Is Market Timing Good for Shareholders?*

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ABSTRACT

We challenge the view that equity market timing always benefits shareholders. By distinguishing the effect of a firm’s equity decisions from the effect of mispricing itself, we show that market timing can decrease shareholder value. Additionally, the timing of equity sales has a more negative effect on existing shareholders than the timing of share repurchases. Our theory can be used to infer firms’ maximization objectives from their observed market timing strategies. We argue that the popularity of stock buybacks, the low frequency of seasoned equity offerings, and the observed post-event stock returns are consistent with managers maximizing current shareholder value.

JEL codes: G30, G32, G35

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The question of whether managers can time the market in making share repurchase and equity issuance decisions has been hotly debated in the literature. Yet, a more important question that has not been addressed before is whether managers should want to time the market. In this paper, we aim to fill this gap in the literature by analyzing wealth transfers between a firm’s selling, ongoing, and new shareholders that are caused by market timing. Surprisingly, we find that in many instances successful market timing does not benefit existing shareholders. Furthermore, shareholders fare worse when the manager issues overpriced equity than when she repurchases undervalued stock.

Our main insight is that current/existing shareholders are net sellers of a firm’s stock and are affected by mispricing even if a firm does not issue or repurchase equity. For example, current shareholders are already better off during a temporary overpricing because some of them are able to sell the stock at a higher price. To accurately assess the effect of market timing, therefore, one needs to measure the incremental changes in shareholder value that are caused by repurchase and issuance decisions. Instead, financial economists have traditionally thought about the combined effect of stock mispricing and firms’ actions triggered by this mispricing.

When we measure the net effect of firm’s market timing, we find that the casual intuition is often wrong. For example, we show that a firm selling overpriced shares can hurt its existing shareholders rather than investors buying these shares. This is because by issuing additional equity, the firm conveys some of its negative information to the market, which decreases the stock price. Furthermore, the firm is now competing with its own shareholders for potential buyers of the stock. As a result, a firm’s shareholders are able to sell fewer overpriced shares than they otherwise might and also must sell them at a lower price. Both of these effects

1Brockman and Chung (2001) and Dittmar and Field (2014) conclude that managers exhibit substantial timing ability in executing repurchases. In survey of executives, Graham and Harvey (2001), and Brav, Graham, Harvey, and Michaely (2005) find that the perception of mispricing is one of the most important factors driving repurchase and issuance decisions. Additionally, a large literature documents stock return patterns that could be symptomatic of market timing (Baker and Wurgler (2000), Jenter, Lewellen, and Warner (2011), Ikenberry, Lakonishok, and Vermaelen (1995), and Loughran and Ritter (1995)). The market timing interpretation of these results is disputed by Eckbo, Masulis, and Norli (2000), Butler, Grullon, and Weston (2005), and Dittmar and Dittmar (2008).

2Throughout the paper, we focus on the distributional effects of market timing and do not consider situations where it creates or destroys total value (e.g., by affecting a firm’s investment policy).
make the firm’s selling shareholders worse off. As we further show in the model, all current shareholders (who will become either selling or ongoing shareholders) can be worse off as a group. But if the firm buys back its undervalued stock, current shareholders benefit at the expense of new investors because the latter are able to buy fewer underpriced shares and must buy them at a higher price.

We develop our argument by building a theoretical model in the rational expectations framework. In the model, we require only that prices reflect all publicly available information—i.e., the investors recognize that the repurchase or equity sale conveys news about stock mispricing—and that the market clears additional demand for or supply of shares from the firm. A firm manager is endowed with private information and can use it to trade on the firm’s behalf. All shareholders and new investors are fully rational: they can learn from the firm’s decisions and trade their stock accordingly. Because some firms in the economy issue or repurchase equity for non-informational reasons, the equilibrium is not fully revealing and informed managers can take advantage of stock mispricing.

We show that the result of a firm’s equity market timing on existing shareholders can be described by three effects—which we label as the quantity effect, the price effect, and the long-term gain effect. The quantity effect appears because a firm’s additional demand for shares must be accommodated by either current shareholders or new investors. For example, suppose that, in a typical year, current shareholders sell 1,000 shares to new investors. If the firm decides to repurchase 100 shares during this year, it is plausible that current shareholders will have to sell 1,050 shares and new investors will buy only 950. The quantity effect in this example reduces the wealth of selling shareholders and new investors by the amount of mispricing multiplied by 50 shares. Because the quantity effect is a result of adverse selection, it negatively affects all uninformed parties.

An important piece of intuition comes from the price effect, which takes place because a firm’s decision to repurchase or issue stock conveys new information to the market and permanently affects the stock price. Unlike the quantity effect, the price effect creates asymmetric

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Specifically, we do not require any temporary market imperfections, such as liquidity dry-ups, simultaneous trading, or price pressure.
changes in the wealth of the firm’s current shareholders and new investors. For example, the price drop at the announcement of a seasoned equity offering (SEO) protects new investors from buying into an overpriced firm, but at the same time it also decreases the expected profit of selling shareholders.

