Investor Irrationality and Optimal Open-market Share Repurchasing

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Investor Irrationality and Optimal Open-market Share Repurchasing

By

Richard Fairchild¹ and Ganggang Zhang²

Abstract

As a method of distributing cash to investors, open-market share repurchases have grown rapidly (relative to dividends) in the past decade. There is much evidence that managers believe that they can use share repurchases to time the market profitably. However, some firms repurchase their shares intensively and some of them repurchase gradually over time. In this paper, we developed a model of market timing using share repurchases, based on irrational investors’ lagged reaction to repurchase announcements, to explain how managers make their actual repurchase decisions. We find that managers attempt to trade off the effects of repurchase size and time on investors’ reaction to maximize their profits from repurchase timing.

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Section 1: Introduction

Recent research in corporate payout policy to investors has identified an increasing use of share repurchasing, and a corresponding reduction in dividends. Graham, Harvey and Michaely’s (2004) 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 free cashflows. 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 analyse the differences between share repurchases and dividends (eg Grullon and Michaely 2000, Jagannathan et al 1999, Reynolds 2004, Sarig 1999). 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 cashflows, and they prefer to keep dividends smooth. They view repurchasing activity as more flexible, they repurchase out of residual freecashflow, and they are not worried about volatile
repurchasing.

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). Cook, Krigman and Leach (2000) take this analysis further by examining the firm’s decision to engage in immediate intensive repurchases, or gradual and smooth repurchasing over time.

The issue of market timing using share repurchases is the focus of our 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.

Given the evidence on investors’ differential reaction to dividends and repurchases, and the evidence on market timing, we take a new approach. We 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 shareholder wealth. The market would immediately react by increasing the market value to its true
value, and the manager would be unable to profit.

In our model, irrational investors do not fully understand the implications behind the firms’ repurchasing activity of undervalued shares, and they react with a time lag. Furthermore, these irrational investors’ reactions are driven by two factors; a) the size of the share repurchase at a point in time (intuitively, the larger the immediate repurchase, the more information revealed to these investors), and b) time (as the firm takes more time over gradual repurchasing, there is a gradual leakage of information to investors). The combined effects of these two factors enables us to analyse when managers will prefer immediate intensive repurchasing, and when it is better to repurchase slowly and gradually over time. Thus our model provides an explanation for Cook et al’s (2000) analysis.

(1) Growing repurchasing activity

For decades, corporations have overwhelmingly preferred distributing cash in the form of dividends over repurchases. However, things have changed dramatically over the last twenty years. Open-market share repurchase programs have become increasingly popular.

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, 2001). 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. Jagannathan, Stephens and Weisbach (1999) find that the announced value of open-market share repurchases by US industrial firms between 1985 and 1996 has increased from $15.4 billion to $113 billion. Using the aggregate data from COMPUSTAT, Grullon and Michaely (2000) find that expenditures on open-market share repurchases (relative to total earnings) increased from 4.8% in 1980 to 50.1% in 1998.

(2) Evidence of Repurchase Timing

The incredible growth of open-market share repurchase programs makes it an important method of paying out to investors. According to Grullon and Michaely (2000), share repurchases as a percentage of total dividends increased from 13.1% in 1980 to 104.4% in 1998. The growing importance of open-market share repurchases has attracted many research interests. One research question relates to managerial timing of open-market share repurchase programs.
Ikenberry, Lakonishok and Vermaelen (1995) examine long-run 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 (2000) carried out a pioneering analysis of 64 firms’ disclosed trading data to examine actual repurchase timing and execution. They find that NYSE firms on average beat their benchmarks while Nasdaq firms do not. Ginglinger and Hamon (2003) 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, but only the smallest firms listed on the least liquid market segments successfully take advantage of it. Brav et al’s (2004) extensive survey of financial executives revealed that about 50% of the CFOs believed that they could time the market with their repurchases. Further, they find that many firms claimed that their repurchase timing enabled them to beat the market by $1 or $2 per share over the course of the year, and also their decisions within a given day beat the market on average.
Furthermore, Cook et al. (2000) find that repurchase program executions vary widely across firms. Some firms repurchase very intensively while some repurchase very slowly over time. Brockman and Chung (2001) and Ginglinger and Hamon (2003) find a similar phenomenon in Hong Kong and in France respectively.

