early age to construct models based on information asymmetry between insiders and outsiders of the company. They report that a firm’s cash distribution can be used to signal its future cash flow [6][46]. Vermaelen (1981) was the first to conduct the abnormal returns around the announcement date to explain the hypothesis. It is based on open market share repurchase and tender offers, and the outcome turns out that firm size plays an important role, since small firms are most promising. Vermaelen (1981) concludes that small firms have less coverage in financial media, less attention by financial analysts and lower institutional ownership, and all these result in the high level of information asymmetry and are more likely to be undervalued. In the contrast, large firms show lower levels of abnormal returns on the announcement day [58]. Stephens and Weisbach (1998) support on the conclusion and they find that firm size and announcement day abnormal return have a negative relation [57].

However, firms do not have to actually take share repurchase action even if they make announcements (Rau and Vermaelen, 2002 [51]). Some researchers suspect the technique used to test the signaling hypothesis. Chan, Ikenberry and Lee (2004) show that firms look at changes in earnings and decide whether to repurchase after that. They also find the negative relation between abnormal returns on announcement dates and abnormal returns after announcement [15]. Stephens and Weisbach (1998) also confirm this since they find that there is negative relation between the share repurchase in one quarter and the stock performance in the prior quarter [57].

2.4.2 Free cash flow hypothesis

Another possible explanation for share repurchase is free cash flow hypothesis, which is formed on Jensen’s (1986) agency theory. According to Jensen (1986) agency theory, managers and shareholders have a conflict of interest due to the separation of control and management [36]. To
be more specific, shareholders expect the managers to maximize their wealth while managers may pursue to maximize their own benefits. When a firm has excess cash flow and limited valuable investment opportunities, managers will invest in value destroying projects which generate the negative NPV, since they often pursue firm size and company growth. In this case, the power and source under managers’ control increase but decrease under shareholders’ control at the mean time. Grullon and Mickealy (2004) find that firms with low book-to-market ratio and high cash reserves are more likely to waste money. One solution is to increase the payout ratio of free cash flow [29]. Therefore, firms will distribute excess cash flow to shareholders so as to reduce manager power. Stephens and Weisbach (1998) find a positive relation between excess cash flow and repurchase transactions, the more excess cash flow, and the larger quantities of share repurchased [57]. This trend may imply that share repurchase can indeed be used by firms to distribute excess cash flow.

However, Ikenberry et al (2000) doubt that free cash flow hypothesis is inconsistent, and they find that firms which do not execute share repurchase after announcements earn a higher excess return than those who actually repurchase shares [33].

2.4.3 Capital structure hypothesis

Grullon and Ikenberry (2000) state that share repurchase is a popular way for firms to change their capital structure, and firms may use share repurchase to fine-tune their capital structure and respond to the potential dilutive effects from employee stock option plans [27]. Some firms choose to initiate a share repurchase program because they prefer debt rather than equity (Mitchell, Dharmawan and Clarke, 2001[47]). Dittmar (2000) states that a firm may choose to repurchase shares if its leverage level is below the target level [19]. Kivi (2006) explains that when a firm repurchases shares, its debt-to-equity leverage ratio increases since the amount of equity decreases [37]. In this case, Jensen (1986) concludes that firms with higher leverage ratio should generate higher abnormal returns, since there is less free cash flow to waste and managers should invest on valuable projects to maximize the firm value [36]. In addition, Bagwell and Schoven (1989) and Opler and Titman (1996) add that firms may repurchase shares to reach the target leverage ratio, which is the optimal leverage ratio [4][49].
However, Dann (1981) proposes that it is not the best option for a firm to initiate a share repurchase program if it tends to achieve the optimal leverage ratio, since issuance of new debt would be a better alternative. Moreover, Allen and Michaely (2002) argue that the amount of share repurchase is small; hence the effect of optimal leverage ratio on share repurchase is small.

2.4.4 Dividend substitution hypothesis and tax efficiency hypothesis

Dividend substitution hypothesis and tax efficiency hypothesis are complementary for each other. Dividend substitution hypothesis implies that share repurchase is a substitute for dividend payout, since it is more flexible. As Jagannathan, Stephens and Weisbach (2000) suggest that dividend is a permanent commitment to the shareholders on a regular basis and share repurchase is used to distribute potentially temporary cash flows. Moreover, Dittmar (2000) reports that companies have no obligation to carry out share repurchase actions after announcements. In addition, researchers like Denis et al (1994), Isagawa (2000), and Zhang (2005) find the negative relation between dividend cut and firm value, while share repurchase programs do not bear such kind of risk.

Tax efficiency hypothesis implies that companies may prefer share repurchase if the tax burden is higher on dividends than on capital gains, since dividends are subject to the ordinary income tax, while in terms of share repurchase, investors only need to pay tax on the difference between the purchase price and the selling price, which is the capital gain tax. In addition, share repurchase has the advantage of postponing the realization of capital gains and therefore postpone the tax payment. Earlier research of Bagwell and Shoven (1989) has indicated that firms substitute share repurchase for dividend payout in order to get the tax benefit for shareholders. In May 2003, the legislation on the decrease of maximum tax rate of dividends from 38 percent to 15 percent was approved, and Brav et al (2005) report that difference in tax rates between dividends and capital gains is not an important motive for corporate executives to repurchase shares. Nevertheless, the finding of Blouin, Raedy and Shackelford (2007) confirms that directors in the U.S. consider tax benefit when choosing between share repurchase and dividend payout, besides the economic cycle change considerations.
2.5 Legislation of share repurchase in China and United States

This section describes the legislation settings in China and the U.S., which includes the legal system, legislation changes during the period from 1st of January 2004 until 31st of December 2013 in both countries.

