Investor Irrationality and Open Market Share Repurchases: Theory and Evidence

Ganggang Zhang

A thesis submitted for the degree of Doctor of Philosophy

University of Bath

School of Management

September 2008

COPYRIGHT

Attention is drawn to the fact that copyright of this thesis rests with its author.

This copy of the thesis has been supplied on condition that anyone who consults it is understood to recognise that its copyright rests with its author and that no quotation from the thesis and no information derived from it may be published without the prior written consent of the author.

This thesis may be made available for consultation within the University Library and may be photocopied or lent to other libraries for the purpose of consultation.
Abstract

Dividends and share repurchases are two main approaches that companies use to return cash back to investors. For a long time companies have preferred dividends over share repurchases. However, in the past decade share repurchases have begun to play an important role in companies’ pay out policies. Share repurchases have increased so dramatically that some researchers suggest that “share repurchases are being used as substitutes for dividends” (Grullon and Michaely, 2002).

Many differences have emerged between dividends and share repurchases, such as contracts in flexibility, information content, signaling, related cash flow, etc. These differences also encompass both investors’ and managers’ different attitude towards dividends and share repurchases. Why are there such differences and how do they impact on companies’ payout policy? To date there have been few studies in this field. Black (1977) said dividends were a ‘puzzle’. I believe these differences are ‘puzzling’ too and I refer to them as the “repurchase - dividend” puzzle. My research is directly motivated by this puzzle, aims to provide insight into these differences and examines the potential consequences on corporate payout policy and other corporate issues.

In this thesis, I present a series of theoretical models I developed during my PhD research as well as my survey results and empirical evidence. By using these models I examine managers’ timing ability during share repurchasing, the substitution hypothesis, the repurchase catering theory, and the relationship between share repurchases and corporate governance. Several notable results were generated by these models and well supported by the survey and empirical evidence. I believe my research provides insights into the “repurchase - dividend” puzzle, enriches the literature of corporate payout policy and also leads to some practical policy implications.
Content

Section 1 ............................................................................................................................................9

Chapter 1 Introduction: ‘Repurchase - Dividend’ Puzzle .................................................................11

Chapter 2 Literature Review ............................................................................................................17

2.1 Growing Repurchase Activity, ‘Disappearing Dividends’ and the Substitution Hypothesis’ ..17

2.1.1 Main Types of Share Repurchase Activities...........................................................................17

2.1.2 Growing Repurchase Activity around the World ................................................................. 18

2.1.3 The ‘Disappearing Dividends’ and the ‘Substitution Hypothesis’ ........................................19

2.2 Payout Signaling and the Differences between Dividends and Share Repurchases.................22

2.2.1 Different motivations for share repurchase programs ..........................................................23

2.2.2 The Payout Signaling/the Information Content of Payout policy .........................................25

2.2.3 Differences between Dividends and Share Repurchases .......................................................28

2.3 Managerial Timing Evidence, Market Inefficiency and the Lagged Reaction Assumption.....32

2.3.1 The Evidence of Managerial Timing by Using Share Repurchases.......................................32

2.3.2 The Implication of Market Inefficiency..................................................................................35

2.3.3 Behavioral Finance and the Lagged Reaction Assumption ...................................................38

Section 2 ..........................................................................................................................................41

Chapter 3 Investor Irrationality and Optimal Open-market Share Repurchasing .........................43

3.1 Introduction ..................................................................................................................................43

3.2 The Model ...................................................................................................................................46

3.3 Future Research: Timing VS Price-supporting........................................................................63

3.4 Conclusion...................................................................................................................................64

Chapter 4 Dividends, Share Repurchases and the Substitution Model ...........................................65

4.1 Introduction ..................................................................................................................................65
4.2 Model description ................................................................................................................................67
4.2.1 Model Introduction ..........................................................................................................................67
4.2.2 The way investors form their expectation ..................................................................................70
4.3 Model Solution and Analysis ........................................................................................................75
4.3.1 Case 1 (Actual Earnings are Stable) ..........................................................................................75
4.3.1.1 Case Description ....................................................................................................................75
4.3.1.2 Case 1 Analysis .......................................................................................................................78
4.3.2 Case 2 (when the Actual Earnings are Volatile) .........................................................................80
4.3.2.1 Case Description ....................................................................................................................80
4.3.2.2 Case 2 Analysis .......................................................................................................................84
4.3.2.4 The Numerical Example ........................................................................................................91
4.4 Conclusion ..........................................................................................................................................93

Chapter 5 Repurchase and Dividend Catering, Managerial Myopia, and Long-run Value-destruction
........................................................................................................................................................95
5.1 Introduction .......................................................................................................................................95
5.1.1 Catering Theories of Dividends and Repurchases .........................................................................97
5.2 Model description ............................................................................................................................98
5.3 The Model Analysis ..........................................................................................................................100
5.4 Policy implications ..........................................................................................................................105
5.5 Conclusion .......................................................................................................................................106

Chapter 6 Investor Protection, Share Repurchases, Irrationality and Agency Conflicts: The
Implications for Corporate Governance ................................................................................................109
6.1 Introduction .......................................................................................................................................109
6.2 Background Information ..................................................................................................................111
6.2.1 Background of Share Repurchases .............................................................................................111
6.2.2 Evidence on shareholder protection and repurchases ..................................................................113
6.3 Analysis of Models .................................................................................................................. 114
6.3.1 Repurchases and the Agency Costs of Free Cash Flow ....................................................... 114
6.3.2 Repurchase Timing and Share-holder Rights...................................................................... 122
6.3.3 Repurchase Catering and Investor Rights........................................................................... 125
6.4 Repurchases and Irrationality: My Survey Evidence ............................................................ 128
6.5 Implications of My Models for Corporate Governance ......................................................... 131
6.6 Conclusion............................................................................................................................... 134

Chapter 7 Managers’ and Investors’ View on Share Repurchases: A Survey................................. 135
7.1 Introduction ............................................................................................................................ 135
7.2 Background Information ........................................................................................................ 137
7.2.1 Motives for Share Repurchases............................................................................................ 137
7.2.2 Previous Survey Results....................................................................................................... 137
7.2.3 My Survey ............................................................................................................................ 138
7.3 Data and Methodology............................................................................................................ 140
7.3.1 The Sample and Data........................................................................................................... 140
7.3.2 The Questionnaire................................................................................................................ 141
7.4 Survey Result Analysis............................................................................................................ 144
7.4.1 Internal Consistency and Cronbach’s Alpha................................................................. 144
7.4.2 Descriptive Results............................................................................................................... 145

Chapter 8 Empirical Tests About Managers’ Timing Ability in and Investors’ Reaction to Share Repurchases In the U.K. ................................................................................................................ 153
8.1 Introduction ............................................................................................................................ 153
8.2 Background Information ......................................................................................................... 157
8.2.1 Market Reaction to Share Repurchase Announcements ..................................................... 157
8.2.1.1 Short-term Market Reaction Following Announcements..................................................... 157
8.2.1.2 Long-term Market Reaction Following Announcements..................................................... 159
8.2.2 Managers’ Timing Ability by Using Share Repurchases ..................................................... 160

8.2.3 Empirical Studies about Share Repurchases In the UK...................................................... 162

8.3 Disclosure Requirements and Regulations on Open Market Share Repurchases Across Countries ...................................................................................................................................... 166

8.3.1 Disclosure Requirements and Regulations in the US........................................................... 166

8.3.2 Disclosure Requirements and Regulations in Some Other Countries................................. 168

8.3.3 Disclosure Requirements and Regulations in the UK.......................................................... 169

8.4 Data Methodology .................................................................................................................. 170

8.4.1 Sample and Data .................................................................................................................. 170

8.4.2 Descriptive Statistics ............................................................................................................ 174

8.5 Bootstrapping-Empirical Tests on Managerial Timing Ability by Using Share Repurchases177

8.6 Conclusion............................................................................................................................... 181

Chapter 9 Conclusion .................................................................................................................... 183

9.1 Chapter Review....................................................................................................................... 184

9.2 Policy Implications.................................................................................................................. 186

9.3 Limitations and Future Research ........................................................................................... 188

References ..................................................................................................................................... 191

Appendix 1.................................................................................................................................... 198

Appendix 2.................................................................................................................................... 199

Appendix 3.................................................................................................................................... 201

Appendix 4.................................................................................................................................... 204

Appendix 5.................................................................................................................................... 216
Investor Irrationality\(^1\) and Open Market Share Repurchases: Theory and Evidence

**Section 1**

This thesis is divided into four sections. Section 1 focuses on introduction and literature review. In section 2 I present my theoretical work, which includes the theoretical models I developed during my PhD research—two models were published in international journals and one was published as a University of Bath School of Management working paper. Section 3 features my survey and empirical work, while section 4 (Chapter 9) offers conclusions to my research.

In the first part of section 1 (Chapter 1) I will give a brief introduction of why I have chosen share repurchases as my research topic, my research assumptions, how I conducted my research and my contribution to the current literature review. In the second part (Chapter 2) I will focus on my literature review. A general review is given first and followed by reviews specific to each of the four models. When presenting the models in the later part of this thesis, I will briefly mention some of the relevant literature and will give reference to the detailed literature review presented in this chapter.

---

\(^1\) Barberis and Thaler (2002) suggest rationality means two things. First, when they receive new information, agents update their beliefs correctly, in the manner described by Bayes’ law. Second, given their beliefs, agents make choices that are normatively acceptable, in the sense that they are consistent with Subjective Expected Utility (SEU). Barberis and Thaler (2002) further suggest irrationality means either agents fail to update their beliefs correctly, or agents update their beliefs correctly, but make choices that are normatively questionable. In this thesis, I assume investors have a lagged reaction to share repurchases. In other words, they cannot update their beliefs correctly when receiving payout signals. In accordance with Barberis and Thaler (2002), investors are irrational. Therefore, ‘irrationality’ in this thesis means investors cannot react immediately to share repurchases to update their beliefs correctly.
Chapter 1 Introduction: ‘Repurchase - Dividend’ Puzzle

According to Miller and Modigliani (hereafter MM, 1961) a firm would be indifferent between dividends and share repurchases, as both essentially serve as a similar signal to the market.

However, open-market share repurchase programs have become increasingly popular in the past two decades. In 1985 only 129 open-market share repurchase programs were announced, but in 1996 there were 1,319 programs announced in the US (Jagannathan and Stephens, 2003). Many other researchers have also recently documented the growing share repurchase activity in the US (e.g., Jagannathan, Stephens and Weisbach, 1999; Grullon and Michaely, 2002; Fried, 2002; etc.). Share repurchases are also becoming popular in other countries around the world, with evidence showing dramatic growth in Canada, UK, France, Norway, Japan, Hong Kong, Australia, etc. (see Ikenberry, Lakonishok and Vermaelen, 2000; Rau and Vermaelen, 2002; Ginglinger and Hamon, 2007; Skjeltorp, 2004; Zhang, 2002a; Brockman and Chung, 2001 and Lamba and Ramsay, 2000).

The increasing share repurchase activities around the world are accompanied by growing research interest, which has generated several interesting empirical findings. These can contribute to my ‘repurchase v dividend’ puzzle are as follows.

a) As Linter (1956) find, managers still smooth dividends from year to year. They place less emphasis on share repurchase, with the result that repurchases are more volatile than dividends (e.g. Jagannathan, Stephens and Weisbach, 2000; Brav, Graham, Harvey and Michaely, 2005).

---

2 Black (1977) describes dividend policy as a ‘puzzle’. Here I use this term to attempt to demonstrate the conflicting evidence on dividends and share repurchases. I first used this term during a discussion with my supervisor, and we both agreed that this is an insightful way to describe my research and distinguish it from previous studies.
b) Evidence finds that dividends are more likely to arise from permanent cash flow while repurchases are mainly from temporary cash flow (Gelb 2000, Guay and Harford 2000);

c) Survey evidence from Brav et al. (2005) reveals that managers view dividend signals as containing more information than share repurchases, and hence they are more concerned with dividends;

d) Isagawa (2002) finds the market has a lagged reaction to share repurchase announcements when compared to the reaction to dividend announcements;

e) Many researchers have found evidence that managers can time the market to buy back their shares at a price that is lower than their fundamental value (e.g. Cook, Krigman and Leach 2004, Brockman and Chung 2001, Ginglinger and Hamon 2007).

The evidences in a) to e) suggests that investors react to repurchase in a different way to dividends. They react to dividends intensively and immediately, while their response to share repurchases seems to be much slower and over time.

Why do investors react differently? Will investors learn one time to understand repurchases? If they do, will they be indifferent between dividends and share repurchases? And at that stage will payout methods matter to managers? These fundamental questions intrigue me and I group them collectively as the ‘repurchase v dividend’ puzzle. This puzzle provides the driving force for this thesis.

During my study, I developed a series of theoretical models in which investors are irrational and have a lagged reaction to share repurchase announcements\(^3\).

\(^3\) The lagged reaction assumption is relative to investors' immediate reaction to dividends. And as you will read in the later part of this thesis model 1 (Chapter 3), model 2 (Chapter 4) and model 3 (Chapter 5) share similar
My first model (Chapter 3) is a repurchase timing / signaling game, which aims to investigate how managers execute share repurchases, and which factors affect their repurchasing behavior. In this model, I assume there are two firms: firm H and firm L. Firm H is undervalued while firm L is accurately valued by the market. Each firm has 3 options in relation to share repurchases: repurchasing nothing, using half of the cash flow on share repurchases and using all of the cash flow on share repurchases. Our game shows that the best response for firm L is repurchasing nothing while the dominant strategy for firm H depends on the size effects of share repurchases on the share prices. If share prices increase dramatically with increasing share repurchases, share prices will go up quickly and manager H will find the shares are too expensive to buy back. Therefore, he will only choose repurchasing gradually by spending half of the cash flow on share repurchases. If the size effect is weak, investors’ reaction is not strong and share prices do not go up too much. Manager H will find optimal to buy back shares intensively by splashing out all the money on share repurchases. Thus my model provides an explanation for Cook et al’s (2004) analysis.

My second model aims to investigate how investors’ lagged reaction to share repurchases and their irrationality influence managers’ choice of optimal payout method(s). In this model, I assume that investors react immediately to dividend announcements but react to repurchase announcements with some time lag. Investors’ lagged reaction to repurchase announcements may result from market inefficiency and/or from their bounded rationality or some psychological problem, such as conservatism (Edwards, 1968). To formalize how investors develop their beliefs in this model I followed Barberis, Shleifer and Vishny (1998) by assuming that investors wrongly believe that the earnings move between two states: trending or mean-reverting.

assumptions (i.e., irrational investors and lagged reaction to share repurchases). However in the final model (model 4, Chapter 6) I return to the efficient market assumption when analyzing the relationship between shareholder rights and share repurchases where share repurchases are used as a device of controlling the free cash flow problem.
My model predicts that when earnings are stable, investors observe the earnings through payout signal and believe with higher probability they are in a trending state. In this situation, paying out through dividends, or through repurchases, or a co-through does not make any difference. The choice of payout method is of no consequence. When earnings are volatile, investors’ lagged reaction to share repurchases has a marked impact. My model demonstrates that at this time, the length of the lag is significant. If the length of the lag is an even number, investors will observe the same signals each period no matter whether the payout is through dividends or through repurchases. However, if the length of the lag is an odd number, then the signal investors observe each period when paying out through repurchases is opposite to the signal they observe when paying out only through dividends. Therefore, paying out through both dividends and share repurchases could be the best choice as the impact of volatile dividends are exactly offset by the impact of volatile share repurchases.

The results from this model provide explanation for some of the differences between dividends and share repurchases. The model also shows how the payout method(s) affect the expected firm value, the volatility and managers’ compensation. Hence it helps managers make a more informed choice of payout method(s) and gives us a better understanding of the managers’ choice.

My third model is based on the work of Baker and Wurgler (2004). Baker and Wurgler (2004) developed a theory to explain that managers’ decision to pay dividends is decided by investor demand. Managers try to cater to investors and just give investors what they want. The aim of this model is to determine whether open market share repurchases can be used to cater for investors in addition to dividends.

In my model, I assume that investors react to dividends immediately and fully. Here ‘immediately’ signifies that there is no lag in their reaction to dividends. ‘Fully’ means
they react to dividends completely and with no further reaction following dividend announcements. Investors’ reaction to repurchase announcements, however, is different. Based on the large body of evidence of managerial timing by using open market share repurchases, I assume that investors under-react to repurchase announcements. They have some immediate initial reaction to repurchase announcements, but this is very weak. The investors’ major reaction to repurchase announcements, however, is lagged and gradually growing over time.

My model reveals that managers’ choice actually depends on how investors react to that choice. They always choose the one that could bring them the highest compensation. If investors react strongly to catering, managers will choose catering. And if investors’ later reaction at date 2 to repurchases is growing very strong, managers will choose repurchase catering instead of dividend catering. And managers’ decision is also affected by the weights on each date in their compensation function. If their compensation is largely relying on date 1 firm value, managers are more likely to choose the decision that has the highest investor reaction at date 1. I believe this is a development of Baker and Wurgler’s (2004) dividend catering theory.

My final model, presented in this thesis, concerns the relationship between share repurchases and shareholder rights. This work has been motivated by Jiraporn (2006), who considers the effect of shareholder rights on repurchase activity in the face of agency problems of free cash flow. In particular, he found a positive relationship between the strength of shareholder rights and repurchases (that is, they are complements). I ask the question, are they complements or substitutes?

---

4 The assumed way investors react to repurchases in my model is well supported by the ‘learning direction theory’ (Selten and Stoecher, 1986 and Selten, 1998). Learning direction theory describes an influence of cognition on adaptation. This theory says in a class of repeated tasks learning from feedback information after each period will help to do better the next time. Applying this theory to investors’ reaction to repurchases, I can say that investors don’t understand repurchases very well at first. But after information comes through, they start to learn about share repurchases and react to them. As a result, their reaction gradually grows over time.

5 Hence, my analysis provides a natural complement to the analysis of La Porta et al. (1997) who analyzed whether dividends and investor protection are substitutes or complements.
My work provides a theoretical analysis of the effects of the strength of investor rights on a firm’s share repurchase policy in the face of agency conflicts and behavioral biases. I consider three reasons for firms to repurchase their shares; to eliminate agency costs of free cash-flow, to time the market, and to cater to investors. In the first case, I demonstrate that investor rights and repurchases may be complements or substitutes in addressing free cash flow problems. In the second case, I argue that stronger investor rights increase informational disclosure which reduces the ability to time the market using repurchases. In the final case, I argue that stronger investor rights may decrease value-reducing repurchase catering.

The thesis is organized as follows. In chapter 2 I will present my general literature review which is followed by specific literature review of each model. Section 2 includes 4 chapters: chapter 3, 4, 5 and 6, presenting model 1, model 2, model 3 and model 4 respectively. In section 2 I only present theoretical models, result analysis and a discussion of the implication. In section 3 I present my empirical evidence. This section includes two chapters: chapter 7 and chapter 8. Chapter 7 presents my survey results and chapter 8 presents my empirical analysis by using UK share repurchase data. Section 4 is the final section. It includes only one chapter - Chapter 9, which concludes this thesis.
Chapter 2 Literature Review

2.1 Growing Repurchase Activity, ‘Disappearing Dividends’ and the Substitution Hypothesis

2.1.1 Main Types of Share Repurchase Activities

There are three main types of share repurchases: open-market share repurchases, fixed-price tender offers and Dutch auction tender offers. Although the aim of all three types of share repurchase is the same - to buy back their own shares from the market – in practice, how this buy back is achieved varies across the three types.

With an open-market share repurchase program, companies announce the total number of shares authorized for potential repurchases, but offer no commitments about price, timing, or even execution. If the company does repurchase, it will buy back at prevailing market prices.

With a fixed-price tender offer, companies will open the process with an announcement inviting shareholders to tender their shares to the company over a 20- to 30-day period at a preset price that reflects some premium—typically between 15% and 20% above the prevailing market price.

With a Dutch auction tender offer, the company begins the process by announcing that it is seeking tenders from shareholders for a specified proportion of its shares and is willing to pay between, say 10% and 20% above market value for them. The shareholders respond by informing the company within a specified time period how many shares they are willing to sell at what minimum price within the range. Once all the tenders are in, the final clearing price is set and all shares are executed at this
clearing price.

Open-market share repurchases are the most popular method and nowadays comprise 90 to 95 percent of announced share repurchase programs (Grullon and Michaely, 2002). In this thesis ‘share repurchases’ means open market share repurchases. I choose open market share repurchases because; a) open market share repurchases are the most popular, b) empirical data is available, and c) the existence of previous studies means my research can present a valid comparison.

2.1.2 Growing Repurchase Activity around the World

Dividends and share repurchases are the two most popular ways of distributing cash back to investors. For decades, corporations have overwhelmingly preferred distributing cash in the form of dividends over repurchases. However, things have begun to change dramatically over the last twenty years, and now open-market share repurchase programs have become increasingly popular.

In the US, in 1985 only 129 open-market share repurchase programs were announced, but in 1996 there were 1,319 (Jagannathan and Stephens, 2003). Jagannathan and Stephens further observed that in 1986 only 27% of the firms announcing an open-market repurchase program had previously initiated such in the prior five years. However in 1996 this figure had grown to nearly 54% and over a half of the firms had two or more open-market share repurchases in the prior five years. Fried (2002) also documents that between 1980 and 1998, share repurchases rose from $1.4 billion to $220 billion annually, accounting for more than 50% of the total cash distributed by publicly traded US firms in 1998. Among of them, 90%-95% of stock repurchases were open-market share repurchases. Jagannathan, Stephens and Weisbach (2000) have found that the value of announced open-market share repurchases by US industrial firms between 1985 and 1996 increased from $15.4 billion to $113 billion. Using aggregate data from COMPUSTAT, Grullon and Michaely (2002) find that
expenditures on open-market share repurchases (relative to total earnings) increased from 4.8% in 1980 to 50.1% in 1998.

Share repurchases have become popular not only in the U.S. but also in other countries around the world. For example, in Canada there were only 62 open market share repurchase programs announced in 1993 with a total value of 1.458.7 million Canadian dollars. In 1997, however, there were 172 repurchase programs with a total value of nearly 10 billion Canadian dollars (Ikenberry, Lakonishok and Vermaelen, 2000). In the UK there was only 1 share repurchase program in 1985 with value of just 1.1 million pounds, while in 1997 there were 50 share repurchase programs with a total value of 4,661.9 million pounds (Rau and Vermaelen, 2002). Ginglinger and Hamon (2007) have used the data from Euronext Paris (the Paris Stock Exchange) to study repurchase timing and they find that between 2000 and 2002 there were 352 open market share repurchases in France with a total value of 33,925.1 Euros. In Norway share repurchases have also become a popular way of distributing cash to investors. According to Skjeltorp (2004) there were only 28 repurchase programs announced in 1998. In 2001, however, the number of announced share repurchase programs was 112. In Japan there were only 2 repurchase programs announced in 1995 with a total value of 25.0 billion Yen. Two years later 36 repurchase programs were announced with a total value of 394.2 billion Yen (Zhang, 2002a). Hatake and Isagawa (2004) also observe this dramatic increase in share repurchase announcements in Japan between 1995 and 1998. In Hong Kong there were 8 share repurchase programs in 1992, but in 1995 100 such programs were announced (Brockman and Chung, 2001). Zhang (2002b) also notes the growing repurchase activities in Hong Kong. In Australia due to legislation there was almost no share repurchase announcements before 1995. However, in 1998 there were 41 share repurchase programs announced (Lamba and Ramsay, 2000).

2.1.3 The ‘Disappearing Dividends’ and the ‘Substitution Hypothesis’
At the same time as the increasing prevalence of repurchases, dividends are ‘disappearing’. Fama and French (2001) published an insightful paper regarding the ‘disappearing dividends’ issue: the percentage of firms paying dividends has declined sharply since 1978. They find that the population of dividend payers has shrunk by over 50 percent since 1978. There were 2,419 dividends payers in 1978 but only 1,182 in 1991 and 1,063 in 1999. In addition, the percentage of firms paying cash dividends has decreased from 66.5 percent in 1978 to 20.8 percent in 1999.

This leads to the question, why is the percentage of dividend payers declining? Fama and French (2001) provided an explanation. Firstly, they find that the characteristics of listed firms are changing. Before 1978, listed firms have strong investment opportunities and are more profitable than newly listed firms after 1978. They conclude that the surge of newly listed firms with strong investment opportunities but poor profitability has led to the decline of the percentage of dividend payers. However, this is not the full story. Fama and French (2001) find that even after controlling their characteristics, firms are becoming less inclined to pay dividends. They imply that this may be because the expected benefits of dividends decline through time.

As a strong response to Fama and French (2001), Amihud and Li (2002) also report that dividends are ‘disappearing’. However, they assume that dividends are disappearing because the information content of dividend announcements is declining. They conclude that this is partly due to the increasing shareholdings by institutional investors, who are normally assumed to be well informed and be better at monitoring management. Baker and Wurgler (2004) also give an explanation for the ‘disappearing dividends’. They found that the catering theory offers the best explanation and explain that when investors put a discount (rather than a premium) on dividend payers, there will be few firms that wish to pay dividends. They further used empirical test results to prove their theory.

On the other hand, DeAngelo, DeAngelo and Skinner (2004) find that although the
number of dividend payers declines, the aggregate real dividends paid by industrials increase over the same period. From their point of view, dividends have not disappeared. They imply that the decline in the percentage of dividend payers is almost entirely among the firms who pay very low dividends and that the real dividends paid by the top dividends payers ‘swamp the modest dividend reduction associated with the loss of many small firms’. They suggest that the high and increasing concentration in the supply of dividends from top payers reflects, in return, a high and increasing earnings concentration. Julio and Ikenberry (2004) reexamined the dividend policy in America and found that although the percentage of dividend payers declined during the last two decades of the 20th century, this trend has dramatically reversed since 2001. They find in the third quarter of 2001 the downward trend in propensity reached a low of 15%. However the figure climbed steadily to over 20% by the first quarter of 2004. They conclude that neither the catering theory nor the agency theory explains this ‘reappearing dividends’.

Grullon and Michaely (2002) also noticed the decline in dividend payers over the last twenty years and the accompanying growth in share repurchasing activity. According to their data, expenditure on share repurchase programs (relative to total earnings) increased from 4.8 percent in 1980 to 50.1 percent in 1998 and while repurchases grew at an average annual rate of 28.3 percent, dividends only grew at an average annual rate of 7.5 percent. With evidence of declining dividends and increasing share repurchases, Grullon and Michaely (2002) have investigated whether share repurchases are being used as a substitute for dividends (i.e., the Substitution Hypothesis). They find that the dividend forecast errors (the difference between actual and expected dividend payments) are negatively correlated with share repurchase activity and concluded that these empirical results support the substitution hypothesis. Grullon and Michaely (2002) also predict that share repurchases would increase if they were better protected from manipulation charges by the SEC. Indeed the upward shift in share repurchase activities following the adoption of Rule 10b-18 could be viewed as support for the ‘substitution hypotheses of the authors.
In contrary to the ‘substitution hypothesis’ of Grullon and Michaely (2002), Chowdhry and Nanda (1996) developed a model, in which firms distribute some cash in the form of dividends despite the relative tax disadvantages and carry the rest forward to future periods. However, when shares are substantially undervalued, firms will distribute all accumulated cash through repurchases. From Chowdhry and Nanda’s point of view, repurchases are not being used as substitutes for dividends. Dividends and repurchases are just two ways of distributing cash at different times. David Gelb (2000) also provided some findings that are contradictory to the “substitution hypothesis”. He assumes a “payout composition”, and suggested that the market reaction is more favorable when regular dividends comprise a larger proportion of the total payout. The findings from a recent paper by Lee and Rui (2007) also run counter to the “substitution hypothesis”. Lee and Rui (2007) have used a time-series approach to test various hypotheses on dividends and share repurchase, and have found that share repurchases and dividends are not perfect substitutes. Actually, they are both complements and substitutes.

So, are dividends disappearing? If this is the case, why? Are share repurchases substitutes for dividends? If not, what different role(s) do they play in a firm’s payout policy and how do these differences affect a firm’s payout policy? These questions really draw my attention and in order to offer answers I consider the differences between dividends and share repurchases in the next section. Only after I understand the differences between them can I examine why they exist and how they impact managers’ payout decisions.

2.2 Payout Signaling and the Differences between Dividends and Share Repurchases

As I demonstrate above, tracing the differences between dividends and share repurchases is a key store of my study. Current literature has already documented several differences between dividends and share repurchases (e.g., Guay and Harford,
2000; Jagannathan, Stephens and Weisbach, 2000; Gelb, 2000; Oded, 2005; Grullon and Michaely, 2002, etc.). I believe that some of the differences between them are related to the signaling function or information content of corporate payout policy. Therefore, reviewing the literature about payout signaling (or information content of corporate payout) before presenting these differences could help us have a better understanding.

Signaling function is identified as one of the most popular motivations for share repurchases. Wansley, Lane and Sarkar (1989) conducted a survey into management’s view on the motives for share repurchases. In their paper, they summarized the most popular reasons of buying back shares from the market. These motives are considered in the following section, before I focus on the signaling function.

2.2.1 Different motivations for share repurchase programs

Wansley, Lane and Sarkar (1989) describe the different motives for open market share repurchases as follows.

‘Signaling’

Signaling is the most widely studied explanation for share repurchases both in academia and in practices. The basis of signaling theory is that a firm’s management has an information advantage over outside investors about the firm’s true value. Owing to this information asymmetry, prevailing share prices may not reflect the firm’s true value because investors only have access to public information. Repurchasing shares may function as a signal to the market that existing share prices are below the firm’s fundamental value.

Agency Costs of Free Cash Flows
The agency problem of free cash flows is another popular explanation for open market share repurchases. Easterbrook (1984) and Jensen (1986) argue that when firms distribute cash to shareholders by paying dividends, the firms reduce the agency costs associated with managers’ over-investing or investing in negative NPV projects. This argument is readily extended to share repurchases.

*Tax Motivated Substitution for Dividends*

This theory argues that firms repurchase their own shares so that shareholders can benefit from the tax advantage of a repurchase. In the US the tax rate on cash dividends is much higher than that on capital gains. Therefore, if the firm uses repurchases rather than dividends to distribute cash back to investors, personal taxes can be reduced.

*Leverage/Capital Restructure*

This theory argues that managers may use share repurchases to deliberately change the firm’s capital structure. For example, as discussed by Vermaelen (1981) and Opler and Titman (1994), repurchases are used by firms to reduce their equity and increase the leverage ratio. When firms are below their target ratio, firms are more likely to repurchase shares. A recent study by Chan, Ikenberry and Lee (2000) find evidence that companies may time repurchase announcements to coincide with the exercise of executive stock options. This result also provides evidence that companies may use open market share repurchases to accomplish small required changes in capital structure.

*Anti-takeover*

A repurchase may also be used by a firm as a defensive payout in response to hostile takeover attempts. Denis (1994) examined defensive changes in corporate payout
policy and found that share repurchases are an effective device for countering hostile takeovers.

*Other motives*

Various other theories aim to give an explanation for open market share repurchases. For example, Dittmar (2000) find evidence that repurchases are used to count the dilution effect of management- and employee options. Bens et al. (2003) have argued that repurchases are used to increase earnings per share (EPS) figures. Wansley et al. (1989) list 17 reasons for share repurchases, but I do not intend to describe them here.

**2.2.2 The Payout Signaling/the Information Content of Payout policy**

In 1961 Miller and Modigliani (M&M) published a theoretical paper that demonstrated the irrelevance of corporate payout policy to firm value. In their classic paper, Miller and Modigliani tell us that in a perfect, frictionless capital market, firm value is irrelevant to payout policy. As a result, corporate payout policy has no effect on share prices. Furthermore, it is unnecessary for managers to smooth dividend from year to year. If a firm can essentially avoid distributing cash (or at least defer distribution for a long period) without harming shareholders in a frictionless world, why so we still observe large volume of dividends paid out each year in spite of some disadvantages of doing so?6

Since M&M (1961), many theories have been put forward to demonstrate how payout policy can affect firm value if one or more of the M & M assumptions are violated, leading to a situation which is more realistic and closer to the real world. Those theories show us how some factors, such as taxes, clientele effects, agency conflicts

---

6 Black (1976) think dividends were a ‘puzzle’ because it’s problematical to explain why firms pay dividends in spite of their relative tax disadvantages over capital gains. DeAngelo and DeAngelo (2004) have also asked why a firm would distribute cash when floatation costs, taxes, and/or asymmetric information problems encourage retention.
etc., can affect firm value in the real world. One of the most popular factors is the signaling function of payouts (or the information content of payouts).

Miller and Modigliani (1961) assume that outside investors and inside managers possess the same information about the firm’s current earnings and future opportunities. However, there are information asymmetries between managers and outside investors. Inside managers very possibly have superior information to outside investors. Many researchers, therefore, have suggested that corporate payouts may convey information and function as a signal of firms’ prospects to outside investors.

For example, Bhattacharya (1979) assume that managers have better information about firms’ profitability than outside investors and that cash dividends are taxed at a higher rate than capital gains. He tried to explain why firms still pay dividends despite the relative tax disadvantages of dividends to capital gains. He developed a model to demonstrate that dividends function as a signal of expected cash flows. Miller and Rock (1985) formulated a model that also assumes that firms’ managers know more than outside investors about the true state of the firms’ current earnings. They said that ‘in a world of rational expectations, the firm’s dividend announcements provide just enough pieces of the firm’s sources and uses statement for the market to deduce the unobserved pieces, to wit, the firm’s current earnings’. A notable finding from the survey of Brav et al. (2005) is that 94 percent of CFOs agree that outside investors will gain information about their firm prospects from both dividends and share repurchases. This is the highest rate of agreement in the entire survey.

The signaling function of corporate payouts also helps explain the observed reluctance of managers to change dividends. Linter’s (1956) survey reveals that managers are extremely reluctant to cut dividends for fear of sending a negative signal, and conversely are reluctant to increase dividends for fear of having to reverse them in the future. As a result, managers choose to smooth dividends.
Based on the theory and evidence of the signaling function of corporate payouts, a substantial body of literature has emerged, which is concerned with whether payouts signal the past or the future. The evidence is mixed. For example, Bhattacharyya (1979), Miller and Rock (1985), John and Williams (1985) and Healy and Palepu (1988) all assume that dividend changes are explicit signals about future earnings, sent intentionally and at some cost by management to the firm and its shareholders. However, Benartzi, Michaely and Thaler (1997) find evidence that this relationship does not hold true for the more general changes to regular cash dividends. Specially, they find that the non-initiation and non-omission dividend changes are preceded by earnings changes of the same direction. Koch and Sun (2004) also present evidence that changes in dividends conveys information about the persistence of past earnings changes. However, the debate over whether dividend changes signal the past or the future is not the focus of my thesis.

At this point, I must clarify that when I say information content and signaling, I do not make any distinction between them. In other words, I imply that information content and signaling of dividends are equivalent. However, some models make a strict distinction between information content and the signaling function of dividends (e.g., Bhattacharya and Dittmar 2003, Oded 2005). To them, information content means that managers do not have an intention to signal – their action simply conveys information about firms’ prospects. Signaling, however, means managers use dividends deliberately as a costly signal to change market perceptions about future earnings ability (e.g., Bhattacharya 1979, Miller and Rock 1985) and can use signals to separate themselves from their peers (Bhattacharya and Dittmar, 2003). In my research, I assume that the signaling function and the information content are the

---

7 That is, I am not going to examine what dividends signal, the past or the future, as my focus in this thesis is share repurchases. However, readers can find that in Chapter 4 of my “substitution model” I imply that investors use current dividend signal to adjust their forecast of the earnings in the future. Similarly, I assume in this thesis that investors also use share repurchase as a signal to adjust their future forecast. The only difference is that their lagged reaction to share repurchases makes them use previous period’s repurchasing signal, rather than current signal, to forecast future. Readers interested in the debate can refer to the following references: Watts (1973), Brickley (1983), Penman (1983), Benartzi, Michaely and Thaler (1997) and Arnott and Asness (2001), Lee and Yan (2003).
Previously I stated that some of the differences between dividends and share repurchases are related to the information content. As I have now given my review of the literature about the signaling function of corporate payouts, I will proceed to examine these differences.

2.2.3 Differences between Dividends and Share Repurchases

The first difference that I have identified is that dividends need to maintain consistency with historic dividend policy. This is not a requirement for repurchases and, as a result they are more flexible than dividends. According to Lintner’s (1956) investigation, managers are concerned with dividend changes. They are reluctant to cut dividends for fear of sending negative signals to the market and they are also reluctant to suddenly increase dividends for fear of the need to cut dividends in the future. Therefore, managers need to find a way to smooth dividend changes to avoid transmitting negative signals to the market. According to Lintner (1956), the dividends changes per share equal a coefficient times the difference between the target dividend payout and lagged dividend per share. Managers, therefore, smooth dividend flows from year to year according to the target payout ratio, such that current dividends maintain a consistency with historic dividend policy.

Repurchases, however, do not need to maintain consistency with historic repurchase policy and are found more flexible than dividends. This was confirmed by Jagannathan, Stephens and Weisbach (2000). They assume that repurchases do not appear to be replacing dividends, but rather seem to serve the complementary role of paying out short-term cash flow. Gelb (2000) also implies that a dividend increase represents an implicit commitment to maintain the payout level in the future, while share repurchases involve no such commitment and “are suitable for payouts that may not be sustainable in future periods”. The survey of Brav et al. (2005) also reveals that
nearly 90 percent of firms agree that they smooth dividends from year to year while only 21.3 percent of firms agree that they are reluctant to make repurchase changes that may have to be reversed in the future.

I believe that the first difference between dividends and share repurchases implies that dividends contain more information than share repurchases. This leads managers to be concerned about dividends and to share repurchases being flexible. Lee and Rui (2007) provide support for this assertion. They find that dividends contain additional information about future earnings (or cash flows) whereas share repurchases do not. The key question is: if dividends and repurchases are ‘more or less’ two equivalent ways of paying out cash back to investors (e.g., Brealey and Myers, 1996; Grinblatt and Titman, 1998), why is dividend policy conservative in nature while repurchase are flexible? In addition, why do dividends contain more information than share repurchases? To date no published work has given a satisfactory explanation.

The second difference I identified between dividends and repurchases is the market differential reaction to dividends and share repurchases. As the majority of signaling models predict, the market reacts positively to dividend increases but punish firms severely when there are dividend cuts (e.g., Bhattacharya, 1979, Miller and Rock, 1985; Arnott and Asness, 2001 and Brav et al., 2005). This is why managers are anxious about dividend changes and seek to smooth dividends.

For share repurchases, the situation is different. The market also has a positive reaction to share repurchase announcements. For example, Grullon and Michaely (2002) document that the market reacts positively to share repurchase announcements as these events are associated with a reduction in the agency costs of free cash flow and with a reduction in the firm’s cost of capital. Oded (2005) also assumes that the announcement of an open-market share repurchase program is accompanied by a price increase even though the announcement is not a commitment. On this basis, he develops a signaling model. Similarly, Bhattacharya and Dittmar
(2003) use the positive price reaction to open-market share repurchases announcements to develop a costly and costless signaling model, which can separate good firms from bad firms. Chowdhry and Nanda (1996) also develop a model that assumes prices react positively to open-market repurchase announcements.

However, although many researchers find that the market reacts positively to share repurchase announcements, the market seems more willing to accept share repurchase cuts than dividend cuts. According to the survey evidence of Brav et al. (2005), almost 90 percent of executives think that there are negative consequences to reducing dividends, while only 22.5 percent of them believe that there are negative consequences to reducing share repurchases. This difference is very significant.

Furthermore, literature sources document that even when the market reacts positively to both dividend increase announcements and share repurchase announcements, there are differences between the reactions. For example, David Gelb (2000) examines the effects of ‘payout composition’ and finds that the market reacts more positively to payout in which dividends comprise a larger proportion. Therefore, he infers that regular dividends are a more positive signal concerning future cash flows and elicit a more favorable market reaction than stock repurchases. Aharony and Swary (1980), Dann (1981) and Jensen and Smith (1985) find that on average a share repurchase provokes a significantly higher stock price response than a dividend increase. Ofer and Thakor (1987) attempt to explain why the market reacts more favorably to share repurchase announcements than dividend increase announcements.

The first two differences between dividends and share repurchases are very similar. They are both regarding the information content of payout methods, and they can partially explain each other. The difference arising from information content results in a market differential reaction, while the difference due to market reaction, in return, reinforces the information content difference. This leads to the question of why is there such a difference in information content between dividends and share
repurchases? Why does the market react differently to dividends and share repurchases? I shall now return to the original questions.

The third difference between dividends and repurchases stems from cash flow differences. Many works assume and present evidence that dividends are paid from permanent cash flow while repurchases are mainly from temporary cash flow (e.g., Gelb, 2000; Guay and Harford, 1998). Jagannathan, Stephens and Weisbach (2000) assume that dividends are from permanent cash flow while repurchases are paid from temporary cash flow. They find that when the firm has more permanent, operating cash flow, there is a higher possibility that it will choose to payout through dividends. Conversely, when the firm has more temporary, non-operating cash flow, there is a higher probability that it will choose repurchases. Therefore, dividends and share repurchases are used at different times from one another by different types of firms. Jagannathan et al. (2000) also imply that the flexibility inherent in share repurchases is one reason to explain their recent growth in popularity.

Guay and Harford (2000) assume that the payout method reflects the nature of the underlying cash flow process. Thus, the market can use the announcement of the payout method to update its beliefs about the permanence of past and contemporary cash flows. They find that firms use share repurchases to distribute cash flows that are primarily transient, and use dividends for cash flows that contain a larger permanent component. Furthermore, Guay and Harford (2000) find evidence that when the payout method does not match the market’s expectations, the market updates its previous assessment of the permanence of the cash flow.