How do managers decide the timing and amount of repurchasing? How do managers trade off between intensive repurchases and slow repurchases? Our model aims to provide an explanation.

(3) Implication of Repurchase Timing for market efficiency and investor rationality

Hence there is a large amount of evidence that managers may be able to time the market using share repurchases. This is in conflict with the idea of the Efficient Capital Market Hypothesis (ECMH) and rational investors. According to the ECMH, prices should reflect all available public information. Prices react to information immediately and no one can profit from any piece of information. Therefore, if the market is efficient, prices should go up quickly following repurchase announcements, and hence there is no chance of managerial timing. But the evidence reveals that managers can time the market and ‘in some firms the persons implementing the repurchases are rewarded financially for beating the market’ (Brav et al., 2004). All of this points to market inefficiency and/or investor irrationality. That is, if the manager 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.

We develop a theoretical model in which managers can time the market due to investor irrationality. That is, investors do not immediately fully understand the signals provided by a firm’s share repurchase program. We consider the effect of two factors on investor reaction to repurchases; a) the size of the repurchase at a point in time, and b) the length of time since the start of repurchasing. Combining the two effects, we derive the manager’s optimal share repurchasing policy, which may either be intensive and immediate repurchasing, or gradual and smooth repurchasing over time. Hence, our model is able to explain the empirical evidence on timing found by Cook et al (2000).

The paper is organized as follows. Section 2 describes our theoretical model. Section 3 analyzes this model and presents some implications from this model. Section 4 concludes this paper.
Section 2: The Model

We consider a two-period model (date 0 and date 1) in which a firm announces, and then executes a share repurchase program. In particular, the firm announces that it will repurchase an amount \( \overline{N} \) of shares by the end of date 1. The manager then decides on an amount to repurchase in each period. That is, he decides to repurchase an amount \( N_0 \) at date 0, followed by the balance \( \overline{N} - N_0 \) at date 1. His objective is to maximize his profit from the repurchase.

Investors are irrational in the following sense. They do not fully understand the signals provided to them by the share repurchase (for example, they may suffer from bounded rationality), and hence they under-react. Their reaction is affected by both the size of the repurchase at a point in time, and the length of time since the repurchase began.

The manager chooses \( N_0 \) and \( \overline{N} - N_0 \) to maximize his two-period profit. Due to the two factors (time and size) affecting investor reaction, the manager’s optimal policy may involve immediate intense repurchasing, or slow, smooth gradual repurchasing.

Throughout the analysis, the fundamental value of the firm is \( \overline{V} \). The market value of the firm at time \( t \) is \( V_t \). Hence, at the pre-announcement date, the market value is
Following the repurchase announcement at date 0, the market value is $V_0$. In the final period, market value is $V_f$.

We assume that $V_{-1} < V$, That is, the pre-announcement price per share ($V_{-1}$) is lower than the firm’s fundamental value per share ($V$). In other words, undervaluation provides the motivation for open-market share repurchases.

The market share price at date $t$ is given by;

$$V_t = V_{t-1} + \delta_t.$$  \hspace{1cm} (1)

The parameter $\delta_t$ is the price premium, and reflects the investors’ reaction to open-market share repurchase announcements. The price premium is given by

$$\delta_t = \alpha(\bar{V} - V_{t-1}) + (1 - \alpha)\left(\beta t + \frac{\gamma N_t}{N}(\bar{V} - V_{t-1})\right).$$  \hspace{1cm} (2)

Note that $\alpha$ represents the level of investor irrationality. When $\alpha = 1$, investors are fully rational, and they react to the repurchase announcements immediately (that is, the market value immediately increases to the fundamental value at the announcement date). Therefore, the market share price $V_t$ is always equal to the fundamental value $\bar{V}$. Therefore, there is no opportunity for managerial timing.