2.5.1 Legal systems

The U.S. and China are under different law regimes. The U.S. is a representative of common law countries, while China is a representative of civil law countries. The difference between these two regimes lies in the different law mechanisms. To be more specific, common law is a type of case law, which is in the form of public judicial opinions, while civil law is predominated by the codified statutes. According to Eije and Megginson (2008), companies in common law countries are more likely to pay cash dividends while companies in civil law countries are more likely to repurchase shares.\(^{[20]}\) Laporta et al (2000) provide the explanation that in common law countries, where legal systems protect the investors, shareholders are able to force the managers to pay out free cash flow as dividends, while they cannot do this in civil law countries.\(^{[39]}\) Furthermore, Bottazzi et al (2009) add that common law countries have more typical downside protection in contracts and provide with better legal protection. Also, they find that investors are provided with more non-contractible support in those countries.\(^{[9]}\)

2.5.2 Legislation settings

According to Voss (2012) research, prior to the early 1980s, share repurchase programs were nearly non-existent.\(^{[60]}\) That is because the Securities and Exchange Act of 1934, Section 9, prohibited the manipulation in securities prices (U.S. Securities and Exchange Commission, 1934). Moreover, it states in Section 10b-5 of the Securities Exchange Act that “any act or omission resulting in fraud or deceit in connection with the purchase or sale of any security” is prohibited (U.S. Securities and Exchange Commission, 1934). Grullon and Michaely (2002) find that the SEC charged firms with illegally manipulating their stock prices by share repurchase programs; also they report that this situation put the firms in the risk of SEC investigation and illegal market manipulation.\(^{[28]}\) It was not until 1982 when SEC adopted the 10b-18 safe harbor
rule, share repurchase increased significantly. Gingliner and Hamon (2007) find that the U.S. has the most lenient regulation for share repurchase before 2004. Firms do not need to make prior announcements; they only need to disclose the amount of shares outstanding at quarterly financial reporting. SEC amended the 10b-18 rule since early 2004, which requires firms to disclose actual share repurchase and average price paid, also on the announcement dates, repurchase size, and repurchase method (Banyi et al, 2008). For now, the SEC 10b-18 safe harbor rule is the only guide for share repurchase.

However, things are quite different in China. China has stricter regulations on share repurchase; therefore, the amount of share repurchase in China is much less than that in the U.S. Share repurchase was introduced in China in 1990, and the main relative regulation on that is the Companies Law of People’s Republic of China. The law cites the restriction on share repurchase. In 2005, China amended the law and the detailed Article 143 lists four situations under which firms are allowed to repurchase shares: 1) to reduce its registered capital; 2) to merge with another company which holds its shares; 3) to reward its employees with its shares; 4) a shareholder asks the company to repurchase his shares if he objects to the merger or division of the company. The new broadened regulation became effective on 1st of January 2006 and share repurchase became more common since then. Due to the effect of crisis in 2008, China further broadens the restrictions on share repurchase and removes the license constraints for share repurchase in the end of 2008, which also encourages the share repurchase.
Chapter 3 Methodology

The main methodology in this paper aims to capture the short-term and medium-term market reactions to share repurchase in China and US stock markets when announcements are made. Also investigation of motivation theories behind the different results is included. As a result, the research can be divided into two parts: one is event study methodology on abnormal returns and the other is regression analysis on motivation theories.

3.1 Event study methodology

An event study is conducted to measure the influence of a specific event on the value of a firm. To be specific, the event study in this paper is designed to empirically test whether share repurchase announcements are value enhancing or value destroying. If market reacts positively to the share repurchase announcements, then we can reasonably conclude that share repurchases are value enhancing and vice versa.

To assess the market reaction to the share repurchase announcements, I employ the market model to compute the abnormal returns. However, there are several biases when using this event study methodology. According to Mackinlay (1997), one bias is the uncertainty of announcement date. Since it is difficult to identify the exact event date, I follow Lakonishok et al (1995) method but shorten the shortest event window to [-1, +1] rather than the event window of [-2, +2] in his research. The second bias relates to the assumption that daily returns are normal and the abnormal returns are correlated. Brown and Warner (1985) point out in their paper that the level of non-normality in daily NYSE abnormal returns has no serious effect on the test statistics. Campbell and Wasley (1993) document a substantial non-normality in the NASDAQ daily returns. In addition, Leone et al (2005) show that there is no significant difference in this bias. So I do not make adjustments to the daily returns. The third potential problem is the cross-sectional dependence of returns, since the standard event study methodology assumes that the abnormal returns of each security is not correlated in the cross section. However the event windows of each security can be overlapping in calendar time. To overcome this, Brown and
Warner (1980) make a solution to calculate the test statistics as the sum of the standardized prediction errors divided by the square root of the number of sample firms \[12\].