Finally, the long-term gain effect applies to those investors who hold the firm’s stock until all information is revealed, i.e., ongoing shareholders and new investors who join the firm. In particular, a share repurchase conducted by an informed manager generates the trading profit for a firm and allows its stockholders to sell shares at a higher price in the future. Importantly, the extent to which current shareholders benefit from this effect depends on the magnitude of net selling because some stockholders liquidate their positions before the long-term gain is realized.

The model generates two new results. First, we show that current shareholders prefer share repurchase timing to new issuance timing. This result is driven by the price effect. Because current shareholders are net sellers, they benefit when the firm corrects underpricing but sometimes prefer to leave overpricing uncorrected. We demonstrate that the manager who wants to maximize current shareholder value will use share repurchases more often than new equity sales. In particular, she will repurchase stock when it is fairly priced or even somewhat overpriced, but will not always issue overvalued equity. Repurchases by informed managers will then be followed by a smaller magnitude of abnormal returns and generate a smaller average profit than new equity sales. Therefore, the continuing popularity of stock buybacks that do not appear to exploit large undervaluation can be rationalized by the preference of managers for current shareholders. To the best of our knowledge, this explanation for repurchases has not been previously explored in the literature, and we view it as complementary to the commonly cited motives of redeploying excess cash, managing earnings, improving alignment between management and shareholders, and counteracting dilution from equity-based compensation plans.\(^5\)

\(^4\)Here it is important to see the difference between our study and the much simpler idea that share repurchases raise the price for selling shareholders. First, the remaining shareholders are negatively affected by excessive repurchases or repurchases made during the overpricing. More important, by creating an additional demand for stock, a share repurchase changes the number of the firm’s selling and remaining shareholders.

\(^5\)See, e.g., Kahle (2002), Grullon and Michaely (2004), and Huang and Thakor (2013).
Second, we show that in many circumstances current shareholders are worse off because of market timing. One such circumstance is when a firm issues overvalued stock and the mispricing is relatively small. In this case, the decrease in wealth of selling shareholders caused by the price and quantity effects is larger than the long-term gains to ongoing shareholders, so that current shareholders are collectively worse off. Another situation when market timing is value destroying for current shareholders is when the share turnover is relatively high. In this case, the wealth of current shareholders always decreases with the timing of equity sales and can also decrease with the timing of share repurchases. The intuition for this result is that the high share turnover strips current shareholders of some long-term gains and the quantity effect works against them. We show that in this situation current shareholders prefer a manager who never times the equity market to a manager who systematically responds to mispricing by issuing shares and repurchasing stock.

Determining how different shareholder groups are affected by market timing is not only interesting in and of itself; it can also give us insights into the firm’s implicit value maximization objectives. By observing how the manager of a particular firm uses her information to time the market, it is possible to infer what shareholder group’s wealth the manager really cares about. Given the theoretical predictions of the model, the data suggest that an average large U.S. firm times the market as if it were trying to create value for current shareholders. First, there are larger post-event abnormal returns following equity issuances than following repurchases. Specifically, over the period 1982-2010, the average three-year abnormal return after seasoned equity offerings is $-12.6\%$, but only $3.4\%$ after repurchases. Second, the average measure of profit from SEO timing is considerably larger than the profit from repurchase timing. We document this result by using a new empirical measure of profit from market timing, calculated as the additional return earned from equity timing by a shareholder holding one share. The difference between issuance and repurchase profits captures the imbalance in timing by a particular firm, with positive values indicating a relative preference by the manager for current shareholders. We find that an SEO adds on average $0.37\%$ in return to ongoing shareholders, while a repurchase adds only $0.04\%$. Finally, it appears that repur-
chases are more frequent than SEOs, with 36.8% of all firm-years posting a repurchase and 4.0% having an SEO. These results do not support the view that the average firm acts in the interest of ongoing or future shareholders, but are consistent with current shareholder value maximization.

The rest of this paper is organized as follows. The next section provides a brief overview of the literature. Section 2 solves for the equilibrium in the presence of informed trading by a firm and analyzes wealth transfers between current shareholders and new investors. The data sources and empirical results are described in Section 3. The final section offers concluding remarks.

I. Literature Overview

Our model has its roots in the theoretical literature on share issuance and repurchase decisions under asymmetric information. There are two main differences from prior work. First, most earlier studies do not focus on the welfare of existing and new shareholders of a firm’s stock, which is at the heart of our theoretical analysis. Instead, related studies usually derive the manager’s optimal policy given a particular objective function, such as maximizing a weighted average of the current market price and expected intrinsic value (e.g., Persons (1994) and Ross (1977)). In comparison with the approach in these papers, the maximization problem for current shareholders in our model has variable weights; that is, the manager’s timing has an effect not only on the prices, but also on the number of current shareholders who will sell stock at each date. Second, the prior literature often assumes shareholders and other investors are passive. This assumption ignores the fact that shareholders and investors who are able to learn from the firm’s decisions can optimally rebalance their portfolios, which has a feedback effect on managerial decisions.