I term this the ‘repurchase versus dividend’ puzzle (see Introduction for more detail). As most textbooks inform us, dividends and repurchases are equivalent methods of corporate payout. If this were the case, dividends would be expected to have the same or similar effects on the market as repurchases and repurchases should be made as conservatively as dividends. However, the real facts contradict this view. There are
numerous differences between dividends and repurchases. Although there are many sources that seek to find these differences, none has managed to offer a reasonable explanation. Recently, many works have considered managerial timing by using open-market repurchases (e.g. Cook, Krigman and Leach (2004)) and market inefficiency (e.g. Isagawa (2002)). These works have suggested to me an alternative approach to explain the differences between dividends and repurchases.

2.3 Managerial Timing Evidence, Market Inefficiency and the Lagged Reaction Assumption

2.3.1 The Evidence of Managerial Timing by Using Share Repurchases

The evidence of managerial timing by using open market share repurchase has two parts. Firstly, do managers themselves believe that they can beat the market by using open market share repurchases? Secondly, do managers really display timing skills when they actually buy back their shares from the market?

The answer to the first question is ‘yes’. According to the results from the extensive survey by Brav et al. (2005), over 50 percent of CFOs think that they can time the market with their share repurchases. This is a relatively significant result. Furthermore, most firms claim that they keep track of whether they ‘beat the market’ over the long run (e.g., annually) or short run (e.g. daily or monthly). Some firms even claim that their decisions to execute share repurchases can beat the market by $1 or $2 per share over the course of the year, and also that even their decisions within a given day can beat the market on average. In addition, while repurchases are normally not regarded as a ‘profit center’, in some firms the persons in charge of executing the actual share repurchases are rewarded financially for beating the market.

Although Brav et al.’s (2005) survey reveals that managers believe that they can time the market by using share repurchases, do managers actually display timing skills
when they execute share repurchases? The answer is ‘yes’ and there are significant evidences from around the world to support this assertion.

Ikenberry, Lakonishok and Vermaelen (1995) examine long-term firm performance following open-market share repurchase announcements between 1980 and 1990. They find that managers of firms that repurchase their own shares ‘appear to have been correct, on average, in assuming that they can buy shares at bargain prices to the benefit of their long term shareholders’. Stephens and Weisbach (1998) also imply that the popularity of open-market share repurchase programs is ‘due to the inherent flexibility of these programs with respect to the timing and quantity of actual purchases’.

Cook, Krigman and Leach (2004) perform pioneering work on the timing and execution of open market repurchases. One difficulty in studying actual share repurchases in the US is that U.S. firms are under no obligation to disclose when they are trading. Cook, Krigman and Leach (2004) use 64 firms’ supplementally disclosed repurchase-trading data to provide the first examination of repurchase timing and execution. They find that the execution of repurchases varies across firms from immediate intense repurchasing to delayed and smoothed repurchasing. They start by examining whether managers time their trade with their decisions of repurchase days. If this is the case, we would expect to see increased buying following price declines and in advance of price increases. However, the author’s evidence shows that the firms’ share repurchases appear to be insensitive to market and own price movements. There is no evidence that firms consistently repurchase their shares in advance of price increases.

However, when Cook et al. (2004) begin to examine the within-day repurchase timing of the firms, they find that NYSE firms\(^8\) react quickly to and take advantage of the

---

\(^8\) Among the 64 firms’ sample from Cook Krigman and Leach (2004), there are 24 NYSE firms and the remainder are Nasdaq firms. Cook et al. (2004) formed them into two sub-samples and compare the timing evidence from
changing market conditions. They find on the NYSE trading levels display the
familiar U-shaped patterns: volume is higher in the morning and late afternoon than
during the middle of the day. Furthermore, to collect the timing evidence Cook et al.
(2004) begin to compare the actual share repurchase costs with some benchmarks. They find that the NYSE firms appear to exhibit some timing skill. Their acquisition
 costs are lower than the uniform and proportional benchmarks, and 14 out of 23 firms
(60.8 percent) did pay less than repurchasing their shares as soon as possible.

Ginglinger and Hamon (2007) use data from Euronext Paris (the Paris Stock
Exchange) to study repurchase timing and the impact of repurchase activity on
liquidity. They find that the mean price in a non-repurchase session is 103.49 Euros,
but the mean price during a repurchase session is 79.03 Euros. Firms are buying back
their shares at prices considerably lower than the average, which indicates an effective
timing ability. Furthermore, they find that firms act against the market trends, timing
their share repurchase to take advantage of falling prices.

Brockman and Chung (2001) also did research on managerial timing by using open
market share repurchases in Hong Kong, and they also find significant evidence of
managerial timing in using repurchases. They randomly generate 50 thousand
alternative repurchase plans for each firm-year in the sample, and then they compare
the costs under these plans to the actual costs of this company. They find the overall
mean (median) bootstrapped costs represent 109 percent (104 percent) of the actual
repurchase costs, which suggests that managers are able to buy back shares at a lower
cost than their alternative strategies.

Ikenberry, Lakonishok and Vermaelen (2000) investigate actual share repurchase

---

9 Cook et al. (2004) use five benchmarks, which are the purchase price as a percent above minimum cost strategy;
the purchase as a percent below maximum price strategy; the purchase price as a percent difference from ASAP
strategy; the purchase price as a percent difference from proportional strategy and the purchase price as a percent
difference from uniform strategy. The details of each strategy will be presented later in the empirical test chapter.
Interested readers also can refer to their papers.
activity in Canada. They study the 1,060 Canadian share repurchase programs between 1989 and 1997 and find that the completion rates in Canada are sensitive to mispricing. Furthermore, they find that trades also appear to be linked to price movements and managers buy more shares when prices decline. This provides more evidence of managerial timing ability by using share repurchases.

2.3.2 The Implication of Market Inefficiency

As I outlined above there is ample evidences of managerial timing by using share repurchases around the world. The problem is that this evidence is in conflict with the idea of the Efficient Capital Market Hypothesis (ECMH)\(^{10}\) and rational investors.

According to the ECMH, prices should reflect all available public information. Prices react to information immediately and no one person can profit from any piece of information. Therefore, if the market is efficient, prices should go up quickly following repurchase announcements, and there will be no scope for managerial timing. Ikenberry et al. (1995) said that if markets respond efficiently, prices should adjust immediately in an unbiased manner. The new equilibrium price should fully reflect the true value of the new information.

However, the evidence is that managers actually can time the market and ‘in some firms the persons implementing the repurchases are rewarded financially for beating the market’ (Brav et al., 2005). The evidences for managerial timing ability, therefore, points to market inefficiency and/or investor irrationality. In other words, if the manager can time the market, investors must be reacting with a lag.

A substantial body of literature shows how market inefficiency derives from empirical evidence of market reaction. Ikenberry et al. (1995) investigate long-term firm

\(^{10}\) For a good description of current theory on market efficiency, interested readers can reference ‘Hidden social costs of open market share repurchases’ (Song, The Journal of Corporation Law, Spring 2001, p452-454).
performance following open-market share repurchase announcements in the US. They examine a sample of 1,239 open market share repurchases announced between January 1980 and December 1990, and find that the information conveyed by open market share repurchases is largely ignored. They find that beginning in the month following the open market share repurchase announcement, the average buy-and-hold return over the next four years is over 12 percent above that of a control portfolio. Therefore, they assume that the market treats repurchase announcements with skepticism, leading prices to adjust slowly over time. Their reaction to share repurchase announcements is thus delayed. However, if the market is efficient it should be possible to observe that stock prices are unbiased following the announcements, and that the long term share performance is not above average. Therefore, they conclude that their evidence implies market inefficiency and investor irrationality. Skjeltorp (2004) investigates the market impact and timing of open market share repurchases in Norway, and he also finds that ‘the market seems to under react to the announcement signal’. He said ‘if the market acts efficiently, and in an unbiased fashion, it adjusts the price as a response to the announcement signal, and these firms should not experience an abnormal performance following the announcements’.

Notably, Taffler, Lu and Kausar (2004) also find that the market underreact to the going-concern audit report disclosures. They investigates the medium-term price reaction to going concern audit report disclosures by London Stock Exchange (LSE) firms over one calendar year following their publication in the firm’s annual report. They find that over the 12-month period commencing with the month following disclosure, the sample firms under perform by between 24 percent and 31 percent, depending on the benchmark adopted. To find an explanation, they turn to behavioral theories and assume an irrational investor explanation for their results. They point out that their results are clearly anomalous to the ECMH.

Isagawa (2002) observes that firms continue to buy back their outstanding shares even
after share prices respond positively to open-market share repurchase announcements. He explains that if the market is efficient, share prices should rise to its fundamental values immediately. The repurchase of their shares are, therefore, not profitable following announcements, and with the ECMH, it is problematic to explain these facts. Isagawa cited another solution. He assumes that the market is inefficient in the sense that smart traders cannot eliminate the market misperception immediately.

One possible objection is that the timing evidence does not imply market inefficiency and /or investor irrationality at all. Perhaps the market’s lagged reaction is because investors gain information about repurchases gradually over time. However, a significant result from Brockman and Chung (2001) counters this argument.

Brockman and Chung (2001) show us that the disclosure requirements in Hong Kong are very strict. Any information about repurchases must be reported to the public on the following business day. Therefore, I can say that the information about repurchases is available to investors immediately. If information availability is indeed the reason for the market’s lagged reaction, I would expect that in Hong Kong there should be very little evidence of managerial timing. Surprisingly, Brockman and Chung (2001) report significant evidence of timing and they discover that managers exhibit substantial timing ability. They also reveal that the average number of days on which repurchases were undertaken in Hong Kong is 27 days over the period 1991-1999. Their findings imply that besides the information availability problem, there must be some other factors accounting for the market’s lagged reaction. Isagawa (2002) assumes costly smart traders, and Barberis et al. (1998) assume irrational investors. In my model I assume that investors react to repurchase announcements with a lag. I do not point out what leads to this type of lagged reaction. However, my survey results do reveal that investors believe they know more about dividends than repurchases and that it is easier to understand dividend announcements than repurchase announcements. Maybe this could be a potential reason for investors’ different reactions to dividend announcements and repurchase announcements.
2.3.3 Behavioral Finance and the Lagged Reaction Assumption

In 1978, Jensen famously pronounced that “there is no other proposition in economics which has more solid empirical evidence supporting it than the efficient Market Hypothesis.” But twenty years later the “weaknesses of efficient market theory is apparent to anyone who care to look for them” (Stout, 2003). A new framework has been developed, namely “behavioral finance”.

Behavioral finance is a new approach to financial markets that has emerged, at least in part, in response to the difficulties faced by the traditional theory. Barberis and Thaler (2002) have said that behavioral finance has two building blocks\(^{11}\): *limits to arbitrage*, which argues that it can be difficult for rational traders to undo the dislocations caused by less rational traders and *irrational investors*, which catalogues the kinds of deviations from full rationality I might expect to see. The authors further explain that some costs and risks (for example, noise trader risk and the implementation costs) could render strategies designed to correct market mispricing difficult. On the irrational investor side, Barberis and Thaler (2002) summarize what psychologists have learned about how people appear to form their beliefs in practice: overconfidence; optimism and wishful thinking; representativeness; conservatism, anchoring, etc\(^{12}\).

Based on the concepts of “limits to arbitrage” and “investor irrationality”, many theoretical models have been developed. In my models, I follow the “investor irrationality” route, and assume that investors’ reaction to share repurchases is lagged relative to their reaction to dividends. The lagged reaction assumption underpins all four models in the later part of this thesis. However, there are small differences

\(^{11}\) Gilson and Kraakman (2003) and Stout (2003) also think that investor irrationality and limits on arbitrage are the two principles of behavioral finance.

\(^{12}\) For a detailed description of each theory, please refer to “A Survey of Behavioral Finance” (Barberis and Thaler, Handbook of the Economics of Finance, 2002).
between the four models.

In my timing model (Model 1), I aim to investigate managers’ share repurchase behavior. In other words, do they buy back shares immediately and intensively following share repurchase announcements or do they buy back shares slowly and gradually over time? I assume that investors’ reaction is lagged and that their reaction and rationality are affected by the size of share repurchases announced.

In my substitution model (Model 2), I aim to investigate how managers make a choice of payout method between dividends and share repurchases. Besides the lagged reaction, I follow Barberis et al. (1998) and assume that investors are also irrational in believing that the move of earnings follows two states: trending and mean-reverting, which are both wrong actually. Combining these two types of irrationality, I demonstrate how managers make their choice of payout method.

My third model (Model 3) is inspired by the catering theory of Baker and Wurgler (2004). In this model, I aim to investigate whether share repurchases can be also used to cater to investors, and when there is an investment opportunity and dividend catering as an option, how managers choose their catering device. In this model, investors are treated as irrational and underreact to share repurchases at the start. However, their reaction becomes stronger and more intensive during the lag. With this assumption, I demonstrate how managers make a trade off decision between investing, dividend catering and share repurchase catering.

My final model (Model 4) investigates the relationship between share repurchases and shareholder rights. It incorporates three simple models, in which I consider three reasons for firms to repurchase their shares; to eliminate agency costs of free cash-flow, to time the market, and to cater to investors. In these three models, I no

\[^{13}\text{Barberis et al. (1998) imply that if investors are rational they should believe that earnings moves following a random walk, rather than in “fixed regimes”. Therefore, their belief in that the move of earnings follows either trending or mean-reverting states implies their irrationality.}\]
longer assume lagged reaction. This is the biggest difference to the previous three models (Model 1, 2 and 3). However, I do discuss the effects of behavioral factors, such as bounded rationality, overconfidence, and regret, on the efficacy of governance systems to deal with the problems relating to repurchases.
Section 2

In the first section I provided a brief description of the theoretical models I developed during my PhD study and detailed literature review. In this section I present all the models in detail, including the specific literature review, model assumptions, model description, model analysis and numerical examples.

This section includes four chapters (chapter 3 to 6). Chapter 3 presents my repurchase timing model. Chapter 4 presents my repurchase substitution model. Chapter 5 presents my repurchase catering model and in Chapter 6 I present my models on the relationship between share repurchases and shareholder rights.

I acknowledge the valued input of my supervisor, Dr. Richard Fairchild, into these models. He gave me very good suggestions on developing these models and spent much time in helping me to improve them. His support has been very much appreciated.
Chapter 3 Investor Irrationality and Optimal Open-market Share Repurchasing

3.1 Introduction

Recent research in corporate payout policy to investors has identified an increasing use of share repurchasing, and a corresponding reduction in dividends. Brav, Graham, Harvey and Michaely’s (2005) extensive survey of financial executives’ attitudes to payout policy reveals that these executives view maintaining the dividend level as very important, while repurchases are made out of residual temporary free cash flows. As in Lintner’s (1956) survey, the executives adopt dividend smoothing policies, while viewing repurchasing as a flexible activity. Overall, the implication of the survey is that managers are concerned with the informative signals provided by dividend policy, but are not concerned with the signals provided by repurchasing. In other words, managers view dividends as providing more information to investors than repurchasing.

An increasing body of research has attempted to analyze the differences between share repurchases and dividends (eg. Grullon and Michaely 2002, Jagannathan et al 2000, Reynolds 2004, Sarig 1999). The main findings of the empirical work support the survey of Brav et al (2005); namely, that firms view dividends as rigid, they prefer to pay dividends out of the permanent element of their cash flows, and they prefer to keep dividends smooth. They view repurchasing activity as more flexible, they repurchase out of residual free cash flow, and they are not worried about volatile repurchasing.

---

14 This chapter is co-authored with my PhD supervisor-Dr. Richard Fairchild and was initially published on the ICFAI Journal of Behavioral Finance, September 2005 (Vol. II, No. 3). However, following the viva presentation, the original timing model is replaced by current repurchase timing/signaling game.
Consistent with the idea that managers feel that dividends reveal more information than repurchases regarding the firm, some researchers reveal that managers believe that they can time the market using repurchasing activity (that is, they can repurchase undervalued shares cheaply, thereby increasing the wealth of current shareholders, and their own wealth).\(^{15}\) Cook, Krigman and Leach (2004) take this analysis further by examining the firm’s decision to engage in immediate intensive repurchases, or gradual and smooth repurchasing over time. They find that the actual share repurchase behavioral varies widely across firms. The program length, aggression and timing ability of the actual share repurchases vary widely in their sample. “For example, one firm completed its announced program on one trade day, while another repurchase on 288 days of 387 trading days following the program’s announcement” (Cook et al. 2004, pp3-4).

Consistent with the evidence from Cook et al. (2004), Ginglinger and Hamon (2007) find that the actual share repurchase behavioral varies widely across firms in France. They find that some firms spread their repurchases over several months, while others make fewer transactions but time them precisely, buying back shares after a significant decline in price. Specifically, Ginglinger and Hamon (2007) find that 4.54 percent of firms repurchase their shares on only one session over the whole three-year period. 9.94 percent of firms carry out repurchases on 2 to 5 trading days. More than 46 percent of firms repurchase on 16 to 100 trading days while nearly 5 percent of firms repurchase their shares in the market on more than 300 trading days.\(^{16}\) Brockman and Chung (2001) also find similar patterns about the actual share repurchase behavioral in Hong Kong. According to their findings, about 20 percent of the sample firms repurchase only five or even fewer times during the sample period, while slightly over 15 percent of them repurchase their shares in the market more than 50 times.

\(^{15}\) For the detailed literature review of managerial timing evidence by using open market share repurchase, please refer to the related section in Chapter 2.

\(^{16}\) Ginglinger and Hamon (2007) have a detailed description about the variable share repurchase behavioral. Interested readers can go to their paper (2003, pp9-12).
The issue of market timing using share repurchases is the focus of my analysis. The existing research has not identified why firms are able to use dividends and share repurchases in different ways. It does not explain why investors react differently to dividends and repurchases. As merely different methods of payout, dividends and repurchases should provide very similar signals to the market. Further, there is no existing literature that has examines why the actual share repurchase behavioral varies widely across firms, and as far as I know no previous research has been done about what affect managers’ decisions on whether buy back shares intensively or buy back shares gradually over time.

These questions inspire my research interests. Given the evidence on investors’ differential reaction to dividends and repurchases, and the evidence on market timing, I take a new approach. I assume that investors exhibit some kind of irrationality when observing a firm’s repurchasing activity. In an efficient capital market, if investors are rational, the manager would be unable to use a share repurchasing policy to time the market in order to increase existing share holder wealth. The market would immediately react by increasing the market value to its true value, and the manager would be unable to profit. The large evidence of managerial timing by using open market share repurchases, therefore, points to market inefficiency and/or investor irrationality. That is, if managers can time the market, investors must be reacting with a lag.

Ikenberry, Lakonishok and Vermaelen (1995) find that the reason that managers can time the market is because investors under-react to repurchase announcements. They find that the average market response to the news of an open-market share repurchase is only 3.5%, while the four-year abnormal performance following the announcement is more than 12%. It takes investors a long time to fully react to repurchase announcements.

My model is a repurchase timing/signaling game. In my model, irrational investors do
not fully understand the implications behind the firms’ repurchasing activity of undervalued shares, and they react with a time lag. Managers try to take advantage of this lagged reaction to buy back shares cheaply. My model reveals that firm L’s best response is repurchasing nothing while for firm H it is better to repurchase, but how much to repurchase depends on the market reaction to the size of share repurchases. If investors react dramatically to the size of share repurchases, shares would be getting expensive and so manager H will find it optimal to repurchase slowly and gradually by using only half of the cash flow on repurchase. If investors do not react strongly to the size of share repurchases, share prices would not increase too much following the announcement and so manager H will find it optimal to buy back cheap shares intensively by splashing all the cash flow on share repurchases. Hence, my model is able to explain the empirical evidence on timing found by Cook et al (2004).

The Chapter is organized as follows. Section 3.2 presents description of my theoretical model and the main results from the model analysis. In section 3.3 I outline potential future research and section 3.4 concludes.

3.2 The Model

We consider a repurchase timing/signaling game consisting of 2 firms, \( i \in \{H, L\} \), and a passive stock market. All agents are risk-neutral, and the risk-free rate is zero. Investors have a lagged reaction to share repurchases. By assuming so, they cannot respond immediately and fully to share repurchases and as a result the market value and share prices do not go back to its fundamental value immediately. This will give managers the motive to time the market by buying back shares cheaply.

Firm H (L) is run by a high-quality (low-quality) manager. Firm \( i \) has a fundamental value \( F_i + X \), where the first term represents the present value of the future expected cash flows, and the second term represents current cash flow available to the firm.
The high-quality firm has a higher fundamental value than the low quality firm, i.e., \( F_H > F_L \).

The number of shares outstanding for each firm at date 0 is \( N \). The number of shares held by insiders is \( N_I \). Therefore, the number of shares held by outsiders is \( N_S = N - N_I \). Define the insiders’ and outsiders’ respective fractional equity stakes \( \alpha = N_I / N \) and \( 1 - \alpha = (N - N_I) / N \).

The timeline of the game is as follows.

Due to behavioral factors, the market undervalues firm H at date 0. That is, the date 0 market value of firm H is \( M_H = \theta F_H \), with \( \theta \in (0,1) \). We define \( \theta \) as the undervaluation parameter. In order to simplify the analysis, the market accurately values firm L\(^{17} \); that is, \( M_L = F_L \). We assume that \( \theta F_H > F_L \) (that is, in spite of the undervaluation of firm H, the market value of firm H still exceeds that of firm L at date 0).

At date 0, the firms are observationally equivalent to the stock market. Prior to the managers’ date 1 repurchase decisions, the market assigns an equal probability to each firm being of type H or L. Therefore, the date 0 market value of each firm (excluding the current cash flow) is \( \bar{M} = \frac{\theta F_H + F_L}{2} \).

At date 1, each firm simultaneously announces its intention to use a proportion \( x \in \left\{ 0, \frac{X}{2}, X \right\} \) of the free cash-flow to repurchase a number of shares \( N_R \) (\( N_R \) depends on the share prices at date 1 and the proportion of cash flow used in share

\(^{17}\) This is a simplifying assumption in order to focus on the analysis.
repurchases).

Following the firms’ repurchase announcement, the market updates its beliefs as follows. If both firms make the same announcement, the market is unable to update its beliefs, and continues to assign an equal probability to each firm being H or L. If one firm announces a higher repurchase than the other firm, the market believes that the former (latter) firm is firm H (L).

Furthermore, the size of repurchase affects firm H undervaluation as follows. If the manager announces $x \in \left\{0, \frac{X}{2}, X\right\}$, then the undervaluation parameter at date 1 becomes $\{\theta, \theta, \theta, \theta > \theta\}$ respectively.

Each manager makes his repurchase decision to maximize his payoff, given his expectation of the other manager’s choice. Specifically, his choice affects the date 1 market value (through the signal and through the premium attached by the market), which affects the number of cheap shares that he can repurchase, which affects his terminal wealth, as follows.

### 3.2.1 The Timing Game

In order to solve for the equilibrium of the game, we need to consider the effect of the simultaneous repurchasing decision at the date 1 market value on each managers’ expected terminal wealth.

At date 1, the firm announces its intention to use a proportion $x_i \in [0, X]$ of the free cash-flow to repurchase a number of shares $N_g$. The market reacts to the announcement, such that the post-announcement/pre-repurchase market value of the
firm becomes \( m + X \). After the repurchase takes place, market value of the firm becomes \( m + X - x_1 \).

Therefore, the *pre-repurchase/post-announcement* price per share is

\[
P_1 = \frac{m + X}{N}.
\]  

(3.1)

The *post-repurchase* price per share becomes

\[
\hat{P}_1 = \frac{m + X - x_1}{N - N_R}.
\]  

(3.2)

We note that the pre-repurchase/post-announcement price per share must equal post-repurchase price per share, \( P_1 = \hat{P}_1 \). That is, following the repurchase announcement, the pre-repurchase and post-repurchase share prices are identical. The reduction in total market value from \( m + X \) to \( m + X - x_1 \) due to the repurchase is exactly offset by the reduction in the number of shares outstanding from \( N \) to \( N - N_R \), with price per share unaffected.\(^\text{19}\) Solving \( P_1 = \hat{P}_1 \), we obtain the number of shares to be repurchased at date 1;

\[
N_R = \frac{Nx}{m + X}.
\]  

(3.3)

We now consider the effect of the repurchase on the date 1 wealth of inside

---

\(^{18}\) At this stage of the analysis, we simplify the analysis by representing the date 1 value by the general parameter \( m + X \). In the next section, we solve the game by considering the effect of the managers’ simultaneous announcements on each firm’s specific date 1 market value.

\(^{19}\) Hence, we have identified a form of repurchase irrelevance; the share price is unaffected by the repurchase, since the lower number of shares is exactly matched by reduction in total market value due to the firm using cash flow to execute the repurchase. This is in contrast to the traditional erroneous argument that repurchasing benefits shareholders by spreading market value over fewer shares, increasing the price per share (eg Kennon). Such argument neglects the fact that the firm is reducing total assets to repurchase the shares.
shareholders, non-tendering outside shareholders, and tendering outside shareholders.

First, consider the date 1 post announcement/pre-repurchase wealth levels, of the inside and outside shareholders, respectively;

\[
\Pi_M = N_M P_1 = N_M \frac{m + X}{N} = \alpha(m + X), \quad (3.4)
\]

\[
\Pi_S = (N - N_M) P_1 = (N - N_M) \frac{m + X}{N} = (1 - \alpha)(m + X). \quad (3.5)
\]

Hence

\[
\Pi_M + \Pi_S = m + X. \quad (3.6)
\]

Now consider the post-repurchase position. The firm uses cash flow \( x \) to repurchase \( N_R \) shares. Hence, the date 1 post announcement/post-repurchase wealth levels, of the inside shareholders, the non-tendering outside shareholders, and the tendering outside shareholders are, respectively;

\[
\Pi_M = N_M \hat{P}_1 = N_M \frac{m + X}{N} = \alpha(m + X). \quad (3.7)
\]

\[
\Pi_{NTS} = (N - N_R - N_M) \hat{P}_1 = (N - N_M - N_R) \frac{m + X}{N} = \hat{V}_{NTS} = (1 - \alpha)(m + X) - x
\]

\[
\Pi_{TS} = x. \quad (3.9)
\]

Hence, \( \Pi_M + \Pi_{NTS} = M + X - x \). Examination of (3.8) and (3.9) reveals that, since
the insiders’ (manager’s) number of shares is fixed, and since the price per share is unchanged, the manager’s wealth is unchanged following the repurchase at date 1. The reduction \( x \) in total market value arises due to the reduction in the number of outside shareholders, as some become non-tendering and some become tendering shareholders.

At date 2, firm value rises to equal fundamental value \( F_i + X - x \). Therefore, the date 2 share price becomes

\[
P_2 = \frac{F_i + X - x}{N - N_R}.
\]

(3.10)

We note that \( N - N_R = \frac{N(m + X - x)}{m + X} \).

Therefore,

\[
P_2 = \frac{(F_i + X - x)(m + X)}{N(m + X - x)} = \frac{F_i + X - x}{m + X - x} P_1
\]

(3.11)

Equation (3.11) demonstrates the increase in date 2 share price resulting from the firm repurchasing cheap shares at date 1.

The wealth of the inside shareholders, the non-tendering outside shareholders, and the tendering outside shareholders at date 2 are, respectively

\[
\Pi_M = N_M P_2 = \frac{\alpha(F_i + X - x)(m + X)}{m + X - x}.
\]

(3.12)
\[ \Pi_{NTS} = (N - N_{M} - N_{R})P_{z} = \frac{(1 - \alpha)(F_{i} + X - x)(m + X) - F_{i}x}{m + X - x} \]  

(3.13)

Therefore, \( \Pi_{M} + \Pi_{NTS} = F_{i} + X - x \).

Manager H and manager L simultaneously choose \( x \) to maximize his terminal wealth at date 2.

\[ \Pi_{j} = \frac{\alpha (F_{i} + X - x)(m + X)}{m + X - x} \]  

(3.14)

given each manager’s expectation of the other manager’s decision, and market belief formation.

### 3.2.2 Equilibrium

We consider the following normal form game.

<table>
<thead>
<tr>
<th>H\L</th>
<th>( x = 0 )</th>
<th>( x = \frac{X}{2} )</th>
<th>( x = X )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( x = 0 )</td>
<td>G1, G2 (-)</td>
<td>G3, G4</td>
<td>G5, G6</td>
</tr>
<tr>
<td>( x = \frac{X}{2} )</td>
<td>G7, G8 (-)</td>
<td>G9, G10</td>
<td>G11, G12</td>
</tr>
<tr>
<td>( x = X )</td>
<td>G13, G14 (-)</td>
<td>G15, G16</td>
<td>G17, G18</td>
</tr>
</tbody>
</table>

We solve for the Nash equilibrium of the game by considering best responses. First, consider manager L’s best responses (these are represented by (-) in the above normal form game).

If manager H chooses \( x = 0 \), manager L’s payoffs from \( x = 0 \), \( x = \frac{X}{2} \), and \( x = X \)
Investor Irrationality and Optimal Open-market Share Repurchasing

are, respectively (using equation (3.14));

\[
\Pi_L = \alpha (F_L + X) \quad \text{(G2)}
\]

\[
\Pi_L = \alpha (F_L + \frac{X}{2}) \left( \frac{\theta F_H + X}{\theta F_H + \frac{X}{2}} \right) \quad \text{(G4)}
\]

\[
\Pi_L = a F_L \frac{\theta F_H + X}{\theta F_H} \quad \text{(G6)}
\]

Since \( \theta F_H > F_L \), it can easily be shown that (G2) > (G4), and (G2) > (G6).

Therefore, manager L’s best response is not repurchasing, which is shown by (–) in
the normal form game.

Next, if manager H chooses \( x = \frac{X}{2} \), manager L compares (G8), (G10) and (G12);

\[
\Pi_L = \alpha (F_L + X) \quad \text{(G8)}
\]

\[
\Pi_L = \alpha (F_L + \frac{X}{2}) \left( \frac{F_L + \theta F_H + X}{2} \right) \quad \text{(G10)}
\]

\[
\Pi_L = a F_L \frac{(\theta F_H + X)}{\theta F_H} \quad \text{(G12)}
\]

It can easily be shown that (G8) is manager L’s best response.

Finally, if manager H chooses \( x = X \), manager L compares (G14), (G16) and (G18);

\[
\Pi_L = \alpha (F_L + X) \quad \text{(G14)}
\]

\[
\Pi_L = \alpha (F_L + \frac{X}{2}) \left( \frac{F_L + X}{2} \right) = \alpha (F_L + X) \quad \text{(G16)}
\]
\[ \Pi_L = \alpha F_L \left( \frac{F_L + \theta F_H + X}{2} \right) \]  
\[ \text{(G18)} \]

It can easily be shown that (G14) = (G16) > (G18). We assume that, since manager L is indifferent between (G14) and (G16), he chooses (G14).

Therefore, we have the following Lemma.

**Lemma 1**: Manager L’s dominant strategy is not to repurchase any shares: \( x_L^* = 0 \).

Recall our assumption that firm L is accurately valued at date 0. If manager L announces any share repurchases at date 1, repurchasing will push share price up due to market positive reaction to share repurchases. Therefore, the share prices of firm L will over its fundamental value. If manager L announces share repurchases (and I assume here that share repurchases are credible signals and commitments to the market), manager L will be repurchasing overvalued shares at negative NPV. Therefore, manager L will find it better off not repurchasing.

Given lemma 1, it is now straight-forward to solve for the equilibrium of the game.

We consider manager H’s best responses to \( x_L^* = 0 \).

Manager H compares (G1), (G7) and (G13).

\[ \Pi_H = \alpha (F_H + X). \]  
\[ \text{(G1)} \]

\[ \Pi_H = \frac{\alpha (F_H + \frac{X}{2})(\theta F_H + X)}{\theta F_H + \frac{X}{2}} \]  
\[ \text{(G7)} \]
\[ \Pi_H = \frac{\alpha F_H(\theta_i F_H + X)}{\theta_i F_H} \]  

(G13)

It can easily be shown that (G7) > (G1). Therefore, we can eliminate \( x_{ij} = 0 \) from consideration; manager \( H \) will definitely repurchase some shares (although the market reacts positively to share repurchases, they are still undervalued, so manager \( H \) will prefer to repurchase compared to not repurchasing: note the contrast with manager \( L \)).

Therefore, manager \( H \) makes his decision by comparing (G7) and (G13). If (G7) > (G13), he optimally chooses \( x = \frac{X}{2} \). If (G13) > (G7), he optimally chooses \( x = X \).

Define a critical date \( 1 \) undervaluation parameter \( \theta_i^C \), which equates (G7) and (G13). It can easily be shown that, when \( \theta_i = \theta \), (G13) > (G7), such that the manager optimally chooses \( x = X \). Furthermore, when \( \theta_i = 1 \), (G7) > (G13), such that the manager optimally chooses \( x = \frac{X}{2} \). Therefore, \( \theta_i^C \in (\theta_i,1) \).

We therefore obtain the following result:

**Lemma 2:** Given that manager \( L \) chooses not to repurchase, and given the stock market’s expected belief formation and reaction to repurchases, manager \( H \) optimally chooses \( x = X \) if \( \theta_i \in [\theta, \theta_i^C] \), and \( x = \frac{X}{2} \) if \( \theta_i \in (\theta_i^C, 1] \).

Combining lemmas 1 and 2, we obtain our main result, as follows.
Proposition:

(a) If $\theta_1 \in [\theta, \theta^C_1]$, the equilibrium is $x_L^* = 0, x_H^* = X$.

(b) If $\theta_1 \in (\theta^C_1, 1]$, the equilibrium is $x_L^* = 0, x_H^* = \frac{X}{2}$.

From the proposition above, we can see that for firm L the dominant strategy is always not repurchasing shares. As a result of not repurchasing, firm L’s share prices at date 1 and date 2 are the same. Its date 0 share price is the same as Firm H’s because at date 0 there is no share repurchase announcement for both firms and the market/investors cannot separate one from the other without signaling. For firm H the dominant strategy is, however, depending on the size effect of share repurchases (i.e. market different reaction to various repurchase sizes).

If the size effect is very big, i.e. the market react intensively to increasing size of share repurchases ($\theta_1$ is getting very big) and share prices following firm H’s announcements go up quickly. Manager H will find that the shares are getting more expensive than before. There is no big profit margin by spending all of the cash on share repurchases. Therefore, manager H finds it optimal to repurchase slowly and gradually by spending only half of the available cash flow at date 1 (Part (b)) of my proposition.

If the size effect is weak, i.e., the market reaction is not growing proportionally with the increasing size of share repurchases and share prices following firm H’s announcement do not increase significantly. Manager H will find that the shares are still relatively cheap although he announces to spend all the cash flow on share repurchases. As a result, he will proceed to spend all the available cash flow to buy back cheap shares (i.e. repurchase intensively, Part (a) of my proposition). This result is consistent with the results from Cook et al. (2004) and other previous empirical results.
For example, if $\theta = \theta_1$ we can get $(G13) > (G7)$ for sure. This means that if there is no extra premium from repurchasing the whole amount, manager H would prefer to repurchase intensively. That is, manager H is timing the market to buy back cheap shares.

In Indro and Larsen’s (1996) signaling model where the good manager wants to use repurchases to separate from bad manager to signal type: he is rewarded on current market value. In our model, the good manager (manager H) wants to repurchase to time the market to maximize terminal wealth by repurchasing cheaply. He does not want to identify himself, since this pushes up the share price that he has to repurchase at, but he still does so because he can still repurchase cheaply. Therefore, his signaling of type is incidental, not deliberate (his gain from repurchasing cheaply offsets his loss form signaling type).

### 3.2.3 Numerical Examples

In order to clarify the analysis, we now consider a numerical example. This will enable us to demonstrate the effect of the repurchase announcement on share price and firm values over time in a clear manner.

We assign the following numerical values to the parameters of the model:

$$ F_H = 1500, \quad F_L = 500, \quad \theta = 1/2, \quad \text{and} \quad X = 100. $$

From lemma 1 and the proposition, we take as given that manager L does not repurchase. Therefore, we focus on manager H’s strategy. For our numerical example, we focus on the case \(^{20}\) where $\theta_1 \in (\theta_1^C, 1]$, such that manager H chooses to

---

\(^{20}\) The interested reader is invited to recalculate our analysis for the case where $\theta_1 \in [\theta, \theta_1^C]$, such that manager H repurchases $X = 100$ in equilibrium.
repurchase $X/2 = 50$ in equilibrium.

We assume that the total number of shares, the manager’s shares, and the outsiders’ shares are respectively; $N = 1000, N_I = 500, N_S = 500$. Hence, $\alpha = 1 - \alpha = 0.5$.

Prior to the repurchase announcement, the date 0 market value of each firm is $M = \frac{850 + 600}{2} = 725$. Therefore, the date 0 share price of each firm is $P_0 = 725/1000 = 0.725$.

Now, manager H separates from manager L by choosing to repurchase shares to the value $X/2 = 50$. Following the repurchase announcement (but prior to actual repurchasing), the market reacts as follows;

\[
M_H + X = \theta_0 F_H + X = 750 + 100 = 850.
\]
\[
M_L + X = F_L + X = 600.
\]

Therefore, firm L’s share price falls to $600/1000 = 0.6$.

For firm H, the pre-repurchase, post-announcement share price increases to

\[
P_1 = \frac{850}{1000} = 0.85.
\]

Given this share price, the number of shares to be repurchased, $N_R$, is derived as follows.

\[
0.85 = \frac{750 + X / 2}{N - N_R} = \frac{750 + 50}{1000 - N_R} \Rightarrow N_R = 58.8.
\]

Therefore, following the repurchase, the remaining number of outstanding shares
is $N - N_R = 941$.

Manager H’s wealth and the non-tendering shareholders’ wealth at date 1 is as follows:

$$\Pi_M = 500 \times 0.85 = 425 = \alpha \times V = 0.5 \times 850$$

$$\Pi_{NTS} = 441.2 \times 0.85 = 375.$$  

Therefore,  $$\Pi_I + \Pi_{NTS} + \Pi_{TS} = 425 + 375 + 50 = 850.$$  

At date 2, firm H’s share price increases to  

$$P_2 = \frac{F_H + X - x}{N - N_R} = \frac{1550}{941} = 1.647 = \frac{1550}{800} \times 0.85 = 1.647.$$  

The manager’s terminal (date 2) wealth is  

$$\Pi_I = 500 \times 1.647 = 823.5 \text{ and } 0.5 \times \frac{1550}{800} \times 850 = 823.5.$$  

We now proceed to represent the results of our numerical example graphically. In diagrams 3.1-3.4, we consider the effect of repurchasing on share price, firm value, number of outstanding shares, and managers’ wealth over time.
**Diagram 3.1**: Effect of the Share Repurchase on Share Price.

![Diagram 3.1](image)

**Diagram 3.2**: Effect of Share Repurchase on Firm Values.

![Diagram 3.2](image)
**Diagram 3.3:** Effect of Share Repurchase on Number of shares outstanding

![Graph showing the effect of share repurchase on the number of shares outstanding over time.](image)

**Diagram 3.4:** The Effect of the Share Repurchase on Manager H's wealth

![Graph showing the effect of share repurchase on Manager H's wealth over time.](image)
These diagrams add insight into the effects of share repurchasing as follows. Diagram 3.1 demonstrates that the market reacts positively to the share repurchase announcement, with an initial increase in the share price (since share repurchasing signals a high-quality firm whose shares are currently undervalued). The price falls for the firm that does not repurchase (since this signals a low quality firm whose shares are currently overvalued).

However, in our model, the market does not fully react initially, and the price continues to drift upwards over time (this is consistent with the empirical evidence). This provides the motivation and opportunity for manager H to time the market.

In diagram 3.2, the value of firm H increases upon the repurchase announcement (but prior to the actual repurchase) to 850, with the post announcement/pre-repurchase share price increasing to 0.85 (see diagram 1). Manager H then uses cash flow of 50 to make the repurchase. Therefore firm value falls to 800, with a corresponding decrease in the number of shares outstanding (see diagram 4), such that the post announcement/post repurchase share price remains at 0.85. Diagram 3.1 and 3.2 demonstrate that the share price and firm value both continue to drift upwards as the market slowly reacts to the repurchase.

Next, consider the effect of the repurchase on manager H’s wealth. At date 0, prior to the announcement, manager H owns half of the equity in a firm valued at the pooling value 725. Therefore, manager H’s date 0 wealth equals 362.5. Manager H holds 500 shares throughout the analysis. Since the post announcement/pre-repurchase and post announcement/post repurchase are identical (both equalling 0.85), manager H’s post announcement/pre-repurchase and post announcement/post repurchase wealth are identical, and valued at 425. Hence, the reduction of 50 in total firm value from its post announcement/pre-repurchase level (850) to its post announcement/post repurchase level (800) is entirely due to some outside shareholders relinquishing their shares. Finally, manager H’s wealth
increases at date 2 to 823, due to the repurchase of cheap, undervalued shares at date 1.

Note that the increase in manager H’s wealth from 425 to 823 is due entirely to the manager’s ability to time the market in order to repurchase cheap shares. If the market had reacted fully to the repurchase announcement at date 1 (that is, if the share price had increased to its fundamental value \((1500 + 100)/1000 = 1.6\), manager H would not be able to profit from timing the market, and would be indifferent between repurchasing and not repurchasing shares. To see this, consider equation G7, with \(\theta = 1\) (the market reacts fully to the repurchase announcement, so that price rises to its fundamental value). Substituting \(\theta = 1\) into equation G7, we observe that manager H’s terminal wealth becomes \(\Pi_H = \alpha(F_H + X)\), which, in our numerical example equals \(\Pi_H = 0.5(1600) = 800\). This is identical to manager H’s date 2 wealth under a strategy of not repurchasing and merely waiting for the firm true fundamental value to be revealed at date 2\(^{21}\).

3.3 Future Research: Timing VS Price-supporting

We have assumed that the manager is aiming to maximize terminal date 2 wealth through his repurchasing activity (i.e. buying cheap shares at date 1). This affects his decision whether to repurchase a small or large amount (because of the size effect).