The guidelines and formulas are based on the papers of Mackinlay (1997) \[43\] and De Jong and De Goeij (2011) \[26\]. The estimation window spans from day -250 to day -21 (Brown and Warner, 1985 \[13\]) relative to the announcement date, day 0. The market model is used to estimate the coefficients. The detailed way is to run regressions on each company’s raw daily returns against each company’s country main market index, that is Chinese and US market indexes respectively. The market adjusted model assumes that alpha is set equal to zero and beta to one (De Jong and De Goeij, 2011 \[26\]). The market model formula is described as follows:

\[
R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}
\]

For \(t=-250, -249 … -21\)

\[
E(\epsilon_{it}) = 0 \quad \text{Var}(\epsilon_{it}) = \sigma^2
\]

Where \(i\) stands for firm, \(t\) stands for time, \(m\) stands for market, \(\alpha_i\) is the constant, \(\beta_i\) is the beta of each firm, \(R_{mt}\) stands for market return and \(\epsilon_{it}\) is the standard error.

The daily returns are calculated by the formula as follows:

Daily return \((t) = \frac{(\text{Stock price } (t)-\text{Stock price } (t-1))}{\text{Stock price } (t-1)}\)

The market returns are using the local market index and calculated in a similar way as the following formula:

Market return \((t) = \frac{(\text{Market price } (t)-\text{Market price } (t-1))}{\text{Market price } (t-1)}\)

Next, after calculating the coefficients from the market model, the coefficients are used to calculate the expected returns for every announcement. Also, there are restrictions on the amount of trading days before the announcement to ensure that normal returns can be calculated. It is conducted using the formula as follows:

\[
NR_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt}
\]

For \(t=-20, -19 … 149,150\)
Then, abnormal returns are calculated by comparing the actual returns and the expected returns, which aim to grasp the share repurchase announcement effect on share prices.

\[ AR_{it} = R_{it} - NR_{it} \]

For \( t = -20, -19 \ldots 149, 150 \)

The next step is to calculate the cumulative abnormal returns (CAR) by summarizing the abnormal returns in the event window identified by each announcement. CAR is the sum of abnormal returns during the event window periods.

\[ CAR_i = \sum_{t=t_1}^{t_2} AR_{it} \]

Different time periods are used to investigate in the timing effect of share repurchase and it spans from -20 to 150 days surrounding the event date, which includes the short and medium term.

Afterwards, the cumulative average abnormal returns (CAAR) can be calculated using the average of CAR as follows:

\[ CAAR = \frac{1}{N} \sum_{i=1}^{N} CAR_i \]

Finally, statistical tests are executed in order to test whether the calculated abnormal returns are statistical significant, whether are significantly different from zero or not. The null hypothesis is tested as follows:

\[ H_0: E(AR_{it}) = 0 \]

In addition, abnormal returns and cumulated abnormal returns are tested by t-statistics.

\[ TS_1 = \sqrt{N} \frac{AAR_i}{\sigma} \sim N(0, 1) \]

\[ TS_2 = \sqrt{N} \frac{CAAR}{s} \approx N(0,1) \]

Where \( s = \left( \frac{1}{N-1} \sum_{i=1}^{N} (CAR_i - CAAR)^2 \right)^{\frac{1}{2}} \)
3.2 Regression analysis

In this section OLS regressions are used to test the hypotheses described in chapter 2. After the event study in the former section, the behavior of share price changes in the pre-event and post-event is studied. In the regression analysis, different variables are defined to test the above hypotheses respectively based on domestic level and to find the dominant variable in each country.

3.2.1 Signaling hypothesis

Firm size is defined as the natural logarithm of total assets

\[ \text{Size} = \ln(\text{total assets}) \]

Firm size is used to test the signaling hypothesis. According to Jensen (1986), companies can be divided into small and large firms, where large firms have low financing cost and almost no information asymmetry while small firms have higher level of information asymmetry. Managers have inside information and can use it to signal the market\(^{[36]}\). Therefore, firm size is a proxy for information asymmetry. It is expected that there is negative relation between firm size and abnormal returns, since small firms are less monitored and covered by media, which cause a higher intention to signal information to the market.

Market to book value is defined as firm’s market value divided by its book value.

**Market to book value (MTBV)** = Market value of equity / Book value of equity

MTBV is the second proxy for signaling hypothesis. This can be explained by the distinction between value firms and growth firms. Value firms have lower MTBV and less investment opportunities, so they have more incentives to distribute cash to shareholders; while growth firms intend to invest the earnings to enlarge the firm and have fewer incentives to pay out cash to shareholders. Therefore, the expected relation between MTBV and abnormal returns on share repurchase is negative.
3.2.2 Free cash flow hypothesis

Free cash flow (FCF) is defined as free cash flow (operating, investing and financing) divided by total assets.

\[ \text{FCF} = \frac{\text{Free cash flow}}{\text{Total assets}} \]

Free cash flow variable is used as a proxy for free cash flow hypothesis. According to the hypothesis, when a firm distributes excess cash flow to shareholders, the market takes it as a signal that the firm is paying out to shareholders instead of investing in negative net present value projects. So less free cash flow means that less money can be wasted by managers. Consequently, negative relation between free cash flow and abnormal returns is expected.

Return on equity (ROE) is defined as net income divided by shareholder’s equity.

\[ \text{ROE} = \frac{\text{Net income}}{\text{Shareholder’s equity}} \]

Return on equity is another proxy for free cash flow hypothesis. ROE is a measure of firm’s profitability by revealing how much profit a firm generates with the money shareholders have invested. Firms with high ROE are defined as profitable, since they can use the funds to invest in positive net present value projects and distribute excess cash to valuable investment opportunities. In the contrary, firms that are less profitable face fewer invest opportunities or even negative net present value projects. Thereby, these firms should distribute excess cash to shareholders rather than investing in negative NPV projects. Hence, the negative relationship between ROE and abnormal return is expected.