The literature on optimal issuance decisions usually analyzes a firm seeking external financing for new investment projects (see Heinkel (1982), Brennan and Kraus (1987), Leland

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\(^{6}\)Lucas and McDonald (1990) do recognize that shareholders may disagree about the desired equity issue policy. However, they further assume that there is a sufficient number of long-term shareholders so that management acts in their interest.
and Pyle (1977), Williams (1988), Myers and Majluf (1984), and Morellec and Schurhoff (2011)). Our paper differs from this strand of literature because there is no investment in the model, and the issuance decisions are motivated solely by mispricing. The repurchase signaling literature shows that stock repurchases can signal positive information to investors (see, e.g., Vermaelen (1981), Ofer and Thakor (1987), Hausch and Seward (1993), Persons (1994), and Buffa and Nicodano (2008)). For example, in the model of Constantinides and Grundy (1989), a manager can use a positive signal conveyed by repurchases to issue equity-like securities. These studies are not primarily concerned with the wealth transfers between different groups of investors.

Two studies give special attention to conflict of interests between different groups of shareholders in repurchases. Brennan and Thakor (1990) show that repurchases lead to a wealth transfer from uninformed to informed shareholders. They argue that since the costs of gathering information are larger for small shareholders, a repurchase is expected to benefit large shareholders. Unlike Brennan and Thakor (1990), we assume that all of a firm’s investors and current shareholders have the same information and that only the manager has access to private information. In another study, Oded (2005) shows that repurchases can hurt those shareholders who need to sell the mispriced stock after a liquidity shock.

Some of the earlier studies reach different conclusions than ours because they assume that equity timing originates from differences in beliefs among investors rather than from information (Huang and Thakor (2013) and Yang (2013)). Firms can also take advantage of aggregate market mispricing (Baker and Wurgler (2002)) or react with their repurchase and issuance decisions to a change in the overall business environment (Dittmar and Dittmar (2008)). In contrast, the predictions of our model are based on mispricing across firms.

Our study contributes to a large empirical literature that documents and explains equity mispricing around new equity issuances and repurchases. For example, Ikenberry, Lakonishok, and Vermaelen (1995) document positive abnormal returns following the announcement of

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7 Signaling with both issuance and repurchases is explored in a number of structural dynamic models. For example, Hennessy, Livdan, and Miranda (2010) build a dynamic equity signaling model, where signaling is achieved through higher leverage and, consequently, higher bankruptcy costs. Bolton, Chen, and Wang (2013) assume that firms exploit the opportunity to issue equity at a lower cost, but they also assume an exogenous time-varying cost of financing.
open market share repurchases and Loughran and Ritter (1995, 1997) provide evidence on the underperformance of firms conducting IPOs and SEOs. Additionally, Pontiff and Woodgate (2008) document that share issuance exhibits a strong cross-sectional ability to predict stock returns. Baker, Ruback, and Wurgler (2007) provide a thorough overview of this literature. We contribute to this line of research by developing a new measure of profit from market timing. We also show that it is important to simultaneously analyze repurchase and issuance decisions. For example, based on the issuance data alone, a researcher cannot separate the manager’s timing ability from her preferences.

II. MODEL

A. Setup

In this section, we build a model of market timing based on the rational expectations framework of Grossman (1976). The economy is populated with a proportion \( \lambda < 1/2 \) of firms that are controlled by informed managers who are able to time the market (“timing firms”), and a proportion \( 1 - \lambda \) of firms that sell and repurchase equity for reasons that are unrelated to misvaluation. For example, firms might repurchase stock to distribute excess cash, manage earnings, adjust leverage, increase the pay-performance sensitivity of employee contracts, or counteract the dilution from exercises of employee stock options (Grullon and Michaely (2004), Skinner (2008), and Babenko (2009)). Similarly, new equity issuance can be motivated by the need to finance new investment. For example, DeAngelo, DeAngelo, and Stulz (2010) find that, without SEO offer proceeds, 63% of issuers would run out of cash the year after an SEO.\(^8\)

We assume that the demand for shares by firms that issue and repurchase equity for exogenous reasons is normally distributed

\[
F \sim N(\mu_u, \sigma_u^2). \tag{1}
\]

We show that it is possible to choose the parameters \( \mu_u \) and \( \sigma_u^2 \) in such a way that investors who observe a manager’s actions cannot distinguish whether the demand comes from an

\(^8\) Additionally, Hertzel, Huson, and Parrino (2012) find that timing of SEOs can be determined by market perception of a potential overinvestment problem, as opposed to equity mispricing.
informed or uninformed manager (we use the same notation $F$ for the demand by the informed manager).\textsuperscript{9} Thus the equilibrium is not fully revealing, and informed managers are able to take advantage of mispricing.