Now, consider the case where he is rewarded both at date 1 and date 2 (or gets utility from both date 1 and date 2 wealth), perhaps with some weighting on date 1 and date 2. From the diagram 3.4, we can see that his wealth climbs a little to date 1 (the signaling or 'price-supporting' effect), and then climbs fully at date 2 as the firm goes to full value (i.e. 823, of which 800 is fundamental value plus 23 NPV from timing).

\(^{21}\) Effectively, when the market fully reacts to the manager’s repurchase announcement, repurchasing becomes a zero-NPV activity, and the manager cannot create wealth for himself by repurchasing.
If he'd repurchased a large amount ($X$ instead of $\frac{X}{2}$) at date 1, the graph would be flatter, as size premium is higher at date 1, so he would benefit at date 1 but lose some of his timing gain at date 2. In the extreme, if $\theta_1$ equals 1, the graph would be flat at date 1 and 2 at 800.

Now, the manager faces a real trade-off between buying large at date 1 to push the price up a lot at date 1 but losing some timing gain, or buying small at date 1 to have a large timing gain, but not so much price support at date 1. Therefore, the model would now combine the manager's timing and price-supporting motives. Empirically, a small, gradual repurchase may be support of the timing motive, while large repurchasing may be support of the price-supporting motive. It would be interesting to see which motive the empirical results support.

### 3.4 Conclusion

As a method of distributing cash to investors, open-market share repurchases have grown rapidly (relative to dividends) in the past decade. There is large evidence that managers believe that they can buy back shares cheaply. However, some firms repurchase their shares intensively while some repurchase gradually over time.

In this paper, I have developed a timing/signaling game, based on irrational investors’ lagged reaction to repurchase announcements. Firm H is undervalued while firm L is accurately valued. Each firm has three options in relation to share repurchases. My game reveals that firm L’s best response is to repurchase nothing. Firm H will repurchase, but how much to repurchase depends on the market’s reaction to the size of share repurchases. If the size effect is strong, manager H will repurchase slowly. If the size effect is weak, he will repurchase intensively to time the market by using all available cash flow to buy back cheap shares. Thus my game provides explanation for Cool et al’s (2004) findings.
Chapter 4 Dividends, Share Repurchases and the Substitution Model

4.1 Introduction

My substitution model is inspired by the debate on the “disappearing dividends” and the “substitution hypothesis”.

As I presented earlier in Chapter 2, Fama and French (2001) observe that “dividends are disappearing”: the percentage of firms paying dividends has declined sharply since 1978. Furthermore, they find that the characteristics of newly listed firms are changing. Amihud and Li (2002) and Baker and Wurgler (2002) also observed the “disappearing dividends” and both of them advanced theories to explain it. On the other hand, DeAngelo, DeAngelo and Skinner (2002) find that although the number of dividend payers declines, the aggregate of real dividends paid by industrials actually increase over the same period. Julio and Ikenberry (2004) reexamine the dividend policy in America and find that although the percentage of dividend payers declines during the last two decades of the 20th century, this trend makes a dramatic reversal since 2001.

Grullon and Michaely (2002) also notice the decline in dividend payers over the last twenty years. Almost at the same time the share repurchase activity is growing quickly around the world. Grullon and Michaely (2002) investigate whether share repurchases are being used as a substitute for dividends (i.e., the Substitution Hypothesis). In contrast to the ‘substitution hypothesis’ of Grullon and Michaely (2002), Chowdhry and Nanda (1996) use a theoretical model and find that share

---

22 For a detailed literature review on the “disappearing dividends” and the “substitution hypothesis”, please refer to related parts in Chapter 2, pp 9-12. Similarly, the related literature review that has been presented in detail in Chapter 2 will only be covered briefly here.
repurchases are not being used as substitutes for dividends. Dividends and repurchases are just two ways of distributing cash at different times. David Gelb (2000) also provides some findings that are contradictory to the “substitution hypothesis”. He assumes a ‘payout composition’, and suggests that the market reaction is more favorable when regular dividends comprise a larger proportion of the total payout. The findings from a recent paper by Lee and Rui (2007) also fail to support the “substitution hypothesis”. Lee and Rui (2007) use a time-series approach to test various hypotheses on dividends and share repurchases, and they find that share repurchases and dividends are not perfect substitutes. Actually, they are both complements and substitutes.

These debates inspired my research interest and made me consider a series of questions about dividends and share repurchases: are dividends disappearing? If “yes”, why? Are share repurchases substitutes for dividends? If not, what different role(s) do they play in a firm’s payout policy? More importantly, how do these differences affect a firm’s payout policy and especially how do they affect managers’ choice of payout methods?

Based on the evidence of managerial timing and investors’ lagged reaction, I have built a theoretical model in which investors are irrational and have a lagged reaction to share repurchases. In other words, investors react immediately to current dividends while they cannot react to current share repurchase announcements until a later date. Investors’ lagged reaction to share repurchases could result from their limited understanding of share repurchases or suspicion of share repurchases.

In this model I assume that investors’ expectation of the firm’s value is linked to the firm’s payout policy. That is, I assume the signaling function of corporate payout policy. Furthermore, in this model the payout method is of importance due to the differential reaction of investors to dividends and share repurchases. This means that the payout method will impact the investors’ expectation of the firm’s value.
The way investors use signals to form their beliefs about the firm’s value is another of my important assumptions. I follow Barberis, Shleifer and Vishny (1998), and assume that investors are irrational in the following sense: they believe that the earnings, rather than random walk, move between two “states”: mean-reverting or trending, and that in each state there is a model governing earnings. When investors observe two identical signals in a row (e.g., “positive, positive” or “negative, negative”), they will believe with high probability that the firm is in the trending state. When investors observe two different signals (e.g., “positive, negative” or “negative, positive”), they will believe with higher probability that the firm is in the mean-reverting state. In my model, investors use the observed latest earnings/payout announcement to update their belief of which state the firm is in and hence develop their expectation of the firm’s value.

Managers, however, are rational in my model, and they forecast their firms’ future earnings and seek to maximize their compensation by choosing different payout methods. My model predicts that the best payout method depends on investors’ different reaction to dividends and share repurchases, and the volatility of actual earnings.

This chapter is organized as follows. Section 4.2 features a description of the model, in which I outline the managers’ utility function and the main assumptions. Section 4.3 presents my model solution and analysis and section 4.4 concludes.

4.2 Model description

4.2.1 Model Introduction

In this model, I assume that the firm is all-equity financed. Due to free cash flow problem (Jensen, 1986), managers pay out all free cash flow of each period through
dividends or repurchases. I also assume that investors are risk-neutral but managers are risk-averse. Managers do not hold any share of their own firm.

Ross (1977) assumes managers’ compensation as part of the firm value of two periods. I follow his lead and assume that management receives a compensation contract in which management payoff is part of the firm value. Furthermore, managers are risk-averse. To take account of risk adversity, Ofer and Thakor (1987) deduct the variance of manager’s payoff from the total payoff they expect to receive in the managers’ utility function. Based on these works, I assume that the expected utility of management is given by:

\[ E(U) = \beta E(V) - \kappa S^2 \]  

(4.1)

where, \( E(V) \) is the mean value of the expected firm value, and \( S \) is the standard deviation of the expected firm value. I assume that \( k \) is positive and that \( \beta \) is positive and less than 1. From (4.1), I can see that managers’ payoff is positively related to the firm value and is negatively related to the volatility of the expected firm value. This means that to maximize their own utility, managers should make a payout decision by trading off the firm value and the volatility.

Managers are rational in this model and they forecast their firm’s future earnings and attempt to find the best payout way to maximize their utility. Investors, however, react to repurchase announcements with a lag relative to their reaction to dividend announcements. The lagged reaction assumption, here, means that investors cannot understand repurchase announcements immediately, but gradually. At the end of the lag, they understand the announcements and react to them. For example, if it is a

---

23 If investors are risk-averse, then they need to take risk into account when forecasting future payouts. This can be done by adjusting the discount rate (i.e. the cost of capital). In this model, I would expect the cost of capital in a mean-reverting state would be higher than the trending state if investors were risk-averse.

24 Actually there are many researchers examining the relationship between open market share repurchases and managers’ stock holdings (e.g., Fenn and Liang, 2000; Jolls, 2000; Weisbenner, 2001; Liljeblom and Pasternack, 2006, etc.). Here, to simplify my model I assume that managers do not hold any shares in their own companies.
two-period lag, investors cannot understand the current repurchase announcement until two periods later.

I assume that when the firm is in the good state, the net income realized is \( N + \delta \) while in the bad state the net income realized is \( N - \delta \) (\( \delta > 0, \ N > 0 \)). Hence, the net income at date \( t \) (i.e., \( N_t \)) is \( N + \delta_t \), in which \( \delta_t \in \{\delta, -\delta\} \) is the earnings shock at date \( t \). Investors cannot observe whether the firm is in the good or bad state until they receive some signals. Investors use the infinite dividend growth model to measure the expected firm value (i.e., \( E_n(V) = \text{expected dividends each period/\( \rho \)} \)). As I assume that investors are risk-neutral, I treat \( \rho \) as given. When there is no payout, there is no signal for investors. The investors expect that there will be equal probability of the firm being in the good state and the bad state (e.g. 50:50) through all the following periods.

I use two extreme cases to describe the model. In the first case the actual earnings are stable while in the other they are volatile. Furthermore, I assume that investors react differently to dividend payouts and repurchase payouts. They have an immediate and full reaction to dividends, but a lagged response to payouts through share repurchases. However, at the end of the lag they react fully to repurchases. This relationship can be described as follows.

\[
q_{r,t} = q_{d,t}
\]

(4.2)

where, \( q_{r,t} \) is the probability with which investors believe what the firm’s future earnings will be when payout is through repurchases and \( q_{d,t} \) is the probability when payouts are through dividends. From (4.2) we can see that I assume investors react to share repurchases with the same magnitude as they react to dividends. The only difference is that investors react to current period dividends but previous period share dividends.
repurchases.

To simplify my model simple and to facilitate analysis, I only examine four periods (period $t$, $t+1$, $t+2$ and $t+3$). To avoid the effect of starting points and to make the four periods representative of the following period, I assume that $t = T+1$ (T is the length of the lag). This means I began my analysis one period after the starting point. For example, if the length of the lag is one period ($T=1$), I will start my analysis from period 2. As you will see in the later part of this paper (esp. the numerical examples), under this condition the four periods are quite representative of the whole horizon.

### 4.2.2 The way investors form their expectation

Investors are risk-neutral in my model with constant discount rate $\rho$. There is only one security, which pays out 100% of its earnings through dividends, or repurchases or both of them. If investors are fully rational, future returns are unpredictable because the earnings move follows a random walk. Based on empirical evidence, investors are sometimes irrational in my model and incorrectly believe that there is some pattern in the earnings’ movement.

Following Barberis, Shleifer and Vishny (1998), I assume that investors believe earnings move between two ‘states’ (i.e. mean-reverting and trending) and that in each state there is a model governing earnings. In state 1 (mean-reverting state), Model 1 determines earnings and earnings are mean-reverting. In state 2 (trending state), Model 2 determines earnings and earnings are trending. When investors observe that a positive earnings shock is followed by a negative earnings shock (or conversely, a positive earnings shock following a negative one), it will make them believe that with higher probability $\pi$ ($\pi > 0.5$) they are in mean-reverting state and that Model 1 determines earnings. When investors observe two identical earnings signals (i.e., both are positive or both are negative in a row), it will make them believe with a higher
probability \( \pi \) \((\pi > 0.5)\) that they are in the trending state and Model 2 determines earnings. Investors are not aware of the real movements in future earnings, and just use the announced payouts to update their expectations. These can be described by the following mathematical models.

### Table 4-1 Model 1 Mean-reverting

<table>
<thead>
<tr>
<th>( \delta_{t+1} = \delta )</th>
<th>( \delta_{t+1} = -\delta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \delta_t = \delta )</td>
<td>( 1 - \pi )</td>
</tr>
<tr>
<td>( \delta_t = -\delta )</td>
<td>( \pi )</td>
</tr>
</tbody>
</table>

### Table 4-2 Model 2 Trending

<table>
<thead>
<tr>
<th>( \delta_{t+1} = \delta )</th>
<th>( \delta_{t+1} = -\delta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \delta_t = \delta )</td>
<td>( \pi )</td>
</tr>
<tr>
<td>( \delta_t = -\delta )</td>
<td>( 1 - \pi )</td>
</tr>
</tbody>
</table>

Suppose that earnings at any time \( t \) are \( N_t = N + \delta_t \), where \( \delta_t \) is the earnings shock at time \( t \). \( \delta_t \) has two states: \( \delta \) the good state and \( -\delta \) the bad state. If investors are rational, they should always believe with 50:50 chances that the earnings will be in the good state and in the bad state respectively. However, investors are irrational and believe that the move of earnings falls into either mean-reverting state or trending state, rather than a random walk.

My model follows Barberis et al. (1998), and assumes that investors believe the earnings move follows two states: mean-reverting or trending, which are both wrong actually. My model is different to their model in the following respects. Firstly, I use
\( \pi \) and \( 1 - \pi \) to replace \( \pi_L \) and \( \pi_H \). This makes my model simpler. Secondly, Barberis et al. (1998) assume a transition between the mean-reverting state and the trending state. They assume that investors believe there is an underlying state-switching process that determines which state earnings are in at any time. However, in my model, there is no such a model-switching process, because I am seeking to examine the impacts of payout methods on investors’ firm value expectations. In the interests of simplification, I assume that the movements of future earnings will be either mean-reverting or trending throughout all periods. There is no model-switching. Investors do not know this and they still use the payouts they are aware of to update their expectation of what state the firm will be in next period. As there is no state-switching process, \( \lambda_1 \) and \( \lambda_2 \) in Barberis et al. (1998) are both zero.

Finally, the focus of Barberis et al. (1998) is to explain how the mean-reverting and trending states lead to market under- and over-reaction. My focus, in contrast, is how managers exploit investor irrationality on repurchase announcements and reach payout method decisions to maximize their utility when the forecasted earnings are stable and volatile respectively. In other words, the payout method is of importance in my model.

In order to value the security, investors need to make future earnings forecasts. There is an information asymmetry. Managers have certain super information and use it to forecast whether future earnings will be stable or volatile. Investors cannot access this information and use the earnings of each period (i.e. payouts, because here I assume managers payout 100% of earnings) to update their forecasts of future earnings. Investors do not know what state the earnings are in and so they first need to solve this problem. In particular, at time \( t \), having observed the earnings shock is \( \delta_t \), investors calculate \( q_t \), which is the probability that \( \delta_t \) was generated by Model 1.

With probability \( 1 - q_t \), \( \delta_t \) was generated by Model 2. Hence investors expect that with probability \( q_t \) the earnings will be in mean-reverting state again and with
1−qt that they will be in the trending state. Following Barberis et al. (1998) I can describe

\[ q_t = \Pr(S_t = 1 | S_{t-1}, \delta_{t-1}, q_{t-1}) \]

I suppose that the updating follows Bayes Rules, such that

\[ q_{t+1} = \frac{q_t \times \Pr(\delta_{t+1} | S_{t+1} = 1, \delta_t)}{q_t \times \Pr(\delta_{t+1} | S_{t+1} = 1, \delta_t) + (1−q_t) \times \Pr(\delta_{t+1} | S_{t+1} = 2, \delta_t)} \]  \hspace{1cm} (4.3)

where \( S_{t+1} \) is the earnings state at time \( t+1 \). Remember that \( \lambda_1 \) and \( \lambda_2 \) in Barberis et al. (1998) are both zero (see Barberis et al. (1998), pp323).

If \( \delta_{t+1} \) is the same as \( \delta_t \) in equation (4.3) (i.e., two identical signals in a row), investors upgrade \( q_{t+1} \) from \( q_t \), using

\[ q_{t+1} = q_t \times (1−\pi) \]

and

\[ \tilde{q}_{t+1} = 1 - q_{t+1} \]

where \( \tilde{q}_{t+1} \) is the probability that \( \delta_{t+1} \) is generated by Model 2 (i.e. the trending model).

If \( \delta_{t+1} \) is opposite to \( \delta_t \) in (4.3) (i.e., two different earnings shocks), I can derive

\[ q_{t+1} = q_t \times \frac{\pi}{\pi + (1−q_t) \times (1−\pi)} \]

\[ \tilde{q}_{t+1} = \frac{(1−q_t) \times (1−\pi)}{q_t \times \pi + (1−q_t) \times (1−\pi)} \]
where, \( q_{t+1} \) is the probability that \( \delta_{t+1} \) is generated by Model 1 (i.e., the mean-reverting model), and \( \tilde{q}_{t+1} \) is the probability that \( \delta_{t+1} \) is generated by Model 2 (i.e., the trending model).

When \( \delta_{t+1} \) is the same as \( \delta_t \), investors will guess that they are likely to be in a trending model. This could make them believe with higher probability that earnings could be in the trending state again (i.e., having the same earnings shock in the future). Therefore, I expect that \( \tilde{q}_{t+1} > q_t \).

Similarly, when \( \delta_{t+1} \) is opposite to \( \delta_t \), investors will guess that they are in the mean-reverting model. This could make them believe with higher probability that earnings could be in mean-reverting state again (i.e. having the opposite earnings shock in the future). Therefore, this time I expect that \( q_{t+1} > q_t \).

To clarify this point, a numerical example is considered. In this example, \( q_0 = 0.5 \) and \( \pi = 0.6 \).

**Table 4-3 Numerical example**

<table>
<thead>
<tr>
<th></th>
<th>Trending Model</th>
<th></th>
<th>Mean-reverting Model</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \delta_t )</td>
<td>( q_t )</td>
<td>( \tilde{q}_t )</td>
<td>( \delta_t )</td>
</tr>
<tr>
<td>0</td>
<td>( \delta )</td>
<td>0.50</td>
<td>0.50</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>( \delta )</td>
<td>0.40</td>
<td>0.60</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>( \delta )</td>
<td>0.31</td>
<td>0.69</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>( \delta )</td>
<td>0.23</td>
<td>0.77</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>( \delta )</td>
<td>0.16</td>
<td>0.84</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>( \delta )</td>
<td>0.12</td>
<td>0.88</td>
<td>5</td>
</tr>
</tbody>
</table>

Note: \( q_t \) is the probability with which investors believe that the move of earnings follows the mean-reverting state, while \( \tilde{q}_t \) is the probability with which investors believe that the move of earnings follows the trending state.
From Barberis et al. (1998), I can see that if the earnings shock $\delta_{t+1}$ is the same as $\delta_t$ (i.e., trending state), $\tilde{q}_{t+1} > \tilde{q}_t$. Similarly, if $\delta_{t+1}$ is different to $\delta_t$ (i.e., mean-reverting state), $q_{t+1} > q_t$ (Proof: see Barberis et al. (1998), Appendixes, pp337). I shall use these results in the following solutions of my model.

4.3 Model Solution and Analysis

In my model I use two different cases to examine how managers make their choice of payout method to maximize their utility. In the first case I assume that the actual future earnings are stable (i.e. trending) and in the other case I assume that the actual future earnings are volatile (i.e. mean-reverting). Using these two extreme cases, I exploit investors’ irrational reaction to signals (as outlined by Barberis et al (1998)) with the expectation that their reaction could influence managers’ decisions about what payout method(s) to choose.

4.3.1 Case 1 (Actual Earnings are Stable)

In this case I assume that the actual realized net incomes are stable throughout all the periods. Suppose that the net incomes are $N + \delta$, $N + \delta$, $N + \delta$, and $N + \delta$ from date $t$ to date $t+3$ respectively. Let us consider the outcomes.

4.3.1.1 Case Description

Case 1-1 Paying out only through dividends

At date $t$, the payout is $N + \delta$ (i.e., earnings shock at date $t$ is $\delta$). Investors observe this and assume that earnings are in the trending because all the previous earnings shocks are the same as current shocks. Recall that when investors observe two
identical earnings shocks, $\tilde{q}_{d,t}$ is the probability with which they believe that earnings are in the trending state. Therefore, it will make them believe with a higher probability $\tilde{q}_{d,t}$ that the earnings will be the same again (i.e. trending), which are $N + \delta$ (i.e., earnings will be $N - \delta$ with probability $1 - \tilde{q}_{d,t}$). Therefore, the expected firm value at date $t$ is:

$$E_t(V) = \frac{\tilde{q}_{d,t}(N + \delta) + (1 - \tilde{q}_{d,t})(N - \delta)}{\rho} = \frac{N + (2\tilde{q}_{d,t} - 1)\delta}{\rho}$$

and similarly,

$$E_{t+1}(V) = \frac{N + (2\tilde{q}_{d,t+1} - 1)\delta}{\rho}$$

$$E_{t+2}(V) = \frac{N + (2\tilde{q}_{d,t+2} - 1)\delta}{\rho}$$

$$E_{t+3}(V) = \frac{N + (2\tilde{q}_{d,t+3} - 1)\delta}{\rho}$$

**Case 1-2 Paying out only through repurchases**

Recall that investors experience a reaction lag to repurchase announcements. At date $t$, investors cannot realize the repurchase announcement of this date, which signals earnings of $N + \delta$. However, because in this case the realized income is stable throughout all the periods, investors react to previous repurchases announcements, which is also $N + \delta$. Observing stable earnings makes investors believe that they are in trending state. This convinces them with a higher probability ($\tilde{q}_{s,t}$) that the future earnings could be the same again. Therefore, the expected firm value at date $t$ is:
Dividends, Share Repurchases and the Substitution Model

\[ E_t(V) = \frac{\tilde{q}_{r,t} (N + \delta) + (1 - \tilde{q}_{r,t})(N - \delta)}{\rho} = \frac{N + (2\tilde{q}_{r,t} - 1)\delta}{\rho} \]

and similarly,

\[ E_{t+1}(V) = \frac{N + (2\tilde{q}_{r,t+1} - 1)\delta}{\rho} \]
\[ E_{t+2}(V) = \frac{N + (2\tilde{q}_{r,t+2} - 1)\delta}{\rho} \]
\[ E_{t+3}(V) = \frac{N + (2\tilde{q}_{r,t+3} - 1)\delta}{\rho} \]

Case 1-3 Paying out one half of the free cash flow through dividends and paying out the other half through repurchases

In this case, I assume that dividends and repurchases are available to all investors. At date \( t \), investors observe the dividend signal and react immediately to the half payout through dividends, which is \( N + \delta \). Investors’ reaction to the other half payout through repurchases experiences a lag to current repurchases. Instead, they react to prior period repurchases, which is also \( N + \delta \) in this case. By observing stable earnings in this case (no matter if it is paid through dividends or repurchases), investors assume that they are in the trending state and expect with a higher probability that the future earnings will be the same. Therefore, the expected firm value at date \( t \) is:

\[ E_t(V) = 0.5 \frac{N + (2\tilde{q}_{d,t} - 1)\delta}{\rho} + 0.5 \frac{N + (2\tilde{q}_{r,t} - 1)\delta}{\rho} = \frac{N + (\tilde{q}_{d,t} + \tilde{q}_{r,t} - 1)\delta}{\rho} \]

Similarly, I can derive the expected firm value of the following three dates.

\[ E_{t+1}(V) = \frac{N + (\tilde{q}_{d,t+1} + \tilde{q}_{r,t+1} - 1)\delta}{\rho} \]
\[ E_{t+2}(V) = \frac{N + (\tilde{q}_{d,t+2} + \tilde{q}_{r,t+2} - 1)\delta}{\rho} \]
\[ E_{t+1}(V) = \frac{N + (\tilde{q}_{d,t+1} + \tilde{q}_{r,t+1} - 1)\delta}{\rho} \]

4.3.1.2 Case 1 Analysis

Now recall the managers’ utility function. Given that the variances under each case are the same, the choice of payout method depends on the mean value of the expected firm value. It can be established that

\[ E_d(V) = \frac{N + 0.5(\tilde{q}_{d,t} + \tilde{q}_{d,t+1} + \tilde{q}_{d,t+2} + \tilde{q}_{d,t+3} - 2)\delta}{\rho} \quad (4.4) \]
\[ E_r(V) = \frac{N + 0.5(\tilde{q}_{r,t} + \tilde{q}_{r,t+1} + \tilde{q}_{r,t+2} + \tilde{q}_{r,t+3} - 2)\delta}{\rho} \quad (4.5) \]
\[ E_{d+r}(V) = \]
\[ \frac{N + 0.25(\tilde{q}_{d,t} + \tilde{q}_{d,t+1} + \tilde{q}_{d,t+2} + \tilde{q}_{d,t+3} + \tilde{q}_{r,t} + \tilde{q}_{r,t+1} + \tilde{q}_{r,t+2} + \tilde{q}_{r,t+3} - 4)\delta}{\rho} \quad (4.6) \]

where \( E_d(V) \), \( E_{d+r}(V) \), and \( E_r(V) \) are the mean values of the expected value when payout is solely through dividends, solely through repurchases and one half dividends and the other half repurchases, respectively.

From equation (4.2) it is known that that \( q_{r,d} = q_{d,D} \), \( D \in (t, t+1, t+2, t+3) \) and \( t = T + 1, T \in (0, 1, 2, 3, \ldots) \). Therefore, the following result can be obtained.

\[ E_d(V) = E_r(V) = E_{d+r}(V) \quad (4.7) \]
From equation (4.1), it is apparent that managers’ utility and hence managers’ choice of payout method depends on both the expected firm value and the volatility of expected firm value. Let us now consider the variance under each payout method. No matter what T is, the following relationship is always true:

\[ S_d^2 = S_r^2 = S_{d+r}^2 \]  

(4.8)

Proof: please refer to Appendix 1.

**Proposition 1:**

*When the forecasted earnings are stable, paying out only through dividends, or paying out only through repurchases or paying out one half through dividends and the other half through repurchases doesn’t make any difference to managers. In this case payout methods are irrelevant to managers.*

Proof:

(a) Result comes from examination of both (4.7) and (4.8).

The intuition behind this proposition is simple. Dividend announcements form an immediate signal to investors. When the forecasted earnings are stable, paying out only through dividends gives investors an immediate and strong signal that the firm will repeatedly be in the good state. As a result, stable earnings result in an expectation of strong firm value.

Although investors’ response to share repurchase announcements is delayed, it is the same full reaction as the reaction to dividend announcements. Since the earnings are stable in this case, investors react to the previous period’s repurchases but to the same level as their reaction to current dividends. As a result, stable and strong earnings show no difference between paying out through dividends, repurchases or both.
4.3.2 Case 2 (when the Actual Earnings are Volatile)

In this case, I intend examining what will happen when the forecasted earnings are volatile (i.e. …$N + \delta$, $N - \delta$, $N + \delta$, $N - \delta$, $N + \delta$, …). I assume that the actual realized earnings are $N + \delta$, $N - \delta$, $N + \delta$, $N - \delta$ from period $t$ through to period $t+3$. Observing volatile earnings throughout the periods will make investors believe with a higher probability they are in the mean-reverting state. Recall that when investors observe two opposite earnings shocks (mean-reverting), $q_{d,t}$ is the probability that earnings are in mean-reverting state. Let us consider the outcome.

4.3.2.1 Case Description

Case 2-1 Paying out only through dividends

At date $t$ the payout is $N + \delta$ (i.e. earnings shock is $\delta$). Observing this earnings shock which is different to the previous shock is likely to make investors believe that they are in the mean-reverting state. Investors will then believe with higher probability $q_{d,t}$ that the earnings shock could be $-\delta$ for the next period. Therefore, the expected firm value at date $t$ is:

$$E_t(V) = \frac{q_{d,t} (N - \delta) + (1 - q_{d,t})(N + \delta)}{\rho} = \frac{N + (1 - 2q_{d,t})\delta}{\rho}$$

Similarly,

$$E_{t+1}(V) = \frac{N + (2q_{d,t+1} - 1)\delta}{\rho}$$
$$E_{t+2}(V) = \frac{N + (1 - 2q_{d,t+2})\delta}{\rho}$$
Dividends, Share Repurchases and the Substitution Model

\[
E_{t+3}(V) = \frac{N + (2q_{d,t+3} - 1)\delta}{\rho}
\]

Case 2-2 Paying out only through repurchases

When paying out through repurchases, the situation is different. I assume in this case that the actual net income is volatile \((\ldots N + \delta, \ N - \delta, \ N + \delta, \ N - \delta, \ N + \delta \ldots)\). Therefore, the length of the lag is significant. When the length of the lag is an odd number at date \(t\), investors realize and react to the previous repurchase announcement which is \(N - \delta\). When the length of the lag is an even number, at date \(t\) investors realize and react to the previous repurchase announcement which is \(N + \delta\). For example, I know the net income at date \(t\) is \(N + \delta\). If the lag is one period (\(T=1\), an odd number), at date \(t\) investors react to the last period’s (period \(t-1\)) repurchases, which in this case should be \(N - \delta\). If the lag is two periods (\(T=2\), an even number), at date \(t\) investors react to repurchases of period \(t-2\), which in this case should be \(N + \delta\).

(1) \(T=2\chi\), \(\chi \in \{1, 2, 3, \ldots\}\) (T is an even number)

Under this condition, at date \(t\) investors become aware of previous period’s repurchase payout that is also \(N + \delta\) (i.e. earnings shock is \(+\delta\)). Actual payouts are volatile and hence investors will observe volatile earnings shocks. This will make them guess that they are likely to be in a mean-reverting state. This make investors believe with a higher probability \(q_{r,t}\) that the firm will have an opposite earnings shock in the future and with probability \(1-q_{r,t}\) that the firm will have the same shock again (i.e. in the trending state). Hence the expected firm value at date \(t\) is:

\[
E_t(V) = \frac{q_{r,t}(N - \delta) + (1-q_{r,t})(N + \delta)}{\rho} = \frac{N + (1-2q_{r,t})\delta}{\rho}
\]
Similarly,

\[ E_{t+1}(V) = \frac{N + (2q_{r,t+1} - 1)\delta}{\rho} \]

\[ E_{t+2}(V) = \frac{N + (1 - 2q_{r,t+2})\delta}{\rho} \]

\[ E_{t+3}(V) = \frac{N + (2q_{r,t+3})\delta}{\rho} \]

(2) \( T = 2\chi + 1, \quad \chi \in (0, 1, 2, 3, \ldots) \) (T is an odd number)

As I stated previously, when the length of lag is an odd number, the previous repurchase payout to which investors realize and react at date \( t \) should be \( N - \delta \). Similarly, investors observe volatile earnings shocks and guess that they are in the mean-reverting state. Observing \(-\delta\) will make investors believe with a higher probability \( q_{r,t} \) that the firm will have an opposite earnings shock (i.e., \(+\delta\)) in the future and with a lower probability \( 1-q_{r,t} \) that the firm will have the same shock again. Therefore, the expected firm value at date \( t \) is:

\[ E_t(V) = \frac{q_{r,t}(N + \delta) + (1 - q_{r,t})(N - \delta)}{\rho} = \frac{N + (2q_{r,t} - 1)\delta}{\rho} \]

Similarly,

\[ E_{t+1}(V) = \frac{N + (1 - 2q_{r,t+1})\delta}{\rho} \]

\[ E_{t+2}(V) = \frac{N + (2q_{r,t+2} - 1)\delta}{\rho} \]

\[ E_{t+3}(V) = \frac{N + (1 - 2q_{r,t+3})\delta}{\rho} \]
Case 2-3 Paying out one half of the free cash flow through dividends and paying out the other half through repurchases

Similar to case 1-3, this payout method means that half of the investors’ reaction depends on current dividend announcements, which is immediate and the other half depends on previous repurchase announcements, which is lagged. However, as we saw in case 2-2, whether the length is an odd number or an even number matters when the paying out is through repurchases. Hence, in this case I still perform a separate analysis of the expected firm values when the length is an odd number and when it is an even number.

(1) \( T=2\chi, \ \chi \in (1, 2, 3, \ldots) \) (\( T \) is an even number)

At date \( t \) the actual earnings is \( N + \delta \). When half of the payout is through dividends, investors react immediately. When the other half is through repurchases, investors react to previous repurchase announcements (due to their lagged reaction) which is also \( N + \delta \). Similarly, due to the volatile actual earnings investors guess that they are in the mean-reverting state. This will make them believe that future earnings shock could be opposite to what is currently observed. Therefore, investors’ expectation at date \( t \) is:

\[
E_t(V) = 0.5 \frac{N + (1 - 2q_{d,t})\delta}{\rho} + 0.5 \frac{N + (1 - 2q_{r,t})\delta}{\rho} = \frac{N + (1 - q_{d,t} - q_{r,t})\delta}{\rho}
\]

Similarly,

\[
E_{t+1}(V) = \frac{N + (q_{d,t+1} + q_{r,t+1} - 1)\delta}{\rho}
\]

\[
E_{t+2}(V) = \frac{N + (1 - q_{d,t+2} - q_{r,t+2})\delta}{\rho}
\]
\[ E_{t+3}(V) = \frac{N + (q_{d,t+3} + q_{r,t+3} - 1)\delta}{\rho} \]

(2) \( T = 2\chi + 1, \ \chi \in (0, 1, 2, 3, \ldots) \) (T is an odd number)

At date \( t \) the actual net income is \( N + \delta \). When half the payout is through dividends investors react to it immediately. When the other half is through repurchases investors react to previous repurchase announcements, which is \( N - \delta \) under the condition that \( T \) is an odd number. As investors guess that they are likely to be in the mean-reverting state, they expect that future earnings could be opposite to the currently observed position. Therefore, investors’ expectation of future firm value at date \( t \) is:

\[ E_i(V) = 0.5 \frac{N + (1 - 2q_{d,i})\delta}{\rho} + 0.5 \frac{N + (2q_{r,i} - 1)\delta}{\rho} = \frac{N + (q_{r,i} - q_{d,i})\delta}{\rho} \]

Similarly,

\[ E_{t+1}(V) = \frac{N + (q_{d,t+1} - q_{r,t+1})\delta}{\rho} \]
\[ E_{t+2}(V) = \frac{N + (q_{r,t+2} - q_{d,t+2})\delta}{\rho} \]
\[ E_{t+3}(V) = \frac{N + (q_{d,t+3} - q_{r,t+3})\delta}{\rho} \]

4.3.2.2 Case 2 Analysis

I have shown above what the expected firm values will be from period \( t \) to \( t+3 \) under each payout method. Let us examine how managers make their decision on payout
method. Recall equation (4.1), in which managers attempt to maximize firm value and minimize the volatility of firm value in order to maximize their own utility. As I demonstrated above, when the payout is through repurchases the result differs if T is an odd number or T is an even number. My analysis is correspondingly divided into two parts—when T is an even number and when T is an odd number.

Let us first consider the case when T=0.

When T=0 (i.e. there is no lagged reaction to share repurchases) paying out through share repurchases serves as the same signal to the market as dividends. At this time investors should be indifferent between these two methods. Therefore, I derive my second proposition.

**Proposition 2**

_When the expected earnings are volatile and there is no lagged reaction to share repurchases, paying out only through dividends, only through repurchases, or half through dividends and half through repurchases make no difference to investors. Managers have no incentive to favor one method over another as repurchases serves exactly the same signal as dividends._

The intuition behind proposition 2 is very straightforward. If investors have no lagged reaction to share repurchases, there is no difference between dividends and share repurchases. Paying out through dividends or through share repurchases makes no difference to managers. Hence, under this situation payout methods are still irrelevant to managers.

Now let us investigate the situation when T ≠ 0 (i.e. investors do have a lagged reaction to share repurchases). As I mentioned above, the length of lag is important here.
(1) When \( T = 2 \chi \), \( \chi \in (1, 2, 3, \ldots) \) (T is an even number)

The mean value of the expected firm value throughout these four periods can be calculated:

\[
E_d(V) = \frac{N + 0.5(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})\delta}{\rho} \tag{4.9}
\]

\[
E_r(V) = \frac{N + 0.5(q_{r,t+1} - q_{r,t} + q_{r,t+3} - q_{r,t+2})\delta}{\rho} \tag{4.10}
\]

\[
E_{d+r}(V) = \frac{N + 0.25(q_{d,t+1} + q_{r,t+1} - q_{d,t} - q_{r,t} + q_{d,t+3} + q_{r,t+3} - q_{d,t+2} - q_{r,t+2})\delta}{\rho} \tag{4.11}
\]

We know that \( q_{r,d} = q_{d,d} \), and, therefore, have:

\[
E_d(V) = E_r(V) = E_{d+r}(V) \tag{4.12}
\]

and \( S_d^2 = S_r^2 = S_{d+r}^2 \) \( \tag{4.13} \)

Proof: please see Appendix 2.

Based on the results in (4.12) and (4.13), I come to the following proposition.

**Proposition 3**

*When expected earnings are volatile, investors have a lagged reaction to share repurchases and the length of the lag is an even number, paying out only through dividends, or only repurchases, or half through dividends and half through repurchases still makes no difference to managers.*

**Proof:**

(a) Result comes from examination of (4.12) and (4.13).
Compared with proposition 2, it is interesting to note that even if investors do have a lagged reaction to share repurchases, paying out through dividends or through share repurchases still makes no difference to profit maximizing managers. The intuition behind proposition 3 is very simple. Although investors have a lagged reaction to share repurchases in this case, the previous earnings (share repurchase) signal they observe and react to is the same as the current earnings (dividend) signal when the length of lag is an even period. Given the assumption that investors’ react to dividends and share repurchases of equal magnitude in the same way (i.e. equation 4.2), dividends and share repurchases actually provide the same signal to the market. As a result, managers have no preference for paying dividends or repurchasing shares.

One important elements of proposition 3 is that the three payout methods make no difference to managers. As the actual earnings are volatile, the signal to the market (no matter if it is dividend, share repurchase or both) results in a volatile expected firm value. This is not the outcome that managers seek. Recalling equation (4.1), managers would try to minimize the volatility of firm value to maximize their profits. Although the payout methods are irrelevant here, managers would find it optimal to try to smooth the payouts to reduce the impact of volatile earnings on firm value. Basically, this is what Lintner (1956) find: managers try to smooth payouts.

(2) When T=2χ+1, χ ∈ (0, 1, 2, 3, …) (T is an odd number)

Let us have a look at what will happen when T is an odd number. Similarly, I first examine the mean values of expected firm value under each period.

\[
E_d(V) = \frac{N + 0.5(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})\delta}{\rho}
\]  
\[\text{(4.14)}\]

\[
E_r(V) = \frac{N + 0.5(q_{r,t} - q_{r,t+1} + q_{r,t+2} - q_{r,t+3})\delta}{\rho}
\]  
\[\text{(4.15)}\]
\[ E_{d+} (V) = \frac{N + 0.25(q_{r,2} - q_{d,2} + q_{d,t+1} - q_{r,t+1} + q_{r,t+2} - q_{d,t+2} + q_{d,t+3} - q_{r,t+3})\delta}{\rho} \]  

(4.16)

I know that \( q_{r,D} = q_{d,D} \). Therefore, using \( q_{d,D} \) to replace \( q_{r,D} \) I can obtain

\[ E_r (V) = \frac{N + 0.5(q_{d,1} - q_{d,t+1} + q_{d,t+2} - q_{d,t+3})\delta}{\rho} \]  

(4.17)

\[ E_{d+} (V) = \frac{N}{\rho} \]  

(4.18)

I have already proved in the earlier part of the model that

\[ 0 < q_{d,2} < q_{d,t+1} < q_{d,t+2} < q_{d,t+3} < 1 \]  

(4.19)

Hence I can state that

\[ E_r (V) < E_{d+} (V) < E_d (V) \]  

(4.20)

Now managers’ best payout choice depends on the variances under each method.

I can obtain that

\[ S_r^2 = S_d^2 > S_{d+}^2 = 0 \]  

(4.21)

Recall the managers’ utility function, and it is easy to prove that at this time

\[ E_d (U) > E_r (U) \quad \text{and} \quad E_{d+} (U) > E_r (U) \]  

(4.22)

where, \( E_d (U), \ E_r (U) \) and \( E_{d+} (U) \) are, respectively the managers’ expected utility
when the payout is through dividends only, repurchases only and one half through dividends and the other half through share repurchases. It is clear that under this condition the worst choice is paying out only through repurchases. The best choice, on the other hand, is the larger one between $E_d(U)$ and $E_{d+r}(U)$.

Using managers’ utility function I can obtain

$$E_d(U) = \beta \frac{N + 0.5(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})\delta}{\rho} - \kappa S_d^2$$

$$E_{d+r}(U) = \beta \frac{N}{\rho}$$

Therefore, the comparison between $E_d(U)$ and $E_{d+r}(U)$ now depends on

$$\frac{0.5\beta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})\delta}{\rho}$$

and $\kappa S_d^2$.

**Proposition 4**

When the forecasted earnings are volatile, investors have a lagged reaction to share repurchase and the length of lag is an odd number, I can get

1) Paying out only through repurchases is the worst choice, and
2) The best payout method depends on the extent to which managers dislike the volatility of expected firm value.

a) If $0 < \kappa < \frac{6\beta\rho(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{A\delta}$ (i.e., managers slightly dislike volatility), $E_d(U) > E_{d+r}(U)$ and the best payout method is through dividends only.

b) If $\frac{6\beta\rho(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{A\delta} < \kappa < 1$ (i.e., managers strongly dislike
volatility), $E_d(U) < E_{d,r}(U)$ and the best payout method is half through dividends and half through repurchases.

c) If $0 < \kappa = \frac{6\beta p(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{A\delta} < 1$ (i.e., managers dislike volatility, but not strongly), $E_d(U) = E_{d,r}(U)$ and there is no difference between paying out only through dividends and paying out half through dividends and half through repurchases.

Note: in proposition 3,

$$A = (2 - 3q_{d,t} - q_{d,t+1} - q_{d,t+3} + q_{d,t+2})^2 + (3q_{d,t+1} + q_{d,t} - q_{d,t+3} + q_{d,t+2} - 2)^2$$

$$+ (2 - q_{d,t+1} + q_{d,t} - q_{d,t+3} - 3q_{d,t+2})^2 + (q_{d,t} - q_{d,t+1} + q_{d,t+2} + 3q_{d,t+3} - 2)^2$$

Proof: please see Appendix 3.