When $\alpha = 0$, investors are fully irrational. Now, their reaction is dependent on size.
and time; that is, \( \delta_t = (\beta t + \frac{\gamma N}{N})(\overline{V} - V_{-1}) \). The initial repurchase size \( N_0 \) has an effect. This accords with the evidence of Ginglinger and Hamon (2003), who find that when repurchase activity is intense over a given day, the price tends to go up. Based on their findings, we assume that the more shares the firm repurchases at one date, the more reaction investors will have to them. We represent this relationship, using \( \frac{\gamma N}{N} \), with \( \gamma \geq 0 \). \( (\overline{V} - V_{-1}) \) measures the degree of undervaluation before the repurchase announcements. Furthermore, investor reaction is increasing with the time. We use \( \beta t \) to describe this relationship, with \( \beta \geq 0 \).

The parameter \( \alpha \) measures the level of rationality. When \( \alpha \) is between 0 and 1, it means investors are partially irrational. At this time, investor reaction is affected by both the degree of undervaluation before the repurchase announcements \( (\overline{V} - V_{-1}) \) and the time and size effect \( (\beta t + \frac{\gamma N}{N})(\overline{V} - V_{-1}) \).

**Section 3: The Model Analysis**

The manager chooses \( N_0 \) and \( \overline{N} - N_0 \) to maximize his two-period profit:

\[
\Pi = N_0 (\overline{V} - V_0) + (\overline{N} - N_0)(\overline{V} - V_1)
\]  

(3)

Substituting equation (2) into (1), and replacing for \( t = 0 \) and \( t = 1 \), we obtain

\[
V_0 = V_{-1} + \alpha(\overline{V} - V_{-1}) + (1 - \alpha)\left(\frac{\gamma N_0}{N}\right)(\overline{V} - V_{-1})
\]  

(4)
\[ V_1 = V_0 + \alpha (V - V_0) + (1 - \alpha) \left( \beta + \frac{\gamma N_1}{N} \right) (V - V_{-1}) \]  

(5)

Substituting for \( V_0 \) from (4) in (5), we obtain

\[ V_1 = V_{-1} + \alpha (V - V_{-1}) + (1 - \alpha) \left( \beta + \frac{\gamma N_0}{N} \right) \left[ \alpha \left( 1 - \frac{\gamma N_0}{N} \right) + (\gamma + \beta) \right] \]  

(6)

Substituting (4) and (6) into (3), we obtain the manager’s two-period profits;

\[ \Pi = N_0 \left[ (1 - \alpha) (V - V_{-1}) \left( 1 - \frac{\gamma N_0}{N} \right) \right] + \left( N - N_0 \right) \left[ (1 - \alpha) (V - V_{-1}) \left( 1 - \alpha \left( 1 - \frac{\gamma N_0}{N} \right) - \gamma - \beta \right) \right] \]

Solving \( \frac{\partial \Pi}{\partial N_0} = 0 \), we obtain the manager’s optimal (profit-maximising) date 0 share repurchase size;

\[ N_0^* = N \left[ \frac{\gamma (1 + \alpha) + \alpha + \beta}{2 \gamma (1 + \alpha)} \right] \]  

(7)

This analysis provides our main result regarding the effect of investor irrationality on the manager’s optimal timing of share repurchases.

**Proposition:** The rationality, timing and size parameters \( \alpha, \beta \) and \( \gamma \) affect the optimal date 0 repurchase amount \( N_0^* \) as follows:

a) When \( \alpha = 1 \) (investors are fully rational), repurchase timing is irrelevant. The manager cannot profit by timing the market.

b) When \( \alpha \in (0,1) \) (investors are partially rational), \( N_0^* \geq \frac{N}{2} \). Furthermore,
Share repurchasing becomes more immediate and intensive as investor rationality increases, and as the time effect increases. Share repurchasing becomes less immediate and intensive as the size effect increases. Further, when \( \beta = 0 \), \( N_0^* = \frac{N}{2} \). That is, when investors are totally irrational, and there is no time effect, so that the size effect totally dominates, it is optimal for the manager to repurchase smoothly and with equal repurchase sizes over time.