Each timing firm is endowed with a risk-neutral manager who receives private information at date 1 and can trade on the firm’s behalf. The true per share value of the firm is drawn from a normal distribution and is realized at date 2

$$P_2 \sim N(\overline{P}, \sigma_p^2).$$

The manager has a noisy signal $v$ about the future firm value and can use this information to buy or sell stock for the firm

$$v = P_2 + \varepsilon, \text{ where } \varepsilon \sim N(0, \sigma_\varepsilon^2).$$

Note that the long-term price can change if the manager repurchases or issues stock; we denote this price by $P'_2$

$$P'_2 = P_2 + \frac{F (P_2 - P_1)}{N - F},$$

where $N$ is the initial number of outstanding shares, and $P_1$ is the market price of the stock at date 1. We assume that a firm’s decision to repurchase or issue equity and the market-clearing price are fully observable by everyone in the market. Note, however, that whether investors observe repurchases and equity issuances is not important in our setting since the same information can be inferred from the market price. In this way, our model differs from the one used by Oded (2005), who assumes that both prices and repurchases are unobservable and that investors submit their bids for stock through an auction in which a firm receives priority over other participants.

There are $n$ current shareholders holding the firm’s shares and $m$ outside investors interested in buying the firm’s stock.\textsuperscript{10} All shareholders and potential investors are rational and

\textsuperscript{9}Formally, the distribution of demand by the informed managers is the same in equilibrium as the exogenous distribution of demand by the uninformed managers. This assumption helps us to significantly simplify the learning problem by individuals who observe firm action $F$, but do not know whether the firm is timing the market or acting for exogenous reasons. Appendix A provides the fixed-point solution for parameters $\mu_u$ and $\sigma_u$.

\textsuperscript{10}In our model, each shareholder can hold a different number of shares, so that the number of current shareholders does not need to coincide with the number of outstanding shares.
can trade in the firm’s stock at any point in time. Shareholders and new investors maximize their expected wealth given the available information, but also have specific preferences for buying or selling shares, modeled through the following objective function

$$EU_i \equiv \max_{X_i} E(W_i|F) - \frac{\theta}{2} (X_i - Q_i)^2,$$

(5)

where

$$W_i = (N_i + X_i)P_0^* - X_iP_1.$$

(6)

Here $i \in \{1, 2, \ldots, n + m\}$ indexes different investors, with $i \in \{1, \ldots, n\}$ referring to current shareholders and $i \in \{n + 1, \ldots, n + m\}$ to new investors, $W_i$ is the investor’s wealth, $N_i$ is the initial number of shares held by the investor, and $X_i$ is the optimal demand for shares at date 1. Specifically, at date 1 investor $i$ buys $X_i$ shares at the price $P_1$ and sells all his holdings $N_i + X_i$ on the final date at the price $P_2'$. The quadratic term in the objective function (5) is introduced for modeling convenience. It serves two purposes: to induce shareholders and new investors to trade and to ensure that the demand for stock is finite in equilibrium. $Q_i$ is the investor’s preference for buying shares (i.e., the number of shares the investor would buy absent any new information), and the parameter $\theta$ captures the elasticity of the investor’s demand.

Our assumption of the utility function (5) is identical to specifying the investor’s optimal demand as

$$X_i^* = Q_i + \frac{E(P_2'|F) - P_1}{\theta} \approx Q_i + \frac{E(P_2|F) - P_1}{\theta}.$$

(7)

The first term, $Q_i$, is the investor’s status quo demand for stock, and the second term is the additional demand triggered by the information contained in the firm’s trade, similar to the one in the model by Grossman (1976). Because the investor’s profit decreases in price $P_1$, the demand by individual investors is downward sloping in equilibrium, and the market can clear.\textsuperscript{11}

In line with actual experience and to ensure that the shareholder base changes over time, we assume that the average parameter $Q_i$ is positive for new investors who prefer to buy the firm’s

\textsuperscript{11}The downward-sloping demand functions can also be justified by differences in shareholder beliefs (Bagwell (1991) and Huang and Thakor (2013)), the investor trades being processed sequentially through the limit order book (Biais, Hillion, and Spatt (1995)), or the firm’s stock having no close traded substitutes (Wurgler and Zhuravskaya (2002)). Empirical evidence in support of downward-sloping demand functions is provided in Greenwood (2005) and Shleifer (1986).
stock (e.g., to complement and diversify their portfolios) and negative for current shareholders who prefer to sell the stock (e.g., for liquidity or diversification reasons). If this assumption were not true, trading would be possible only between current shareholders. Section III.A provides empirical evidence supporting the validity of this assumption. We normalize the average $Q_i$ of all individual investors and shareholders to zero, so that the equilibrium market-clearing price when the firm is not trading in its stock is $P_1 = \overline{P} = E(P_2)$.

Next, we specify the equilibrium and examine how the welfare of current shareholders is affected by the firm’s market timing strategies.

**B. Symmetric Market Timing: Implications for Current Shareholders**

We first analyze the basic case in which the manager maximizes the expected profit from trading $F$ shares conditional on her signal. A priori this seems to be a natural choice of the objective function since it leads to a symmetric market timing strategy: repurchase stock when it is undervalued and issue stock when it is overvalued. It is also consistent with the usual assumption in the literature that the manager cannot tender her own shares during a repurchase or participate in a seasoned equity offering (e.g., Morellec and Schurhoff (2011) and Constantinides and Grundy (1989)) and wants to maximize the value of a fixed equity stake. We allow the manager to be strategic in her trades; i.e., she takes into account the effect of her trade on the stock price,

$$\max_F E[(P_2 - P_1(F)) F|v].$$

Positive values of $F$ indicate stock buybacks and negative values capture stock issuances. The following proposition describes the linear equilibrium.