3.2.3 Capital structure hypothesis

Debt is defined as long term debt divided by total assets.

\[ \text{Debt} = \frac{\text{Long-term debt}}{\text{Total assets}} \]

The variable debt is constructed to show how much of the firm’s assets are financed through debt. Bagwell and Shoven (1998) show that a firm can achieve an optimal leverage ratio by increasing the above depicted debt ratio[^4]. Also, share repurchase do not decrease debt ratio, it increases it.
When reaching the optimal leverage ratio, the firm can decrease the cost of capital and benefit from tax deduction. Therefore, the sign is expected to be positive when a firm has balanced positive and negative effects. However, a negative sign may appear when there is no or a bad investment strategy and the market has no confidence in the logic of share repurchase activity.

### 3.2.4 Dividend substitution hypothesis and tax efficiency hypothesis

Dividend dummy (Divdum) is generated as 1 if firm pays dividend and 0 if not.

**Dividend dummy** = 1 if firm pays dividend and 0 if firm doesn’t pay dividend

Dividend payout is a substitute for share repurchase. To explain this hypothesis, dividend dummy is considered. When testing the dividend substitution hypothesis in the domestic country level, dividend dummy is generated to measure the interchange ability. Moreover, tax plays an important role on the decision whether to pay dividends, since share repurchase do not result in double taxation on shareholders’ income and it allows postpone of tax payment. Therefore, it is expected that non dividend payers have higher abnormal returns, which indicates the negative relation.
Chapter 4 Data

The sample is constructed from Zephyr and SDC M&A database for the announcements of intention to repurchase ordinary shares from January 2004 to December 2013. These two databases complement each other and other isolated share repurchase announcements are added from NYSE, NASDAQ and Shanghai Stock Exchange (SSE). After verifying the firms and announcements, detailed stock prices and firm specific financial information are collected from DataStream. To be included in the sample, firms are required to have their share prices and financial information on DataStream. Based on Grullon and Ikenberry (2000) research, 95% of the share repurchases are open-market repurchase\(^\text{[27]}\). Therefore other types of share repurchases like Dutch auction, self-tender offer and fixed-price tender offer are excluded from the whole data selection. In addition, the sample includes all the open-market share repurchase announcements which intend to repurchase, while whether the repurchase was actually completed does not matter, since we only investigate the effect of share repurchase at the moment of announcements. For the Zephyr and Securities Data Companies platinum Merger & Acquisitions databases, the announcement dates and companies are collected, as well as the DataStream code. Besides the announcements gathered from the above databases, official press is also used to complement the entire data sample. After verifying the data sample, the DataStream codes are imported into Thomson DataStream to gather the stock prices and corporate financial information like total assets, long-term debt, and earnings per share etc. accordingly.

In order to conduct the event study and regression analysis in the later part, the companies selected should have enough information to investigate the share price effects. Therefore, the share prices from 250 until 21 business days before the event date should be available as the estimation window. Moreover, there exist companies which have multiple announcements, due to the overlapping of event windows, especially the share repurchase effects over long term event windows, only the first announcement of each company is selected. Furthermore, the S&P 500 index and Shanghai Stock index are used as local market indexes for United States and Chinese stock markets respectively. The local market index prices are also gathered from
Thomson DataStream. The data used in regression analysis is corrected for outliers, since these extreme observations may significantly bias the results. Also, each company should have the enough financial information like total asset, long-term debt etc.

As a result, there are 190 announcements in China and 3208 announcements in US during the 2004-2013 period. The summary data information is described in Table 1.

[Insert Table 1 Panel A & Panel B here]

Table 1 Panel A illustrates the sample firms’ distribution in United States and China by year, with one year interval. Table 1 Panel B illustrates the firms’ distribution by industry sector, with gathered SIC codes to identify each industry.
Chapter 5 Empirical results

This section presents the main findings based on the tests in chapter 3. It is divided into two sections: the first section contains the timeline of event study and cumulative average abnormal returns; the second section contains the OLS regression results to explain the drivers for share repurchases described in paragraph 3.2.

5.1 Event study

The event study timeline is constructed according to the guidelines of De Jong and De Goeij (2011). In order to test the short and medium term effects of share repurchase announcements, both very short event window like [-1,+1] and longer event window like [+20,+150] are generated.

[Insert Figure 1 here]

Table 2 shows the cumulative average abnormal returns (CAAR) for both countries in different event windows and tests for their significance. Over the pre-event window [-20,-5], China shows a positive and non-significant coefficient, while the U.S. shows a statistical significant negative coefficient of -0.0153 (t=-4.26). The U.S. result is in line with Ikenberry et al (1995) research that companies time their announcements to repurchase shares, which also complies with signaling hypothesis that companies signal the market of the undervalued stock. Based on the efficient market hypothesis, US market is semi-strong efficient while Chinese market is weak-form efficient tested by many Chinese scholars, which can be explained to the slower speed of price adjustment to information and non-significant result. In addition, the very short interval [-1, +1] for both countries show the positive and significant coefficients of 0.3153(t=5) and 0.0231(t=11.68) respectively, both at 1% significant level. Over the 5 day and 11 day period event windows [-2, +2] and [-5, +5], both show the positive and significant effects on stock price, while the magnitude is lower than that of [-1, +1]. All these indicate that the information is positively accepted. Over the post-event periods, US stock prices increase by 0.0072% (t=3.38) over [+5, +20] and 0.0379% (t=5.05) over [+20, +150] medium term; China also shows the
positive results of 0.0319% (t=2.81) and 0.0703% (t=2.31) respectively. Both countries report the positive share price behavior after announcement and in the medium term. However, US has a lower magnitude in price change than that of China except for the 11 day event window, also the abnormal return is lower than 3.5% as indicated by past research. These results suggest that US market is under-reacting to the announcements of share repurchase.