**Proof:**

a) When \( \alpha = 1 \), \( \frac{\partial \Pi}{\partial N_0} = 0 \). Therefore, \( N_0 \) has no effect on the total profits.

Furthermore, \( \Pi = 0 \) for any \( N_0 \). This is because when \( \alpha = 1 \), investors are fully rational, and react immediately to the repurchase announcement. Hence, managers cannot profit from repurchasing their own shares.

b) Result comes from examination of equation (7).
c) Result comes from examination of equation (7).

**Discussion.**

We observe that the manager’s optimal profit-maximising repurchase-timing policy is affected by the degree of investor rationality, and the size and time effects.

When investors are fully rational, timing policy is irrelevant. That is, the manager cannot use repurchases to increase profit, since rational investors react immediately to share repurchases, and the firm’s market value immediately increases to equal the fundamental value. Therefore, the manager has to repurchase the shares at full value.

When investors are less than fully rational, the optimal repurchase policy depends on the relative time and size effects. When the time effect dominates, more intensive and immediate repurchasing is optimal. When the size effect dominates, smooth and gradual repurchasing is optimal.

An interesting result is that immediate and intensive repurchasing is optimal in two polar cases; a) when investors are highly rational, or b) when investors are highly irrational, but the timing effect dominates the size effect. The intuition for a) is that the market price reacts very quickly to share repurchasing, and so the manager wishes to repurchase intensively and very quickly to beat the market reaction. The intuition for b) is that investors react slowly at first, with increasing reaction over time. If the size effect is small, the manager will again find it optimal to repurchase immediately and intensively. We demonstrate this with the following numerical example.
Numerical Example.

\( a) \) High investor rationality: \( \alpha = 0.9 \).

From equation (7): \( N_0^* = N \left[ \frac{1.9 \gamma + 0.9 + \beta}{3.8 \gamma} \right] \).

Consider low timing effect, and high size effect; \( \beta = 0, \) and \( \gamma = 1 \). In this case, \( N_0^* = 0.74N, N_1^* = 0.26N \).

Next, consider high timing and size effect; \( \beta = 1, \) and \( \gamma = 1 \). In this case, \( N_0^* = \overline{N}, N_1^* = 0 \). Therefore, intensive and immediate repurchasing is optimal.

\( b) \) Low investor rationality: \( \alpha = 0.2 \).

In contrast to a), consider high timing effect, and low size effect; \( \beta = 0.8, \) and \( \gamma = 0.5 \). In this case, \( N_0^* = 1.33\overline{N} > \overline{N} \). Therefore, intensive and immediate repurchasing is optimal.

This confirms that intensive and immediate repurchasing is optimal either a) when investors are highly rational, or b) when investors have low rationality, combined with high timing effect and low size effect.

This result has interesting empirical and behavioral implications. If it is observed that managers engage in immediate and intensive repurchasing, is it because managers view investors as highly but not totally rational, so that they react very quickly, but
not immediately? Conversely, is immediate and intensive repurchasing symptomatic of highly irrational investors, with slow initial reactions, increasing reactions over time, combined with a low size effect?

Section 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 much evidence that managers believe that they can use share repurchases to time the market profitably. However, some firms repurchase their shares intensively and some of them repurchase gradually over time.

In this paper, we have developed a model of market timing using share repurchases, based on irrational investors’ lagged reaction to repurchase announcements. In determining their optimal timing policy, managers trade off the effects of repurchase size and time on investors’ reactions.

We obtained the following results. When investors are fully rational, repurchase timing is irrelevant. The manager cannot profit by timing the market. When investors are less than fully rational, the manager faces a trade-off between the effect of size and time on investor reaction to share repurchases. When the size effect dominates, slow and gradual repurchasing is optimal. When the time effect dominates, immediate and intensive repurchasing is optimal. Furthermore, immediate and intensive
repurchasing is optimal in two polar cases; a) when investors are highly rational, or b) when investors are highly irrational, but the timing effect dominates the size effect.
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