**Proposition 1.** Suppose the manager maximizes the expected trading profit. There exists a

\footnote{Note that if the average $Q_i$ were not zero or there were a non-zero demand by an uninformed firm, $F$, the market would still clear, but at a different price $P_1$.}
unique linear rational expectations equilibrium with the price and demand for shares given by

\[
P_1 = P + \beta F, \quad (9)
\]

\[
F^* = \frac{\sigma_p^2}{\sigma_p^2 + \sigma_e^2} \frac{v - \bar{P}}{2\beta}, \quad (10)
\]

\[
X_i^* = Q_i - \frac{F}{n + m}, \quad (11)
\]

where \( \beta > 0 \) is a constant given in the Appendix.

The intuition for Proposition 1 is as follows. First, if the firm places a positive order \( F \) for stock, the equilibrium price increases because investors infer that with some probability the order is coming from an informed manager and thus signals positive information. Second, the firm’s optimal demand for shares \( F^* \) is directly proportional to stock mispricing and increases with the precision of the manager’s signal. Therefore the optimal market timing strategy for a profit-maximizing manager is symmetric, with the manager being equally likely to time share repurchases and equity sales. Finally, it is somewhat counterintuitive that the individual demand for shares \( X_i^* \) decreases with the firm’s order size \( F \). This is because, for the market to clear, a firm’s trade must be accommodated by uninformed shareholders and new investors. Uninformed individuals are willing to take the other side of the firm’s trade because the equilibrium price is such that they make up for their losses from trading against timing firms with gains from trading with non-timing firms.

The next proposition compares the observable characteristics of stock repurchases and equity sales for this equilibrium.

**Proposition 2.** Assume that the manager maximizes the expected trading profit. Then the following claims hold.

(i) The frequency and volume of share repurchases are equal, respectively, to those of share issuances

\[
\Pr(F^* > 0) = \Pr(F^* < 0), \quad (12)
\]

\[
E[F|F^* > 0] \Pr(F^* > 0) = E[-F|F^* < 0] \Pr(F^* < 0). \quad (13)
\]
(ii) The profit from share repurchase timing is equal to the profit from share issuance timing

$$E [(P_2 - P_1) F | F^* > 0] = E [(P_2 - P_1) F | F^* < 0].$$

(14)

(iii) The price drift following share repurchases is equal, in absolute value, to the price drift following equity issuances

$$|E [P_2 - P_1 | F^* > 0]| = |E [P_2 - P_1 | F^* < 0]|.$$

(15)

We now analyze how the firm’s market timing affects its existing shareholders. Note that we do not consider how timing by one firm affects shareholders of another firm. This is because firm managers take the policies of other firms as given and cannot influence them in any way.

Recall that, when the firm times the market, i-th shareholder wealth is given by (6). When the firm does not time the market, the shareholder buys $Q_i$ shares at price $\overline{P}$ and can later sell these shares along with original $N_i$ shares at price $P_2$, so that his wealth is $(N_i + Q_i)P_2 - Q_i\overline{P}$. Therefore the change in wealth of shareholder $i$ caused by the firm’s market timing is

$$\Delta W_i = \frac{(N_i + X_i) P_2' - X_i P_1 - ((N_i + Q_i) P_2 - Q_i \overline{P})}{\text{wealth with timing}} - \frac{(N_i + X_i) P_2' - X_i P_1 - ((N_i + Q_i) P_2 - Q_i \overline{P})}{\text{wealth without timing}}. \quad \text{(16)}$$

We can rewrite this expression in the more intuitive form

$$\Delta W_i = \frac{(X_i - Q_i) (P_2' - P_1) + Q_i (\overline{P} - P_1) + (N_i + X_i) (P_2' - P_2)}{\text{quantity effect}} + \frac{(N_i + X_i) (P_2' - P_1)}{\text{price effect}} + \frac{(N_i + X_i) (P_2' - P_2)}{\text{long-term gain}}. \quad \text{(17)}$$

It follows then that the effect on shareholders of trading by a firm in its own stock can be described by three effects: a quantity effect, a price effect, and a long-term gain effect. The first term in (17) captures the quantity effect, which occurs when shareholders change their demand for stock as a result of the firm’s timing actions. The number of shares traded by individuals can be affected because they infer information from the firm’s decisions and also because the market needs to clear additional trades by the firm. The second term in (17) is the price effect, which occurs when the firm’s timing actions change the stock price.
and shareholders buy or sell stock at this new price. Because current shareholders are net sellers (negative $Q_i$ on average), the price effect is positive for stock repurchases and negative for stock issuances. The third term is the long-term gain effect. It captures the fact that shareholders who hold the stock until its true value is revealed benefit from the appreciation in the long-term price.