[Inset Table 2 here]

The output can be explained by the differences in legislation and institutional settings in China and US. Firms in low investor protection countries are more likely to use privately negotiated repurchase with negotiated prices. Therefore, China and the U.S., the two countries are compared in investor protection. According to Francis, Khurana and Pereira (2001), the countries with common law system have higher investor protection while countries with civil law systems have lower investor protection. Hence the U.S. is defined as high investor protection country while China is low investor protection country. Ikenbery et al (1995) report that firms in low investor protection countries are value stocks and in high protection countries are growth stocks. Moreover, value stocks generate higher returns than growth stocks as these firms are undervalued, so firms in low investor protection countries are expected to generate higher returns than those in high investor protection countries.

Furthermore, abnormal return of share repurchase before and after legislation changes in China is studied. The decade is divided into three periods based on legislation changes in 2005 and 2008 and the results are presented in table 3. Between 2004 and 2005, share repurchase activities were rare with only 18 announcements in total, since the law restricted strictly on share repurchase. Share prices increase in the very short event windows like [-1, +1] and [-2, +2] by 0.0356% (t=2.26) and 0.0368% (t=2.16), while abnormal returns in post event and medium term are not significant. From 1st of January 2006, the amended Companies Law allowed some possibilities to repurchase shares, so the number of announcements increased to 56 during 2006 to 2008. The short-term abnormal return is not significant, while the medium term share price increased by 0.1435% (t=2.35). After the license requirement was removed in 2008, the number of share price announcements rose to 116 from 2009 to 2013. Both pre and post event periods show positive and significant abnormal returns at an average of 0.037% level, while the effect of abnormal return is not significant at medium term. In total, broaden of legislation of share repurchase has a
positive effect on abnormal returns and encourages share repurchase announcements at the meanwhile.

[Insert Table 3 here]

### 5.2 OLS regression

OLS regressions are applied to test the drivers behind the motivation theories and compare the share repurchase effects in both countries. When investigating the share repurchase effect in each country, the abnormal return (AR) on the event date is used as the dependent variable. To explain the drivers for share repurchase, six variables are included as described in paragraph 3.2. Table 4, 5 and 6 are the results overview.

The regression model is shown as follows:

\[ AR_l = \alpha_{0,lt} + \beta_1 Size + \beta_2 MTBV + \beta_3 FCF + \beta_4 ROE + \beta_5 Debt + \beta_6 DividendDummy + \epsilon_l \]

Where \( \alpha_{0,lt} \) refers to a constant and \( \epsilon_l \) refers to the standard error.

Also, the correlation check is performed before the regression model, which is used to check whether the variables are correlated to each other and avoid the multicollinearity. The variable that is highly correlated to another variable will be kept in a separate regression. Dividend dummy variable is highly correlated to size in both countries; hence a separate regression is run as suggested by Cohen et al (2013)\(^{[16]}\). The results of correlation for both countries are shown in table 4 & 5.

[Insert Table 4 & 5]

The output of regression is presented in Table 6, with Panel A and Panel B for the U.S. and China respectively.

[Inset Table 6 Panel A & Panel B here]

As it can been seen from the U.S. regression output table, all the six variables are in line with the expected directions of coefficients. However, the free cash flow variable and ROE variable are not significant while other variables show the statistical significance at 5% or 1% level. However,
things are quite different in China. Only ROE, debt and dividend dummy show the significance while other variables are not significant. In addition, the output of debt variable is not in line with the positive coefficient as expected.

To elaborate on the hypotheses, size and MTBV are proxies for signaling hypothesis. Based on the hypothesis of information asymmetry, larger firms need to disclose more information to market while smaller firms have more possibilities to signal information to market due to lower coverage. Therefore firm size is supposed to be negative related to abnormal returns. In the U.S. the sign of -0.0176 at 1% significance level confirms the expectation and implies that US firms benefit from information asymmetry. Next, lower MTBV firms have less valuable investment opportunities and more chances to distribute excess cash to shareholders, so higher abnormal returns are expected. This is also confirmed by the result of -0.0001 in Table 6. While in China, even though both size and MTBV show the negative direction, the insignificant results indicate that the signaling hypothesis would be accepted if the coefficients would be significant, suggesting firms’ motivation to share repurchase is among other things to get the signaling effect.