The results from proposition 4 are very interesting. In contrast to propositions 2 and 3, payout methods do play a role here when the length of lag is an odd number and the earnings are volatile. The volatility of expected firm value is the lowest (i.e. zero) when the payout is through both dividends and share repurchases. This implies that paying out through both dividends and share repurchases can actually smooth the volatility caused by volatile earnings. Hence, it is not surprising to note that in the part 2(b) of this proposition, managers who strongly dislike volatility would find this payout method the best.

From this proposition, it is also interesting to note how managers’ dislike of volatility would have a large impact on the choice of payout methods when the earnings are volatile. Managers who strongly resent volatility (i.e. k is big) would find that paying out through both dividends and share repurchases is the best method because it incurs the lowest volatility of firm value. Those who place more emphasis on expected firm value than volatility would find that paying out through dividends is the best route.
The results from proposition 4 can be illustrated by giving a numerical example.

### 4.3.2.4 The Numerical Example

In this case the earnings are volatile and provide strong volatile signals to the market. This makes investors believe with higher probability that they are in the mean-reverting state. Furthermore, because the length of the lag is an odd number, the signals observed by investors when paying out through repurchases are different to those when paying out through dividends.

Similarly, I assume that $q_0 = \bar{q}_0 = 0.5$, $\pi = 0.6$, $N=100$, $\delta = 2$ and $\rho = 0.1$. As the length of the lag is an odd number in this case, I assume $T=1$. Now let us examine the expected firm values of each period under the three payout methods.

Table 4-4 Expected Firm Values (Case 2, $T=2 \chi^1$)

<table>
<thead>
<tr>
<th></th>
<th>Dividends</th>
<th>Repurchases</th>
<th>Half-Dividends, Half-repurchases</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E_2(V)$</td>
<td>992.4</td>
<td>1007.6</td>
<td>1000</td>
</tr>
<tr>
<td>$E_3(V)$</td>
<td>1010.8</td>
<td>989.2</td>
<td>1000</td>
</tr>
<tr>
<td>$E_4(V)$</td>
<td>986.4</td>
<td>1013.6</td>
<td>1000</td>
</tr>
<tr>
<td>$E_5(V)$</td>
<td>1015.2</td>
<td>984.8</td>
<td>1000</td>
</tr>
</tbody>
</table>

To facilitate understanding, I have plotted all the expected firm values in the graph below.

Table 4-4 above, shows that the expected firm value for each period is the same when the payout is through both dividends and share repurchases. The volatility has been
reduced to zero under this payout method. It is more revealing to consider the results in figure 4-1. From this we can see that the expected firm value for the four periods is a straight line when paying out through both dividends and share repurchases. The volatility caused by volatile dividends and share repurchases offset each other when the length of lag is an odd number. This is because investors observe signals which are exact and opposite when paying out through dividends as opposed to when paying out through repurchases. Therefore, their expectation of firm value goes opposite way. When half of the payout is through dividends and half through repurchases, the opposite effects of the payout exactly offset each other and volatility is reduced to zero.

![Figure 4-1 The Trend of Expected Firm Values (Case 2, T=2 \( \chi +1 \)](image)

In practical terms, if managers know that future earnings will be volatile and investors’ length of lag is an odd number, they can readily reduce the impact of volatile earnings on firm value by choosing to pay out through both dividends and share repurchases. This will be a quick and effective way of maintaining the stability of the firm value.
4.4 Conclusion

In this chapter I present a theoretical model based on timing evidence of using open market share repurchases. I assume that investors’ reaction to repurchase announcements is lagged. Furthermore, investors are irrational in the sense that they believe the earnings of firms move in two certain states rather than in a random walk: trending or mean-reverting.

In my model I use two extreme cases to demonstrate how investors’ differential reaction to dividends and share repurchases can affect managers’ decision of the best payout method to maximize their utility. In each case I compare the results from three different payout methods: paying put only through dividends; paying out only through repurchases; and paying out one half through dividend and the other half through repurchases.

My model reveals that when earnings are stable, investors believe with higher probability that they are in a trending state. In this situation, paying out only through dividends, only through share repurchases or a combination does not make any difference to profit-maximizing managers. Hence, payout methods are irrelevant to managers.

When earnings are volatile, the length of the lag must be taken account of. I separate the analysis with lagged reaction from the analysis without lagged reaction. My model demonstrates that when earnings are volatile and investors react to share repurchases without a lagged reaction, paying dividends and buying back shares are essentially the same payout method. Managers would, therefore, be indifferent between paying dividends and repurchasing shares.

When investors do react to share repurchases with a lag, the length of the lag should
be considered. If the length of the lag is an even number, investors observe the same signals each period no matter whether the payout is through dividends or through repurchases. When payout is through dividends, investors observe the earnings signal of the current period. However, when payout is via repurchases the signal they observe belongs to the prior period. If the length of the lag is an odd number, the signal investors observe each period when paying out through repurchases is exactly opposite to the signal they observe when paying out only through repurchases.

My model reveals that when earnings are volatile and the length of the lag is an even number, paying out only through dividends, only through repurchases or through both still makes no difference to managers. However, when the length of the lag is an odd number, paying out one half through dividends and the other half through repurchases can reduce the volatility caused by volatile earnings. The best payout method also depends on how managers dislike volatility.

To my knowledge my model is the first one to investigate the impact of investors’ differential reaction to dividends and share repurchases on managers’ decision over payout method(s). Although there are several previous studies, based on the timing evidence, also assuming market reaction to repurchases is lagged, my research is the first to directly use the lagged reaction assumption to analyze the effects on managers’ choice of payout method. My findings, therefore, make a contribution in to current literature.
Chapter 5 Repurchase and Dividend Catering, Managerial Myopia, and Long-run Value-destruction

5.1 Introduction

In recent years, share repurchases have become an increasingly attractive alternative to dividends as a method for corporations to return cash to equity holders. In 1985 only 129 open-market share repurchase programs were announced in the US, but in 1996 there were 1,319 programs announced (Jagannathan and Stephens, 2003). Furthermore, Jagannathan and Stephens observed that in 1986 only about 27% of the firms announcing an open-market repurchase program had previously initiated an open-market share repurchase program in the prior five years, but in 1996 this figure was nearly 54% and over a half of them had two or more open-market share repurchases in the prior five years. Fried (2002) also documents that between 1980 and 1998, share repurchases rose from $1.4 billion to $220 billion annually, accounting for more than 50% of the total cash distributed by publicly traded US firms in 1998. Among them, 90%-95% of stock repurchases are open-market share repurchases.

An increasing body of research has attempted to understand the motives behind share repurchasing. Researchers have identified that, due to market imperfections, firms can create value by repurchasing shares. Several motives have been identified, such as tax benefits, adjusting the capital structure, and signaling or market timing in the face of asymmetric information.

Researchers have analyzed the differences between share repurchases and dividends (e.g. Grullon and Michaely 2002, Jagannathan et al 2000, Reynolds 2004, Sarig 1999).

---

25 This chapter is co-authored with my PhD supervisor-Dr. Richard Fairchild, and it was accepted as one of the University of Bath School of Management Working Papers in 2006 (Series No. 2005.21).
Chapter 5

The main findings of the empirical work support the survey of Graham et al; namely, that firms view dividends as rigid, they prefer to pay dividends out of the permanent element of their cash flows, and they prefer to keep dividends smooth. Managers view repurchasing activity as more flexible, they repurchase out of residual temporary free cash flow, and they are not worried about volatile repurchasing. Furthermore, managers view dividends as revealing more information to the market than repurchases.

Recent research suggests that investors react differently to dividends and repurchases. In an efficient market with rational investors, the share price should immediately incorporate the signals provided by dividends or repurchases. According to the signaling hypothesis, investors should react positively and immediately to dividends (e.g., Bhattacharya 1979; Miller and Rock 1985; Bhattacharya and Dittmar 2003; Oded 2005). If repurchasing provides similar positive signals, investors should again react positively and immediately.

However, Ikenberry, Lakonishok and Vermaelen (1995) find long-run abnormal returns in the years following repurchase announcements. They conclude that the market under-reacts to open market repurchase announcements. Some other researchers examine the execution skills of managers and find that managers can time the market and buy back their shares profitably (e.g., Cook, Krigman and Leach, 2004; Brockman and Chung, 2001 and Ginglinger and Hamon, 2007).

If the market is efficient, rational investors should react immediately and fully to repurchase announcements, and the share price should go up immediately. Managers would not be able to time the market and make profits from repurchasing shares. Therefore, the evidence of successful market timing suggests either that the market is inefficient, or that investors are irrational, reacting slowly to the signals provided by repurchases. Indeed, Isagawa (2002) and Fairchild and Zhang (2005) develop models in which managers can time the market with their share repurchasing decisions due to
in investor irrationality.

5.1.1 Catering Theories of Dividends and Repurchases

I have thus far documented the major motives behind share repurchases, and identified the differential reactions of investors to dividends and repurchases. One approach that I have not yet considered (and also the subject of this paper) is the catering motive. According the catering motive, firms cater to investor demand for categories of stock.

According to Baker and Wurgler (BW 2004), “in standard theory, investors do not categorize. Instead, they identify each security with a list of abstract statistics, such as mean return, variance, and covariance. In reality, as Barberis and Shleifer (2002) point out, investors often do categorize securities into ‘small stocks,’ ‘value stocks,’ ‘tech stocks,’ old economy stocks,’ ‘junk bonds.’ …. There are several reasons to suspect that certain institutions and investors categorize ‘dividend payers’.”

Baker and Wurgler (BW 2004) develop a catering model of dividends in which investors categorize firms as dividend-payers and non-dividend payers. Further, investors have a time-varying demand for dividend or non-dividend paying firms, which affects the price premium attached to such firms. For example, when the market has a demand for dividend-payers, such firms attract a price premium. When making its dividend decision, the firm caters to investor demand. BW’s empirical tests support the catering theory.26

26 Since Baker and Wurgler’s (2004) seminal paper, there has been increasing research interest in catering theory. For example, Lai (2004) uses catering theory to explain the well-documented ‘analyst bias’. He suggests that analysts are heavily influenced by investors, and he builds a theory to show how analysts cater to investors’ beliefs. Gemmill (2005) examines the split-capital closed-end funds in the UK which flourished in the late 1990s and find evidence supporting the catering theory. However, Hoberg and Prabhala (2005) argue that the catering theory of Baker and Wurgler (2004) is not the right explanation for the disappearing and reappearing dividend puzzle. Instead, they found risk, especially the idiosyncratic risk, significantly explains the propensity to pay dividends and it accounts for 40% of the disappearing dividend puzzle. Denis and Osobov (2005) found similar declining
As far as I am aware, no model yet exists examining catering through share repurchases. I address this in this paper. That is, I extend Baker and Wurgler’s analysis by developing a model in which a firm may cater to investor demand by paying dividends or repurchasing shares. Alternatively, the firm can use its free cash flow to invest in a new positive NPV project. Under the assumptions of the model (that the market reacts immediately to dividends, reacts strongly but with a time-lag to repurchases, and that investors are initially unaware of the new investment project), I demonstrate that the manager’s decision to invest in the new project, pay dividends, or repurchase shares depends on a) his time-horizon, and b) the relative sizes of the positive NPV of the new project and the premium attached to share repurchases and dividends. Catering through dividends or repurchases is inefficient, since the manager passes up a positive NPV project.

In the next section, I present the model. Section 3 concludes the paper.

5.2 Model description

I consider a firm that must decide between investing its free cash flow in a new project, or catering to investor demand by paying the cash flow to investors in the form of dividends, or using the cash flow to repurchase shares. The manager of the firm is fully rational, and makes his decision in order to maximize his payoff\(^\text{27}\). The market is inefficient, in that the investors are unaware of the existence of the new project, and the investors are irrational in that they place a premium on dividend-payers and firms that repurchase shares. The risk-free rate is zero, and all agents are risk-neutral.

propensity to pay dividends in Canada, UK, German, France and Japan, but they did not find robust support for the catering theory. They argue that the evidence supports the agency cost explanation for dividends instead.

\(^\text{27}\) The manager is fully rational in the following sense: he updates his beliefs correctly when receiving new information and given his belief, he makes choices that are normatively acceptable (Barberis and Thaler, 2002, and also footnote 1). Therefore, maximizing his payoff is a rational behavior for the manager. However, this may be in conflict with the corporate objective of maximizing shareholder value (i.e., agency issue may arise). The agency conflicts are discussed in more details in chapter 6.
The timeline of the model is as follows;

**Date 0:** The firm has a current three-period project in place, which may be successful or fail with equal probability. If it succeeds, it generates date 3 income of $R + \delta$, where $\delta > 0$. If it fails, it generates date 3 income of $R - \delta$. The firm also has a one-period project in place, which will generate income of $I$ for certain at the end of date 1. At date 0, investors believe that this income will be re-invested at zero NPV in financial securities. Therefore, the date 0 value of the firm is $V_0 = R$.

**Date 1:** A new project becomes available, requiring investment $I$ (that is, the manager must use all of the income generated by the one-period project). Alternatively, the manager can pay the cash flow $I$ to investors in the form of dividends, or he can use the cash flow to repurchase shares.

At this time, the investors are unaware of the new project. Therefore, in the absence of dividends or repurchases, the value of the firm continues to be $V_1 = R$ (since the investors continue to believe that, in the absence of dividends or repurchases, the firm will invest the free cash flow in financial securities at zero NPV).

Following Baker and Wurgler (BW 2004), investors place a premium on dividend payers. Further, in contrast to BW, investors also place a premium on repurchasing firms. Hence, the firm may decide to pass up the positive NPV project in order to cater to investor demand using dividends or repurchases. If the firm does so, the value of the firm, following repurchases or dividends, at date 1 is $V_1 = R + \lambda_1$, where $\lambda_1$ represents the date 1 catering-premium (I analyze this premium in more depth below). The manager receives his date 1 compensation (see equation 1 below).

**Date 2:** If the manager has invested at date 1 in the new project, it now achieves date 2 income $X > I$. The existence of the project, and its positive NPV, now becomes
common knowledge. Therefore, the value of the firm at date 1 becomes
\[ V_2 = R + (X - I). \]

If the manager did not invest at date 1 in the new project, and instead paid dividends
or repurchased shares, the firm value at date 2 is \( V_2 = R + \lambda_2 \), where \( \lambda_2 \) represents
the date 2 catering-premium (I analyze this premium in more depth below)\(^{28}\).
The manager receives his date 2 (and final) compensation.

**Date 3:** The three-period project achieves success or failure, and investors are paid all
of the firm’s cash flow as dividends (excluding that already paid to the manager at
date 1 and date 2).

### 5.3 The Model Analysis

The manager makes his date 1 reinvestment/payout decision to maximize his payoff
function;

\[ M = \alpha V_1 + (1 - \alpha) V_2 \] \hspace{1cm} (5.1)

Where \( V_1 \) and \( V_2 \) are the expected market firm value at date 1 and date 2
respectively, and \( \alpha \in [0,1] \) represents the manager’s date 1 compensation parameter.
Note that increasing (reducing) \( \alpha \) represents increasing managerial myopia
(far-sightedness), with the manager increasingly focusing on short-term (long-term)
value, \( V_1 (V_2) \).

\(^{28}\) \( \lambda_1 \) and \( \lambda_2 \) are the catering premium at date 1 and date 2 respectively. As you will see in the later part of this
chapter, I use \( \lambda_{1,d} \) and \( \lambda_{2,d} \) to represent the dividend catering premium at date 1 and date 2 while I use \( \lambda_{1,r} \)
and \( \lambda_{2,r} \) to represent the repurchasing catering premium at date 1 and date 2. The catering premium will directly
impact on the manager’s decision about whether to go ahead with catering and which catering device to use.
The manager’s incentive to cater through dividends or repurchases is affected as follows. I assume that investors react by placing an immediate premium on dividend payers at date 1, which remains into date 2. On the other hand, they react slowly to repurchases.

I model this as follows. If the firm pays out dividends at date 1, investors immediately overweight the probability of the good state; that is, they believe that the good state will occur with probability \( p > 1/2 \). They continue to believe this in date 2.

On the other hand, the investors’ reaction to repurchases is lagged. There is no reaction at date 1, but the investors react more strongly than they do to dividends at date 2. That is, if the firm caters using repurchases, investors correctly infer that there is an equal probability of the good and bad state in date 1. In the following period, they update their belief of the good state probability to \( q > p > 1/2 \).

The manager makes his date 1 decision to maximize his compensation, as given by equation (5.1). If the manager chooses to invest in the new project, then, since investors are unaware of the new project, they believe that he is investing in financial securities at zero NPV. Therefore, \( V_0 = V_1 = R \). At date 2, they become aware of the new project, and its positive NPV. Therefore, \( V_2 = R + (X - I) \).

Therefore, substituting into (5.1), I obtain

\[
M(I) = R + (1 - \alpha)(X - I) \tag{5.2}
\]

If the manager chooses to payout dividends at date 1, the investors immediately believe that the good state probability is \( p > 1/2 \), and continue to believe this at date
2. Therefore, the date 1 and date 2 firm values are $V_1 = V_2 = R + (2p - 1)\delta$. Note that $(2p - 1)\delta$ represents the premium attached to dividend payers (in other words, if the manager choose to payout dividends, $\lambda_{1,d} = \lambda_{2,d} = (2p - 1)\delta$). Therefore, substituting into (5.1), I obtain

$$M(D) = R + (2p - 1)\delta$$  \hspace{1cm} (5.3)

Finally, if manager chooses to use the date 1 cash flow to repurchase shares, then investors do not react at date 1, but react at date 2. Therefore, $V_1 = R$, $V_2 = R + (2q - 1)\delta > V_1$. And in terms of catering premium, we can get that $\lambda_{1,r} = 0, \lambda_{2,r} = (2q - 1)\delta$. Therefore, substituting into (5.1), I obtain

$$M(R) = R + (1 - \alpha)(2q - 1)\delta$$  \hspace{1cm} (5.4)

In order to determine the effect of managerial compensation on his re-investment/payout decision, I compare equations (5.2), (5.3) and (5.4).

**Lemma 1:** *Pair wise comparison of the effect of the policy decision on manager’s payoffs.*

a) If $(1 - \alpha)(X - I) \geq (2p - 1)\delta$, $M(I) \geq M(D)$.

b) If $(2p - 1)\delta \geq (1 - \alpha)(2q - 1)\delta$, $M(D) \geq M(R)$.

c) If $(1 - \alpha)(2q - 1)\delta \geq (1 - \alpha)(X - I)$, $M(R) \geq M(I)$.

Therefore,

**Proposition 1:** *The Manager’s optimal re-investment/payout decision:*

a) If $(X - I) > (2q - 1)\delta$, the manager prefers to re-invest in the new project than to
repurchase shares. His optimal decision is then determined by a comparison of his expected payoffs from re-investing in the new project and paying dividends.

i) He prefers to re-invest in the new project if \( (1 - \alpha)(X - I) \geq (2p - 1)\delta \).

ii) He prefers to pay dividends if \( (2p - 1)\delta > (1 - \alpha)(X - I) \).

b) If \( (2q - 1)\delta \geq (X - I) \), the manager prefers to repurchase shares than re-invest in the new project. His optimal decision is then determined by a comparison of expected payoffs from repurchasing shares and paying dividends.

i) He prefers to pay dividends if \( (2p - 1)\delta \geq (1 - \alpha)(2q - 1)\delta \).

ii) He prefers to repurchase shares if \( (1 - \alpha)(2q - 1)\delta > (2p - 1)\delta \).

**Proof:** The proof comes directly from lemma 1.

Proposition 1 demonstrates that the manager’s decision to use the date 1 free cash flow to re-invest in the new project, pay dividends, or repurchase shares depends on;

I) the size of the new project’s positive NPV versus the date 2 catering-premium from repurchasing,

II) the product of the date 2 compensation parameter and the project’s NPV versus the date 1 and date 2 (identical) catering-premium from paying dividends, and

III) the date 1 and date 2 (identical) catering-premium from paying dividends versus the date 2 catering-premium from repurchasing.

Factor I) arises because the new project’s NPV and the repurchasing premium are not incorporated into firm value until date 2 (the former because the market is inefficient, and the latter because irrational investors react to repurchasing with a time-lag). Therefore, the manager’s decision on between re-investing and repurchasing is not affected by his date 1 and date 2 compensation parameters.
Factor II) demonstrates that his choice between re-investing and paying dividends is affected by the compensation parameters, because the dividend premium affects both date 1 and date 2 value, while the new project’s NPV is not incorporated into firm value until date 2.

Factor III) demonstrates that his choice between catering using dividends and repurchases is affected by the relative premium sizes and the compensation parameters (because paying dividends attracts the premium in both date 1 and date 2, while repurchasing only attracts the premium at date 2, but the repurchasing premium is larger once it occurs).

In order to focus the analysis, I now consider 3 possible compensation schemes for the manager; the manager is completely myopic, $\alpha = 1$, the manager is completely far-sighted $\alpha = 0$, and the manager treats the short-term and long-term equally, $\alpha = 1/2$.

**Proposition 2: The effect of managerial myopia/far-sightedness on his optimal re-investment/payout decision:**

a) If the manager is completely myopic, $\alpha = 1$, the manager’s optimal policy is to pay dividends at date 1; $P^* = D$.

b) If the manager is completely far-sighted, $\alpha = 0$, his optimal policy is to re-invest, $P^* = I$, if $(X - I) > (2q - 1)\delta$. His optimal policy is to repurchase shares, $P^* = R$, if $(2q - 1)\delta \geq (X - I)$.

c) If the manager treats the short-term and long-term equally, $\alpha = 1/2$,

i) If $(2q - 1)\delta \geq (X - I)$, he prefers to repurchase shares than re-invest in the new project. Therefore, his optimal policy is to pay dividends if $(2p - 1)\delta \geq \frac{(2q - 1)\delta}{2} \Rightarrow p \geq \frac{q}{2} + \frac{1}{4}$. His optimal policy is to repurchase
shares if \( \frac{(2q-1)\delta}{2} > (2p-1)\delta \Rightarrow \frac{q}{2} + \frac{1}{4} > p \).

ii) If \( (X-I) > (2q-1)\delta \), he prefers to re-invest in the new project than repurchase shares. Therefore, his optimal policy is to pay dividends if 
\[
(2p-1)\delta > \frac{X-I}{2}.
\]
His optimal policy is to re-invest in the new project if 
\[
\frac{X-I}{2} \geq (2p-1)\delta.
\]

**Proof**: The proof comes directly from lemma 1.

The optimal decision from the investors’ viewpoint is the one that maximizes the fundamental value of the firm. Therefore, catering through dividends or share repurchases, rather than investing in the positive NPV project, is inefficient.

**Proposition 3**: The optimal fundamental value-maximizing decision is given by the manager re-investing in the new project at date 1, since the fundamental value of the firm is independent of the catering premium from repurchasing or paying dividends. That is, the respective fundamental values under re-investing, paying dividends, and repurchasing, are \( FV(I) = R + (X - I), \) \( FV(D) = FV(R) = R \).

### 5.4 Policy implications

I have demonstrated that managerial myopia may result in actions that maximize the short-term market value, not the fundamental value, of the firm. If investors categorize firms that return cash to the market through dividend payments or share repurchases, this may result in a catering-premium. As a result, myopic firms may cater to this demand, which may mean forgoing investment in profitable, positive NPV projects, resulting in long-run destruction of fundamental value.

Indeed, this problem has been identified by Baker et al (2004), who develop a reduced
form model of managerial myopia to demonstrate the trade-off between short-term catering and long-run destruction of fundamental value. Further, Jensen (2005) argues that much research effort is needed to identify and develop appropriate compensation schemes when managers are myopic, self-interested, and the market is inefficient.

Finally, in their extremely interesting book, “Six Roundtable Discussions of Corporate Finance,” Chew and Stern (1986) discuss issues in corporate finance with academics and practitioners. On the subject of dividends, they ask managers what they would do if they had positive NPV projects available, but their investors were demanding dividends. The universal reply was, “I give investors what they want. I would pay the dividends, and ignore the profitable investments.” Hence, this demonstrates short-term catering, managerial myopia, and long-term value-destruction in practice.

5.5 Conclusion

I have developed a model in which a firm decides between catering to investor demand through dividends or share repurchases. Alternatively, the firm may decide not to cater, but instead invest in a positive NPV project. My model develops Baker and Wurgler’s (2004) dividend catering model. Firstly, they only consider dividend catering, and not repurchasing or re-investment. Secondly, they do not consider the effect of the strength of investor reaction (that is, the size of the price premium) on the firm’s catering incentives, nor do they consider the manager’s time horizon. In contrast, I demonstrate that the firm’s incentives to cater through dividends or

Stern and Chew point out to these managers that the ideal solution is to communicate to these investors that the firm has profitable value-adding investment projects available, and that it would therefore be better for the firm to retain the earnings to invest in these projects rather than to cater to the investors by paying dividends. This suggests to us that a model is needed that analyzes the managerial alternatives of catering or communicating to investors. This may bring in such considerations as a) do myopic managers want to communicate to investors, or would they rather cater? b.) If managers do want to communicate, will this be credible? This brings to mind notions of reputation and repeated play.
repurchases, or to retain the cash flow to invest in the new project depends on a) the manager’s time-horizon, and b) the relative sizes of the repurchasing and dividend catering-premium.

My simple model provides a basis for future development. An interesting development would be to introduce asymmetric information over firm type, in addition to investor irrationality. This would enable rigorous derivation of separating and pooling equilibrium, and to consider the relative effects of investor irrationality and signaling. Further, the model could be used to consider competing theories of repurchasing, such as price support, market timing, and catering. Finally, I could consider a model of catering and managerial communication (see footnote 3).
Chapter 6 Investor Protection, Share Repurchases, Irrationality and Agency Conflicts: The Implications for Corporate Governance

6.1 Introduction

In recent years, researchers have been increasingly analysing the complex inter-relationship between a society’s legal system, its corporate governance measures, the strength of shareholder rights, and corporate financing choices. For example, La Porta et al. have written several research papers on the effects of the legal system and shareholder protection on the development of capital markets (1999), dividend policies around the world (2000), the concentration of equity ownership (1999), and the relationship between investor protection and corporate governance (1998). Klapper and Love (2004) examine the relationship between corporate governance rankings and legal systems in emerging markets. Laeven and Majnoni (2004) demonstrate that an increase in judicial efficiency lowers the cost of credit in a large sample of countries. Demirguc-Kunt and Maksimovic (1999) examine the relationship between a country’s institutions, the nature of its financial markets, and the maturity of debt. Some researchers (e.g., Allen and Song (2003), Botazzi and Rin (2002), and Fairchild and Yiyuan (2006)) examine the relationship between legal systems, corporate governance, and the performance of the venture capital sector. Other scholars have focused on governance and corporate finance in specific emerging countries, such as Mexico (e.g., Castaneda Ramos 1999, and Lopez-de-Silanes 2002) and China (e.g., Liu 2003). Furthermore, de Miguel et al (2005) provide an extensive analysis of the complex interactions between institutional factors, ownership structure, and firm performance.

---

30 This chapter is also co-authored with my PhD supervisor Dr Richard Fairchild from University of Bath School of Management. This chapter was submitted to the Journal of Corporate Ownership & Control and was accepted and then published in the Fall of 2006 (Ref: Corporate Ownership & Control, Volume 4, Issue 1, Fall 2006).
In this paper I develop the research agenda on the corporate governance and corporate financing choices by focussing on the relationship between the strength of shareholder rights, monitoring and a firm’s stock repurchase activities. I believe that this is an interesting area to consider for several reasons. Firstly, relatively little work has been carried out in this area, compared with the emerging research on other corporate financing activities (an exception to this is the work by Jiraporn 2006). Secondly, my analysis will complement La Porta et al.’s (1999) analysis of corporate governance and dividends. Thirdly, I have previously employed survey techniques (see Fairchild and Zhang 2005a) that demonstrate that investors have relatively little understanding of the firm’s motivations for repurchasing shares, compared to dividends, and that firms exploit this by timing the market in order to transfer wealth from tendering to non-tendering shareholders. In this paper, I discuss the corporate governance issues surrounding this managerial exploitation of investors. Fourthly, share repurchase timing and catering policies are interesting because they may be based on investors’ behavioural biases. Therefore, my analysis motivates consideration of the effect of behavioural factors on effective corporate governance. Finally, share repurchases were, until very recently, illegal in many countries (especially emerging countries). In this paper, I ask why this may have been the case, and suggest that policy makers in these countries may have been concerned with the exploitation of irrational investors through repurchase timing. Now that repurchasing is legal in many of these countries, what are the governance implications?

I consider the effect of shareholder rights on three aspects of repurchase policy: repurchasing and the agency costs of free cash flow, repurchase timing, and repurchase catering. I have been motivated by Jiraporn (2006), who considers the

---

31 My analysis is similar to Burkart and Panunzi’s (2006) excellent game-theoretic model of the complex interaction between ownership concentration, monitoring, and legal shareholder protection. They show that, through the intermediating monitoring variable, ownership concentration and legal shareholder protection may be complements or substitutes in constraining agency problems. In my model, monitoring is the intermediate variable between repurchases and legal shareholder protection, which again may be complements or substitutes in constraining agency problems.

32 For example, please see Zhang (2002) and Wada (2005) for Japan, Lamba and Ramsay (2000) for Australia, Brockman and Chung (2001) for Hong Kong.
effect of shareholder rights on repurchase activity in the face of agency problems of free cash flow. In particular, he discovers a positive relationship between the strength of shareholder rights and repurchases (that is, they are complements). I ask, are they complements or substitutes\(^{33}\)?

In order to analyse the relationship between shareholder rights and repurchases, and the governance implications, the remainder of the paper is organized as follows. Section 2 motivates my analysis by providing the background to the corporate sector’s burgeoning usage of share repurchases as a payout mechanism. In section 3, I develop my share repurchasing models. In section 4, I outline my survey evidence that demonstrates that investors have little understanding of share repurchases, and that managers can exploit this to expropriate wealth from irrational shareholders. Section 5 present the policy and governance implications of my analysis. Section 6 concludes.

6.2 Background Information

6.2.1 Background of Share Repurchases

For decades, corporations have overwhelmingly preferred distributing cash in the form of dividends over repurchases. However, the landscape has changed dramatically over the last twenty years, with open-market share repurchase programs becoming increasingly popular\(^ {34}\).

Researchers (e.g., Wansley et al 1989, McNally 1999, Wada 2005) have recognized that there are 5 main motives for firms to undertake share repurchases; the capital structure motive (repurchases increase leverage, and are therefore useful if a firm believes that it is operating below its optimal leverage level), the free cash flow

\(^{33}\) Hence, my analysis provides a natural complement to the analysis of La Porta et al. (1999) who analyze whether dividends and investor protection are substitutes or complements.

\(^{34}\) The details of increasing share repurchase activity are presented in Chapter 2 (Literature Review). This chapter is slightly different to the paper published in the journal of Corporate Ownership & Control, because I cut some literature review in this chapter in order to avoid duplication with Chapter 2.
motive (following Jensen 1986, repurchases eliminate free cash flow at the manager’s discretion), the anti-takeover motive, signaling of undervaluation, and wealth transfer due to market timing (repurchasing undervalued shares at bargain prices). In addition to these motives, Fairchild and Zhang (2005) have suggested that repurchases may be driven by the same catering motive identified by Baker and Wurgler (2004) for dividends.

Some literature also addresses the importance of managerial stock options in making share repurchase decision. For example, Bartov, Krinsky and Lee (1998) find that companies are more likely to distribute cash to investors through open-market share repurchases than through dividends when 1) management believes its stock is undervalued; 2) management compensation packages include stock option, and 3) the company stockholder base is dominated by institutional investors. Bens, Nagar, Skinner and Wong (2003) also find that managers increase the level of their firms’ share repurchases when the effect of outstanding employee stock options on diluted earning per share increases.

In considering these motives, it is interesting to relate three particular motives to my present study. The free cash flow motive suggests that, when the firm lacks desirable investment opportunities, repurchases are beneficial and value-adding, since they return cash to the shareholders, rather than leaving free cash flow at the discretion of the firm’s self-interested management. In my study, I then consider whether repurchases and legal share-holder protection are complements or substitutes in eliminating the agency problems of free cash flow.

In contrast, the last two motives mentioned above, the timing motive and the catering motive, reveal the potentially damaging nature of repurchases. In both cases, managers exploit investor irrationality, and in the catering case, this may lead to long-run value-destruction. I suggest that this explains why repurchases have been illegal in many countries until recently.
Besides the motives mentioned above, some literature also addresses the importance of managerial stock options in making share repurchase decision.

6.2.2 Evidence on shareholder protection and repurchases

Jiraporn (2006) examines the relationship between share repurchases and shareholder rights in the face of the agency costs of free cash flow. He demonstrates a positive relationship between shareholder rights and repurchasing activity; firms where shareholder rights are weaker (stronger) tend to repurchase less (more) shares. He argues that this is because managers of firms with weak shareholder rights are better able to exploit the weak shareholder rights and retain more cash with the firm. Managers of firms with strong shareholder rights, however, are forced to disgorge cash to stockholders in the form of repurchases. His work implies share repurchases and shareholder rights are complements.

This is consistent with the results from La Porta et al. (1999), who use the data of more than 4,000 firms from 33 countries around the world to test two agency models of dividends: the outcome model and the substitution model. According to the ‘outcome model’, dividends are paid because outside shareholders pressure corporate insiders to disgorge cash. Therefore, if the outside shareholder rights are strong I should expect higher dividends. According to the ‘substitution model’, insiders interested in issuing equity in the future pay dividends to establish a reputation for decent treatment of outside shareholders. Therefore, if the outside shareholder rights are weak I should expect higher dividends. La Porta et al.’s (1999) results support the outcome model. But they did not examine whether share repurchases have the same function as dividends. Jiraporn (2006) finished their work, and his result is also in support of the ‘outcome agency model’, i.e. there is a positive relationship between shareholder rights and share repurchases.
It is interesting to note that, in many countries, especially emerging countries where shareholder right are weak, share repurchases have been illegal initially (see eg; Zhang (2002) and Wada (2005) for Japan, Lamba and Ramsay 2000 for Australia, Brockman and Chung (2001) for Hong Kong). It seems a supporting evidence of Jiraporn (2006) and La Porta et al. (1999). However, over time, the regulations in these countries have gradually been relaxed, resulting in a fast increase in share repurchases. Does this imply shareholder rights in these countries increase as well or does it suggest there is a negative relationship between shareholder rights and share repurchases (i.e., they are substitutes) instead?

In the current paper, in contrast to Jiraporn (2006) I argue that the motives behind share repurchases may make a difference so that share repurchases and shareholder rights may be substitutes instead of complements. I examine the three most popular motivations behind share repurchases: repurchases as a commitment device in the face of free cash flow; repurchases as a timing device; repurchases as a catering device. In each case I use a very simple theoretical model to demonstrate how share repurchases and shareholder/investor rights could become substitutes rather than complements.

6.3 Analysis of Models

In this section, I develop three repurchase models which examine the effects of legal share-holder protection on repurchasing in the face of agency problems of free cash flow, repurchase timing, and repurchase catering.

6.3.1 Repurchases and the Agency Costs of Free Cash Flow

Jensen (1986) considered the agency costs of free cash flow. He argued that a firm with excess free cash flow is inclined to over-invest by adopting investment projects with negative NPV. If managers are over-investing, an increase in dividends will
reduce the amount of free cash flow, which mitigates the over-investment problem. Hence dividends can help control agency problem by getting rid of the excess free cash flow.

Based on Jensen’s agency problem (1986), Jiraporn (2006) suggests that, like dividends, share repurchases can function as a device to control agency problem. Further he argues that agency theory predicts that the extent to which firms repurchase their stock is a function of the severity of agency costs and agency costs in return are related to the strength of shareholder rights (Gompers et al. 2003). Therefore, he assumes that the amount of share repurchases is influenced by the strength of shareholder rights. He finds that firms where shareholder rights are weaker (stronger) tend to repurchase less (more) stock. Therefore, he argues that shareholder rights and share repurchases are complements.

In La Porta et al’s (2000) analysis of dividends, investor rights and dividends are complements, because stronger rights enable investors to force the firm to disgorge free cash flow in the form of dividends rather than waste it on pet negative NPV projects. They contrast this with the substitution model, where, in the face of investor weakness, firms need to establish a reputation for doing the right thing by paying dividends.

My first model demonstrates that shareholder rights and repurchases may be complements or substitutes. I consider the interaction of shareholder rights, investors’ monitoring incentives, managerial compensation, and private control benefits on the manager’s incentives to repurchase shares.

The model is as follows.

At date 0, the manager of a firm has the opportunity to invest in a new project. The project requires investment $I$ and is expected to provide income of $X$. The project
has negative NPV; that is, \( X - I < 0 \), but provides private benefits to the manager of \( B \). Hence, there may be agency problems of free cash flow.

At this date, the manager makes a payout/investment policy decision. In order to simplify the model, the firm happens to have free cash flow at date 0 equal to \( I \). Therefore, he has exactly enough cash flow to take the project\(^{35} \). Alternatively, he can refuse to repurchase shares and use the cash flow in two alternative ways. He can use the free cash flow \( I \) to repurchase the shares. If he does not do so, then he can invest the free cash flow \( I \) in the negative NPV project, or he can invest it in the financial markets at zero NPV. Investors can observe the manager’s decision. However, the manager’s investment in the negative NPV project is non-verifiable in the absence of monitoring by the investors (hence I consider an incomplete contracts framework).

At date 1, the investors choose whether to monitor the firm at cost \( M > 0 \). This has the following effect. If investors monitor, they prove (to the courts) that the manager invested in the negative NPV project. The manager is penalized by an amount \( F > 0 \), which is transferred to the investors as compensation. However, if the investors monitor, and the manager has not invested in the project, there is no penalty transfer. Therefore, since the investors can observe the manager’s payout investment choice, they will only monitor if the manager has invested in the project (otherwise, they will be expending monitoring costs \( M \) without any gain.

At date 2, the manager and the investors receive their payoffs.

The manager has the following compensation scheme;

\[ M = \alpha V + b, \]

\(^{35}\) Isagawa (2000) makes the same simplifying assumption in his model; the free cash flow exactly equals the required project investment funds.
Where \( b \in \{B > 0, 0\} \) if he takes/does not take the project respectively, \( \alpha \) represents the manager’s equity stake, and \( V \) is the value of equity. I consider two versions of this game. In the first version, the manager has a long-term incentive scheme. That is, he receives his equity (and his private benefits) at date 2. Therefore, the market observes his investment decision (in the financial markets or the project) before valuing the equity. In the second version, he has a short-term incentive scheme, whereby he receives his equity at date 0, when he makes his payout/investment decision. In this case, the value of equity represents the market’s expectation of the manager’s future investment decision.

I solve the model using backward induction.

a. Long-term managerial compensation.

First, I note that if investors observe that the manager has repurchased shares or invested at zero NPV in the financial market at date 0, they will have no incentive to monitor the manager at date 1. This is because the investors’ respective payoffs with and without monitoring are

\[
\Pi_T = (1 - \alpha)V - M, \quad (6.1)
\]
\[
\Pi_T = (1 - \alpha)V. \quad (6.2)
\]

If investors observe that the manager has invested in the negative NPV project, their respective payoffs with and without monitoring are

\[
\Pi_T = (1 - \alpha)(V + X - I), \quad (6.3)
\]
\[
\Pi_T = (1 - \alpha)(V + X - I) + F - M. \quad (6.4)
\]
Therefore, having observed that the manager has invested in the negative NPV project, they will monitor only if \( F > M \). I define strong shareholder rights as the case where \( F > M \) (high penalty/low monitoring costs) and weak shareholder rights as the case where \( F < M \) (low penalty/high monitoring costs). Later, I discuss the relationship to common law countries (strong shareholder protection) and civil law countries (weak investor protection).

I now move back to the manager’s date 0 investment/payout decision. If investor rights are strong \( (F > M) \), the manager knows that, if he invests in the project, the investors will monitor at date 1. He also knows that if he repurchases shares, or invests in the financial market, the investors will not monitor him. Therefore, his respective date 0 expected payoffs from repurchasing, investing in the financial market, or investing in the project are;

\[
\Pi_m = \alpha V, \\
\Pi_m = \alpha V, \\
\Pi_m = \alpha(V + X - I) + B - F. 
\]

Therefore, he will invest in the new project if \( \alpha(X - I) + B - F \geq 0 \); otherwise, he randomizes between repurchasing or investing in the financial markets.

Next, consider the case where investor rights are weak \( (F < M) \). In this case, the manager knows that if he invests in the project, the investors will not monitor him. Now the manager’s payoff from investing in the new project is

\[
\Pi_m = \alpha(V + X - I) + B. 
\]
Hence, the manager will invest in the new project if

$$\alpha(X - I) + B \geq 0.$$  

(6.8)

I focus on the case where $\alpha(X - I) + B \geq 0 > \alpha(X - I) + B - F$. Therefore, if investor rights are weak ($F < M$), the manager will not repurchase, but will invest in the negative NPV project. If investor rights are strong ($F > M$), the manager will randomize between repurchasing and investing in the financial markets, rather than invest in the negative NPV project.

This analysis supports Jiraporn’s (2006) and La Porta et al’s (2000) analysis that investor rights and repurchases are complements. When investor rights are weak, the manager chooses to eliminate repurchases, so that he can invest in the value-reducing project without fear of monitoring and penalties. When investor rights are strong, the manager does not want to invest in the bad project, due to investor monitoring and penalties. Hence, he repurchases shares instead.

**b. Short-term managerial compensation.**

In the previous case, the manager chose his repurchase policy according to his desire to invest in the negative NPV project, and repurchases and shareholder rights were complements. Now I consider the case where he is compensated in the short-term. In this case, repurchases may be used as a commitment device (not to take the value reducing project). Now, repurchases and share-holder rights may be substitutes$^{36}$.