It is the quantity and price effects that distinguish our approach from previous studies. For example, it is well understood that successful market timing increases the wealth of a shareholder with a fixed number of shares. However, this does not need to imply that a manager working in the interest of all ongoing shareholders should time the market. The issue is that the number of ongoing shareholders is not fixed; it is determined in a market-clearing equilibrium and depends on how many shares the manager issues or repurchases. Each of the ongoing shareholders is better off with equity market timing, but the number of these shareholders decreases with repurchases and increases with issuances.

Intuitively, the wealth implications of market timing depend on the number of current shareholders who remain with the firm and benefit from the long-term gains. We first consider the case in which the aggregate number of shares that current shareholders normally sell (and new investors buy), $Q^+ \equiv \sum_{i=n+1}^{n+m} Q_i$, is small. For brevity, we will refer to $Q^+$ as the share turnover.

**Proposition 3.** Denote by $W = \sum_{i=1}^{n} W_i$ the current shareholder value and assume that the share turnover is not too large, i.e., $Q^+ < \overline{Q}$, where

$$\overline{Q} = \frac{N}{2} \frac{m}{n+m}. \quad (18)$$

Then the following claims hold.

(i) Issuance of overvalued stock decreases shareholder value when overpricing is small. Specifically, there exists a threshold $\overline{v}$

$$\overline{v} \equiv \overline{P} - \frac{Q^+ N}{2\gamma (\overline{Q} - Q^+)}.$$  \quad (19)

such that for $\overline{P} > v > \overline{v}$

$$E (W|v, \ v < \overline{P}, \ F^* < 0) < E (W|v, \ v < \overline{P}, \ F = 0). \quad (20)$$
(ii) Share repurchase of undervalued stock always increases shareholder value.

(iii) Given a fixed magnitude of mispricing $|v - \bar{P}|$, current shareholders gain more when the manager times share repurchases than when she times equity sales

$$E (W|v, v > \bar{P}, F^* > 0) - E (W|v, v > \bar{P}, F = 0) >$$

$$E (W|v, v < \bar{P}, F^* < 0) - E (W|v, v < \bar{P}, F = 0).$$

(iv) In expectation, current shareholders benefit from market timing, i.e.,

$$E (W|F^*) > E (W|F = 0).$$

This proposition is central to our study and discusses the implications of the symmetric market timing strategy for shareholder value. The proof of the proposition exploits the fact that dollar gains and losses for all shareholders and new investors must sum to zero. The results can be summarized as follows. When the share turnover is small, many current shareholders remain with the firm until the true value is revealed, and therefore they capture the benefits of timing through the long-term gain effect. However, current shareholders are affected differentially by share repurchases and equity sales. Share repurchases of undervalued stock always make them better off. But, new share sales of overvalued stock can make them worse off. To understand the intuition behind the latter result, recall that current shareholders are net sellers. When a firm issues equity, shareholders who are now competing with the firm end up selling fewer overpriced shares. Additionally, they sell those shares at a lower price. The expected losses of selling shareholders are partially offset by the long-term gains of the ongoing shareholders. The proposition shows that current shareholders as a group are worse off in the region of small overvaluation, where the price and quantity effects dominate the long-term gain effect.

The last result in the proposition shows that, in comparison with a manager who does nothing, current shareholders prefer a manager who always repurchases stock whenever her information is positive and issues shares whenever her information is negative. Because repurchases increase price $P_1$, and equity sales decrease it, and because the market timing strategy is symmetric with respect to stock mispricing, it must be that the price effect averages out
for current shareholders. Given a low share turnover, the current shareholders capture the
benefits of market timing. As we show later, this result reverses for large turnover.

In Appendix B, we discuss how the results of Proposition 3 change if we consider how
market timing affects the full objective function of current shareholders, $U$, instead of share-
holder value, $W$. Intuitively, because by trading on the firm’s behalf the manager conveys
new information to the market, shareholders adjust their demand for the firm’s stock and
deviate from their preferred trades, $Q_i$. Therefore, they experience additional disutility from
market timing.

We next discuss the case in which the share turnover is large.

**Proposition 4.** If the share turnover is large, i.e., $Q^+ > \overline{Q}$, then:

(i) Issuance of overvalued stock always decreases shareholder value

$$E (W|v, v < \overline{P}, F^* < 0) < E (W|v, v < \overline{P}, F = 0).$$

(ii) A share repurchase of undervalued stock decreases shareholder value when underpricing is
large; i.e., there exists a threshold $\overline{v}$

$$\overline{v} \equiv \overline{P} + \frac{Q^+ N}{2\gamma (Q^+ - \overline{Q})},$$

such that for $v > \overline{v} > \overline{P}$

$$E (W|v, v > \overline{P}, F^* > 0) < E (W|v, v > \overline{P}, F = 0).$$

(iii) If $Q^+ > 2\overline{Q}$, then, in expectation, current shareholders are worse off with market timing,
i.e.,

$$E (W|v, F^*) < E (W|v, F = 0).$$

The proposition posits that, when the share turnover is high, current shareholders can
become worse off when the manager times the equity market. Specifically, shareholder wealth
always decreases with the issuance of overvalued stock and can decrease with the repurchase of
undervalued stock if mispricing is large. Overall, shareholders in a high-turnover firm prefer a
manager who does nothing to the manager who systematically uses private information when
issuing and repurchasing stock.
Intuitively, this result obtains because the high share turnover strips current shareholders of most long-term gains associated with market timing. When many new investors purchase the firm’s shares, they are the ones who benefit from the long-term price appreciation. When the long-term gain is small, shareholder wealth is primarily affected through the quantity and/or price effects. The price effect is symmetric with respect to repurchases and share issuances and is therefore zero in expectation. In contrast, the quantity effect makes shareholders worse off because they sell more shares during underpricing and fewer shares during overpricing.