FCF and ROE are proxies for free cash flow hypothesis. When companies have less money to waste, then fewer agency problems and higher abnormal returns are expected. Hence the negative sign is expected. The coefficients of FCF are negative, which comply with the expectation. However, neither the U.S nor China shows significant results. In addition, ROE is a measure of profitability. Negative ROE may indicate that firms do not have sound investment strategy or positive NPV projects to create value, so firms decide to distribute cash to shareholders. The coefficients of ROE confirm the negative sign. Also, the 1% significant coefficient of -0.0007% in China implies that FCF hypothesis is partially accepted in China due to the insignificant sign of FCF. Nevertheless, both FCF and ROE are insignificant in US, which implies that motivation for free cash flow hypothesis is limited in the U.S and it cannot be accepted.

Furthermore, debt is captured to measure capital structure hypothesis. It measures how firms finance its business, and the positive sign implies that more debt will result in less management waste of free cash flow, thereby more cash flow to shareholders. This variable shows a positive correlation to abnormal returns on event day in the U.S with the coefficient of 0.0136 at 5%
significant level. Therefore, there is a stimulation of using more debt in the U.S economic environment and US firms also benefit from the increase in tax shield by finding the optimal capital structure. However, China shows a negative relation between debt and abnormal return, and it is significant at 10% level. The negative sign may indicate that market has no confidence in the logic of share repurchase activity. As suggested by Dann (1981), debt issuance is a better way to reach the optimal leverage ratio and this can be explained on the result [17]. Moreover, Spiess and Graves (1999) further report that debt issue is related to negative abnormal returns which signals that the firm is overvalued [56]. So capital structure hypothesis is rejected in China.

Finally, the dividend substitution hypothesis is captured by a dividend dummy. A negative relation is expected since dividend paying firms have already distributed cash to shareholders. They are perfect substitutes for each other. Since dividend dummy variable is highly related to size, a single regression is run on that. Both countries show significant and negative signs of -0.0098% and -0.0197% respectively. The output complies with the dividend substitution hypothesis and indicates that firms choose to repurchase shares rather than payout dividends in order to seize more profits.

In sum, when testing the motivation theories behind share repurchase in China and the U.S. respectively, different motivations are applied in each country. Signaling hypothesis, capital structure hypothesis and dividend substitution hypothesis are the main drivers of share repurchase in the U.S. While Chinese firms tend to repurchase shares mainly because of dividend substitution hypothesis and partially because of free cash flow hypothesis.
Chapter 6 Conclusions

This last section describes the findings and conclusions for the subject, also some limitations and further research directions are suggested.

6.1 Conclusion

The main objective for this study is to compare the drivers behind the motivation hypotheses of share repurchase in China and the U.S. Also the share repurchases effects in short and medium terms are compared for both countries. The companies included in the sample are listed on NYSE, NASDAQ or SSE, with the time span of a decade from 1st January 2004 to 31st of December 2013. First of all, an event study is conducted to calculate the abnormal returns on the announcement dates and the cumulative abnormal returns around different event windows, both pre and post event dates. The positive abnormal returns are found in the very short event window [-1, +1] and post event medium term [+20, +150] both in China and the U.S. This is in line with the previous research on share repurchase like Stephens and Weisbach (1998) [57] and Vermaelen (2005) [59], which indicate the positive abnormal returns around event dates. The pre-event window results are in the contrary for China and US, with 0.0126% (t=1.07) and -0.0153% (t=4.26). The significant negative result in the U.S. implies that firms will repurchase shares depend on the degree of perceived undervaluation, which is also confirmed by Ikenberry et al (1995) research that companies time their announcements to repurchase shares, and complies with signaling hypothesis that companies signal the market of the undervalued stock [32]. While the positive coefficient for China may indicate that Chinese market is under-reacting to share repurchase announcements, but it is not a strong hypothesis since the t-statistics is not significant. Moreover, the time span in China is divided into three periods based on the legislation changes during the decade. The most striking result is that abnormal returns are significant and positive in short term after removing the licenses requirements, though not significant in medium term. This finding is in conflict with Kivi (2006), who states that company law does not affect share repurchase [37].
In order to investigate the dominant drivers behind the motivation theories on share repurchase in both countries, OLS regressions are conducted. After correlation check, the abnormal returns are regressed with four hypotheses, namely signaling hypothesis, free cash flow hypothesis, capital structure hypothesis and dividend substitution hypothesis. The majority of the results are achieved as expected. In the U.S, signaling hypothesis, capital structure hypothesis and dividend substitution hypothesis are the main drivers, while in China, dividend substitution hypothesis is confirmed, and free cash flow hypothesis is partially confirmed since the result of FCF is not significant.

6.2 Limitations

Although the research is conducted carefully, some critical notes should be taken into consideration. First, there exists huge difference in the amounts of share repurchase announcements in China and US, nearly 16 times US verses China. Therefore, the results in China may be not representative. Second, only one share repurchase announcement is included in the data sample for each firm, which is used to avoid the risk of getting a biased dataset. Third, when analyzing CAAR differences based on cross country level, there is only one country under each legal system, with China as civil law system and US as common law system. The results may not be representative due to the limited number of countries.

6.3 Further research

There are some suggestions regarding further research on this subject. First, only short and medium terms are studied in this paper, and further research could focus on long term to investigate the differences. Second, only four hypotheses are tested for the motivation theory, other hypotheses like earnings per share dilution hypothesis and flexibility hypothesis can be investigated later.
References


Appendix

Table 1 Summary Statistics

This table describes the summary statistics for announcements in China and the U.S. Panel A presents the annual distribution of announcements during 2004-2013 for both countries. Panel B shows the distribution of sample firms by industry sector based on the Standard Industrial Classification (SIC) codes.