This game is different from the previous case in the following respect. When the manager makes his date 1 decision whether to invest in the financial markets or the

$^{36}$ Jiraporn (2006) does not consider the commitment role of repurchases.
new project, he has already received his equity compensation (based on his date 0 decision whether to repurchase shares or not). Therefore, his date 1 decision is purely determined by the private benefits and the penalty. As before, if the investors observe that the manager has invested in the new project, investors will monitor only if $F \geq M$.

Therefore, if $F \geq M$, the manager compares $\Pi_m = 0$ and $\Pi_m = B - F$, his respective payoffs from investing in the financial markets or the project. Therefore, if shareholder rights are strong, the manager will invest in the new project only if $B - F \geq 0$ (note the difference between this and the previous case. The manager’s incentive condition in the previous case included the effect of his decision on his equity stake. Recall that in the current case, the manager has already been paid).

If $F < M$, the investors do not monitor when the manager takes the bad project. Therefore, the manager compares $\Pi_m = 0$ and $\Pi_m = B$, his respective payoffs from investing in the financial markets or the project. Therefore, if shareholder rights are Weak, the manager will invest in the new project only if $B \geq 0$.

From this point, I make the following simplifying assumption; $F > B > 0$. This assumption enables us to focus the analysis. It says that if shareholder rights are strong, the manager will not take the new project, since he fears the penalty from monitoring. If shareholder rights are weak, he will take the new project, since he knows that he will not be monitored.

Now, I move back to examine the manager’s date 0 repurchase/investment decision. If investor rights are strong, the market knows that the manager will not invest in the new project. This will be priced into the current market value of equity. Therefore, the manager’s date 0 payoff will be,
\[ \Pi_M = \alpha V \] 

(6.9)

regardless of whether he repurchases or not at date 0. Since he is indifferent, he randomizes, and repurchases with probability of \( \frac{1}{2} \).

If investor rights are weak, the market knows that the manager will invest in the new project at date 1 if he does not repurchase at date 0. Since there will be no monitoring at date 1, the manager compares (6.10) and (6.11) from repurchasing and not repurchasing respectively.

\[ \Pi_M = \alpha V \] 

(6.10)

And,

\[ \Pi_M = \alpha(V + X - I) + B \] 

(6.11)

Therefore, when shareholder rights are weak, the manager will not repurchase if

\[ \alpha(X - I) + B \geq 0, \] 

(6.12)

and will repurchase if

\[ \alpha(X - I) + B < 0. \] 

(6.13)

In this latter case, he is using the repurchase to eliminate free cash flow, as a commitment device not to invest in the bad project. I note here that, if \( \alpha(X - I) + B < 0 \), shareholder rights and repurchases are substitutes (in contrast to Jiraporn). When shareholder rights are weak, the manager repurchases (in order to commit not to take the bad project). When shareholder rights are strong, the manager randomizes between share repurchases and investing in the financial markets. The
intuition is that repurchases are employed as a commitment not to take the bad project, and substitute for shareholder rights.

Finally, note that, if $\alpha(X - I) + B > 0$, shareholder rights and repurchases are complements. When shareholder rights are weak, the manager will not repurchase (so that he can take the new project). When shareholder rights are strong, the manager randomizes between share repurchases and investing in the financial markets.

Therefore, my model has identified that the relationship between investor rights, repurchases, and performance may be complex. Investor rights and repurchases may complement each other, in eliminating agency problems of free cash flow. On the other hand, they may be substitutes\textsuperscript{37}.

6.3.2 Repurchase Timing and Share-holder Rights

Isagawa (2002), and Fairchild and Zhang (2005a) develop timing models, in which managers exploit investor irrationality to repurchase undervalued shares at bargain prices. These repurchase timing models are based on the vast evidence of managerial timing using open market share repurchases. Cook, Krigman and Leach’s (2004) find that NYSE firms on average beat their benchmarks while Nasdaq firms do not. Ginglinger and Hamon (2007) use data from Euronext Paris (the Paris Stock Exchange) to study repurchase timing and the impact of repurchase activities on liquidity. They find that on average managers have some timing ability. Brockman and Chung (2001), Zhang (2002) and Lamba and Ramsay (2000) also find significant timing evidence in Hong Kong, Japan and Australia respectively. Brav et al’s (2005) extensive survey reveals that managers are even awarded financially for buying back their shares cheaply.

\textsuperscript{37} Two governance papers that analyze such complex relationships are Burkart and Panunzi (2005) who analyze the complex relationship between ownership concentration, monitoring and performance, and Miguel et al (2003) who analyze the relationship between ownership structure and firm value.
If the market is efficient, and investors are rational, managers should not be able to time the market using repurchases. The large timing evidence, therefore, points to market inefficiency and/or investor irrationality. In order to be able to time the market profitably, the firm’s shares must be undervalued at the time of the repurchases, and the market must react with a delay to the repurchase. Indeed, Ikenberry, Lakonishok, and Vermaelen (1995) find that the market has a slow reaction to share repurchases.

In this paper, I incorporate the effect of investor rights into Fairchild and Zhang’s (2005a) timing model. The idea behind my model is that a firm’s shares are currently undervalued, and, due to investor irrationality, the market price reacts slowly to the share repurchase. This provides an incentive for the manager to repurchase shares cheaply in order to transfer wealth from tendering to non-tendering share-holders.

I incorporate investor rights by assuming that these rights enforce some disclosure of the firm’s private information. The greater the investors’ rights, the higher the disclosure. Hence, as investor rights increase, the profit of buying back shares is reduced and managers would choose to repurchase less shares. On the other hand, if investor rights are low or weak, they get very limited information about the firm and they would have a lagged reaction to share repurchases. Managers would take advantage of this to buy back more shares. Hence, share repurchases and investor rights are substitutes for each other.

I use a simple model to explain this. The manager’s profit from timing is

\[
\Pi_{\text{max}} = (V_1 - V_0)N_1 - C
\]  

(6.14)

where \(V_0\) represents the current market value of the equity, and \(V_1\) is the fundamental value of the equity. Assume that the market price does not immediately
react to the share repurchase, but later increases to equal fundamental value. The manager is rewarded based on the timing profit.

The difference between the fundamental value and the current market value depends on disclosure, which is a function of investor rights $I$. Therefore,

$$V_1 = V_0 + \varepsilon(\Delta I)$$  \hspace{1cm} (6.15)

where $\varepsilon'(\Delta I) > 0$ and

$$\Delta I = I_m - I_i$$  \hspace{1cm} (6.16)

Because of asymmetric information problem, I assume managers have more private information about the firm than investors (i.e., $I_m > I_i$), and I also assume that the information gap between managers and investors is depending on investors rights. That is, if investor rights are strong, the information gap (i.e., $\Delta I = I_m - I_i$) is narrowed, while if investor rights are weak, the information gap is expanded. I define

$$I_m = I_i + I(q)$$  \hspace{1cm} (6.17)

Where $I(q)$ is the private information that managers have. $I(q)$ is decreasing when investor rights $q$ is increasing (i.e., $I'(q) < 0$). Under extreme condition where share holder rights are very strong (or very weak), the private information is 0 (or 1).

Using (6.17) to substitute $I_m$ in (6.16) and using (6.16) to replace $\Delta I$ in (6.15), I can get

$$V_1 = V_0 + \varepsilon(I(q))$$  \hspace{1cm} (6.18)
Now using (6.18) to replace $V_i$ in (6.14), I can get that

$$
\Pi_{\tilde{I}_{\min}} = (V_i - V_0) N_i - C = \varepsilon(I(q)) N_i - C
$$

Equation (6.19) is very interesting because it relates investor rights to the timing profits managers can obtain from share repurchases. I know $I'(q) < 0$, so if investor rights are strong, $I(q)$ is getting smaller and so is the timing profits (i.e., $\Pi_{\tilde{I}_{\min}}$). If investor rights are strong enough and information gap between managers and investors ($I(q)$) is close to 0, the timing profit is not sufficient to cover the costs of share repurchases (i.e., $\varepsilon(I(q)) N_i \leq C$). At this time managers will choose not to repurchase at all. However, when investor rights are weak and so the information gap is getting bigger, the timing profits are far more than the costs of share repurchases (i.e., $\varepsilon(I(q)) N_i > C$). At this time, managers will find buying back shares are profitable and decide to buy back more shares. From the analysis of the simple model above, I can see that in the case of repurchases as a timing device, share repurchases and investor rights are substitutes for each other.

### 6.3.3 Repurchase Catering and Investor Rights

In this case I examine whether repurchases and investor rights are substitutes or complements when repurchases are used as a catering device.

Baker and Wurgler (2004) develop a theory to explain that managers’ decision to pay dividends is driven by investor demand. Managers try to cater to investors and just give investors what they want. They assume when investors put a stock premium on dividend payers managers pay dividends to cater to this demand and don’t pay
dividends when investors prefer non-payers. Their empirical test also supports the catering theory.

Fairchild and Zhang (2005b) develop a theoretical model in which managers can use repurchases instead of dividends to cater to investor payout demand. Their model are also based on market irrationality as mine (i.e., investors have a lagged reaction to share repurchases). They show us that repurchase catering instead of dividend catering could be the best choice for managers of catering investors. But they point out that catering through dividends or repurchases is inefficient since managers pass up positive NPV projects.

To show the relationship between share repurchases and investor rights, I also use a simple theoretical model to demonstrate it. Following Baker and Wurgler (2004) and Fairchild and Zhang (2005b) I also assume that there is irrational repurchase demand from investors. Managers are rational in this model and so they know that catering will make them miss some positive NPV projects. But they just do what investors want. Besides, in this model managers’ compensation is also partially relying on the short-term market price after catering. Hence, catering will also give managers chances of making their own profits. There is no investing in this model for the firm, and so I assume the firm’s fundamental value is constant throughout the dates. And I also assume before catering the market value is exactly the same as its fundamental value.

If catering, Managers’ compensation is given by

\[ \Pi_M = \alpha V_1 - q.F(\Delta V), \]  

(6.20)

where \( \alpha \) represents the manager’s equity stake, and \( V_1 \) represents the current market value of the firm after share repurchase catering. \( q.F \) represents the
expected penalty for the manager for his misdeeds. Similarly, \( q \in [0,1] \) is the measure of investor rights, and is the probability of the manager being disciplined, and depends on the strength of the investors and the legal system. \( F(\Delta V) \) is function of the difference between the firm’s fundamental value and market value. That is,

\[
F(\Delta V) = F(V_1 - \overline{V})
\]  
(6.21)

Where, \( \overline{V} \) is the firm’s fundamental value at date 1 and \( V_1 \) is the firm’s market value at date 1. Here, \( F(0) = 0 \) and \( F'(V_1 - \overline{V}) > 0 \) which implies \( F(V_1 - \overline{V}) \) is increasing with the difference between \( V_1 \) and \( \overline{V} \). According to Baker and Wurgler (2004), if managers cater to the market’s irrational payout demand at date 1, the market reacts positively to the catering and thus make the firm’s market value deviates from its fundamental value at date 1. That is, if managers cater to investors using share repurchases, \( V_1 > \overline{V} \).

From (6.20) and (6.21) I can see that here managers’ penalty is depending on two factors: the shareholder rights and the difference between the firm’s market value and its fundamental value. When investor rights are high or strong, they react strongly and positively to repurchase catering. As a result \( V_1 \) is getting very high, which, on the other hand, increases their penalty as well. Obviously, managers’ decision on repurchase more or less depends on the trade off between the market positive reaction and their penalty.

If not catering, the market value is the firm’s fundamental value, and so there is no penalty for managers. Managers’ compensation is given by

\[
\Pi_M = \alpha \overline{V}
\]  
(6.22)
Comparing (6.20) and (6.22), I can get when \( q < \frac{\alpha(V_1 - \overline{V})}{F(\Delta V)} \) (i.e., investor rights are low), managers will choose catering. When \( q > \frac{\alpha(V_1 - \overline{V})}{F(\Delta V)} \) (i.e., investor rights are high), managers will choose not to cater to investors. The result is interesting because in this model share repurchases and investor rights are substitutes as well. When investor rights are low, managers’ private benefit is increasing and their penalty is too small to be a big concern for them. They’ll choose catering. When investor rights are high, the penalty is getting too much for managers even if their private benefit is increasing as well. As a result of this trade off, they’ll choose not to cater instead. Therefore, under this model repurchase catering and shareholder rights are substitutes as well.

### 6.4 Repurchases and Irrationality: My Survey Evidence

In case 2 and 3 I talked about investor irrationality. In case 2 I assume investors have a lagged reaction to share repurchases and managers try to exploit this to time the market profitably by using share repurchases. But, a) do investors under-react, with lagged reaction over time, following share repurchases? b) do managers believe that they can time the market profitably using share repurchases? If so, what is their timing policy (that is, do they repurchase intensively an immediately, or do they repurchase slowly and gradually)? c) do investors react to repurchases and dividends differently? d) do managers believe that investors react to repurchases and dividends differently? If so, how does this affect the manager’s payout policy (that is, his choice between dividends and repurchases)?

---

38 The survey evidence presented here is only small part of the whole survey results. I keep this section to make this chapter exactly the same as the paper that is published on the journal of Corporate Ownership and Control (March 2007). A complete chapter following the models will present full information about the survey, including the survey design, delivery, description and result analysis.
In order to provide support for the assumptions of my model, I surveyed managers and investors regarding their attitudes to share repurchases and dividends (for the details of the survey, like questionnaire structure, delivery methods, etc, please see Fairchild and Zhang (2005a))\(^{39}\). Here, I just briefly introduce some related results from my survey.

From my survey I observe that over 80 percent of investors believe that their reaction to dividends announcements is ‘very quick’ (Question 6.1). Interestingly, although 37.3 percent think their reaction to repurchase announcements is ‘slow’ or ‘very slow’, the majority of them (62.7 percent) still think that their reaction to repurchase announcements is ‘quick’ or ‘very quick’ (Question 6.2). It seems that investors believe that their reaction to both dividend announcements and repurchase announcements are ‘quick’ or ‘very quick’. But, when comparing their reaction to dividends announcements with their reaction to repurchase announcements, 58.1 percent think their reaction to dividend announcements is ‘quicker’ or ‘much quicker’ than to repurchase announcement. This result implies that investors have a lagged reaction to repurchases relative to dividends.

When asking managers whether they attempt to time the market by using repurchases (Question 11.1), 74.2 percent say ‘Yes’. The mean value is –1.74, and the result is significant. This is consistent with Brav et al’s (2005) survey result, in which most CFOs believe that they can time the market and buy back their shares profitably. When managers are asked about how they execute share repurchases (Question 11.2), 43.5 percent say that they will do it intensively while 56.5 percent think that they will do it slowly and gradually over time. The mean value is –1.43 and is significant at 0.05 level. This result is very interesting. My model predicts that share repurchases becomes more immediate and intensive as investor rationality increases. Hence, if investors are highly rational (but not fully), managers will repurchase shares

\(^{39}\) In the paper of Fairchild and Zhang (2005a), the survey results are from the responses by March 2005. In this paper my survey analysis, however, is based on the updated survey responses.
intensively. The result that 56.5 percent think that they will do it gradually implies that at least managers believe that investors are very irrational, and their rationality is growing slowly so that managers can take their time over repurchases. Therefore, my survey supports the view that managers believe that investors reaction slowly to repurchase announcements.

Furthermore I believe it might be interesting to make a comparison between answers from “Investor” and answers from “Manager” to those questions both of the groups are required to answer. Question 7 investigates the share price behavior following dividend increase announcements and share repurchase announcements. Although most of investors and managers believe that share prices will go up immediately following dividend increase announcements, most investors still believe that share price will go up immediately following repurchase announcements while most managers believe that share price will go up gradually following repurchase announcements. And this difference is significant. Manager’s answers are in support of the empirical evidences which find the market has a slow and lagged reaction to share repurchases. However, investors seems have no idea about repurchases. To get to know and understand repurchase, it will take time and so investors’ reaction is slow and lagged. Managers, on the other hand, can take advantage of this to time the market profitably. These provide strong support to my model assumptions. And I believe these could partially explain why investors have a differential reaction to dividends and repurchases.

In summary, the results of my survey provide direct evidence of investors’ and managers’ view toward open-market share repurchases. My survey supports the hypothesis that investors exhibit differential reaction to dividend and repurchase announcements. Managers believe that they can time the market profitably, and investors believe that their reaction to repurchases is affected by the intensity of actual share repurchases.
The results of my survey are consistent with the survey results of Wansley, Lane and Sarkar (1989) and Brav, Graham, Harvey and Michaely (2005). Wansley, Lane and Sarkar (1989) conducted a survey of management’s view on share repurchase and tender offer premiums. They investigated management’s view on the determinants of tender offer premiums. They found that the tender offer premium was affected by the size of the repurchase. Brav, Graham, Harvey and Michaely (2005) investigated CFOs’ belief on payout policy. They also found that managers use repurchases to time the market, and repurchase premium is affected by size of repurchase. Thus, their surveys obtain the same results as mine.

6.5 Implications of My Models for Corporate Governance

In order to consider the implications of my models for corporate governance, it is worth noting that the managerial motives for repurchasing are different in each of the models, and that each model incorporates different levels of rationality.

In model 1, the manager and the investors are fully rational, and repurchasing addresses the agency problem of free cash flow. I demonstrated that repurchases and investor rights may be complements or substitutes in eliminating free cash flow problems. The governance implication of my first model is that if all of the players are rational, and the agency problem results from pure managerial rational self-interest, it should be relatively straight forward to address this problem by strengthening shareholder rights, which (in the complement version) encourages the manager to increase repurchases, hence eliminating the free cash flow problem.

In model 2, investors are irrational (reacting slowly to repurchases), and the rational self-interested manager exploits this to transfer wealth. As in model 1, it should be relatively straight forward to design a governance system that strengthens share-holder rights to eliminate this problem. Note the contrast between model 1 and model 2. In model 1, I seek to encourage repurchases to eliminate agency problems.
In model 2, I seek to eliminate repurchases, since, according to Jensen (2005), “I should not legitimise the principle that “it is OK as a matter of practice to engage in transactions that benefit one group of share-holders at the expense of another … managers and the board will maximize long run value by treating all shareholders equally.”

In discussing the implications of model 3 (the catering model), I refer to the paper by Jensen (2005). In Jensen’s paper, he conducted a pioneering discussion of the agency costs of overvalued equity. He said “when a firm’s equity becomes substantially overvalued, it sets in motion a set of organisational forces that extremely difficult to manage- forces that almost inevitably lead to destruction of part or all of the core value of the firm.” In this paper, I draw a parallel with repurchase catering, whereby managers are rewarded on short-term (overvalued) equity, and so exploit investor irrationality to cater.

Jensen argues that often these forces are dangerous because the manager initially is unaware of the forces involved (bounded rationality). Once the manager realizes the problem it is too late, and he must keep catering (to the outside pressure). Jensen also considers how behavioral factors can expand the range of costly conflicts of interest arising from agency problems. For example, managerial optimism can lead to the vicious circle of catering.

Jensen likens this manipulation to managerial heroin (which I also liken to behavioral factors like overconfidence, emotional attachment to the firm etc). “Like an addictive drug, manning the helm of an overvalued company feels great at first… but as drug users learn, massive pain lies ahead.” In my model of which share repurchases are used as a catering device, managers try to exploit weak shareholder rights by using share repurchases to maximize their compensation. When the share price is far above the firm’s fundamental value, managers cannot and do not intend to derive the price down. At the end, the price is getting too high and destructs the firm value. Once
you start it, you cannot stop it.

Jensen argues that the massive agency costs of overvalued equity point to the failure of the current corporate governance system. Further, Equity-based contracts exacerbate the problem of overvalued equity (like my models demonstrated above). One obvious way out seems to abandon the equity-based compensation contracts. Jensen mentioned that the New York Stock Exchanges suggested director fees as the only type of compensation for the chairman of the audit committee. But he argues this type of compensation is not sufficient to attract top persons for such a position given the work and risks of this position.

What can I do about it now? Stopping overvaluation (like my catering) from happening in the first place is an obvious solution. But the main difficulty, as Jensen said, is the fact that it’s really hard for us to bear the costs in the short-term for the benefits in the long-term.

From the perspective of my paper, I do actually have some solutions to the agency problems. If share repurchases are used as a commitment device, I can solve this rational problem by increasing long-term equity, and/or increasing corporate governance/investor protection. If share repurchases are used as a timing device (in this model manager is still rational, but investors are irrational (market mispricing)), again I can solve this problem by increasing long-term equity/reducing short-term rewards, and/or increasing corporate governance/investor protection. If share repurchases are used as a catering device, and if managers still rational, I can solve as before. However, if the overvaluation is fed by managerial irrationality, then I may not be able to solve by increasing long-term equity/reducing short-term rewards, and/or increasing corporate governance/investor protection. I may need to address the managerial biases of overconfidence, regret etc.
6.6 Conclusion

In this chapter, I have considered the governance implications of the increasing use of share repurchases as a payout mechanism. Further, I examined the relationship between share repurchases and investor rights. I developed 3 models; a model of repurchases and agency costs of free cash flow, a repurchase timing model, and a catering model. I demonstrated that share holder rights and repurchases may be complements or substitutes. Further, I demonstrated that governance systems may be able to address agency problems associated with repurchases when managers and investors are rationally self-interested. However, when managers are irrational, it may be much more difficult to design effective governance systems. I considered this problem in the light of repurchase catering, and drew parallels with Jensen’s (2005) agency costs of overvalued equity. Finally, I note that my chapter has contributed to the debate on the relationship between corporate governance and corporate financing decisions.
Chapter 7 Managers’ and Investors’ View on Share Repurchases: A Survey

7.1 Introduction

Share repurchases have become a common corporate practice. With the growing share repurchase activity, there is large evidence that managers can use share repurchases to time the market to make profits. Cook, Krigman and Leach (2004) find that NYSE firms display such timing ability. Ginglinger and Hamon (2007) find firms in France buy back their shares at prices considerably lower than the market average, which indicates a significant timing ability. Furthermore, they find that firms act against market trends, and time their share repurchases to take advantage of falling prices. Brockman and Chung (2001) also find significant evidence of managerial timing by using repurchases in Hong Kong.

The evidence of managerial timing by using share repurchases points to market inefficiency and/or investor irrationality. In other words, if managers can time the market, investors must be reacting with a lag. Based on the lagged reaction assumption, I developed a series of theoretical models: the repurchase timing model (Chapter 3); the substitution model (Chapter 4) and the repurchase catering model (Chapter 5). However, do investors believe that they have a differential reaction to dividends and share repurchases? Do managers know that investors have a lagged reaction to share repurchases? Furthermore, do managers believe themselves that they can time the market? To find answers to these questions, I carried out this survey.

Questionnaire/survey is a good approach of collecting first-hand empirical data. There are quite a few previous researches that already adopt the questionnaire approach to

search empirical evidence on share repurchases. Baker, Gallagher and Morgan (1981) conducted a survey to document the reasons underlying the growing share repurchases and “to compare the rational of financial managers with theory”\(^{41}\). Wansley, Lane and Sarkar (1989) used a survey to investigate reasons for share repurchases and to identify the determinants of the price premium of tender offer repurchases. Baker, Powell and Veit (2002a) surveyed 642 financial executives to collect their views about why they announce share repurchases. Brav, Graham, Harvey and Michaely (2005) used both questionnaires and interviews to examine managers’ views on corporate payout policy, and they have obtained very interesting findings.

However, the focuses of previous surveys on share repurchases are largely on the motives behind share repurchases. Very few of them investigate both investors’ and managers’ views on managerial timing by using share repurchases. Especially, no previous survey investigates both managers’ and investors’ attitude towards investor’s differential reaction to dividends and share repurchases. I believe that my survey contributes to the current literature.

The results of my survey provide direct evidence of investors’ and managers’ view toward open-market share repurchases. My survey supports the assumption that investors exhibit differential reaction to dividend and repurchase announcements. Managers believe that they can time the market profitably, while investors believe that their reaction to repurchases is partly affected by the intensity of actual share repurchase executions. The results of my survey are consistent with the survey results of Wansley, Lane and Sarkar (1989) and Brav, Graham, Harvey and Michaely (2005).

The rest of this chapter organizes as follows. Section 2 presents related literature review. Section 3 presents my data and methodology. Section 4 provides survey result analysis and section 5 concludes this chapter.

7.2 Background Information

7.2.1 Motives for Share Repurchases

My models assume that firms buy back shares when they believe their shares are undervalued. They use share repurchases as a credible signal of undervaluation. In other words, I imply that undervaluation/signaling is the motive for share repurchases. However, there are many other motives that have been identified to explain share repurchases. Wansley, Lane and Sarkar (1989) have a good summary of the most popular motives for share repurchases, such as the dividend substitution motive, the leverage motive, the reissue motive, the agency cost motive, the wealth transfer motive, etc. Details of these motives are presented in the literature review section. Interesting readers can refer to the paper by Wansley et al. for further details.

7.2.2 Previous Survey Results

Baker, Gallagher and Morgan (1981) surveyed a random sample of 150 NYSE firms to investigate motives behind share repurchase programs between 1977 and 1979. They find there are two major motives for share repurchases during that period: the free cash flow motive and employee bonus or stock options motive. They also find that managers don’t agree that share repurchases are substitutes for cash dividends.

Wansley, Lane and Sarkar (1989) carried out their survey investigating motives behind share repurchases and determinants of tender offer share repurchase premiums. An important finding from their survey is that managers do use share repurchases to signal their confidence in the future of the firm, which management believes is not fully incorporated in stock prices. They also find that almost all the responses disagree with the dividend substitution hypothesis.
Baker, Powell and Veit (2002a) carried out a questionnaire to survey 642 top financial executives to learn their views about share repurchases. Consistent with the findings from the survey by Wansley, Lane and Sarkar (1989), their survey results show that the most highly agreed reason for repurchasing shares is the signaling hypothesis, specifically the undervaluation version of this hypothesis.

Brav, Graham, Harvey and Michaely (2005) recently surveyed 384 CFOs and Treasurers, and conducted in-depth interviews with an additional two dozen, to determine the key factors that drive dividend and share repurchase policies. Unlike the previous surveys, their survey includes many aspects of corporate payout policies and obtains many interesting results. In relation to my work, they find that managers view share repurchases as being more flexible than dividends and that there is strong support for the signaling/undervaluation explanation for share repurchases. Further, they find many managers believe that they can beat the market and some managers claim they are even rewarded financially for beating the market.

7.2.3 My Survey

Based on managerial timing evidence by using open market share repurchases, I assume investors have a differential reaction to dividends and share repurchases. Investors react to dividends immediately while they react to share repurchases with a lag. With this lagged reaction assumption, I have developed a series of theoretical models and I have obtained very interesting results from those models.

Is there any evidence of the lagged reaction assumption? There are indeed some empirical evidences about investors’ lagged reaction to share repurchases. Ikenberry et al. (1995) investigate long-run firm performance following open-market share repurchase announcements in the US, and they find that the information conveyed by open market share repurchases is largely ignored. Therefore, they assume that the market treats repurchase announcements with skepticism, leading prices to adjust
slowly over time. As a result, their reaction to share repurchase announcements is delayed. Skjeltorp (2004) investigates the market impact and timing of open market share repurchases in Norway, and he also finds ‘the market seems to underreact to the announcement signal’.

However, do investors themselves know that they have a differential reaction to dividends and share repurchases? If the answer is “yes”, why do they experience such a lag? Do managers know that investors have a lagged reaction to share repurchases? If this is the case, do managers take into account of this lagged reaction when making payout decisions? No previous survey examines these questions.

Although the survey of Brav et al. (2005) investigates many topics about corporate payout policy, including the issue about managerial timing by using share repurchases, it does not examine the actual share repurchase behavior. Nor does it ask managers what factors affect their repurchase behavior. Answers to these questions are, however, very important to my models.

My survey aims to investigate both investors’ and managers’ view on the topics mentioned above. My questionnaire is made up of two sections. Section A are mainly for both investors and managers. I ask them questions about the dividend substitution hypothesis, the differences between dividends and share repurchases, their views about the differential reactions to dividends and share repurchases, and their reactions to the speed and size of share repurchases. Section B is exclusively for managers. I ask managers: a) whether they believe they can time the market; b) If so, how do they execute their share repurchase: intensively or gradually; c) the importance of communication with investors when there is a dividend cut or a repurchase cut; and d) the effects of the volatility of earnings on managers’ choice on payout methods.

In summary, my survey results, indeed, provide direct evidence that investors and managers have different view towards dividends and open-market share repurchases.
The results of my survey are consistent with the survey results of Wansley, Lane and Sarkar (1989), Baker, Powell and Veit (2003) and Brav, Graham, Harvey and Michaely (2005) in the sense that signaling is the motive behind share repurchases and that managers view their shares are undervalued when they intend to announce share repurchase programs. My survey results also support the hypothesis that investors exhibit differential reaction to dividend and repurchase announcements. Managers believe that they can time the market profitably, and investors believe that their reaction to repurchases is affected by the intensity of actual share repurchases. My survey results also suggest that investors lagged reaction to share repurchases may result from their slow understanding of share repurchases.

7.3 Data and Methodology

7.3.1 The Sample and Data

I have developed a series of models with the assumption that investors have differential reaction to dividends and share repurchases. Specifically, investors react to dividend immediately while they react to share repurchases with a lag. In my share repurchase timing model (Chapter 3) I also assume that managers are able to time the market profitably by repurchasing undervalued shares. This model is again based on the crucial assumption that irrational investors do not immediately fully understand the signals provided by repurchase announcements, and hence initially underreact, with increasing reaction over time.

In order to provide support for the assumptions of my models, I surveyed managers and investors to investigate their attitude towards share repurchases and dividends. My survey was designed to consider my main areas relating to repurchase and dividend policy; a) do investors under-react, with lagged reaction over time, following share repurchases? b) do managers believe that they can time the market profitably using share repurchases? If so, what is their timing policy (that is, do they repurchase
Managers’ and Investors’ View on Share Repurchases: A Survey

intensively and immediately, or do they repurchase slowly and gradually)? c) do investors react to repurchases and dividends differently? d) do managers believe that investors react to repurchases and dividends differently? If so, how does this affect the manager’s payout policy (i.e., his choice between dividends and repurchases)?

The survey questions relating to a) and b) provide direct support for my repurchase timing model. Although my model does not consider the role of dividends, I also ask questions relating to c) and d), that is, the difference between dividends and repurchases. There are two reasons for this. Firstly, if I assume that investors fully understand, and react immediately and rationally, to the signals provided by dividend policy, then my model implicitly posits a differential reaction to dividends and repurchases. Secondly, my substitution model analyzes the difference between dividends and repurchases policies based on investors’ differential reactions. Hence, the survey questions relating to c) and d) will be relevant to this model.

My survey was delivered in late 2004 via the following methods. Firstly, I delivered hard copies of the questionnaire by post to financial managers of 38 randomly-selected companies listed on the London Stock Exchange (I obtained 6 responses). Secondly, I put my questionnaire firstly on the following website (http://www.surveygalaxy.com/surdownloads.asp?survey_id=1256) and then on the website (http://www.my3q.com/home2/50/ganggang/27982.phtml), obtaining a further 52 responses to date. In August 2005 when I was doing empirical tests, I made a second questionnaire delivery to 150 UK repurchasers from my identified samples. I have got 8 responses this round. Therefore, I have 66 responses in total.

7.3.2 The Questionnaire

In section A, I ask investors several questions relating to dividends and repurchases. Some questions in this section are also required to be answered by managers (see, for example, the question relating to the substitution hypothesis). Section B is only for
managers. Investors were not required to answer questions in this section.

There are 9 main questions in Section A. I begin by investigating views about the ‘substitution hypothesis’ (see Q2). This hypothesis states that dividends are disappearing simply because firms are substituting repurchases for dividends. Previous research provides mixed evidence. For example, managers rejected the substitution hypothesis in a survey undertaken by Brav et al (2005).

Question 3 to 5 focus on some largely documented differences between dividends and share repurchases. Question 3 relates to the difference in flexibility between dividend and repurchase policy. Questions 4 to 7 examine the market’s differential reaction to dividend and repurchase announcements. Questions 8 and 9 investigate investors’ understanding of dividends and repurchases. My models implicitly assume that investors have different knowledge about dividends and repurchases, which in turn leads to their differential reactions to them. Answers to these two questions are expected to provide evidence on this assumption.

Question 10 examines investors’ reaction to the speed and size of share repurchases. In Q10.1 I examine investors’ reaction to intensive repurchases while in Q10.2 I examine investors’ reaction to slow and gradual repurchases. Since my model predicts that the speed and intensity of actual share repurchases will affect investors’ reaction, these results will be very important to my model.

Section B is mainly for managers. There are four main questions in this section. Question 11 addresses managers’ belief in their ability to time the market. Q11.1 asks managers whether they attempt to time the market by using repurchases. On this basis, Q11.2 investigates how managers time the market by using share repurchases. Question 12 investigates how important it is for managers to communicate dividend cuts and repurchase cuts with investors. This investigates the difference between dividends and repurchases from manager’s point of view.
Table 7-1 Descriptive Analysis of Survey Results (1)

<table>
<thead>
<tr>
<th>Q</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Q1</td>
<td>35</td>
<td>53.0%</td>
<td>23</td>
<td>34.8%</td>
</tr>
<tr>
<td>Q2</td>
<td>28</td>
<td>42.4%</td>
<td>24</td>
<td>36.4%</td>
</tr>
<tr>
<td>Q3.1</td>
<td>2</td>
<td>3.0%</td>
<td>6</td>
<td>9.1%</td>
</tr>
<tr>
<td>Q3.2</td>
<td>16</td>
<td>24.2%</td>
<td>42</td>
<td>63.6%</td>
</tr>
<tr>
<td>Q3.3</td>
<td>10</td>
<td>15.2%</td>
<td>4</td>
<td>6.1%</td>
</tr>
<tr>
<td>Q4.1</td>
<td>1</td>
<td>1.5%</td>
<td>2</td>
<td>3.0%</td>
</tr>
<tr>
<td>Q4.2</td>
<td>33</td>
<td>50.0%</td>
<td>5</td>
<td>7.6%</td>
</tr>
<tr>
<td>Q4.3</td>
<td>4</td>
<td>9.3%</td>
<td>29</td>
<td>67.4%</td>
</tr>
<tr>
<td>Q5.1</td>
<td>15</td>
<td>22.7%</td>
<td>3</td>
<td>4.5%</td>
</tr>
<tr>
<td>Q5.2</td>
<td>12</td>
<td>18.2%</td>
<td>4</td>
<td>6.1%</td>
</tr>
<tr>
<td>Q6.1</td>
<td>35</td>
<td>81.4%</td>
<td>7</td>
<td>16.3%</td>
</tr>
<tr>
<td>Q6.2</td>
<td>10</td>
<td>23.3%</td>
<td>17</td>
<td>39.5%</td>
</tr>
<tr>
<td>Q6.3</td>
<td>12</td>
<td>27.9%</td>
<td>13</td>
<td>30.2%</td>
</tr>
<tr>
<td>Q7.1</td>
<td>56</td>
<td>84.8%</td>
<td>4</td>
<td>6.1%</td>
</tr>
<tr>
<td>Q7.2</td>
<td>18</td>
<td>27.3%</td>
<td>40</td>
<td>60.6%</td>
</tr>
<tr>
<td>Q8.1</td>
<td>36</td>
<td>83.7%</td>
<td>3</td>
<td>7.0%</td>
</tr>
<tr>
<td>Q8.2</td>
<td>17</td>
<td>39.5%</td>
<td>1</td>
<td>2.3%</td>
</tr>
<tr>
<td>Q8.3</td>
<td>0</td>
<td>0.0%</td>
<td>19</td>
<td>44.2%</td>
</tr>
<tr>
<td>Q9</td>
<td>10</td>
<td>23.3%</td>
<td>4</td>
<td>9.3%</td>
</tr>
<tr>
<td>Q10.1</td>
<td>5</td>
<td>11.6%</td>
<td>23</td>
<td>53.5%</td>
</tr>
<tr>
<td>Q10.2</td>
<td>0</td>
<td>0.0%</td>
<td>1</td>
<td>2.3%</td>
</tr>
<tr>
<td>Q11.1</td>
<td>23</td>
<td>74.2%</td>
<td>8</td>
<td>25.8%</td>
</tr>
<tr>
<td>Q11.2</td>
<td>10</td>
<td>43.5%</td>
<td>13</td>
<td>56.5%</td>
</tr>
<tr>
<td>Q12.1</td>
<td>0</td>
<td>0.0%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Q12.2</td>
<td>13</td>
<td>41.9%</td>
<td>4</td>
<td>12.9%</td>
</tr>
<tr>
<td>Q13.1</td>
<td>1</td>
<td>3.2%</td>
<td>2</td>
<td>6.5%</td>
</tr>
<tr>
<td>Q13.2</td>
<td>14</td>
<td>45.2%</td>
<td>5</td>
<td>16.1%</td>
</tr>
<tr>
<td>Q14.1</td>
<td>10</td>
<td>32.3%</td>
<td>9</td>
<td>29.0%</td>
</tr>
<tr>
<td>Q14.2</td>
<td>21</td>
<td>67.7%</td>
<td>6</td>
<td>19.4%</td>
</tr>
</tbody>
</table>

Note: Total sample is 66, which includes 35 ‘Investor’, 23 ‘Manager’ and 8 ‘Both investor and manager’. Those who choose ‘Both investor and manager’ can answer all the questions. Therefore, for questions in section A (Q4.3, 6, 8, 9, and 10) that are only for investors, the total sample is 43 (i.e., 35+8=43). In Section B (Q11-14), all the questions are for ‘Manager’. Hence, the total sample is the sum of the sample for ‘Manager’ and the sample for ‘Both investor and manager’, which is 31 (i.e., 23+8). Q11.2 is based on the answer from Q11.1. Total sample for this question is 23.
Questions 13 and 14 focus on the effects of earnings volatility on managers’ choice between dividends and repurchases as a payout method. Q 13 is about whether managers believe that the stability of future earnings has an effect on their payout method decisions. On this basis, Q14 asks managers which payout method(s) they would choose when the forecasted earnings are stable and volatile respectively. These questions are directly related to my substitution model, and answers to them will provide evidence for my model assumptions.

7.4 Survey Result Analysis

7.4.1 Internal Consistency and Cronbach’s Alpha

My questionnaire aims to investigate both managers’ and investors’ attitude towards dividends and share repurchases. A big difference to normal questionnaires is that my questionnaire is comprised of two multiple-item, four-point Likert type scales\textsuperscript{42} (i.e. Section A and Section B). Typically, in a five-point Likert type scale, subjects are instructed to select one of five answers: strongly agree, agree, undecided, disagree, or strongly disagree. In my four-point Likert scale, I only designed four choices of answer for each question, based on experimental evidence that people are more inclined to choose the answer in the middle (i.e. the neutral one, like undecided/no opinion) of a survey. I allocate different points to the four answers ranging from -2 to 2.

Section A of my survey focuses on investors’ attitude towards dividends and share repurchases. It contains a twenty-item, four-point Likert type scale. Cronbach’s alpha coefficients for section A is 0.87. Also, the section is comprised of seven sub-scales: policy flexibility (Cronbach’s alpha = 0.70), consequences of reducing payout (Cronbach’s alpha = 0.71), cash flow difference (Cronbach’s alpha = 0.82), speed of

\textsuperscript{42} Many other researchers also use the four-point Likert type scale survey instead of the traditional five-point scale, for example, Wingenbach, 2000, Journal of Agricultural Education, Vol.41, Issue1.
reaction (Cronbach’s alpha = 0.74), price reaction (Cronbach’s alpha = 0.80), understanding (Cronbach’s alpha = 0.81), and reaction to actual repurchases (Cronbach’s alpha = 0.80).

Section B contains the same Likert type scale as section A, but consisted of 8 items that measures managers’ attitude toward dividends and share repurchases. Section B Cronbach’s coefficients are 0.81. It is comprised of three sub-scales: communication (Cronbach’s alpha = 0.70), importance of stability of future earnings (Cronbach’s alpha = 0.74), and impact of stability of future earnings on payout methods (Cronbach’s alpha = 0.71).

The Cronbach’s alphas of both section A and section B are more than 0.7, which proves that section A and section B are internally consistent\(^ {43}\). Furthermore, the Cronbach’s alpha of each sub-scale within these two sections is no less than 0.7. These results confirm that my survey results are robust.

### 7.4.2 Descriptive Results

The table above\(^ {44}\) (Table 7-1) provides summarized descriptive results from my survey. In total, I have received 66 responses (35 ‘Investor’, 23 ‘Manager’, and 8 who are ‘Both investor and manager’). The results are as follows.

To analyze the survey results\(^ {45}\), I allocate four points to the four answers A to D (-2, -1, 1, 2). I calculate the mean value of each question, using two-tailed t tests to test for significance at the 5% level. The result is reported in the Table 7-2 below. Since the questionnaire is designed for three different groups (‘Investor’, ‘Manager’, and ‘Both

\(^ {43}\) Cronbach’s alpha measures internal consistency of the items in a scale. A high value of Cronbach’s alpha indicates good internal consistency, and so the results from this scale are robust. George and Mallery (2003) point out that a Cronbach’s alpha with a value no less than 0.7 is normally acceptable.

\(^ {44}\) I do not provide the actual survey questions here. Interested reader can refer directly to the survey at http://www.surveygalaxy.com/surpublishes.asp?survey_id=1256. My survey at the website (http://www.my3q.com/home2/50/ganggang/27982.phtml) has expired.

\(^ {45}\) My approach follows closely the methodology adopted by Wansley et al (1989).
investor and manager”), sample sizes may vary by questions.

Questions in section A are mainly for the ‘investor’ group. The sample size for these questions is 43. Some questions in this section are also available for the ‘manager’ group. The sample size for these questions is 66. Section B is for the ‘manager’ group only. Therefore, the sample size for these questions is the sum of the ‘manager’ and ‘both investor and manager’ groups, that is, 31. Question 11.2 is dependent on those who give a ‘Yes’ answer to Question 11.1, and hence, the sample size for this question is 23.