C. Optimal Market Timing Strategy for Current Shareholders

Thus far we have focused on the effects of a symmetric market timing strategy on a firm’s current shareholders. We now derive the optimal market timing strategy by a manager maximizing the current shareholder value. (Appendix B shows that the results are qualitatively similar if the manager maximizes the current shareholders’ full objective function). Relying on the results in the previous section—that market timing decreases shareholder value when the share turnover is large—we only consider the case when the turnover is moderate, \( Q^+ < \bar{Q} \).

Recall that under a symmetric timing strategy (i.e., the strategy that maximizes the trading profit of the informed firm and calls for a repurchase when the stock is undervalued and share issuance when it is overvalued), current shareholders can be made worse off. Specifically, we established in Proposition 3 that a share issuance by the firm when its stock is overpriced sometimes hurts its current shareholders. We therefore anticipate that a manager creating value for current shareholders would favor market timing with share repurchases rather than with equity sales. The next proposition establishes this result formally.

**Proposition 5.** Suppose the manager wants to maximize current shareholder value, \( W \), and the share turnover is not large, \( Q^+ < \bar{Q} \).

Then, for any mispricing, \( v - \bar{P} \), the equilibrium price, the firm’s demand, and individuals’

\[ \text{13If the manager maximizes the full current shareholders’ objective function, the optimal market timing strategy is less sensitive to the manager’s information because, intuitively, the manager would like to minimize the shareholders’ disutility associated with deviations of their trades from initial preferences.} \]
The demand for stock are

\[ P_1 = \mathcal{P} - \alpha + \beta F. \]  
\[ F^* = \mathcal{F} + \frac{\frac{\sigma_p^2}{\sigma_p^2 + \sigma_e^2}}{2\beta} \frac{v - \mathcal{P}}{\frac{\sigma_p^2}{\sigma_p^2 + \sigma_e^2}}, \]  
\[ X_i^* = Q_i - \frac{F}{n + \mathcal{F}}, \]  

where constants \( F > 0, \alpha > 0, \) and \( \beta > 0 \) are given in the Appendix.

The important result established by the proposition above is that a manager who wants to maximize current shareholder value repurchases more (and issues less) stock than the one who wants to maximize the trading profit by following a symmetric strategy. In particular, the optimal timing strategy calls for repurchasing a positive number of shares, \( F^* \), and then amending the demand in a way that is proportional to mispricing. Note also that the equilibrium price \( P_1 \) is adjusted downward because investors realize that the manager over-repurchases. In particular, when the manager neither repurchases nor issues equity \( (F = 0) \), the price is below average. Note, however, that because the optimal demand for stock by the firm increases with mispricing, a larger repurchase still conveys better news.

Having derived the optimal market timing strategy for a manager who wants to create value for the firm’s existing shareholders, we can now examine the frequency and volume of stock repurchases and equity sales, the profit from stock repurchases and equity sales, and post-event stock returns.

**Proposition 6.** Assume that the manager wants to maximize current shareholder value. Then the following claims hold.

(i) The frequency and volume of share repurchases are larger, respectively, than those of equity issuances

\[ \Pr (F^* > 0) > \Pr (F^* < 0), \]  
\[ E[F|F^* > 0] \Pr (F^* > 0) > E[-F|F^* < 0] \Pr (F^* < 0). \]
(ii) The profit from share repurchases is smaller than that from equity issuances

\[ E \left[ (P_2 - P_1) F | F > 0 \right] < E \left[ (P_2 - P_1) F | F < 0 \right]. \] (32)

(iii) The price drift following repurchases is smaller, in absolute value, than that following equity issuances

\[ |E \left[ (P_2 - P_1) | F > 0 \right]| < |E \left[ (P_2 - P_1) | F < 0 \right]|. \] (33)

As established in the previous proposition, managers acting in the interest of current shareholders conduct repurchases even if they do not believe that the stock is significantly undervalued. In contrast, they issue equity highly selectively. From this observation it follows that the profit conditional on share repurchase is smaller than the profit conditional on equity issuance. The proposition further states that the average post-event stock returns must be higher following an equity sale than following a share repurchase. This is because the magnitude of stock mispricing needed to trigger an equity sale is much larger than the one required for a stock repurchase.