<table>
<thead>
<tr>
<th>Country</th>
<th>China</th>
<th>US</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panel A: Annual Distribution of Announcements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>6</td>
<td>511</td>
<td>517</td>
</tr>
<tr>
<td>2005</td>
<td>12</td>
<td>477</td>
<td>489</td>
</tr>
<tr>
<td>2006</td>
<td>12</td>
<td>363</td>
<td>375</td>
</tr>
<tr>
<td>2007</td>
<td>5</td>
<td>511</td>
<td>516</td>
</tr>
<tr>
<td>2008</td>
<td>39</td>
<td>532</td>
<td>571</td>
</tr>
<tr>
<td>2009</td>
<td>53</td>
<td>166</td>
<td>219</td>
</tr>
<tr>
<td>2010</td>
<td>9</td>
<td>165</td>
<td>174</td>
</tr>
<tr>
<td>2011</td>
<td>33</td>
<td>214</td>
<td>247</td>
</tr>
<tr>
<td>2012</td>
<td>12</td>
<td>143</td>
<td>155</td>
</tr>
<tr>
<td>2013</td>
<td>9</td>
<td>126</td>
<td>135</td>
</tr>
<tr>
<td>Total</td>
<td>190</td>
<td>3208</td>
<td>3398</td>
</tr>
</tbody>
</table>
Panel B: Distribution of the sample firms by Industry

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>China</th>
<th>Percentage</th>
<th>US</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, Forestry &amp; Fishing</td>
<td>4</td>
<td>2.11%</td>
<td>9</td>
<td>0.28%</td>
</tr>
<tr>
<td>Mining</td>
<td>18</td>
<td>9.47%</td>
<td>146</td>
<td>4.55%</td>
</tr>
<tr>
<td>Construction</td>
<td>9</td>
<td>4.74%</td>
<td>65</td>
<td>2.03%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>22</td>
<td>11.58%</td>
<td>105</td>
<td>3.27%</td>
</tr>
<tr>
<td>Transportation, Electric &amp; Communications</td>
<td>51</td>
<td>26.84%</td>
<td>767</td>
<td>23.91%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>14</td>
<td>7.37%</td>
<td>101</td>
<td>3.15%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>23</td>
<td>12.11%</td>
<td>576</td>
<td>17.96%</td>
</tr>
<tr>
<td>Finance, Insurance &amp; Real Estate</td>
<td>13</td>
<td>6.84%</td>
<td>940</td>
<td>29.30%</td>
</tr>
<tr>
<td>Services</td>
<td>36</td>
<td>18.95%</td>
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<td>14.37%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>0</td>
<td>0.00%</td>
<td>38</td>
<td>1.18%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>190</td>
<td></td>
<td>3208</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1 Timeline of event study**

This timeline shows the estimation window and event window for the event study. The numbers are days around the announcement day [0].
Table 2: Cumulative average abnormal returns around announcement dates

This table presents the cumulative average abnormal returns in different event windows for both countries. The sample consists of 190 Chinese firms and 3208 US firms in the time span of 1st of January 2004 until 31st of December 2013. T-stat corresponds with AAR, *, ** and *** represent the statistical significance at 10%, 5% and 1% level respectively.

<table>
<thead>
<tr>
<th>Country</th>
<th>China</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CAAR</td>
<td>t-statistics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[-20,-5]</td>
<td>0,0126</td>
<td>1,07</td>
</tr>
<tr>
<td>[-1,+1]</td>
<td>0,3153</td>
<td>5***</td>
</tr>
<tr>
<td>[-2,+2]</td>
<td>0,0293</td>
<td>3,87***</td>
</tr>
<tr>
<td>[-5,+5]</td>
<td>0,0245</td>
<td>2,58***</td>
</tr>
<tr>
<td>[+5,+20]</td>
<td>0,0319</td>
<td>2,81***</td>
</tr>
<tr>
<td>[+20,+150]</td>
<td>0,0703</td>
<td>2,31**</td>
</tr>
</tbody>
</table>

Table 3: Impact of institutional changes on the market reaction to share repurchase in China (legal settings changed in 2005 and 2008)

This table presents the cumulative average abnormal returns in different event windows in China. The decade is divided into three periods: 2004-2005, 2006-2008 and 2009-2013 based on legislation changes.

<table>
<thead>
<tr>
<th></th>
<th>2004-2005</th>
<th>2006-2008</th>
<th>2009-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CAAR</td>
<td>t-statistics</td>
<td>CAAR</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>[-20,-5]</td>
<td>0,0017</td>
<td>0,09</td>
<td>-0,0305</td>
</tr>
<tr>
<td>[-1,+1]</td>
<td>0,0356**</td>
<td>2,26</td>
<td>0,0227</td>
</tr>
<tr>
<td>[-2,+2]</td>
<td>0,0368**</td>
<td>2,16</td>
<td>0,0214</td>
</tr>
<tr>
<td>[-5,+5]</td>
<td>0,0236</td>
<td>1,45</td>
<td>-0,0031</td>
</tr>
<tr>
<td>[+5,+20]</td>
<td>-0,0099</td>
<td>-0,46</td>
<td>0,0117</td>
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<tr>
<td>[+20,150]</td>
<td>0,0183</td>
<td>0,3</td>
<td>0,1435**</td>
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</table>
Table 4 Correlation matrix of variables in China

This table presents the correlations between different independent variables that are used to explain different hypotheses for share repurchases. The sample is based on Chinese firms. Size is defined as the natural logarithm of total assets. MTBV is calculated by dividing market value of equity to book value of equity. FCF is calculated by dividing free cash flow through total assets. ROE is defined as net income divided by shareholders’ equity. Debt is depicted as the long-term debt scaled by total assets. Divdum represents dividend dummy, which is set to 1 if firms payout dividends and 0 if not.