To analyze the significance of the results, a two-tailed t test with p-value has been used in Table 7-2 and 7-3. P-value measures the probability that a particular result of the t test would occur by chance if the null hypothesis is true (Howell, 2004, “Fundamental Statistics for the Behavioral Sciences”). For example, if the significance level is 0.05, then the results are only 5% (2.5% on either side) likely to accept that the hypothesis is true. In other words, for 95% of the results we need to reject the hypothesis. Therefore, if the actual p-value is 0.04 (less than 0.05) then we are confident to reject the null hypothesis and so our results are statistically significant at 0.05 level.

In my model, repurchases are not substitutes for dividends. They are used to time the market. Question 2 focuses on the dividend substitution hypothesis, and provides support for my model. From Table 7-1, it is clear that most respondents do not believe that repurchases are substitutes for dividends. 87.8 percent disagree or strongly disagree that repurchases are substitutes for dividends. The mean value for this question is –0.97. The closest answer to it is Answer B, which is ‘strongly disagree’. Furthermore, from table 7-2, I observe that the p-value for this question is less than 0.001, which means the probability to reject the null hypothesis is more than 0.999.
Therefore, the result is significant at 0.05 level.

This result is interesting, because many researchers observe the declining percentage of dividend payers and the rapidly increasing use of open-market share repurchases and they assume that repurchases are substituting for cash dividends (e.g. Fama and French 2001, Grullon and Michaely, 2002). My survey result reveals that neither managers nor investors believe that repurchases are substitutes for dividends.

In my models, I assume that investors under-react to repurchase announcements, and that managers take advantage of this investor irrationality to time the market. I now turn to the survey results relating to investor reaction and management timing policy.

### Table 7-2 Descriptive Analysis of Survey Results (2)

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Mean Value (N=66)</th>
<th>p-value</th>
<th>Question No.</th>
<th>Mean Value (N=43)</th>
<th>p-value</th>
<th>Question No.</th>
<th>Mean Value (N=31)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2</td>
<td>-0.97</td>
<td>p&lt;0.001</td>
<td>Q4.3</td>
<td>-0.47</td>
<td>p&lt;0.02</td>
<td>Q11.1</td>
<td>-1.74</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Q3.1</td>
<td>0.97</td>
<td>p&lt;0.001</td>
<td>Q6.1</td>
<td>-1.74</td>
<td>p&lt;0.01</td>
<td>Q12.1</td>
<td>1.61</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Q3.2</td>
<td>-0.98</td>
<td>p&lt;0.001</td>
<td>Q6.2</td>
<td>-0.16</td>
<td>p&gt;0.5</td>
<td>Q12.2</td>
<td>-0.39</td>
<td>p&lt;0.2</td>
</tr>
<tr>
<td>Q3.3</td>
<td>0.61</td>
<td>p&lt;0.001</td>
<td>Q6.3</td>
<td>-0.02</td>
<td>p&gt;0.5</td>
<td>Q13.1</td>
<td>1.10</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Q4.1</td>
<td>1.53</td>
<td>p&lt;0.001</td>
<td>Q8.1</td>
<td>-1.65</td>
<td>p&lt;0.001</td>
<td>Q13.2</td>
<td>-0.61</td>
<td>p&lt;0.1</td>
</tr>
<tr>
<td>Q4.2</td>
<td>-0.56</td>
<td>p&lt;0.01</td>
<td>Q8.2</td>
<td>-0.16</td>
<td>p&lt;0.5</td>
<td>Q14.1</td>
<td>-0.45</td>
<td>p&lt;0.2</td>
</tr>
<tr>
<td>Q5.1</td>
<td>0.30</td>
<td>p&lt;0.1</td>
<td>Q8.3</td>
<td>0.53</td>
<td>p&lt;0.02</td>
<td>Q14.2</td>
<td>-1.35</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Q5.2</td>
<td>0.42</td>
<td>p&lt;0.02</td>
<td>Q9</td>
<td>0.19</td>
<td>p&lt;0.4</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Q7.1</td>
<td>-1.62</td>
<td>p&lt;0.001</td>
<td>Q10.1</td>
<td>-0.28</td>
<td>p&lt;0.2</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Q7.2</td>
<td>-0.98</td>
<td>p&lt;0.001</td>
<td>Q10.2</td>
<td>1.12</td>
<td>p&lt;0.001</td>
<td>Q11.2</td>
<td>-1.43</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>

*Note: Questions in column 1 are required to be answered by all the ‘Investor’, ‘Manager’ and ‘Both investor and manager’. Questions in column 4 are only for those who choose ‘Investor’ or ‘Both investor and manager’ of Q1. Questions in column 7 are for those who choose ‘Manager’ or ‘Both investor and manager’ when answering Q1. A two-tailed t-test against the hypothesis that the mean value of answers to each question is zero is also presented.*
From Table 7-1, I observe that over 80 percent of investors believe that their reaction to dividends announcements is ‘very quick’ (Q6.1). Interestingly, although 37.3 percent think their reaction to repurchase announcements is ‘slow’ or ‘very slow’, the majority of them (62.7 percent) still think that their reaction to repurchase announcements is ‘quick’ or ‘very quick’ (Q6.2). Investors seem to believe that their reaction to both dividend announcements and repurchase announcements is ‘quick’ or ‘very quick’. The mean value to Q6.1 is –1.74. It strongly suggests answer A, which says investors believe their reaction to dividend announcements is ‘very quick’ and the result is significant at 0.05 level. On the other hand, the mean value to Q6.2 is –0.16. The closest answer to it is Answer B, which says ‘quick’, but the result is not significant at 0.05 level.

When I observe their answers to Q6.3, the difference between their reaction to dividend announcements and to repurchase announcements is much clearer. When comparing their reaction to dividends announcements, 58.1 percent think their reaction to dividend announcements is ‘quicker’ or ‘much quicker’ than to repurchase announcements. The mean value to it is –0.02, which suggests most of them believe they react to dividend announcements quicker than to repurchase announcements. However, according to the p-value, the result is not significant.

When asking managers whether they attempt to time the market by using repurchases (Q11.1), 74.2 percent say ‘Yes’. The mean value is –1.74, which suggests answer A, and the result is significant. This is consistent with Brav et al’s (2005) survey results, in which most CFOs believe that they can time the market and buy back their shares profitably.

When managers are asked about how they execute share repurchases (Q11.2), 43.5 percent say that they will do it intensively while the rest of them think that they will do it slowly and gradually over time. The mean value is –1.43 and is significant at 0.05 level.
This result is interesting. My timing model predicts that share repurchases becomes more immediate and intensive as investor rationality increases. Therefore, managers should repurchase intensively if investors are highly rational (but not fully). The result that 56.5 percent think that they will do it gradually implies that most of managers believe that investors are very irrational, and their rationality is growing slowly so that managers can take their time to repurchase shares. Hence, my survey suggests that managers believe that investors react slowly to repurchase announcements.

My timing model predicts that investors’ rationality and hence reaction to repurchases will depend on the time and size effects. Therefore, I ask their reaction to intensive and gradual repurchases. It reveals that the majority (65.1 percent) believes that their reaction to intensive actual repurchases is ‘strong’ or ‘very strong’. When I ask for their reaction to gradual actual repurchases, 81.4 percent of them believe their reaction will be weak (Q 10). The mean value of this question (Q10.2) is 1.12, which is significant at 0.05 level. This implies that investors believe that their reaction to actual repurchases will be affected by the intensity of actual repurchases, which in turn is affected by the time and size of actual repurchases. This provides strong support for my model.

Furthermore, I believe a comparison between answers from “Investor” and those from “Manager” to those questions that both of the groups are required to answer could generate more interesting insights into the difference between investors’ and managers’ attitude towards dividends and share repurchases. The results are presented in Table 7-3.

Q2 investigates the “substitution hypothesis”. We can see that relative to “Investor”, “manager” is more reluctant to believe that repurchases are used to substitute for dividends. The p-value confirms the difference is significant.
Table 7-3 Survey Comparison between ‘Investor’ and ‘Manager’

This table presents the comparison results between "investor" and "manager" about the questions both of them are required to answer. Mean values are presented for both investors and managers. A two tailed t-test with p-value is against the hypothesis that there is no difference between "investor" and "manager".

<table>
<thead>
<tr>
<th>Question No.</th>
<th>&quot;Investor&quot; (mean value)</th>
<th>&quot;Manager&quot; (mean value)</th>
<th>Difference</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2</td>
<td>-0.6000</td>
<td>-1.6087</td>
<td>1.0087</td>
<td>0.0021</td>
</tr>
<tr>
<td>Q3.1</td>
<td>0.8571</td>
<td>1.2174</td>
<td>-0.3602</td>
<td>0.1451</td>
</tr>
<tr>
<td>Q3.2</td>
<td>-0.8571</td>
<td>-1.0870</td>
<td>0.2298</td>
<td>0.3389</td>
</tr>
<tr>
<td>Q3.3</td>
<td>0.5429</td>
<td>0.9565</td>
<td>-0.4137</td>
<td>0.1959</td>
</tr>
<tr>
<td>Q4.1</td>
<td>1.2857</td>
<td>1.7391</td>
<td>-0.4534</td>
<td>0.0385</td>
</tr>
<tr>
<td>Q4.2</td>
<td>-0.3429</td>
<td>-0.7391</td>
<td>0.3963</td>
<td>0.3550</td>
</tr>
<tr>
<td>Q5.1</td>
<td>0.0857</td>
<td>1.0435</td>
<td>-0.9578</td>
<td>0.0026</td>
</tr>
<tr>
<td>Q5.2</td>
<td>-0.0571</td>
<td>1.0435</td>
<td>-1.1006</td>
<td>0.0008</td>
</tr>
<tr>
<td>Q7.1</td>
<td>-1.5714</td>
<td>-1.9565</td>
<td>0.3851</td>
<td>0.1172</td>
</tr>
<tr>
<td>Q7.2</td>
<td>-1.3714</td>
<td>-0.7826</td>
<td>-0.5888</td>
<td>0.0165</td>
</tr>
</tbody>
</table>

Note: Because the aim of this table is to compare the answers from ‘Investor’ with the answers from ‘Manager’ to the same questions, answers from ‘Both investor and manager’ group are excluded. Therefore, the total sample for ‘Investor’ is 35 (i.e. 43-8=35) and the total sample for ‘Manager’ is 23 (i.e. 31-8=23).

Q3, Q4 and Q5 investigate investor and manager’s response to some largely documented differences between dividends and share repurchases. From Q3, we can see managers are more likely to believe than investors that dividend policy is less flexible than repurchase policy. This result is consistent with empirical evidence, but it is not significant, which means there is not statistically significant difference between investors and manages in this question. Q4 investigates whether there is negative consequence to reducing dividends and repurchases. My results reveal that although both investors and managers believe there are negative consequences to reducing dividends, the statement is more strongly supported by managers, and the difference is significant. Q5 investigates cash flow difference between dividends and share repurchases. The mean value of ‘investor’ group for Q5.1 is 0.0857, only slightly in support of the statement relative to the mean value of “manager”. And the difference is significant. Similar result comes from Q5.2. From the p-value we can see the difference is significant. The results suggest that investors have very little
knowledge about the cash flow difference between dividends and repurchases while managers are aware of these differences. These results reveal that investors experience difficulty in understanding repurchases while managers don’t. Managers have an advantage over investors in understanding the differences between dividends and share repurchases. This probably leads to investors’ differential reaction to dividends and repurchases. Managers, because they are aware of these differences, can take advantage of investors’ differential reaction to make payout decisions.

The difference is much clearer in Q7. Q7 investigate the share price behavior following dividend increase announcements and share repurchase announcements. Although most of investors and managers believe that share prices will go up immediately following dividend increase announcements, most investors still believe that share price will go up immediately following repurchase announcements while most managers believe that share price will go up gradually following repurchase announcements. The difference is significant. Managers’ answers are in support of the empirical evidences which find the market has a slow and lagged reaction to share repurchases. However, investors seem to have little knowledge about repurchases. To get to know and understand repurchase, it will take time and so investors’ reaction is slow and lagged. Managers, on the other hand, can take advantage of this lagged reaction to time the market profitably. These provide strong support to my model. I believe these could partially explain why investors have a differential reaction to dividends and repurchases.

In summary, my survey results provide direct evidence of investors’ and managers’ view toward open-market share repurchases. My survey supports the hypothesis that investors exhibit differential reaction to dividend and repurchase announcements. Managers believe that they can time the market profitably, and investors believe that their reaction to repurchases is affected by the intensity of actual share repurchases.

The results of my survey are consistent with the survey results of Wansley, Lane and
Sarkar (1989) and Brav, Graham, Harvey and Michaely (2005). Wansley, Lane and Sarkar (1989) ask managers why they repurchase their shares and find that undervaluation is the most popular answer while using repurchases to substitute for cash dividends is one of the most unpopular answers. Furthermore, they investigate management’s view on the determinants of tender offer premiums. They find that the tender offer premium is affected by the size of the repurchase.

Brav, Graham, Harvey and Michaely (2005) investigate CFOs’ belief on payout policy. They also find that most of the CFOs do not believe that repurchases are substitutes for dividends. Therefore, these two surveys obtain the same results as mine: repurchases are not substitutes for dividends, managers use repurchases to time the market, and repurchase premium is affected by size of repurchase.

Although my survey provides insight into the “dividend v repurchase” puzzle, there are limitations. Besides the inherent limitations from the survey approach itself, my survey sizes are relatively small and they vary across questions. Furthermore, the multiple-item four-point Likert scale is different to the normal questionnaire. I believe the results would be different if I redesigned it following the normal approach.\textsuperscript{46}

\textsuperscript{46} For detailed analysis of limitation of this survey, please refer to the conclusion chapter (Chapter 9).
Chapter 8 Empirical Tests About Managers’ Timing Ability in 
and Investors’ Reaction to Share Repurchases In the U.K.

8.1 Introduction

In the previous chapters (Chapter 3 to 6) I have presented my models developed during my PhD study. The common assumption these models share is that investors have a differential reaction to dividends and share repurchases. Specifically, investors react to dividends immediately while they react to share repurchases with a lag. Based on this assumption, my “substitution model” examines how managers make their payout method choice when the actual earnings are stable and volatile; my “timing model” analyze what factors affect managers’ actual share repurchase behavior and my “catering model” shows how managers choose the catering device when there are real investment opportunities.

But do investors know that they have a differential reaction to dividends and share repurchases? Do managers know that investors have a lagged reaction to share repurchases? Do managers believe that they can time the market? If “yes”, do they do it intensively or gradually over time, etc.? To answer these questions, I carry out a survey on both investors and managers. The survey results are generally in support of the lagged reaction assumption and the model predictions. But, the potential survey-related bias exists. For example, the possibility of non-response bias does exist although I take the normal precautions to reduce this bias including multiple delivery methods and guaranteeing confidentiality. Also, there is possibility of sample selection bias. Therefore, I believe survey evidence alone is not enough. I need to do empirical work as well to test my model assumptions and results by using the real data from the operations of companies who conduct share repurchase programs.

There is vast literature about the empirical work on market reaction to share
repurchases. The majority of these empirical works find that the market reacts favorably to share repurchase announcements, which results in abnormal stock return in the short-term following share repurchase announcements. For example, Comment and Jarrell (1991) compare three forms of common stock repurchases, and find that open market share repurchase programs induce an average excess return of 2%. Liano, Huang and Manakyan (2003) examine the short-term and long-term returns to firms following open market share repurchase announcements, and they find that repurchasing firms enjoy significant positive excess returns during the five-day announcement window. Zhang (2002a) investigates the share price performance surrounding share repurchase announcements in Japan, and he finds that there is a statistically significant abnormal return at the announcements about 5%. Hatakeda and Isagawa (2004) also investigate stock price behavior surrounding stock repurchase announcements in Japan and they find similar results that stock prices in Japan go up in response to stock repurchase announcements.

To the market reaction and price performance following share repurchase announcements in the long term, the empirical evidences are mixed. Ikenberry, Lakonishok and Vermaelen (1995) examine long-run performance following open market share repurchase announcements and they find that the average abnormal four-year buy-and-hold return measured after the initial announcements is 12.2%. Li and McNally (1999) examine open market share repurchases in Canada, and they find the repurchase announcements are preceded by a small decline in share price, accompanied by a significant announcement period return, and are followed by a sustained increase in price. Liano, Huang and Manakyan (2003) examine the short-term and long-term returns to firms following open market share repurchase announcements, and they find that repurchasing firms, however, in average do not outperform their industry peers in the long run. Zhang (2002b) studies share price performance following actual share repurchase in Hong Kong, and he finds that on average repurchasing firms do not exhibit superior abnormal performance either initially or over long horizons. But, to some small and value firms, the three-year
Empirical Tests

buy-and hold abnormal return is over 20%. Eberhart and Siddique (2005) examine the reasons behind the firms’ buybacks. In contrast to the signaling theory, they find no consistent evidence of positive long-term abnormal returns following share repurchase announcements.

Among the empirical literature on managers’ timing ability by using actual share repurchases, Cook, Krigman and Leach (2004) carry out a pioneer work. They examine the timing and executions of open market share repurchases in the U.S. and find that NYSE firms do display some timing ability while Nasdaq firms don’t. Brockman and Chung (2001) investigate the timing of open market share repurchases in Hong Kong and find that managers exhibit substantial timing ability. Ginglinger and Hamon (2007) find that in France on average managers have some timing ability.

Although there are vast literature on share repurchases in the U.S., there is very few of them in the U.K. The first empirical evidence, as far as I am aware, is done by Rees (1996). He examines the share price impact of open market share repurchases in the UK and he find that similar to the evidence in the US, there is positive reaction on the day of the announcement of the repurchases. Rau and Vermaelen (2002) examine the share repurchase activity in the UK and find that firms announcing share repurchases earn smaller excess returns, both in the short run and in the long run, than those earned by firms in the US. Oswald and Young (2004) develop the study by Rau and Vermaelen (2002) a bit further. They take a new method to collect repurchase data in the UK and find significantly positive 12-month excess returns following announcements. They also find actual share repurchases are preceded by significantly negative excess returns and so they suggest that managers display some timing ability. But they do not go into such details of measuring managers’ timing ability as Cook et al. (2000) do.

Whether there is abnormal long term excess return following share repurchase announcements is very important to my models. If there is long term excess return
following share repurchase announcements, it suggest the market underreact or react with a lag, just as Ikenberry et al. (1995) suggest. And so it provides a strong support to my lagged reaction assumption.

My empirical tests aim to find out whether there is abnormal long term excess return following share repurchase announcements in the UK market. Both Rau and Vermaelen (2002) and Oswald and Young (2004a) find evidence that there is excess return in the long run following announcements in the UK. I expect I can find similar evidence through my tests. Furthermore, I want to investigate whether UK managers display some timing ability when they execute actual share repurchases. Oswald and Young (2004a) find some evidence that UK managers do have some timing ability. But, they do not go into further details, like how managers execute share repurchases to time the market and how much cheaper managers buy back their shares than the benchmarks? I address these questions in my tests against managers’ timing ability. I first follow Oswald and Young (2004a) to test whether actual share repurchases are preceded by significantly negative excess returns. Then I follow Cook et al. (2004), comparing the actual share repurchase costs with some benchmarks, to see whether managers buy back their shares at a lower costs than the benchmarks.

My empirical test results, in summary, do provide managerial timing evidence by using share repurchases. Managers’ actual acquisition cost is less than both the maximum cost and the closing price cost during the repurchase period. The results also provide a support to the investors’ lagged reaction assumption. Basing on the managerial timing evidence I find, investors must react to repurchase announcements with a lag. Otherwise, managers cannot time the market profitably.

This chapter organizes as follows. Section 8.2 provides literature review about related empirical works. Section 8.3 presents the disclosure requirements and regulations across countries. Section 8.4 presents details of my empirical tests, including the design of tests, identification of samples, data collection and the descriptive statistic
result analysis. Section 8.5 presents the empirical test against managerial timing ability. Section 8.6 concludes this chapter.

8.2 Background Information

8.2.1 Market Reaction to Share Repurchase Announcements

Many researches investigate the motives behind share repurchase programs and develop many theories, like the dividend substitution hypothesis, the free cash flow/agency problem hypothesis, the signaling/price supporting hypothesis, the wealth transfer hypothesis, etc. Among these motives, the signaling hypothesis is one of the most popular ones (e.g., Wansley, Lane and Sarkar, 1989; Baker, Powell and Veit, 2003; and Brav, Graham, Harvey and Michaely, 2005).

The signaling theory says that because of information asymmetry between managers and outside investors, managers may have some superior information about the firms’ fundamental value than outside investors. When managers observe that the share prices are far below its fundamental value (i.e., managers think their firms are undervalued), they intend to announce share repurchase programs to function as a signal to the market. The signaling theory predicts that the market should respond favorably to the signals and the share prices are expected to go up following share repurchase announcements.

8.2.1.1 Short-term Market Reaction Following Announcements

Based on the signaling motive, many empirical works try to find evidence of market reaction to the share repurchase signals. The majority of these empirical works find that the market reacts favorably to share repurchase announcements, which results in abnormal stock return in the short-term following share repurchase announcements. For example, Comment and Jarrell (1991) compare three forms of common stock
Chapter 8

repurchases: Dutch-auction share repurchases, fixed-price self-tender offers and open market share repurchases. To examine the cumulative average excess returns centered on the public announcement dates, they define a firm’s daily excess return as its daily return less a CRSP equally weighted market return. And they find that open market share repurchase programs induce an average excess return of 2%.

Liano, Huang and Manakyan (2003) examine the short-term and long-term returns to firms following open market share repurchase announcements. Their initial sample is identified from all open market share repurchase announcements reported in the WALL Street Journal Index from 1982 to 1997 by firms included in the CRSP NYSE/AMEX/Nasdaq daily returns file with no other concurrent announcements from two days before to two days after the announcement of share repurchases. To calculate the short-term excess return, they follow a methodology similar to Comment and Jarrell (1991) and Ikenberry et al. (1995), in which the firm’s daily market adjusted abnormal return equals the daily return of the firm less the daily return on the CRSP value-weighted index on that day. Using this methodology they find that repurchasing firms enjoy significant positive excess returns during the five-day announcement window.

Zhang (2002a) investigates the share price performance surrounding share repurchase announcements in Japan, and he finds that there is a statistically significant abnormal return at the announcements about 5%. Hataked and Isagawa (2004) also investigates stock price behavior surrounding stock repurchase announcements in Japan and they find similar results that stock prices in Japan go up in response to stock repurchase announcements. Both Zhang (2002a) and Hataked and Isagawa (2004) follow a similar methodology to Comment and Jarrell (1991) to calculate the short-term market adjusted abnormal returns.
8.2.1.2 Long-term Market Reaction Following Announcements

Although much evidence about the short-term market reaction to repurchase announcements is in quite favor of the signaling theory, evidence on long-term market reaction following share repurchase announcements is mixed.

Ikenberry, Lakonishok and Vermaelen (1995) examine long-run firm performance following open market share repurchase announcements, 1980-1990. To calculate long-run performance, they employ two different approaches. The first is the more common technique based on cumulative abnormal returns relative to some benchmarks. The second approach calculates long-run abnormal returns assuming a buy-and-hold strategy. Following the two approaches, they find that the average abnormal four-year buy-and-hold return after the initial announcements is 12.1%. Further, they suggest that if the market fully incorporates the information conveyed through an open market share repurchases, we should observe that share prices following those announcements are unbiased, and that long-run performance is not above average. Therefore, their evidence implies market inefficiency. In their words, “the market treats repurchase announcements with skepticism, leading prices to adjust slowly over time”\(^{47}\).

Li and McNally (1999) examine open market share repurchases in Canada between 1989 and 1992. They compare the cumulative abnormal returns between repurchasing firms and non-repurchasing firms. For the repurchasing firms, they find there is a decline in share price prior to the repurchase announcements, a small rise in price around the announcement date, and finally a significant increase in price in months following the repurchase announcements. For the non-repurchasing firms, they do not observe such a price move following announcements.

Liano, Huang and Manakyan (2003) study an inter-industry comparison of open market share repurchases to identify the role of industry affiliation in the magnitude of the firms’ short-term and long-term returns following the repurchase announcements. On the basis of Ikenberry et al. (1995), they use three approaches to calculate the long-term share price performance: the buy-and-hold approach, the cumulative excess return approach and the Fama-French (1993) three factor model. They find that for the full sample of firms announcing share repurchases, the excess returns during the year following the repurchase announcements is positive and significant. They reveal that the excess return of about 2.8 percent from their research is similar in magnitude to the one-year excess return reported by Ikenberry et al. (1995). However, they find that after controlling for size and book-to-market ration (B/M), repurchasing firms do not outperform their industry peers in the long term. They conclude that their evidence doesn’t support the signaling theory.

Zhang (2002b) study share price performance following actual share repurchases in Hong Kong. He uses the buy-and-hold return approach to measure the long-term excess returns after actual share repurchases. He finds the price performance of repurchasing firms varies across firm size and market –to-book ratios. The three-year buy-and-hold abnormal return is over 20%. Eberhart and Siddique (2005) examine the motives behind share repurchase announcements. When they measure the long-term price performance they follow Fama- French three factor model and they find no consistent evidence of positive long-term evidence following announcements. Instead, they find that the buying and selling of their own shares that firms do following announcements increases their share’s liquidity and they suggest this explains market positive reaction to share repurchase announcements.

8.2.2 Managers’ Timing Ability by Using Share Repurchases

With growing research interest in share repurchases, an increasing body of research focuses on the market timing ability by using open market share repurchases. That is,
can managers beat the market to buy back their shares at prices that are far below its fundamental value?

Cook, Krigman and Leach (2004) carry out a pioneer work, using 64 firms’ supplementally disclosed repurchase trading data, to provide the first examination of managers’ repurchase timing and execution. To test managers’ timing ability, Cook et al. take three steps. Firstly, how managers choose the repurchase days? They suggest that this choice should be related to market conditions such as price movement, aggregate trading volume and market liquidity. If so, I should see increased buying following price declines and in advance of price increases. Their analysis indicates that NYSE firms do display some timing ability. Secondly, how managers make their repurchase decision within a day? They find that on the NYSE, firms repurchase significantly more shares when non-repurchase volume is higher and they appear to repurchase less lately in the day. They suggest that the results support the notion that NYSE firms react quickly to, and take advantage of, changing market conditions. On the Nasdaq, there is no similar evidence.

Finally, Cook et al. (2004) assume that repurchasing firms prefer low acquisition costs and high returns on the repurchase portfolio. They compare actual accumulation strategies with other benchmark strategies that achieve the same ultimate share holdings. They compare the actual acquisition costs with the actual dollar cost strategy, the minimum cost strategy, the maximum cost strategy, the uniform repurchase cost strategy, the proportional cost strategy and the closing price cost strategy\textsuperscript{48}. They find that NYSE firms’ acquisition costs are lower than the uniform and proportional benchmark costs. They suggest NYSE firms appear to exhibit some timing skills.

Ginglinger and Hamon (2007) investigate managers’ timing ability by using open market share repurchases in France. They firstly compare the value weighted average

\textsuperscript{48} For the details of each cost strategy, please refer to this paper, “On the timing and execution of open market repurchases”, which is downloadable from www.ssrn.com.
price for trading days when there is no share repurchases with those when repurchase take place, for the whole of the sample. They find that firms are buying back their shares at prices considerably lower than the average. They suggest that this evidence indicates an effective piece of timing evidence. Then, they observe the price movements during and prior to the repurchase sessions. They find firms do indeed time their repurchases to coincide with falling prices. Furthermore, they run multiple regressions to test timing behavior. They find that when repurchase activity is intense over a given day, the price tends to rise. Their result is in quite support of my timing model, which assumes market reacts positively to repurchase intensity.

Brockman and Chung (2001) investigate the timing of open market share repurchases and the resultant impact on firm liquidity in Hong Kong. To test managers’ timing ability, they treat as given (1) the authorized repurchasing period, (2) the number of actual repurchase days during the authorized period, and (3) the number of actual shares repurchased on each repurchase day during the authorized period. For each firm-year sample, they use computer to randomly generate 50 thousand alternative repurchase plans holding constant (1), (2) and (3) and only allow the timing of the repurchases to vary. Then they construct empirical distributions of the repurchase costs and compare them with the actual repurchase costs. Using this technique, they find significant managerial timing evidence when executing share repurchases in Hong Kong.

8.2.3 Empirical Studies about Share Repurchases In the UK

With the increasing repurchase activity and the growing research interest in open market share repurchases around the world, there is a body of research examining the open market share repurchase activity in the UK.

49 For the details of the regression model, please go to page 15 of this paper, “Actual share repurchases and corporate liquidity”, which is downloadable from www.ssrn.com.
As far as I am aware, although open market share repurchases was legalized in the UK by the Companies Act 1981, Rees (1996) is the one who carries out the first empirical study on open market share repurchases in the UK. He tries to study the impact of open market share repurchases on UK equity prices. To test market reaction to share repurchases, Rees (1996) takes a pooled time series model, estimated using OLS. He explains that because of the clustered fashion of UK repurchases, it is inappropriate to restrict the analysis to isolated instances or to extract a sub-sample and ignore the impact of other cases within the event window. His results confirm that during the five days prior to the share repurchase announcements, share prices declines by a significant amount. He also finds evidence that there is a positive relationship between the proportion of shares repurchased and the market reaction on the day of the transaction. This result provides a support to my timing model presented in Chapter 3.

The sample in Rees’s (1996) study is from both the Stock Exchange Weekly Official Intelligence that records the date of the announcements and the Extel Record of Takeovers and Issues, which reports the date of the transaction. But even Rees himself admitted that in large instances the two sources were not in agreement.

Rau and Vermaelen (2002) run an empirical study on UK share repurchases. Their sample includes 264 substantial share repurchase announcements reported by SDC (i.e., Securities Data Corporation) between 1985 and 1998. Their samples include open market share repurchases, private repurchases and repurchase tender offers. Using these samples, they examine the relationship between share repurchases and the tax and regulatory environment, and the market reaction to share repurchases.

In the tests of Rau and Vermaelen (2002), the short-term cumulative abnormal returns are computed with respect to the FTSE all share market index using the market adjusted model. But only examining short-term market reaction may be misleading as the market may not capture all the effects of the announcements in the short-term. To
test the market long-term reaction, they separate the samples into different quintiles using size and price-to-book ratio. Abnormal returns are calculated for each firm relative to its size and price-to-book-based benchmark (as the difference between its monthly return and that of its control portfolio) every month from 12 months before to 12 month after the month of the repurchase announcement. Cumulative abnormal returns are then calculated by averaging across all repurchasing firms every month and then adding these averages together. Rau and Vermaelen (2002) find that firms announcing share repurchases earn excess returns both in the short-term and in the long-term.

On the basis of the empirical work by Rau and Vermaelen (2002), Oswald and Young (2004a) carry out an extensive empirical research on UK open market share repurchases. However, Oswald and Young (2004a) point out that while the SDC represents an established source of data on repurchase announcements by the US firms, less is known about the extent to which it accurately captures open market share repurchases in the UK. Further, they compare the UK share repurchase data from SDC with similar information but from a variety sources such as the London Stock Exchange Regulatory News Services, The Financial Times and firms’ published financial reports and statements. They find the number of open market share repurchase intention announcements reported by these sources exceeds the SDC number by more than 100 percent. They suggest only using data from SDC could provide an incomplete picture of the volume and value of share repurchase activities in the UK. Banyi, Dyl and Kahle (2005) also point out that there are several problems with SDC data. For example, the SDC database obtains corporate announcements of share repurchases from a variety of sources, and may have duplicate entries for a single announcement if it appears in different sources on different days. Further, SDC reports both announcements of new programs and announcements of shares actually bought back under existing programs; it is not clear which is which without searching other media sources.
Hence, Oswald and Young (2004a) using samples from the London Stock Exchange Regulatory News Services, The Financial Times and firms’ published financial reports and statements between January 1995 and December 2000, they carry out a series of empirical tests. They first test market’s short-term reaction to share repurchase announcements. The abnormal returns are calculated against the FTSE all share index using the market-adjusted model. They report a larger market reaction than Rau and Vermaelen’s (2002). For the long-term market reaction following share repurchase announcements, they follow Rau and Vermaelen (2002) and find significant positive abnormal returns for the full sample over the one-year period following share repurchase announcements.

Oswald and Young (2004a) also use UK actual share repurchase execution data to study the relationship between share repurchases and underpricing. They expect to find some managers’ timing evidence. They run two versions of regression: (1) they estimate the model using all available years for all firms that repurchased shares in at least one year during the sample period (when there is no shares bought back, the aggregate share acquisition percent measured on a fiscal-year basis takes the value zero), and (2) they estimate regression using only those firm-years where the aggregate share acquisition percent measured on a fiscal-year is non-zero (i.e. actual share reacquisition years only). They find that UK managers trade strategically in response to share price movements. Managers buy back more shares following price fall. In addition, they find share prices tend to move upwards over the one-year period following share repurchases.

Whether there is long-term abnormal returns following open market share repurchase announcements in the UK, and whether UK managers can time the market to buyback their shares are crucial to my theoretical model assumptions. My empirical work aims to follow previous UK empirical studies to reexamine the market reaction and managers’ timing ability in the UK.
I follow Oswald and Young (2004a) using a variety of sources to identify my samples and data. To test long-term market reaction to share repurchases, I follow Oswald and Young (2004a) and estimate two versions of regression models. To test managers’ timing ability, I follow Cook et al. (2004) to compare the actual share acquisition costs with some benchmark strategies, such as the minimum price strategy, the maximum price strategy and the closing price cost strategy.

My results are consistent with Oswald and Young (2004a). I find statistically significant abnormal returns in the long term following share repurchases. Managers in the UK appear to have some timing ability. I believe this is a support of my previous models’ lagged reaction assumption.

8.3 Disclosure Requirements and Regulations on Open Market Share Repurchases Across Countries

All the researchers who intend to carry out empirical study using actual share repurchase data will encounter one big problem: how to obtain these data. This research difficulty results from the disclosure requirements and regulations of the authority. But the disclosure requirements and regulations vary across countries.

8.3.1 Disclosure Requirements and Regulations in the US

In the US share repurchases are regulated by the SEC under the anti-manipulation provisions of the Securities Exchange Act 1934. According to these provisions, it is illegal to (a) manipulate share prices by creating actual or apparent trading in the security or by raising or depressing the price of the security, and (b) use any manipulative device or contrivance in connection with the purchase or sale of a security. Additionally, Rule 10b-18 of the Exchange Act creates a safe harbor from

---

50 For a good and detailed description of the US disclosure requirements and regulations, please see the paper “Measuring share repurchases” by Banyi, Dyl and Kahle, 2005.
charges of price manipulation when repurchasing shares on the open market, provided the firm complies with certain conditions regarding the timing and amount of such share repurchases. Under these regulations, firms are not obligated to disclose their trade execution details. That is why examining the actual share repurchase is so difficult in the US. Except Cook et al. (2004) whose share repurchases execution data is from 64 firms’ voluntary disclosure, previous researches, such as Stephens and Weisbach (1998), can only use varies proxies for actual open market share repurchases to carry out their empirical studies.

In November 2003 the SEC adopted new disclosure requirements for share repurchases in the US\footnote{These new disclosure requirements became effective in December 2003.}. As a result of new Item of 703 of Regulation S-K, public firms must now provide details in their quarterly and annual reports that show on a month-by-month basis the repurchase made during the quarter, including the number of shares repurchased, the average repurchase price, and whether the repurchase was part of a publicly announced repurchase program. These new disclosure requirements apply regardless of whether the repurchases were made under the Rule 10b-18, and regardless of whether they are public or private transactions.

Item 703 requires ex post disclosure of details of share repurchases in the market, but both it and Rule 10b-18 do not require firms to publicly announce their intention to repurchase in order to satisfy the safe harbor requirements. However, if a firm do announce their intention to buy back shares, it must identify when share repurchases occur outside of a publicly announced repurchase program by providing a footnote which describes the number of shares repurchased outside of a publicly announced plan and the nature of the repurchases (for example, whether they are open market share repurchases, self-tender offers, or private transactions).

With these new disclosure requirements in the US, some of the data about actual share repurchases in the US is obtainable now. It is expected that there will be some
increasing empirical studies on actual share repurchase executions in the US following the new disclosure requirements and regulations.

8.3.2 Disclosure Requirements and Regulations in Some Other Countries

To overcome the problem of collecting actual share repurchase data, researchers have two alternative approaches. One is to try to use current information to make a proxy for actual share repurchases, like Stephens and Weisbach (1998) do. The other approach is trying some other markets where the disclosure of the details of actual share repurchases is required. Brockman and Chung (2001) and Ginglinger and Hamon (2007) take the second approach.

Brockman and Chung (2001) use the actual share repurchase data in Hong Kong to study managerial timing ability of open market share repurchases and the resultant impact on firm liquidity. The legal and regulatory requirements in Hong Kong are very different from that in the US with respect to share repurchases. In Hong Kong, any shares repurchased (including prices and volumes) on a given day must be reported to the SEHK (Stock Exchanges Hong Kong) no later than 9:30 a.m. on the following business day. Furthermore, the repurchasing firm’s annual reports must include repurchased prices and volumes aggregated on a monthly basis. This means in Hong Kong examining actual share repurchases does not need to rely on estimated data and limited voluntary disclosures.

Ginglinger and Hamon (2007) investigate the actual share repurchase activities in France. Although firms in France are not required to report their share repurchases on the following day like in Hong Kong, they are required to disclose repurchases for any given month at the beginning of the following month. But the publicly released information only includes the total number of shares repurchased during the past month. Detailed information about share repurchases, like trading dates, time and prices are not available to the public. But there is a database in France containing such
information, and Ginglinger and Hamon are lucky to be the first one authorized to getting access to this database to carry out their empirical work.

In Canada, repurchasing firms must report each month the number of shares they actually repurchases (Ikenberry, Lakonishok and Vermaelen, 2000). In Norway, when a firm actually execute an open market share repurchases, the law requires the firm to report this to the OSE (Oslo Stock Exchanges) on the same day or before the trading starts the following day (Skjeltorp, 2004).

8.3.3 Disclosure Requirements and Regulations in the UK

The legal and regulatory requirements on open market share repurchases in the UK are very different to those in the US in several important aspects (Oswald and Young, 2004b). For example, share repurchases were firstly legalized by the Companies Act 1981 and currently are regulated by a combination of the Companies Act 1985 and the Listing Rules of the London Stock Exchange (LSE). UK firms must seek shareholder approval at their Annual General Meeting before repurchasing shares in the open market although such authority does not represent a commitment to make actual share repurchases. Furthermore, Company Law restricts the fraction of shares that can be bought back in the open market during a 12-month period to 15 percent of the outstanding shares at the beginning of the period. And not like in the US where the repurchased shares can be held as treasury stocks, the repurchased shares in the UK must be cancelled.

The disclosure requirements in the UK are very similar to those in Hong Kong reported by Brockman and Chung (2001). Firms in the UK are not required to announce their intention to buy back shares. But, firms are required to report details of all executed repurchases to the London Stock Exchange by 8.30am the following day. Further, complete details of all executed share repurchases during the fiscal year must be disclosed in firms’ published financial reports and statements, including the
motives of share repurchases. These rules enable us to make precise measurements of the actual share repurchase activity in the UK.

8.4 Data Methodology

8.4.1 Sample and Data

There are extensive empirical researches about open market share repurchases around the world. This rich literature can be classified into two distinct methodologies: researches focusing on investors’ reaction to the share repurchase announcements (e.g., Grullon and Michaely, 2002; Ikenberry, Lakonishok and Vermaelen, 1995; and Vermaelen, 1981) and researches examining the execution of actual share repurchases (e.g., Ginglinger and Hamon, 2007; Brockman and Chung, 2001; and Cook et al., 2004). My models assume that investors have a lagged reaction to share repurchases and managers can buy back their shares profitably, and my timing model predicts that the actual share repurchases are affected by the time and size effects. Therefore, my empirical test, here, will focus on actual share repurchases.

I intend to find out some managerial timing evidence by using open market share repurchases in the UK. I follow Oswald and Young (2004a), using various sources to search for my share repurchasing samples. I run a keyword search of The Financial Times five-year company news and announcement databases. A search for the period during 1 January, 2000 to 31 December, 2004 using the keywords ‘repurchase’, ‘buy back’, ‘buyback’, ‘cancellation’ and combinations thereof generates 3,232 initial announcements. Following both the sample selection criteria by Rau and Vermaelen (2002) and by Oswald and Young (2004a), the following samples are removed:

• Announcements by non-UK-domiciled firms and non-LSE-listed firms
• Closed end funds and investment companies
• Transactions where the repurchase method is not open market buy back
• Duplicate announcements, market speculation about and analyst comment on a share repurchase
• Negative announcements (i.e., announcements share repurchase won’t take place)
• Firms whose shares repurchased are not ordinary shares.

The final sample consists of 725 unique open market share repurchase announcements, 237 of which are announcements about repurchase intention and the rest 488 are announcements about repurchase executions. Panel A of Table 8-1 provides further details of the sample selection process.