<table>
<thead>
<tr>
<th></th>
<th>size</th>
<th>MTBV</th>
<th>FCF</th>
<th>ROE</th>
<th>debt</th>
<th>Divdum</th>
</tr>
</thead>
<tbody>
<tr>
<td>size</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTBV</td>
<td>0.1776</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>FCF</td>
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<td>-0.0021</td>
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<td></td>
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<tr>
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<td>0.1432</td>
<td>0.0081</td>
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<td></td>
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<tr>
<td>debt</td>
<td>0.3422</td>
<td>0.1242</td>
<td>-0.0378</td>
<td>-0.0212</td>
<td>1</td>
<td></td>
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<tr>
<td>Divdum</td>
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<td>0.1974</td>
<td>-0.0567</td>
<td>-0.1022</td>
<td>0.0874</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5 Correlation matrix of variables in US

This table presents the correlations between different independent variables that are used to explain different hypotheses for share repurchases. The sample is based on US firms. Size is defined as the natural logarithm of total assets. MTBV is calculated by dividing market value of equity to book value of equity. FCF is calculated by dividing free cash flow through total assets. ROE is defined as net income divided by shareholders’ equity. Debt is depicted as the long-term debt scaled by total assets. Divdum represents dividend dummy, which is set to 1 if firms payout dividends and 0 if not.

<table>
<thead>
<tr>
<th></th>
<th>size</th>
<th>MTBV</th>
<th>FCF</th>
<th>ROE</th>
<th>debt</th>
<th>Divdum</th>
</tr>
</thead>
<tbody>
<tr>
<td>size</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTBV</td>
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<tr>
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<td>0.0009</td>
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<td>0.0132</td>
<td>0.0019</td>
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<tr>
<td>debt</td>
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<td>0.0379</td>
<td>-0.0011</td>
<td>-0.0228</td>
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<tr>
<td>Divdum</td>
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<td>-0.0049</td>
<td>-0.0047</td>
<td>0.0363</td>
<td>0.0409</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 6 The output of regression analysis respectively—domestic level

This table presents the outputs of OLS regressions on the announcement day. Dependent variable is the abnormal return on announcement day, AR(0). The independent variables are trying to explain the abnormal returns. Size is defined as the natural logarithm of total assets. MTBV is calculated by dividing market value of equity to book value of equity. FCF is calculated by dividing free cash flow through total assets. ROE is defined as net income divided by shareholders’ equity. Debt is depicted as the long-term debt scaled by total assets. Divdum represents dividend dummy, which is set to 1 if firms payout dividends and 0 if not. *, ** and *** represent the statistical significance at 10%, 5% and 1% level respectively. This table contains two panels, with panel A displays the output of US and panel B displays the output of China.

Panel A: Regression analysis of US

<table>
<thead>
<tr>
<th></th>
<th>AR(0)</th>
<th>AR(0)</th>
</tr>
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<tbody>
<tr>
<td>size</td>
<td>-0.0176***</td>
<td></td>
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<tr>
<td></td>
<td>(-12.31)</td>
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<tr>
<td>MTBV</td>
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<tr>
<td></td>
<td>(-2.23)</td>
<td></td>
</tr>
<tr>
<td>FCF</td>
<td>-1.3706</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.65)</td>
<td></td>
</tr>
<tr>
<td>ROE</td>
<td>-9.906</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.13)</td>
<td></td>
</tr>
<tr>
<td>debt</td>
<td>0.0136**</td>
<td>-0.0098***</td>
</tr>
<tr>
<td></td>
<td>(2.24)</td>
<td>(-3.26)</td>
</tr>
<tr>
<td>Divdum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>_cons</td>
<td>0.1146***</td>
<td>0.0153***</td>
</tr>
<tr>
<td></td>
<td>(13.64)</td>
<td>(7.75)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.0522</td>
<td>0.0054</td>
</tr>
<tr>
<td>Adj R-squared</td>
<td>0.0506</td>
<td>0.0037</td>
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</table>
Panel B: Regression analysis of China

<table>
<thead>
<tr>
<th></th>
<th>AR(0)</th>
<th>AR(0)</th>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td></td>
<td>(-1.06)</td>
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<tr>
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<td>(-0.93)</td>
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<tr>
<td>FCF</td>
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<tr>
<td></td>
<td>(-0.21)</td>
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</tr>
<tr>
<td>ROE</td>
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<tr>
<td></td>
<td>(-3.16)</td>
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</tr>
<tr>
<td>debt</td>
<td>-0.0949*</td>
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</tr>
<tr>
<td></td>
<td>(-1.51)</td>
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</tr>
<tr>
<td>Divdum</td>
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<tr>
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<td>(1.56)</td>
<td>(4.38)</td>
</tr>
<tr>
<td>R-squared</td>
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<td>0.0151</td>
</tr>
<tr>
<td>Adj R-squared</td>
<td>0.0624</td>
<td>0.0096</td>
</tr>
</tbody>
</table>