Oswald and Young (2004a) argue that relative to the US, the Companies Act 1985 makes research on actual share repurchases much easier because UK firms are required to disclose the aggregate number and total cost of shares bought back during the year. Therefore, it is a straight way to regard aggregate repurchases in one fiscal year by a firm as a sample (i.e., one ‘firm-year’ sample) to run empirical tests. I follow their way and use the aggregate share repurchased in one fiscal year by a firm as a sample. My final sample of open market share repurchase execution consists of 221 fiscal year samples by 171 firms: 138 firms make actual share repurchases only in one single fiscal year during the sample period; 21 firms make actual repurchases in two fiscal years and 12 firms make repurchase executions in three or more years. Further details of the process used to generate this set of share repurchase executions are summarized in Panel B of Table 8-1.
Table 8-1 Sample Selection Criteria


Panel A: Financial Times Announcement Sample¹

<table>
<thead>
<tr>
<th>Description</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of repurchase announcements from the Financial Times</td>
<td>3,232</td>
</tr>
<tr>
<td>Less:</td>
<td></td>
</tr>
<tr>
<td>Non-UK-domiciled firms</td>
<td>(63)</td>
</tr>
<tr>
<td>None-listed firms</td>
<td>(27)</td>
</tr>
<tr>
<td>Closed end funds and investment companies</td>
<td>(978)</td>
</tr>
<tr>
<td>Repurchase method is not open-market buy-back</td>
<td>(49)</td>
</tr>
<tr>
<td>Duplicate announcements¹</td>
<td>(1,326)</td>
</tr>
<tr>
<td>Negative announcements¹</td>
<td>(34)</td>
</tr>
<tr>
<td>Firms whose shares repurchased are not ordinary shares</td>
<td>(30)</td>
</tr>
<tr>
<td>Total usable announcements</td>
<td>725</td>
</tr>
</tbody>
</table>

Comprising:

- Repurchase intention announcements (including repurchase authority sought for the first time, repurchase intent indicated, repurchase details announced, extension to existing program) 237
- Repurchase execution announcements (including single repurchase details announced, total number of shares repurchased to date announced) 488

Total 725

(To be continued on the next page)
## Panel B: Actual Share Repurchase Sample²

<table>
<thead>
<tr>
<th>Condition</th>
<th>Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least one share repurchase execution announcement during the sample period</td>
<td>221</td>
</tr>
<tr>
<td><strong>Comprising:</strong></td>
<td></td>
</tr>
<tr>
<td>138 firms make actual repurchases in a single fiscal year during the sample period</td>
<td>138</td>
</tr>
<tr>
<td>21 firms make actual repurchases in two fiscal years during the sample period</td>
<td>42</td>
</tr>
<tr>
<td>12 firms make repurchase in three or more fiscal years during the sample period</td>
<td>41</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>221</td>
</tr>
</tbody>
</table>

**Notes:**

¹ Here I follow Oswald and Young (2004a). Negative announcements are these announcements indicating buyback will not take place or existing repurchases will stop.

² For the empirical test, here I describe the repurchase executed in one fiscal year by a firm as a sample. Repurchases executed by the same firm but in different fiscal year is regarded as a new sample.
8.4.2 Descriptive Statistics

Panel A of Table 8-2 presents different types of repurchase intention announcements. From Panel A of Table 8-1 I know that among the 725 samples there are 237 repurchase intention announcements and 488 are repurchase execution announcements. It’s interesting to note that the 237 repurchase intention announcements contain very different information.

From Panel A of Table 8-2, I can see that 39 of them are the first time of getting the approval from the authority to buy back their shares, but without clear intention to exercise share repurchases. 42 of them announce their intention to execute their share repurchase programs, but do not give any details, such as intended repurchase date, number etc.), of their intended execution. Interestingly, 102 repurchase announcements do give details of their intended share repurchase execution plans. The rest 54 announcements give their intention to continue with existing plan, extend existing plan, extend existing authority, and to resume existing plans or implement previously announced plans.

Panel B of Table 8-2 presents some interesting results. I can see that the number of share repurchases in 2000, 2002 and 2004 are very close. However, in 2001 and 2003 the number of announced share repurchase intention is far less than the average of the five years. The number of repurchase intention announcements reaches the lowest during the five-year period.

It’s interesting to note that the average percent of shares announced to repurchase is 6.16 percent during the five years. According to the regulations, the fractions of shares that can be repurchased in the open market during a 12-month period is no more than 15 percent of the outstanding shares at the beginning of the period. Oswald and Young (2004b) point out that some firms often impose even tighter restrictions (e.g., 5 to 10 percent). My results are consistent with this. One potential bias is the 81 announcements that do not give any information about how many shares they are going to repurchases. To these samples I treat the number of shares to repurchase as zero when I calculate the mean percent of shares that are announced to be bought back.
### Table 8-2
Descriptive statistics for open market share repurchase announcements between 1 January 2000 and 31 December 2004

**Panel A: Announcements of open market repurchase intentions¹**

<table>
<thead>
<tr>
<th>Description</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authority to repurchase shares sought for the first time (no clear intent to exercise authority)</td>
<td>39</td>
</tr>
<tr>
<td>Intent to implement repurchase program in the future (no details of the repurchase program, such as repurchase starting date, intended repurchase number etc.)</td>
<td>42</td>
</tr>
<tr>
<td>Open market share repurchase program (with details of repurchase plan)</td>
<td>102</td>
</tr>
<tr>
<td>Intent to continue with existing plan, extend existing plan, extend existing authority, resume existing plan or implement previously announced plan</td>
<td>54</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>237</td>
</tr>
</tbody>
</table>

**Panel B: Number and value of open market share repurchase announcements between 1 January 2000 and 31 December 2004²**

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Value (£ million)</th>
<th>Means % of shares announced</th>
<th>0 to 5%</th>
<th>5 to 10%</th>
<th>Over 10%</th>
<th>Not stated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>61</td>
<td>23,079.90</td>
<td>5.30%</td>
<td>13</td>
<td>15</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>2001</td>
<td>35</td>
<td>20,703.50</td>
<td>7.57%</td>
<td>3</td>
<td>10</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>2002</td>
<td>56</td>
<td>23,032.16</td>
<td>4.05%</td>
<td>6</td>
<td>5</td>
<td>13</td>
<td>32</td>
</tr>
<tr>
<td>2003</td>
<td>23</td>
<td>7,569.30</td>
<td>6.33%</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2004</td>
<td>62</td>
<td>25,406.32</td>
<td>7.53%</td>
<td>9</td>
<td>15</td>
<td>25</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>237</td>
<td><strong>99,791.18</strong></td>
<td><strong>6.16%</strong></td>
<td><strong>28</strong></td>
<td><strong>42</strong></td>
<td><strong>86</strong></td>
<td><strong>81</strong></td>
</tr>
</tbody>
</table>

**Notes:** ¹ Panel A follows Oswald and Young (2004a, p270). ² To announcements only indicating the number of shares to buy back, the value is calculated by using the close price of the announcement date. To announcements only indicating percent of shares to repurchase, the calculation of number of shares bases on the total outstanding shares at the beginning of the fiscal year from the published financial statements and the value is calculated by using the close price of the announcement date.
Panel A gives the total samples of containing repurchase reasons between 1 January 2000 and 31 December 2004. Panel B summarizes the details of different reasons for repurchases.

### Panel A: Announcements with Reasons for Repurchase

<table>
<thead>
<tr>
<th>Reason for Repurchase</th>
<th>Number</th>
<th>Percent</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managers feel their shares are undervalued (i.e. to signal their confidence in the future to investors/to boost share price (price supporting))</td>
<td>95</td>
<td>50.2%</td>
<td>1</td>
</tr>
<tr>
<td>Capital Restructuring</td>
<td>41</td>
<td>22.0%</td>
<td>2</td>
</tr>
<tr>
<td>Defensive strategy to avoid a takeover (anti-takeover)</td>
<td>22</td>
<td>11.6%</td>
<td>3</td>
</tr>
<tr>
<td>Return excess/surplus cash to investors (return value to investors, lack of investment opportunities)</td>
<td>20</td>
<td>10.5%</td>
<td>4</td>
</tr>
<tr>
<td>To cater to investor demand for share repurchases</td>
<td>5</td>
<td>2.6%</td>
<td>5</td>
</tr>
<tr>
<td>To offer maximum flexibility</td>
<td>3</td>
<td>1.5%</td>
<td>6</td>
</tr>
<tr>
<td>To take advantage of the bear market (timing the market)</td>
<td>2</td>
<td>1.1%</td>
<td>7</td>
</tr>
<tr>
<td>To reduce cost of servicing small, odd shareholdings</td>
<td>1</td>
<td>0.5%</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>189</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>

### Panel B: Details of Repurchase Reasons

Wansley, Lane and Sarkar (1989) have a good description of all kinds of reasons for repurchases. In their work, they outlined 17 reasons for repurchases. In Panel B, I follow their way to present the results, but I combine some similar reasons under their work into one reason considering they are under the same hypothesis.

---

1 Here I first examine repurchase intention announcements, and then I go through all the repurchasing firms published reports and statements to get the samples containing repurchase motives.

2 Wansley, Lane and Sarkar (1989) have a good description of all kinds of reasons for repurchases. In their work, they outlined 17 reasons for repurchases. In Panel B, I follow their way to present the results, but I combine some similar reasons under their work into one reason considering they are under the same hypothesis.
Empirical Tests

I also read through all the 237 repurchase intention announcements to examine the motives behind each repurchase announcements. In the UK firms are not required to announce their intention to repurchase. If they do announce, some of them do not give their reasons of carrying out share repurchases. By reading through all the repurchase intention announcements I only get 60 samples containing share repurchase motives.

However, firms in the UK are required to disclose details, including motives for share repurchases (Companies Act 1985, Schedule 7, paragraph 8 and 9), of all executed share repurchases during the fiscal year in published financial reports and statements. Therefore, I go through all the share repurchase executing firms’ financial reports and statements as well and I get another 129 samples containing motives for share repurchases.

Among all the motives, signaling and/or price supporting is the most popular motives for UK share repurchases. Over 50 percent of the sample firms claim that they repurchase shares because they feel their shares are undervalued or their share prices are far below its fundamental value. This is one of the most notable results in our empirical study, and this result is consistent with the survey results of Wansley et al. (1989), Brav et al. (2005) and my survey results presented in Chapter 7.

8.5 Bootstrapping-Empirical Tests on Managerial Timing Ability by Using Share Repurchases

From Panel B of Table 8-2, we can see that the mean and median values in the table are too distant, and so normal two-tailed t test would not be appropriate. Therefore, I follow Brockman and Chung (2001) using bootstrapping technique to run my empirical tests.

Brockman and Chung (2001) use bootstrapping technique to test managerial timing ability in Hong Kong. In this thesis, I follow Brockman and Chung (2001) and design my timing ability tests to mimic management’s decisions as closely as possible. In other words, I try to hold constant all aspects of the manager’s repurchase decisions with exception of its precise timing.
Similar to Brockman and Chung, my bootstrapping technique treats as given 1) the authorized repurchase period, 2) the number of actual repurchase days during the authorized period, and 3) the number of actual share repurchased on each repurchase day during the authorized period. In my original sample there are 221 firm-year samples during the period from 1 January 2000 to 31 December 2004. For each of the firm-year sample, I randomly generate 2000\(^52\) alternative repurchase plans given 1), 2) and 3) and only allow the timing\(^53\) of actual share purchases to vary.

My bootstrapping procedure of testing managerial timing ability is as follows. I can demonstrate it by examining a relatively simple case of Topps Tiles Plc 2004 share repurchases (i.e. the actual share repurchases in the period from 1 January 2004 to 31 December 2004). Topps Tiles Plc bought back its own shares on 17 separate days during 2004. The actual shares purchased on each day were 24,300; 82,245; 37,482; 220,000; 250,000; 9,880, 50,000; 35,000; 30,000; 25,365; 14,000; 968,760; 142,015; 760,000; 795,000; 32,145; and 10,500 respectively, and the total costs was £6,253,908.

Based on these figures, I randomly select 17 days over the same period and within each day I buy back exactly the same number of shares as the shares purchased on each of the 17 days in the original sample. The cost of this randomly generated bootstrapped repurchase plan is divided by the actual repurchase cost (i.e. £6,253,908) to produce a percentage. I repeat this process 2000 times in order to generate a distribution of bootstrapped-to-actual costs.

To test managerial timing ability, Cook et al. (2004) compare the actual repurchase costs with some benchmarks, such as minimum cost strategy, maximum cost strategy, closing price strategy etc. Brockman and Chung (2001) use similar method, but this time they compare the actual costs with some bootstrapped benchmarks: minimum bootstrapped costs, mean (median) bootstrapped costs and maximum bootstrapped costs.

\(^{52}\) Brockman and Chung (2001) did 50,000 resamples for each of the original firm-year sample. But according to Wood (2004) 2000 resamples are sufficient to give fairly stable results. Based on this, I only generate 2000 resamples for each original sample.

\(^{53}\) In other words, for each firm-year I only allow the repurchase days in the randomly generated bootstrapped programs to differ from the real days in the actual repurchase program of that firm-year. Hence, the choice on the repurchase days can be used to test managerial inter-day timing ability.
I follow Brockman and Chung (2001) and compare the actual share repurchase costs with some bootstrapped benchmarks. I still use The Topps Tiles Plc as an example to demonstrate how I did it. The Topps Tiles Plc minimum bootstrapped costs, mean (median) bootstrapped costs and maximum bootstrapped costs are 90%, 112% (109%), and 149% of the actual share repurchase costs respectively. From the 2000 regenerated bootstrapped share repurchase programs, I find that there are only 76 resamples with total costs less than the actual costs of £6,253,908. Hence, the probability that a random generated share repurchase program incurs costs below the actual repurchase costs (i.e. pseudo-p-value) is 3.8%. I interpret this result implies that it is significant at 0.05 level and it provides support of managerial timing ability in the Topps Tiles Plc 2004 share repurchase program.

The table below presents my empirical results regarding managerial timing ability for all the 221 firm-years in the UK. The second column presents the number of repurchasing firms in each year, and the third column presents total number of days actual repurchases carried out in each specific year. The three bootstrapped benchmarks scaled by costs of actual share repurchases are presented in column 4 through to column 6. In Cook et al. (04)’s results, the minimum costs are less than the actual repurchase costs while the maximum costs are higher than the actual repurchase costs. Similar to their results, from column 4 I can see that in average the minimum bootstrapped costs are 86% of the actual share repurchases costs. The percentage of minimum bootstrapped costs over actual share repurchasing costs ranges from 81% in 2004 to 92% in 2001. From column 6 I can see that the average percentage of bootstrapped costs scaled by actual costs is 145%, which implies the actual share repurchase costs are far below the maximum bootstrapped costs. The percentage ranges from 128% in 2002 to 156% in 2000.
This table presents the result of actual share repurchase costs compared with the bootstrapped repurchase costs of randomly generated share repurchase programs from 1 January 2000 to 31 December 2004 in the UK. The sample of share repurchase firms is comprised of all companies listed on the London Stock Exchanges (LSE) that implemented open market share repurchases during the 60 month period. The original sample comprises of 221 firm-years. A firm-year is defined as the fiscal year in which a firm actually buys back shares from the open market. For the same firm implemented actual share purchases in different year is treated as two different firm-year samples.

The actual costs of all repurchases made by a repurchasing firm in a firm-year are compared with a distribution of randomly generated bootstrapped repurchase costs. The bootstrapped total costs are calculated with the assumption that the repurchases are made on randomly selected trading days in the firm-year instead of actual repurchasing days. I compare the actual share repurchasing costs with three bootstrapped cost benchmarks: minimum bootstrapped costs, mean (median) bootstrapped costs and maximum bootstrapped costs. For each firm-year sample, the distribution is formed by repeating the bootstrapped process 2000 times and calculating each round a total costs for the same number of shares bought back by the managers on the same number of days with the period. A pseudo-p-value is calculated by the percentage of the randomly generated distribution that has costs smaller than the actual repurchase costs. A smaller pseudo-p-value is interpreted as an indication that the repurchase costs of an actual share repurchase program is significantly lower than the bootstrapped costs of a randomly generated share repurchase program, implying managerial timing ability in the UK.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of firm-year samples</th>
<th>Total number of share repurchases included</th>
<th>Minimum bootstrapped costs scaled by actual costs</th>
<th>Mean (Median) bootstrapped costs scaled by actual costs</th>
<th>Maximum bootstrapped costs scaled by actual costs</th>
<th>Number (percent) of firm-years with pseudo-p-value&lt;0.05</th>
<th>Number (percent) of firm-years with pseudo-p-value&lt;0.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>59</td>
<td>1646</td>
<td>0.87</td>
<td>1.22 (1.16)</td>
<td>1.56</td>
<td>24 (40.7%)</td>
<td>19 (32.2%)</td>
</tr>
<tr>
<td>2001</td>
<td>32</td>
<td>518</td>
<td>0.92</td>
<td>1.08 (1.06)</td>
<td>1.49</td>
<td>19 (59.4%)</td>
<td>12 (37.5%)</td>
</tr>
<tr>
<td>2002</td>
<td>51</td>
<td>2119</td>
<td>0.84</td>
<td>1.13 (1.11)</td>
<td>1.28</td>
<td>23 (45.1%)</td>
<td>20 (39.2%)</td>
</tr>
<tr>
<td>2003</td>
<td>20</td>
<td>245</td>
<td>0.88</td>
<td>1.09 (1.08)</td>
<td>1.41</td>
<td>6 (30%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>2004</td>
<td>59</td>
<td>1646</td>
<td>0.81</td>
<td>1.05 (1.04)</td>
<td>1.5</td>
<td>29 (49.2%)</td>
<td>21 (35.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>221</td>
<td>6174</td>
<td>0.86</td>
<td>1.11 (1.09)</td>
<td>1.45</td>
<td>101 (45.7%)</td>
<td>77 (34.8%)</td>
</tr>
</tbody>
</table>
From column 5 I can see that the overall mean (median) bootstrapped costs represents 111% (109%) of the actual share repurchase costs. This implies that managers are able to acquire shares at a lower cost than a randomly selected repurchasing strategy. From 2000 to 2004, the mean (median) bootstrapped costs are over 100% of the actual repurchasing costs in every single year. This suggests strongly managers’ timing ability in share repurchases.

The last two columns in the table above presents the number (percent) of firms that demonstrate their market timing ability in share repurchasing at the 0.05 and 0.01 level respectively. Overall, 45.7% of the firm-years from 2000 to 2004 shows strong timing ability that is significant at 0.05 level, and 34.8% of the firm-years are significant at the 0.01 level. The percentage of firms with timing ability at the 0.05 level ranges from 30% in 2003 to 59.4% in 2001, and the percentage of firms with timing ability at the 0.01 level ranges from 25.0% in 2003 to 39.2% in 2002. Although there is some variation in the percentages from year to year, my results reveal consistent evidence in favor of managerial timing assumption. My results are in consistent with Brockman and Chung (2001)’s empirical results in Hong Kong, and the results show strong support of the assumption that managers in the UK do demonstrate timing ability in buying back shares in the open market. This provides direct evidence of managerial timing ability in the UK and strong support to investors’ lagged reaction assumption.

8.6 Conclusion

There is rich empirical literature about open market share repurchases. Although most of empirical researches find that there are abnormal excess returns in the short term following share repurchase announcements, the evidences of the long-term abnormal excess returns following share repurchases are mixed.

But if there is long-term abnormal returns following share repurchase announcements, the market must be inefficient, reacting to the announcements with a lag (In Ikenberry et al.’s (1995) words, the market underreacts.). The market’s lagged reaction provides managers the chance of timing the market to buy back their shares cheaply. Cook et al.
(2004), Brockman and Chung (2001) and Ginglinger and Hamon (2007) use actual share repurchase data to examine managerial timing ability by using open market share repurchases. In general, they do find that managers do display some timing ability when executing their repurchases. The timing evidences, in return, are supporting the market’s lagged reaction assumption and are consistent with the evidence of long-term abnormal returns following share repurchase announcements.

Empirical studies on open market share repurchases in the UK only started in late 1990s although share repurchases were legalized in 1981. Based on the work of Rau and Vermaelen (2002) and Oswald and Young (2004a), I carry out an empirical study on UK open market share repurchases, aiming to provide some empirical evidence supporting my theoretical models.

My results reveal that UK share repurchases is growing quickly. The average percent of shares announced in the repurchase program is just over 6 percent. One of the most interesting things I find is that over 50 percent of the repurchasing firms claim that they repurchase shares because they try to signal to the market that their shares are undervalued. This result is consistent with the findings from Wansley et al. (1989) and Brav et al. (2005).

To examine managers’ timing ability in the UK a bit further, I follow the approach by Cook et al. (2004), starting to compare the share-weighted average repurchase price for each day with the share-weighted average price of all non-repurchase volume for the day. I find that managers pay less for the repurchases than for the non-repurchase trades. Then I move to compare the actual acquisition costs with the minimum cost strategy, the maximum cost strategy and the closing price cost strategy. I find managers in the UK do display some timing ability when they buy back their shares. These results are consistent with Oswald and Young (2004a), and provide strong support to my model assumption.
Chapter 9 Conclusion

Undoubtedly, share repurchases have been increasing rapidly over the past decades. More companies are choosing to repurchase their shares, and more research has been undertaken to understand share repurchases, and the factors involved. I can say confidently that this is a golden age for share repurchases.

The more you become acquainted with share repurchases, the harder it becomes to have a clear idea about them. Black (1977) said dividends were a ‘puzzle’. I believe that share repurchases are also a puzzle because they have so many characteristics that are difficult to understand and explain.

One of the most important ingredients of the puzzle is recent empirical evidence regarding share repurchases and dividends. For example, managers still smooth dividends, but are not concerned about the volatility of share repurchases; dividends are more likely to be paid from permanent cash flow while share repurchases are more likely to arise from temporary cash flow; managers believe dividends contain more information than share repurchases; investors react to share repurchases with a lag; managers can time the market to buy back their shares and some of them are rewarded financially for beating the market; etc.

Why do managers and investors treat dividends and share repurchases differently? Are they rational when making their financial decisions? Is this difference due to managers and investors lack of understanding on share repurchases or because rational managers try to take advantage of investors’ irrationality to make a profit from share repurchases? Will investors learn at some point to understand repurchases? If they do, will they be indifferent between dividends and share repurchases? And will the payout method still matter to managers? This ‘repurchase v dividend’ puzzle directly inspired my research.

---

54 When I was doing the thesis for my Master’s degree at the Birmingham Business School, I chose dividend policy as my topic and Dr. Richard Fairchild happened to be my external examiner. At that time I never thought that corporate payout policy would still be my PhD research topic at the University of Bath School of Management and that Richard would become my PhD supervisor. Now when I look back I realize how lucky I am to have both of them.
9.1 Chapter Review

There are various ways of looking at these differences. I focus on the behavioral aspect of investors and examine the impact it exerts on investors’ reaction and managers’ payout decisions. On this basis I have developed a series of theoretical models in which investors have a lagged reaction to share repurchase announcements.

In my repurchase timing/signaling game (Chapter 3), there are two players: firm H who is undervalued and firm L who is accurately valued. Each firm has three options in relation to repurchase timing/signaling. My game reveals that for firm L, its best response is to repurchase nothing. For firm H it is always good to repurchase, but how much to repurchase is actually depending on the size effect of share repurchases (i.e. how the market react to the size of share repurchases). If investors react strongly to the size of share repurchases, intensive repurchases will push up share prices quickly and manager H will find it optimal to buy back slowly. If investors' reaction to intensive share repurchases is weak, share prices will not change too much following share repurchases and so manager H will find it optimal to repurchase intensively by using all the cash flow to time the market by buying back cheap shares. Thus my model explains some of the repurchase behavior observed by Cook et al. (2004).

My second model (the substitution model, Chapter 4) aims to investigate how investors' lagged reaction to share repurchases and their irrationality affect managers’ choice of optimal payout method(s). In this model, I assume that investors react immediately to dividend announcements but react to repurchase announcements with some lag. My model predicts that when managers expect earnings to be stable in the future, there is no difference between dividends and share repurchases. Managers can use either method to achieve the same results. When they foresee that future earnings are volatile, the length of the lag matters. The impact of the different reaction to dividends and share repurchases is significant when the length of lag is an odd number. The optimal payout methods at this time also depend on how risk-averse the managers are. Paying out through both dividends and share repurchases could be the best choice as the impact of volatile dividends is exactly offset by the impact of volatile share repurchases. As far as I am aware, my model is the first theoretical attempt to directly
apply investors’ lagged reaction to share repurchases. My results provide explanation for some of the documented facts of share repurchases (for example, many firms in the UK choose to repurchase their shares while still paying dividends).

My third model (Chapter 5) is based on the work of Baker and Wurgler (2004). The aim of this model is to see whether open market share repurchases can be used to cater to investors as well as dividends. In this model I assume that investors react to dividends immediately and fully. However, investors underreact to share repurchase announcements. My model finds that if investors react strongly to catering, managers will choose catering. Managers just do what they are wanted. If investors’ later reaction at date 2 to repurchases is growing very strong, managers will choose repurchase catering instead of dividend catering. The managers’ decision is also affected by the weights on each date in their compensation function. If their compensation is largely relying on the date 1 firm value, managers are more likely to choose the decision that has the highest investor reaction at date 1. This is a development of Baker and Wurglers’ (2004) dividend catering theory.

My final model (Chapter 6) presented in this thesis examines the relationship between share repurchases and shareholder rights. Based on the work of Jiraporn (2006), I provide a theoretical analysis of the strength of investor rights in a firm’s share repurchase policy in the face of agency conflicts and behavioral biases. I consider three reasons for firms to repurchase their shares; to eliminate the agency costs of free cash-flow, to time the market, and to cater to investors. In the first case, I demonstrate that investor rights and repurchases may be complements or substitutes in addressing free cash flow problems. In the second case, I argue that stronger investor rights increase informational disclosure which reduces the ability to time the market using repurchases. In the final case, I argue that stronger investor rights may reduce value-reducing repurchase catering. This represents a notable development of Jiraporn’s (2006) research.

In search of empirical support for the theoretical models, I also conducted a survey (Chapter 7) and empirical tests using share repurchase data in the UK (Chapter 8). In the questionnaire, I asked a range of related questions, varying from testing managers and investors’ understanding of dividends and share repurchases to asking how
managers select the payout method in view of stable and volatile future earnings. The survey results reveal that managers possess better knowledge of dividends and share repurchases than investors and that investors know less about share repurchases than dividends. In general, the survey results do provide support for my model’s underlying assumptions. My empirical tests are based on share repurchase data in the UK during the period 2000 to 2004. The purpose of the tests is to find out if managers in the UK can outperform the market and buy back shares cheaply. If this is the case, it will imply that investors have a lagged reaction to share repurchases and so it provides empirical support to my assumption. By using the bootstrapping technique, my empirical test results reveal that in the UK managers do display timing ability when buying back shares from the market. This, therefore, provides support to my model’s assumption. From the test findings we also find out that undervaluation/price supporting is the most popular motive behind share repurchases in the UK. This empirically supports the results from the timing model, in which managers’ share repurchase behavior is positively related to the market value before share repurchases (i.e. undervaluation).

9.2 Policy Implications

What do the results imply for managers? In each of the previous chapters, I have already discussed the implications for managers. For example, in the timing model I show that managers should trade off the effects of market value before share repurchases, the market’s initial reaction to share repurchases and how fast investors’ reaction is improved to make their actual share repurchase decisions. In the substitution model, I demonstrate that manager’s best payout method is affected by the stability of earnings, the length of investor’s reaction lag and how much they dislike volatility. In the catering model, I suggest that managers’ catering decision actually depend on investors’ reaction to catering at each date and the weights on each date in their compensation contracts.

What do the results imply for investors? In my models managers are striving to maximize their own self-interests, and hence their decisions may actually be value-destructing to the firm as a whole (e.g. my catering model) or may disadvantage investors (e.g. my timing model). How to protect investors themselves? From my
models, a natural answer is to educate investors themselves to improve their understanding and knowledge of share repurchases. This can benefit in two ways: 1) If investors’ knowledge of and reaction to repurchases is the same as dividends, managers would be indifferent between dividends and share repurchases and so repurchases could not be used to maximize their self-interest; 2) Through education investors can gain a better knowledge of the fundamental value of the firm and foresee the consequences of tendering their shares during a share repurchase program. If they find tendering price is below the fundamental value of the firm, investors can choose not to tender their shares.

However, education is costly and time-consuming, and it does not manifest its effects immediately. In addition, many individual investors could find that they cannot afford it. The government should consider taking on the responsibility of providing professional training and financial support to those investors.

The government can also increase the disclosure requirements on share repurchases, especially with respect to actual share repurchase executions. A more detailed and much quicker disclosure following share repurchases could help investors better understand and react to share repurchases, and reduce the chance of managers’ timing the market. Ideally, improved disclosure should help the market to more easily assess a firm’s fundamental value and so the market could know whether or not the shares are undervalued or overvalued. Therefore, improved disclosure could prevent managers from abusing the market in the first place.

Unfortunately, there is no such disclosure and reporting system that could make share prices exactly matches with a firm’s fundamental value. Besides the inherent problems within each system itself, there are many other factors restricting it from functioning effectively. For example, the agency conflicts between investors and managers could result in managers making value-destructing decisions in order to maximize their self-interests.

As I revealed in Chapter 6, an effective corporate governance regime could effectively reduce the agency costs. If share repurchases and investors rights are complements for each other, weak shareholder rights could lead to low share repurchases. If they are
substitutes for each other, strengthening shareholder rights could effectively reduce share repurchases and so reduce the agency costs.

Is the current corporate governance system effective enough to prevent the agency problem? The answer is ‘No’ although strenuous efforts have been made around the world to improve corporate governance. Jenson (2005) said that the high agency costs of overvalued equity point to the failure of the current corporate governance system, and that this is exacerbated by managers’ equity-based contracts (like my models demonstrated above).

An obvious solution seems to be to replace the current equity-based compensation contracts with other non-equity based compensation contracts. For example, the New York Stock Exchange suggested director fees as the only type of compensation for the chairman of the audit committee. However, Jenson has expressed his concerns that other compensation methods could lack incentive for managers and may not be sufficient enough to attract top persons ‘for such a position given the work and risks of this position’.

How can we resolve this now? There is no one method that could solve all the problems. A practical way could be to combine every possible method and apply them at the same time. For example, on one hand the government should provide support, research and training on share repurchases, and on the other hand should increase the disclosure requirements on share repurchases.

9.3 Limitations and Future Research

I presented my models, analyzed my empirical results, and discussed my contributions to the current literature in the previous part of this chapter. However, like all other research, mine also has its limitations.

To examine the impact of the difference between dividends and share repurchases, in my models I assume that relative to their immediate reaction to dividends, investors’ reaction to share repurchases is lagged. In other words, I take the behavioral finance approach. As I mentioned earlier, there are various ways of looking at these
differences. The behavioral finance approach is new and also attracts much criticism. I still believe that this behavioral finance approach is a good way to look at these differences and it does generate very interesting results, even though it is not as a well-developed approach as the traditional view. Further work is needed to make this approach more theoretically sound.

Limitation is also inherent in my survey. Although I have tried different delivery methods, you can see that my sample size is still relatively small. The sample size varies across questions, which makes the analysis problematic and some results uncomparable. During the process of designing the questionnaire, I took into account experimental evidence that people are more inclined to choose the answer in the middle (the neutral one) during a survey. To avoid this, I only designed four choices of answer for each question. This approach is different to the normal questionnaire design (i.e. the five-point Likert-type scales) in which each question has five answers and the neutral one (normally worded as ‘undecided’ or ‘I don’t know’ with value of zero) locates in the middle. I believe that the results would be different if I redesigned my questionnaire following the ordinary approach. Also, redistributing the questionnaire to a larger target population and expanding distribution channels would hopefully generate larger sample size and the survey results would be more significant.

When I was collecting UK share repurchase data for my empirical tests, I followed Oswald and Young (2004a) and to obtain my original data I ran a keyword search in The Financial Times five-year company news and announcements databases. Although Oswald and Young (2004a) claim this approach is much better than the approach adopted by Rau and Vermaelen (2002), it is still far from perfect and it could not cover all the share repurchases during the sample period. Therefore, how to use different methods to try to cover as many repurchase samples as possible is one area that needs further refinement. To avoid the sampling problem, I used the bootstrapping technique to generate 2000 resamples for each original sample and compared the bootstrapped costs with the actual share repurchase costs. This was used to examine if managers display any timing ability during their share repurchasing. However, there are criticisms of using the bootstrapping technique. It would be interesting to see the outcome if I had a much larger size of original samples but
without using bootstrapping. As I mentioned above, trying new search methods and databases is one of the ways of increasing the sample size. Another way is to extend the sample period. Currently my sample period only covers five years, but if I increase the sample period to ten or fifteen years, I would expect the sample size to increase significantly.

Share repurchases have become a common practice adopted by companies all over the world. With the continuous increase in share repurchase activities, there will be more and more research in this area, and I do believe that there will be more and more people who come to join me in researching this fascinating subject.
References


52. Fried, Jesse M., 2002, ‘Open market repurchases: signaling or managerial opportunism?’, UC Berkeley School of Law research paper.


54. Gelb, David, 2000, “Payout Composition and Investors’ Reaction to Dividend and Stock Repurchase Announcements”, SSRN working paper.


trades”, *Journal of Business Finance and Accounting*, 33(5-6), 735-752.


108. Oswald and Young, 2004b, “Open market share re-acquisitions, surplus cash, and agency problems”, SSRN working paper.


47-70.
Appendix 1

I know that the variance can be calculated by the following function.

\[ S^2 = \frac{\sum (x - \bar{x})^2}{N - 1} \]

Therefore, I can get the variances under each payout method.

\[ S_d^2 = \frac{0.25(3\tilde{q}_{d,j} - \tilde{q}_{d,r+1} - \tilde{q}_{d,r+2} - \tilde{q}_{d,r+3})^2 \delta^2}{3\rho^2} + \frac{0.25(3\tilde{q}_{d,j} - \tilde{q}_{d,r+1} - \tilde{q}_{d,r+2} - \tilde{q}_{d,r+3})^2 \delta^2}{3\rho^2} + \frac{0.25(3\tilde{q}_{d,j} - \tilde{q}_{d,r+1} - \tilde{q}_{d,r+2} - \tilde{q}_{d,r+3})^2 \delta^2}{3\rho^2} \quad (A1) \]

\[ S_r^2 = \frac{0.25(3\tilde{q}_{r,j} - \tilde{q}_{r,r+1} - \tilde{q}_{r,r+2} - \tilde{q}_{r,r+3})^2 \delta^2}{3\rho^2} + \frac{0.25(3\tilde{q}_{r,j} - \tilde{q}_{r,r+1} - \tilde{q}_{r,r+2} - \tilde{q}_{r,r+3})^2 \delta^2}{3\rho^2} + \frac{0.25(3\tilde{q}_{r,j} - \tilde{q}_{r,r+1} - \tilde{q}_{r,r+2} - \tilde{q}_{r,r+3})^2 \delta^2}{3\rho^2} \quad (A2) \]

\[ S_{d+r}^2 = \frac{0.0625(3\tilde{q}_{d,j} + 3\tilde{q}_{r,j} - \tilde{q}_{d,r+1} - \tilde{q}_{d,r+2} - \tilde{q}_{d,r+3} - \tilde{q}_{r,r+1} - \tilde{q}_{r,r+2} - \tilde{q}_{r,r+3})^2 \delta^2}{3\rho^2} + \frac{0.0625(3\tilde{q}_{d,j} + 3\tilde{q}_{r,j} - \tilde{q}_{d,r+1} - \tilde{q}_{d,r+2} - \tilde{q}_{d,r+3} - \tilde{q}_{r,r+1} - \tilde{q}_{r,r+2} - \tilde{q}_{r,r+3})^2 \delta^2}{3\rho^2} + \frac{0.0625(3\tilde{q}_{d,j} + 3\tilde{q}_{r,j} - \tilde{q}_{d,r+1} - \tilde{q}_{d,r+2} - \tilde{q}_{d,r+3} - \tilde{q}_{r,r+1} - \tilde{q}_{r,r+2} - \tilde{q}_{r,r+3})^2 \delta^2}{3\rho^2} \quad (A3) \]

Recall equation (2) and I know that at this time \( \tilde{q}_{r,j} = \tilde{q}_{d,j} - TC \). Now using \( \tilde{q}_{d,j} - TC \) to replace \( \tilde{q}_{r,j} \) in (A2) and (A3), I can always get that

\[ S_d^2 = S_r^2 = S_{d+r}^2 \quad (A4) \]
Appendix 2

(1)

Similarly, I can calculate the variance of expected firm value under each payout method.

\[ S^2_d = \frac{0.25(2 - 3q_{d,1} - q_{d,2} + q_{d,3})^2 \delta^2}{3\rho^2} + \frac{0.25(3q_{d,1} + q_{d,2} + q_{d,3} - 2)^2 \delta^2}{3\rho^2} \]  
\[ + \frac{0.25(2q_{d,1} + q_{d,2} - 3q_{d,3})^2 \delta}{3\rho^2} + \frac{0.25(q_{d,1} - 3q_{d,3}^2 + 3q_{d,3} - 2)^2 \delta^2}{3\rho^2} \]  
\[ \text{(A5)} \]

\[ S^2_r = \frac{0.25(2 - 3q_{r,1} + q_{r,2} - q_{r,3})^2 \delta^2}{3\rho^2} + \frac{0.25(3q_{r,1} + q_{r,2} + q_{r,3} - 2)^2 \delta^2}{3\rho^2} \]  
\[ + \frac{0.25(2q_{r,1} - 3q_{r,2} - q_{r,3})^2 \delta}{3\rho^2} + \frac{0.25(q_{r,1} + 3q_{r,2} - 3q_{r,3} - 2)^2 \delta^2}{3\rho^2} \]  
\[ \text{(A6)} \]

\[ S^2_{d+r} = \frac{0.0625(4 - 3q_{d,1} + q_{d,2} + q_{d,3} - 4q_{r,1} - q_{r,2} + q_{d,3} - 3q_{r,1} - 3q_{r,2} + q_{d,3} - q_{r,3})^2 \delta^2}{3\rho^2} \]  
\[ + \frac{0.0625(3q_{d,1} + q_{d,2} + q_{d,3} - 3q_{r,1} + q_{r,2} + q_{d,3} - q_{r,1} - 3q_{r,2} - 3q_{r,3} - 4)^2 \delta^2}{3\rho^2} \]  
\[ + \frac{0.0625(q_{d,1} + q_{d,2} - 3q_{d,3} - 3q_{r,1} + q_{r,2} + q_{d,3} - 3q_{r,2} - 3q_{r,3} - 4)^2 \delta}{3\rho^2} \]  
\[ + \frac{0.0625(q_{d,1} - 3q_{d,3} + q_{d,2} + q_{d,3} - 3q_{r,1} - 3q_{r,2} - 3q_{r,3} - 4)^2 \delta^2}{3\rho^2} \]  
\[ \text{(A7)} \]

Recall equation (2) and I know that at this time \( q_{r,1} = q_{d,1} - TC \). Now using \( q_{d,1} - TC \) to replace \( q_{r,1} \) in (A6) and (A7), I can get that

\[ S^2_r = \frac{0.25(2 - 3q_{d,1} - q_{d,2} + q_{d,3} + 4TC)^2 \delta^2}{3\rho^2} + \frac{0.25(3q_{d,1} + q_{d,2} + q_{d,3} - 2 - 4TC)^2 \delta^2}{3\rho^2} \]  
\[ + \frac{0.25(2 + q_{d,2} - q_{d,3} - 3q_{d,2} + 4TC)^2 \delta}{3\rho^2} + \frac{0.25(q_{d,1} + q_{d,2} + 3q_{d,3} - 2 - 4TC)^2 \delta^2}{3\rho^2} \]  
\[ \text{(A8)} \]

\[ S^2_{d+r} = \]
Comparing (A5), (A8) and (A9), I can see that when T=0 and whatever C is,  
$q_{r,t}=q_{d,t}$  and at this time I can get that  
$$S^2_d = S^2_r = S^2_{d+r}$$  
(A10)

(2)  
When T>0 (there is lagged reaction to repurchase announcements) and C>0 (there is information loss during the lag), $q_{r,t}<q_{d,t}$. Now from (A8) I can get that  
\[
S^2_r = \frac{0.25(2 - 3q_{d,t} + q_{d,t+1} + q_{d,t+2} - q_{d,t+3})^2 + 2(2 - 3q_{d,t} - q_{d,t+1} + q_{d,t+2} - q_{d,t+3})4TC + 16T^2C^2}{3\rho^2} \delta^2 \\
+ \frac{0.25(3q_{d,t+1} + q_{d,t} + q_{d,t+2} - q_{d,t+3} - 2)^2 - 2(3q_{d,t+1} + q_{d,t} + q_{d,t+2} - q_{d,t+3} - 2)4TC + 16T^2C^2}{3\rho^2} \delta^2 \\
+ \frac{0.25(2 + q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3} - 3q_{d,t+1} - q_{d,t+2} - q_{d,t+3} - 3q_{d,t+2})4TC + 16T^2C^2}{3\rho^2} \delta^2 \\
+ \frac{0.25(q_{d,t} - q_{d,t+1} + q_{d,t+2} + q_{d,t+3} - 2)^2 - 2(q_{d,t} - q_{d,t+1} + q_{d,t+2} + q_{d,t+3} - 2)4TC + 16T^2C^2}{3\rho^2} \delta^2 \\
= \frac{S^2_d + 0.25[32TC(2 - q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3} + 2TC)]\delta^2}{3\rho^2} 
\]  
(A11)

I know that TC- $q_{d,t}=-q_{r,t}$. Similarly I can get that TC- $q_{d,t+1}=-q_{r,t+1}$. Therefore I can get that  
\[
S^2_r = S^2_d + \frac{0.25[32TC(2 - q_{r,t} - q_{r,t+1} - q_{r,t+2} - q_{d,t+3})]\delta^2}{3\rho^2} 
\]  
(A12)

I know that  $q_{d,t}>0.5$ and $q_{r,t}>0.5$, and  
\[
\frac{0.25[32TC(2 - q_{r,t} - q_{r,t+1} - q_{r,t+2} - q_{d,t+3})]\delta^2}{3\rho^2} <0 
\]

Therefore, I can get  
$$S^2_r < S^2_d$$  
(A13)

Similarly, I can use $S^2_d$ to describe $S^2_{d+r}$.  
\[
S^2_{d+r} = S^2_d + \frac{0.25[16TC(2 - q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3} + TC)]\delta^2}{3\rho^2} 
\]  
(A14)
\[
S_d^2 = S_d^2 + \frac{0.25[16TC(2 - q_{r,j} - q_{d,je1} - q_{d,je2} - q_{d,je3})]\delta^2}{3\rho^2} \tag{A15}
\]

Similarly, I know that

\[
\frac{0.25[16TC(2 - q_{r,j} - q_{d,je1} - q_{d,je2} - q_{d,je3})]\delta^2}{3\rho^2} < 0, \text{ and}
\]

\[
S_{d+e}^2 < S_d^2 \tag{A16}
\]

Using (A11) to minus (A14), I can get that

\[
S_r^2 - S_{d+e}^2 = \frac{0.25[16TC(2 - q_{d,j} - q_{d,je1} - q_{d,je2} - q_{d,je3} + 3TC)]\delta^2}{3\rho^2} \tag{A17}
\]

I know that TC - q_{d,j} = -q_{r,j}. Using -q_{r,j} to replace TC - q_{d,j} in (A17), I get that

\[
S_r^2 - S_{d+e}^2 = \frac{0.25[16TC(2 - q_{r,j} - q_{r,je1} - q_{r,je2} - q_{d,je3})]\delta^2}{3\rho^2} \tag{A18}
\]

I know that \(q_{d,j} < 0.5\) and \(q_{r,j} > 0.5\), and hence

\[
S_r^2 < S_{d+e}^2 \tag{A19}
\]

Combining the results from (A13), (A16) and (A19), I know that when T>0 and C>0,

\[
S_r^2 < S_{d+e}^2 < S_d^2 \tag{A20}
\]

Appendix 3

Firstly using the same method I can calculate the variances under each method.

\[
S_d^2 = \frac{0.25(2 - 3q_{d,je1} - q_{d,je3} + q_{d,je2})^2 \delta^2}{3\rho^2} + \frac{0.25(3q_{d,je1} + q_{d,je3} - q_{d,je2} - 2)^2 \delta^2}{3\rho^2} + \frac{0.25(2 - q_{d,je1} + q_{d,je3} - 3q_{d,je2})^2 \delta^2}{3\rho^2} + \frac{0.25(q_{d,je1} + q_{d,je3} + 3q_{d,je2} - 2)^2 \delta^2}{3\rho^2} \tag{A21}
\]

\[
S_r^2 = \frac{0.25(3q_{r,je1} + q_{r,je3} - q_{r,je2} + q_{r,je3} - 2)^2 \delta^2}{3\rho^2} + \frac{0.25(2 - 3q_{r,je1} - q_{r,je3} - q_{r,je2} + q_{r,je3})^2 \delta^2}{3\rho^2} + \frac{0.25(q_{r,je1} - q_{r,je2} + q_{r,je3} + 3q_{r,je2} - 2)^2 \delta^2}{3\rho^2} + \frac{0.25(2 - q_{r,je1} + q_{r,je3} - q_{r,je2} - 3q_{r,je3})^2 \delta^2}{3\rho^2}
\]

\[
S_{d+e}^2 = \frac{0.25(q_{r,je1} - q_{r,je2} + q_{r,je3} - 2)^2 \delta^2}{3\rho^2} + \frac{0.25(2 - q_{r,je1} + q_{r,je3} - q_{r,je2} - 3q_{r,je3})^2 \delta^2}{3\rho^2}
\]
\[
\frac{0.0625[(3q_{r,t} - 3q_{d,t}) - (q_{d,t+1} - q_{r,t+1}) - (q_{r,t+2} - q_{d,t+2}) - (q_{d,t+3} - q_{r,t+3})]^2 \delta^2}{3\rho^2} + \\
\frac{0.0625[(3q_{d,t+1} - 3q_{r,t+1}) - (q_{r,t} - q_{d,t}) - (q_{r,t+2} - q_{d,t+2}) - (q_{d,t+3} - q_{r,t+3})]^2 \delta^2}{3\rho^2} + \\
\frac{0.0625[(3q_{r,t+2} - 3q_{d,t+2}) - (q_{r,t} - q_{d,t}) - (q_{d,t+1} - q_{r,t+2}) - (q_{d,t+3} - q_{r,t+3})]^2 \delta^2}{3\rho^2} + \\
\frac{0.0625[(3q_{d,t+3} - 3q_{r,t+3}) - (q_{r,t} - q_{d,t}) - (q_{d,t+1} - q_{r,t+1}) - (q_{r,t+2} - q_{d,t+2})]^2 \delta^2}{3\rho^2} \tag{A22}
\]

Using \( q_{d,t} - TC \) to replace \( q_{r,t} \) in (A21) and (A22), I can get that

\[
S_r^2 = \\
\frac{0.25(3q_{d,t} + q_{d,t+1} - q_{d,t+2} + q_{d,t+3} - 2 - 4TC)^2 \delta^2}{3\rho^2} + \\
\frac{0.25(2 - 3q_{d,t+1} - q_{d,t+2} + q_{d,t+3} + 4TC)^2 \delta^2}{3\rho^2} + \\
\frac{0.25(q_{d,t+1} - q_{d,t} + 3q_{d,t+2} + q_{d,t+3} - 2 - 4TC)^2 \delta}{3\rho^2} + \\
\frac{0.25(2 - q_{d,t} + q_{d,t+1} - q_{d,t+2} - 3q_{d,t+3} + 4TC)^2 \delta^2}{3\rho^2} \tag{A23}
\]

\[
S_{d,r}^2 = \frac{4T^2 C^2 \delta^2}{3\rho^3} \tag{A24}
\]

When \( T=0 \) and whatever \( C \) is, I can get that

\[
S_r^2 = S_d^2 > S_{d,r}^2 = 0 \tag{A25}
\]

From equation (22) I know that at this time

\[
E_r(V) < E_{d,r}(V) < E_d(V) \tag{A26}
\]

Recall manager’s utility function (1) it is obvious that

\[
E_d(U) > E_r(U) \tag{A26}
\]

Where \( E_d(U) \) is the utility when paying out is only through dividends and \( E_r(U) \) is the utility managers get when payout is only through repurchases. Now let’s have a look at manager’s utility when one half of the payout is through dividends while the other half is through repurchases.

\[
E_{d,r}(U) = \beta E_{d,r}(V) - \kappa S_{d,r}^2 \tag{A27}
\]
I know $E_{d+r}(V) = \frac{N}{\rho}$ and $S_{d+r}^2 = 0$, so

$$E_{d+r}(U) = \beta \frac{N}{\rho}$$ \quad (A28)

Similarly I can get that

$$E_d(U) = \beta \frac{N}{\rho} + \frac{0.5 \beta (q_d, t+1 - q_d, t + q_d, t+3 - q_d, t+2) \delta}{\rho} - \kappa S_d^2$$ \quad (A29)

From (A28) and (A29) it is obvious that the comparison between $E_{d+r}(U)$ and $E_d(U)$ depends on

$$0.5 \beta (q_d, t+1 - q_d, t + q_d, t+3 - q_d, t+2) \delta \rho - \kappa S_d^2 = 0$$ \quad (A30)

Solving (A30) out I can get that

$$\kappa = \frac{6 \beta \rho (q_d, t+1 - q_d, t + q_d, t+3 - q_d, t+2)}{A \delta}$$ \quad (A31)

Where in (A31),

$$A = (2 - 3q_d, t - q_d, t+1 - q_d, t+3 + q_d, t+2)^2 + (3q_d, t+1 + q_d, t - q_d, t+3 + q_d, t+2)^2$$
$$+ (2 - q_d, t+1 + q_d, t - q_d, t+3 - 3q_d, t+2)^2 + (q_d, t - q_d, t+1 + q_d, t+2 + 3q_d, t+3 - 2)^2$$

Therefore, I can get that

--If $0 < \kappa < \frac{6 \beta \rho (q_d, t+1 - q_d, t + q_d, t+3 - q_d, t+2)}{A \delta}$, $E_d(U) > E_{d+r}(U)$. Combining with results from (A26) I can see that $E_d(U) > E_r(U)$ and $E_d(U) > E_{d+r}(U)$. Hence the best paying out method is through dividends only.

--If $\frac{6 \beta \rho (q_d, t+1 - q_d, t + q_d, t+3 - q_d, t+2)}{A \delta} < \kappa < 1$, $E_d(U) < E_{d+r}(U)$. Combining with results from (A26) I can see that $E_d(U) > E_r(U)$ and $E_d(U) < E_{d+r}(U)$. Hence the best paying out method is paying out one half through dividends and the other half
through repurchases.

If \( \kappa = \frac{6 \beta p (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{A \delta} < 1 \), \( E_d (U) = E_{d_{orr}} (U) \). Combining with results from (A26) I can see that at this time \( E_d (U) > E_r (U) \) and \( E_d (U) = E_{d_{orr}} (U) \). Hence there is no difference between paying out only through dividends and paying out one half through dividends and the other half through repurchases. Paying out only through repurchases is the worst choice.

**Appendix 4**

From Appendix 3 I know how managers make their payout method choice when \( T=0 \) (there is no reaction lag to repurchase announcements). However, what will happen if there is a lagged reaction to repurchase announcements \( (T>0) \) and there is information loss during the reaction lag as \( \text{I II} \) \( (C>0) \)?

(1)

When \( T>0 \) and \( C>0 \) the variances under each payout method are still the same as they are in Appendix 3. Let’s have a look at (A21) and (A6), it is obvious that \( S_r^2 \) in Appendix 3 is exactly the same as in Appendix 2. From (A13) in Appendix 2 I know that when \( T>0 \) and \( C>0 \), I can get

\[
S_r^2 < S_d^2
\]

Similarly, here when \( T>0 \) (\( T \) is an odd number) and \( C>0 \), \( S_r^2 \) and \( S_d^2 \) are exactly the same as they are in Appendix 2 (in which \( T \) is an even number). Hence I can also get that in this case

\[
S_r^2 < S_d^2
\]  \hspace{1cm} (A32)

Since I know that \( S_r^2 < S_d^2 \) now let’s have a look at \( S_d^2 \) and \( S_{d_{orr}}^2 \).

I already know that

\[
S_d^2 =
\]
Examining $S_d^2$, it is not difficult to see that the fMy parts of $S_d^2$ are mathematically symmetric. Therefore, if I can prove the relationship between one part of $S_d^2$ and $\frac{T^2 C^2 \delta^2}{3 \rho^3}$, then I can know which one is bigger between $S_d^2$ and $S_{d+r}^2$.

Therefore, let’s have a look at the first part of $S_d^2$ and $\frac{T^2 C^2 \delta^2}{3 \rho^3}$.

If $\frac{0.25(2 - 3q_{d,t} - q_{d,t+1} - q_{d,t+3} + q_{d,t+2})^2 \delta^2}{3 \rho^2} > \frac{T^2 C^2 \delta^2}{3 \rho^3}$, then I need to prove that

$$(2 - 3q_{d,t} - q_{d,t+1} - q_{d,t+3} + q_{d,t+2})^2 > (2TC)^2 \quad (A33)$$

I know that $TC > 0$ and $2 - 3q_{d,t} - q_{d,t+1} - q_{d,t+3} + q_{d,t+2} < 0$. Then to prove (A33) I only need to prove that

$2 - 3q_{d,t} - q_{d,t+1} - q_{d,t+3} + q_{d,t+2} < -2TC \quad (A34)$

I know that $q_{r,t} = q_{d,t} - TC$, so to prove (A34) is equal to prove that

$2 - q_{d,t} - 2q_{r,t} - q_{d,t+1} - q_{d,t+3} + q_{d,t+2} < 0 \quad (A35)$

I know that $q_{r,t} > 0.5$, $q_{d,t} > 0.5$ and $q_{d,t+3} > q_{d,t+2}$, so I can always have (A35). And then I can get

$$\frac{0.25(2 - 3q_{d,t} - q_{d,t+1} - q_{d,t+3} + q_{d,t+2})^2 \delta^2}{3 \rho^2} > \frac{T^2 C^2 \delta^2}{3 \rho^3} \quad (A36)$$

Similarly, I can prove that

$$\frac{0.25(3q_{d,t+1} + q_{d,t} - q_{d,t+3} + q_{d,t+2} - 2)^2 \delta^2}{3 \rho^2} > \frac{T^2 C^2 \delta^2}{3 \rho^3} \quad (A37)$$

$$\frac{0.25(2q_{d,t+1} + q_{d,t} - 3q_{d,t+3} - 2q_{d,t+2})^2 \delta}{3 \rho^2} > \frac{T^2 C^2 \delta^2}{3 \rho^3} \quad (A38)$$
Adding (A36), (A37), (A38) and (A39) together, I can get that when\(T>0\) (and \(T\) is an odd number) and \(C>0\)

\[
S^2_d > S^2_{d+\tau r}
\]  

(A40)

Combining the results from (A32) and (A40), I know when \(T\) is an odd number and \(T>0\) and \(C>0\),

\[
S^2_r < S^2_d \quad \text{and} \quad S^2_d > S^2_{d+\tau r}
\]  

(A41)

(2)

(A41) is not enough because I need to know the relationship between \(S^2_r\) and \(S^2_{d+\tau r}\) as I II. From (A23) I know that

\[
S^2_r = \frac{0.25(q_{d,t} + q_{d,j+1} - q_{d,i+2} + q_{d,i+3} - 2 - 4TC)^2}{3\rho^2} \delta^2 + \frac{0.25(-3q_{d,j+1} - q_{d,i+2} + q_{d,i+3} + 4TC)^2}{3\rho^2} \delta^2
\]

\[
\geq \frac{0.25\delta^2}{3\rho^2} \left[ (3q_{d,r} + q_{d,j+1} - q_{d,i+2} + q_{d,i+3} - 2)^2 - 8TC(3q_{d,i} + q_{d,j+1} - q_{d,i+2} + q_{d,i+3} - 2) + 16T^2C^2 \right]
\]

(A42)

Therefore,

\[
S^2_r - S^2_{d+\tau r} = \frac{\delta^2}{3\rho^2} \left\{ \frac{12T^2C^2 + 8TC(2 - q_{d,i} - q_{d,j+1} - q_{d,i+2} - q_{d,i+3})}{8TC(2 - q_{d,i} - q_{d,j+1} - q_{d,i+2} - q_{d,i+3}) + 16T^2C^2} \right\}
\]

(A43)

From (A43) I know that the comparison between \(S^2_r\) and \(S^2_{d+\tau r}\) depends on
-rthermore I e can see the comparison, actually, depends on the combined effects of
TC at the end. Let’s assume that

\[
Y = \left[ 12T^2C^2 + 8TC(2 - q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3}) \right. \\
\left. + 0.25 \left[ (3q_{d,t} + q_{d,t+1} - q_{d,t+2} + q_{d,t+3} - 2)^2 + (2 - 3q_{d,t+1} - q_{d,t} - q_{d,t+2} + q_{d,t+3})^2 \\ + (q_{d,t+1} - q_{d,t} + 3q_{d,t+2} + q_{d,t+3} - 2)^2 + (2 - q_{d,t} + q_{d,t+1} - q_{d,t+2} - 3q_{d,t+3})^2 \right] \right] \\
\] (A44)

Y is dependent variable and TC is independent variable.

Let \( Y = 0 \), then I can get that

\[
\Delta = 64(2 - q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3})^2 - \\
\left[ (3q_{d,t} + q_{d,t+1} - q_{d,t+2} + q_{d,t+3} - 2)^2 + (2 - 3q_{d,t+1} - q_{d,t} - q_{d,t+2} + q_{d,t+3})^2 \\
+ (q_{d,t+1} - q_{d,t} + 3q_{d,t+2} + q_{d,t+3} - 2)^2 + (2 - q_{d,t} + q_{d,t+1} - q_{d,t+2} - 3q_{d,t+3})^2 \right] = 16 \left[ -6(q_{d,t} - q_{d,t+2})^2 - 6(q_{d,t+1} - q_{d,t+3})^2 + (2 - q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3})^2 \right] (A45)
\]

I know that If \( \delta_{t+1} \) is opposite to \( \delta_t \) in (3) (i.e. in mean-reverting state), I can get

\[
q_{t+1} = \frac{q_{d,t} \pi}{q_{d,t} \pi + (1 - q_{d,t})(1 - \pi)}
\]

Similarly I can use \( q_{d,t} \) to describe \( q_{d,t+2} \) and \( q_{d,t+3} \).

\[
q_{d,t+1} = \frac{q_{d,t+1} \pi}{q_{d,t+1} \pi + (1 - q_{d,t+1})(1 - \pi)} \quad (A46)
\]

\[
q_{d,t+2} = \frac{q_{d,t+2} \pi^2}{(1 - \pi)^2 - q_{d,t+2}(1 - 2\pi)} \quad (A47)
\]

\[
q_{d,t+3} = \frac{q_{d,t+3} \pi^3}{(1 - \pi)^3 - q_{d,t+3}(1 - 3\pi + 3\pi^2 - 2\pi^3)} \quad (A48)
\]

Using (A46), (A47) and (A48) to replace \( q_{d,t+1} \), \( q_{d,t+2} \) and \( q_{d,t+3} \) in (A45) respectively, I can get

\[
\Delta > 0 \quad (A49)
\]

Let’s make a numerical example. From the Table of numerical example on page 8, I
assume that t=2 and so \((q_{d,t}, q_{d,t+1}, q_{d,t+2}, q_{d,t+3}) = (0.6, 0.69, 0.77, 0.84)\). From (A45) I know that \(\Delta = 0.5016 > 0\). When t=3, \((q_{d,t}, q_{d,t+1}, q_{d,t+2}, q_{d,t+3}) = (0.69, 0.77, 0.84, 0.88)\) and I know that \(\Delta = 1.1619 > 0\).

(A49) means that TC have two values that make \(Y=0\). And I can calculate that when
\[
TC = \frac{-8(2-q_{d,t}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3}) \pm \sqrt{\Delta}}{24}, Y=0
\]
\[
\Delta = 64(2-q_{d,t}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3})^2 -
\]
\[
\frac{12}{12} \left[ (3q_{d,t} + q_{d,t+1} - q_{d,t+2} + q_{d,t+3} - 2)^2 + (2 - 3q_{d,t+1} - q_{d,t} - q_{d,t+2} + q_{d,t+3})^2 
\right]
\]
\[
+ (q_{d,t+1} - q_{d,t} + 3q_{d,t+2} + q_{d,t+3} - 2)^2 + (2 - q_{d,t} + q_{d,t+1} - q_{d,t+2} - 3q_{d,t+3})^2
\]
Now let’s get back to the comparison between \(S_r^2\) and \(S_{d+r}^2\).

--when
\[
\frac{-8(2-q_{d,t}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3}) \pm \sqrt{\Delta}}{24} < TC < \frac{-8(2-q_{d,t}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3}) + \sqrt{\Delta}}{24},
\]
\(S_r^2 < S_{d+r}^2\). Combining the results from (A41), I can get that \(S_d^2 > S_{d+r}^2, S_r^2\).

1) when \(0 < TC < \frac{-8(2-q_{d,t}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3}) - \sqrt{\Delta}}{24}\) or
\[
TC > \frac{-8(2-q_{d,t}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3}) + \sqrt{\Delta}}{24}, \quad S_d^2 > S_{d+r}^2.\]
Combining the results from (A41), I can get that \(S_d^2 > S_{d+r}^2\).

3) when \(TC = \frac{-8(2-q_{d,t}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3}) \pm \sqrt{\Delta}}{24}, \quad S_r^2 = S_{d+r}^2.\)
Combining the results from (A41) I can get that \(S_d^2 > S_{d+r}^2 = S_r^2\).

So far I have solved out the mean values of expected firm value and variances under each payout method. However, manager’s choice depends on their utility. Recall equation (1) I know that manager’s utility depends on both the expected firm value and the volatility of expected firm value.

If\[
\frac{-8(2-q_{d,t}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3}) - \sqrt{\Delta}}{24} < TC < \frac{-8(2-q_{d,t}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3}) + \sqrt{\Delta}}{24},
\]
\[ S^2_d > S^2_{d+r} > S^2_r \] and \[ E_r(V) < E_{d+r}(V) < E_d(V). \]

Firstly,
\[ E_d(U) = \beta \frac{N}{\rho} + 0.5 \beta \frac{q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2}}{\rho} \delta \kappa S^2_d \]
\[ E_r(U) = \beta \frac{N}{\rho} + 0.5 \beta \frac{q_{d,t} - q_{d,t+1} + q_{d,t+2} - q_{d,t+3}}{\rho} \delta \kappa S^2_r \]

I can get that
\[ E_d(U) - E_r(U) = \beta \frac{\delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{\rho} \kappa(S^2_d - S^2_r) \] \hspace{1cm} (A50)

Let (A50)=0, and I can get that
\[ \kappa = \frac{\beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{\rho(S^2_d - S^2_r)} \] \hspace{1cm} (A51)

Therefore, I know that
- If \( 0 < \kappa < \frac{\beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{\rho(S^2_d - S^2_r)} \), \( E_d(U) > E_r(U) \).
- If \( \frac{\beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{\rho(S^2_d - S^2_r)} < \kappa < 1 \), \( E_d(U) < E_r(U) \).
- If \( \kappa = \frac{\beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{\rho(S^2_d - S^2_r)} \), \( E_d(U) = E_r(U) \).

Secondly,
\[ E_d(U) - E_{d+r}(U) = \frac{0.5 \beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{\rho} \kappa(S^2_d - S^2_{d+r}) \] \hspace{1cm} (A52)

Let (A52)=0, and I can get that
\[ \kappa = \frac{\beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2\rho(S^2_d - S^2_{d+r})} \] \hspace{1cm} (A53)

Therefore I know that
- If \( 0 < \kappa < \frac{\beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2\rho(S^2_d - S^2_{d+r})} \), \( E_d(U) > E_{d+r}(U) \).
- If \( \frac{\beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2\rho(S^2_d - S^2_{d+r})} < \kappa < 1 \), \( E_d(U) < E_{d+r}(U) \).
\[ -\text{If } \kappa = \frac{\beta \delta (q_{d,j+1} - q_{d,j} + q_{d,j+3} - q_{d,j+2})}{2 \rho (S_d^2 - S_{d,r}^2)}, \quad E_d(U) = E_{d,r}(U). \]

Examining (A51) and (A53), I can see that it’s necessary to make a comparison between

\[ \frac{\beta \delta (q_{d,j+1} - q_{d,j} + q_{d,j+3} - q_{d,j+2})}{\rho (S_d^2 - S_{d,r}^2)} \text{ and } \frac{\beta \delta (q_{d,j+1} - q_{d,j} + q_{d,j+3} - q_{d,j+2})}{2 \rho (S_d^2 - S_{d,r}^2)}. \]

And this finally depends on the comparison between \((S_d^2 - S_{d,r}^2)\) and \(2(S_d^2 - S_{d,r}^2)\).

\[
2(S_d^2 - S_{d,r}^2) - (S_d^2 - S_{d,r}^2) = \frac{0.25 S^2}{3 \rho^2} \left[ 2(2 + 2TC - 3q_{d,j} - q_{d,j+1} - q_{d,j+3} + q_{d,j+2})^2 + 2(q_{d,j} - q_{d,j+1} + q_{d,j+3} - 3q_{d,j+2})^2 + 2(q_{d,j} - q_{d,j+1} + q_{d,j+2} + 3q_{d,j+3} - 2 - 2TC)^2 \right]
\]

It is obvious that

\[
2(S_d^2 - S_{d,r}^2) > (S_d^2 - S_{d,r}^2) \quad \text{(A54)}
\]

Therefore, I can get that

\[
\frac{\beta \delta (q_{d,j+1} - q_{d,j} + q_{d,j+3} - q_{d,j+2})}{2 \rho (S_d^2 - S_{d,r}^2)} < \frac{\beta \delta (q_{d,j+1} - q_{d,j} + q_{d,j+3} - q_{d,j+2})}{\rho (S_d^2 - S_{d,r}^2)} \quad \text{(A55)}
\]

Therefore, I can have the following results:

-- If \(0 < \kappa < \frac{\beta \delta (q_{d,j+1} - q_{d,j} + q_{d,j+3} - q_{d,j+2})}{2 \rho (S_d^2 - S_{d,r}^2)}\), \(E_d(U) > E_r(U)\) and \(E_d(U) > E_{d,r}(U)\). Therefore, the best method is paying out only through repurchases.

-- If \(\frac{\beta \delta (q_{d,j+1} - q_{d,j} + q_{d,j+3} - q_{d,j+2})}{2 \rho (S_d^2 - S_{d,r}^2)} < \kappa < \frac{\beta \delta (q_{d,j+1} - q_{d,j} + q_{d,j+3} - q_{d,j+2})}{\rho (S_d^2 - S_{d,r}^2)}\), \(E_d(U) > E_r(U)\) and \(E_d(U) < E_{d,r}(U)\). Therefore, the best method is paying out one half through dividends and the other half through repurchases.

-- If \(\frac{\beta \delta (q_{d,j+1} - q_{d,j} + q_{d,j+3} - q_{d,j+2})}{\rho (S_d^2 - S_{d,r}^2)} < \kappa < 1\), \(E_d(U) < E_r(U)\) and \(E_d(U) < E_{d,r}(U)\). Therefore, paying out only through dividends is the worst choice, and the best choice depends on \(E_r(U)\) and \(E_{d,r}(U)\).

\[
E_{d,r}(U) - E_r(U) = -\frac{0.5 \beta \delta (q_{d,j} - q_{d,j+1} + q_{d,j+2} - q_{d,j+3})}{\rho} - \kappa (S_{d,r}^2 - S_{d,r}^2) \quad \text{(A56)}
\]

Let (A56)=0 and I can get that

\[
\kappa = \frac{\beta \delta (q_{d,j+1} - q_{d,j} + q_{d,j+3} - q_{d,j+2})}{2 \rho (S_{d,r}^2 - S_{d,r}^2)} \quad \text{(A57)}
\]

Therefore, I can get the following results:
--If $0 < \kappa < \frac{\beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d,r}^2 - S_r^2)}$, $E_{d,r}(U) > E_r(U)$.

--If $\frac{\beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d,r}^2 - S_r^2)} < \kappa < 1$, $E_{d,r}(U) < E_r(U)$.

--If $\kappa = \frac{\beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d,r}^2 - S_r^2)}$, $E_{d,r}(U) = E_r(U)$.

Now to get final results it is necessary to compare $(S_d^2 - S_r^2)$ and $2(S_{d,r}^2 - S_r^2)$.

$2(S_{d,r}^2 - S_r^2) - (S_d^2 - S_r^2) =

\frac{0.25 \delta^2}{\rho^2} \left[ -2(2 + 2TC - 3q_{d,t} - q_{d,t+1} - q_{d,t+3} + q_{d,t+2})^2 - 2(3q_{d,t+1} + q_{d,t} - q_{d,t+3} + q_{d,t+2} - 2 - 2TC)^2 \right]

It is obvious that

$2(S_{d,r}^2 - S_r^2) < (S_d^2 - S_r^2)$

As a result, I know that

$$\frac{\beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d,r}^2 - S_r^2)} > \frac{\beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{\rho (S_d^2 - S_r^2)}$$

(A58)

Combining results together, I can get that If

$$\frac{\beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{\rho (S_d^2 - S_r^2)} < \kappa < 1, \quad E_d(U) < E_r(U) \quad \text{and} \quad E_d(U) < E_{d,r}(U).$$

Therefore, paying out only through dividends is the worst choice, and the best choice depends on $E_r(U)$ and $E_{d,r}(U)$. Furthermore,

$$E_{d,r}(U) > E_r(U) > E_d(U).$$

Paying out one half through dividends and the other half through repurchases is the best choice.

$$E_{d,r}(U) > E_d(U) > E_r(U).$$

Paying out only through repurchases is the best choice.

$$E_{d,r}(U) = E_r(U) > E_d(U).$$
Combining all the result together, I have My following proposition:

When \( T \) is an odd number and \( C > 0 \) (i.e. there is information loss during the reaction lag), managers’ best payout choice, facing forecasted volatile earnings in future, depends not only on the combined effects between \( T \) (the length of lag) and \( C \) (the loss of information), but on how much managers dislike volatility. Furthermore,

----When
\[
-\frac{8(2-q_{d,d}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3})-\sqrt{\Delta}}{24} < TC < -\frac{8(2-q_{d,d}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3})+\sqrt{\Delta}}{24},
\]
managers’ best payout method choice depends on how much they dislike volatility. And,

--If \( 0 < \kappa < \frac{\beta \delta(q_{d,t+1} - q_{d,d} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d,d}^2 - S_{d,r}^2)} \) (managers slightly dislike volatility), paying out only through dividends is the best choice.

--If \( \frac{\beta \delta(q_{d,t+1} - q_{d,d} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d,d}^2 - S_{d,r}^2)} < \kappa < \frac{\beta \delta(q_{d,t+1} - q_{d,d} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d,r}^2 - S_{r}^2)} \), paying out one half through dividends and the other half through repurchases is the best choice.

--If \( \frac{\beta \delta(q_{d,t+1} - q_{d,d} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d,r}^2 - S_{r}^2)} < \kappa < 1 \) (managers strongly dislike volatility), paying out only through repurchases is the best choice.

(4)

In the previous part, I have proved what payout method managers will choose when
\[
-\frac{8(2-q_{d,d}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3})-\sqrt{\Delta}}{24} < TC < -\frac{8(2-q_{d,d}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3})+\sqrt{\Delta}}{24}.
\]
Now let’s have a look what method managers will choose when
\[
0 < TC < -\frac{8(2-q_{d,d}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3})-\sqrt{\Delta}}{24} \
or \
TC > -\frac{8(2-q_{d,d}-q_{d,t+1}-q_{d,t+2}-q_{d,t+3})+\sqrt{\Delta}}{24}.
\]
---If $0 < \text{TC} < \frac{-8(2 - q_{d,1} - q_{d,2} - q_{d,3}) - \sqrt{\Delta}}{24}$ or

$\text{TC} > \frac{-8(2 - q_{d,1} - q_{d,2} - q_{d,3}) + \sqrt{\Delta}}{24}$, I can get that

$S_d^2 - S_{d,r}^2 > S_r^2$ and $E_r(V) < E_{d+r}(V) < E_d(V)$ \hspace{1cm} (A59)

Recall equation (1) and I can get that

$E_{d+r}(U) = \beta E_{d+r}(V) - \kappa S_{d+r}^2$

$E_r(U) = \beta E_r(V) - \kappa S_r^2$

Therefore,

$E_{d+r}(U) - E_r(U) = \beta [E_{d+r}(V) - E_r(V)] - \kappa (S_{d+r}^2 - S_r^2)$ \hspace{1cm} (A60)

From (A59) it is obvious that (A60) > 0, so I get that at this time

$E_{d+r}(U) > E_r(U)$ \hspace{1cm} (A61)

Now let’s have a look at the comparison between $E_d(U)$ and $E_{d+r}(U)$. From (A52) I know that

$E_d(U) - E_{d+r}(U) = \frac{0.5 \beta \delta (q_{d,1} - q_{d,2} + q_{d,3} - q_{d,2})}{\rho} - \kappa (S_d^2 - S_{d+r}^2)$, and that

--If $0 < \kappa < \frac{\beta \delta (q_{d,1} - q_{d,2} + q_{d,3} - q_{d,2})}{2 \rho (S_d^2 - S_{d+r}^2)}$, $E_d(U) > E_{d+r}(U)$.

--If $\frac{\beta \delta (q_{d,1} - q_{d,2} + q_{d,3} - q_{d,2})}{2 \rho (S_d^2 - S_{d+r}^2)} < \kappa < 1$, $E_d(U) < E_{d+r}(U)$.

--If $\kappa = \frac{\beta \delta (q_{d,1} - q_{d,2} + q_{d,3} - q_{d,2})}{2 \rho (S_d^2 - S_{d+r}^2)}$, $E_d(U) = E_{d+r}(U)$.

Therefore, combining these results with the results from (A61), I know that

--If $0 < \kappa < \frac{\beta \delta (q_{d,1} - q_{d,2} + q_{d,3} - q_{d,2})}{2 \rho (S_d^2 - S_{d+r}^2)}$, $E_d(U) > E_{d+r}(U) > E_r(U)$. Hence, the best payout method is through dividends only.

--If $\frac{\beta \delta (q_{d,1} - q_{d,2} + q_{d,3} - q_{d,2})}{2 \rho (S_d^2 - S_{d+r}^2)} < \kappa < 1$, $E_d(U) < E_{d+r}(U)$ and $E_r(U) < E_{d+r}(U)$. Therefore, the best payout method is to pay out one half through dividends and the other half through repurchases.
\[ \kappa = \frac{\beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_d^2 - S_{d,t+1}^2)}, \quad E_d(U) = E_{d,e}(U) > E_r(U) \]  
Hence paying out only through dividends or paying out one half through dividends and the other half through repurchases make no difference to managers under these conditions. But the worst choice is to pay out only through repurchases.

\[ -\text{If TC} = \frac{-8(2 - q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3}) \pm \sqrt{\Delta}}{24}, \text{ I can get that} \]

\[ S_d^2 > S_r^2 = S_{d,e}^2 \text{ and } E_r(V) < E_{d,e}(V) < E_d(V) \quad (A62) \]

From (A60) I know that

\[ E_{d,e}(U) - E_r(U) = \beta [E_{d,e}(V) - E_r(V)] - \kappa (S_{d,e}^2 - S_r^2) \]

Using the results from (A62), it is obvious that

\[ E_{d,e}(U) > E_r(U) \quad (A63) \]

Similarly, let’s have a look at \( E_d(U) \) and \( E_{d,e}(U) \). From (A52) I know that

\[ E_d(U) - E_{d,e}(U) = \frac{0.5 \beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{\rho} - \kappa (S_d^2 - S_{d,e}^2), \text{ and that} \]

\[ \begin{array}{ll}
\text{--If } 0 < \kappa < \frac{\beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_d^2 - S_{d,e}^2)}, & E_d(U) > E_{d,e}(U). \\
\text{--If } \frac{\beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_d^2 - S_{d,e}^2)} < \kappa < 1, & E_d(U) < E_{d,e}(U). \\
\text{--If } \kappa = \frac{\beta \delta (q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_d^2 - S_{d,e}^2)}, & E_d(U) = E_{d,e}(U). 
\end{array} \]

Combining these results with (A63) I can get exactly the same results when

\[ 0 < \text{TC} < \frac{-8(2 - q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3}) - \sqrt{\Delta}}{24} \text{ or } \text{TC} > \frac{-8(2 - q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3}) + \sqrt{\Delta}}{24}. \]

Therefore, combining all the results together I have the following proposition:

\[ \text{----When } 0 < \text{TC} \leq \frac{-8(2 - q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3}) - \sqrt{\Delta}}{24} \text{ or } \text{TC} > \frac{-8(2 - q_{d,t} - q_{d,t+1} - q_{d,t+2} - q_{d,t+3}) + \sqrt{\Delta}}{24}, \text{ paying out only through repurchases is not managers’ choice. The best payout method is between paying out through dividends and paying out one half through dividends and the other half through repurchases. Furthermore,} \]
If \( 0 < \kappa < \frac{\beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d}^{2} - S_{d+\tau}^{2})} \) (managers slightly dislike volatility), paying out only through dividends is the best choice.

If \( \frac{\beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d}^{2} - S_{d+\tau}^{2})} < \kappa < 1 \) (managers strongly dislike volatility), paying out one half through dividends and the other half through repurchases is the best choice.

If \( \kappa = \frac{\beta \delta(q_{d,t+1} - q_{d,t} + q_{d,t+3} - q_{d,t+2})}{2 \rho (S_{d}^{2} - S_{d+\tau}^{2})} \), paying out only through dividends or paying out one half through dividends and the other half through repurchases makes no difference to managers.
Appendix 5

Questionnaire On Dividends and Repurchases

Note: Dividends and repurchases, here, refer to cash dividends and open market repurchase programs respectively.

(Please tick one answer to each question that you mostly agree.)

1. Which of the following choices best describe your position within the security market?
   A. Investor
   B. Manager
   C. Both investor and manager

(Note: —If your answer is ‘investor’, please answer all the questions in Section A; —If your answer is ‘manager’, please answer questions 2, 3, 4.1, 4.2, 5, and 7 in Section A and all of Section B; —If your answer is ‘both investor and manager’, please answer all the following questions. However, please feel free to do all the questions if you are interested.)

Section A

2. Dividends and repurchases are two popular ways of distributing cash back to shareholders. Do you agree with the statement that repurchases are substitutes for dividends (In other words, do you agree that given a fixed total payout, paying more dividends or repurchasing more shares doesn’t make any difference)?
   A. Disagree
   B. Strongly disagree
   C. Agree
   D. Strongly agree
3.1 In your opinion, the practice of *dividend policy* is … (Here, flexibility means that firms do not need to make consistency with historic payout policy and hence do not need to worry about changes of payout.)

   A. Very flexible
   B. Flexible
   C. Inflexible
   D. Very inflexible

3.2 In your opinion, the practice of *repurchase policy* is …

   A. Very flexible
   B. Flexible
   C. Inflexible
   D. Very inflexible

3.3 Do you agree with the statement that relative to repurchases, dividend policy is less flexible?

   A. Disagree
   B. Strongly disagree
   C. Agree
   D. Strongly agree

4.1 Do you agree with the statement that there are negative consequences to *reducing dividends*?

   A. Disagree
   B. Strongly Disagree
   C. Agree
   D. Strongly agree

4.2 Do you agree with the statement that there are negative consequences to *reducing repurchases*?

   A. Disagree
   B. Strongly disagree
   C. Agree
   D. Strongly agree

4.3 Suppose that managers communicate that they want to cut dividends or repurchases in order to finance their good investments, your reaction is …

   A. Strongly positive
B. Positive
C. Strongly negative
D. Negative

5.1 Do you agree with the statement that *dividends* are more likely to be paid from permanent, operating cash flow?
   A. Disagree
   B. Strongly disagree
   C. Agree
   D. Strongly agree

5.2 Do you agree with the statement that *repurchases* are more likely to be paid from temporary, excess non-operating cash flow?
   A. Disagree
   B. Strongly disagree
   C. Agree
   D. Strongly agree

6.1 How quick is your reaction to *dividend* announcements?
   A. Very quick
   B. Quick
   C. Very slow
   D. Slow

6.2 How quick is your reaction to *repurchase* announcements?
   A. Very quick
   B. Quick
   C. Very slow
   D. Slow

6.3 Suppose there are dividend and repurchase announcements at the same time. Which of the following statements best describe your reaction?
   A. I react to dividend announcements *much quicker* than to repurchase announcements
   B. I react to dividend announcements *quicker* than to repurchase announcements
   C. I react to dividend announcements *more slowly* than to repurchase announcements
D. I react to both of them equally

7.1 Suppose there is a *dividend increase* announcement. Which of the following statement about share prices is most accurate?
   A. Prices will go up immediately
   B. Prices will go up gradually over time
   C. Prices don’t change at all
   D. Prices will decline

7.2 Suppose there is a *repurchase increase* announcement. Which of the following statement about share prices is most accurate?
   A. Prices will go up immediately
   B. Prices will go up gradually over time
   C. Prices don’t change at all
   D. Prices will decline

8.1 Do you agree with the statement that it is costly or difficult to get to understand *dividends*?
   A. Disagree
   B. Strongly disagree
   C. Agree
   D. Strongly agree (If possible, could you specify what kind of costs or difficulties are?)

8.2 Do you agree with the statement that it is costly or difficult to get to understand *repurchases*?
   A. Disagree
   B. Strongly disagree
   C. Agree
   D. Strongly agree (If possible, could you specify what kind of costs or difficulties are?)

8.3 Which one of the following statements best describes your opinion?
   A. To understand dividends is *more difficult* than to understand repurchase
   B. To understand dividends is *easier* than to understand repurchase
   C. To understand dividends is *much easier* than to understand repurchase
   D. To understand dividends is *as difficult as* to understand repurchase
9. Do you agree with the statement that you know more about dividends than about repurchases? (In other words, do you agree that you are more familiar with dividends than with repurchases?)
   A. Disagree  
   B. Strongly disagree  
   C. Agree  
   D. Strongly agree

10.1 Following share repurchase announcements, two types of repurchasing policy exist. Actual share repurchases are sometimes made intensively and sometimes are made slowly over time. How do you react to **intensive repurchases** (i.e., actual repurchases)?
   A. Very strongly  
   B. Strongly  
   C. Weakly  
   D. No reaction

10.2 How do you react to **slow repurchases** (i.e., actual repurchases)?
   A. Very strongly  
   B. Strongly  
   C. Weakly  
   D. No reaction

---

Section B

11.1 Do you attempt to ‘time the market’ using repurchases (i.e., create long-term shareholder value by buying back shares when they are undervalued by the market)?
   A. Yes  
   B. No

11.2 If your answer to question 11.1 is ‘Yes’, which of the following methods do you prefer? (If your answer is ‘No’, please ignore this question.)
   A. Immediate intense repurchasing of large number of shares  
   B. Slow gradual repurchasing of small number of shares over a long time
12.1 How important is to communicate the reason for *dividend cuts* with investors?

A. Unimportant  
B. Very unimportant  
C. Important  
D. Very important

12.2 How important is to communicate the reason for *repurchase cuts*\textsuperscript{55} with investors?

A. Unimportant  
B. Very unimportant  
C. Important  
D. Very important

13.1 Do you agree with the statement that the stability of future earnings is important to your company’s *dividend* decisions?

A. Disagree  
B. Strongly disagree  
C. Agree  
D. Strongly agree

13.2 Do you agree with the statement that the stability of future earnings is important to your company’s *repurchase* decisions?

A. Disagree  
B. Strongly disagree  
C. Agree  
D. Strongly agree

14.1 If the forecasted future earnings are *volatile*, which of the following decisions could be your choice?

\textsuperscript{55} Compared to ‘dividend cuts’ ‘repurchase cuts’ here means the following two situations: (1) some firms have started share repurchases as announced, but for some reason they stop carrying on repurchasing shares in the middle. As a result the shares actually repurchased are less than the amount announced; (2) firms do repurchase shares in the previous year, but they choose not to repurchase shares in the current year and/or for the years in the future.
A. Paying out only through dividends
B. Paying out only through repurchases
C. Paying out through both dividends and repurchase
D. Do not pay out at all

14.2 If the forecasted future earnings are stable, which of the following decisions could be your choice?

A. Paying out only through dividends
B. Paying out only through repurchases
C. Paying out through both dividends and repurchase
D. Do not pay out at all