These results are important in light of some stylized empirical facts, such as a relatively low frequency of SEOs, a high frequency of stock buybacks, and the evidence that some repurchases are conducted at prices seemingly above fundamental values. For example, managers announcing new stock repurchase programs often claim that their goal is to enhance shareholder value, yet it is not unusual to observe low stock returns after a repurchase. In particular, Bonaime, Hankins, and Jordan (2014) find that managers repurchase when stock prices are high and valuation ratios (book-to-market and sales-to-price) are unfavorable; they conclude that managers do not appear to successfully time the market with share repurchases.

Our theory provides a simple new explanation for this circumstance. The extant literature focuses on other reasons for doing buybacks, which are outside the scope of our model, such as distributing unneeded cash and managing earnings per share. Equivalently, the lack of a large volume of SEOs is usually explained by large underwriting fees and other fixed costs.
III. Empirical Analysis

In this section, we use data to validate our assumption that current shareholders are net sellers of a firm’s stock and then test the main predictions of the model by analyzing the volume and frequency of repurchases and equity issuances, post-event stock returns, and the profit from market timing.

A. Are Current Shareholders Net Sellers?

Our model relies on the important assumption that current shareholders are net sellers. Although this assumption is natural, two situations, issuance of new shares and short selling, merit discussion. First, the additional issuance of shares by the firm may result in current shareholders increasing their holdings. Note that this is consistent with our model since we only require shareholders to be net sellers in an inactive firm. Second, shares can be sold short by new investors, particularly by institutions that have different information or beliefs. This may temporarily increase the holdings of stock by current shareholders. However, one does not expect institutions to short-sell stock most of the time, and even when they do so on occasion, it is unlikely that all new investors as a group (including new retail investors) will sell the firm’s stock. It is therefore likely that current shareholders remain net sellers in these situations as well.

To evaluate whether data support our assumption of net selling by current shareholders and to assess the magnitude of such selling, we empirically examine trades by one group of current shareholders—firms. We focus on this group of shareholders because data on their positions are readily available, unlike, e.g., data on retail investors. The data are obtained from the institutional holdings database (Thomson Reuters) for the period January 1980 to January 2014. Each quarter \( t \) we consider all institutions with non-zero holdings of a firm’s stock and define them as current shareholders. We then calculate the changes in the number of shares held by these institutions from this quarter to the next and sum across all institutions that had stock at date \( t \). If the resulting number is negative, it means the current (institutional) shareholders sell the security as a group during this quarter and we classify
them as net sellers.

As an alternative, we repeat the same procedure at the annual frequency and also for the changes in normalized holdings—i.e., the number of shares held by institutions normalized by the number of shares outstanding. The results are reported in Table 1. Most of the time (78.1% of all quarters and 81.3% of all years), the current institutional shareholders are net sellers. The percentage of net sellers is even higher if we focus on the changes in the normalized holdings rather than a raw number of shares (81.5% of all quarters and 87.7% of all years). On average, institutions sell 3.8% of outstanding shares each quarter and 9.0% each year, and these numbers are statistically different from zero. Thus our empirical results strongly support our assumption that current shareholders are net sellers. One caveat, of course, is that we capture trading by only one group of current shareholders, and there are likely to be systematic differences between institutions, venture capitalist/founders, and retail investors. Nevertheless, institutions hold, on average, a considerable fraction of the firm’s stock (approximately 27%). Additionally, other groups of current shareholders, such as private equity, venture capitalists, and firm employees, may have a greater need for diversification and therefore a greater tendency to sell the stock.

B. Data and Main Variables

Next, we analyze volume, frequency, post-event stock returns, and the profit from market timing to see whether they can be rationalized based on managers’ preference for current shareholders. We use standard measures of volume and post-event abnormal stock returns. However, in our search of the academic literature, we could not find any measures of profit from market timing. Therefore we motivate and develop a new measure that empirically assesses the success of market timing strategies.

Our sample includes the universe of Compustat firms with non-missing balance sheet data for the period 1982-2010. We start in 1982 because the safe harbor provisions under the Securities and Exchange Act were adopted at this time and firms could repurchase stock without facing any legal uncertainty. Following Stephens and Weisbach (1998), we proxy for share repurchases with the monthly decreases in split-adjusted shares outstanding reported
by the Center for Research in Security Prices (CRSP). This method assumes that the firm has not repurchased any shares if the number of shares increased or remained the same during the month. We take the last day of the month as the repurchase date and calculate the stock return over a period of either one or three years from that date. The fraction of shares repurchased in each month is the number of shares repurchased during the month divided by the number of shares outstanding at the end of the previous month.

A potential problem with this measure is that it tends to underestimate the amount of true share repurchases (see, e.g., Jagannathan, Stephens, and Weisbach (2000)). For example, if a company buys back stock and issues equity during the same month, we can record a zero repurchase. This is particularly important for small firms since they tend to issue more equity though broad-based equity compensation programs (Bergman and Jenter (2007)) and also do more SEOs. We therefore also employ a commonly used alternative approach to calculate the actual repurchases by using the Compustat quarterly data on the total dollar value spent on repurchases. These data can contain information unrelated to repurchases of common stock (see, e.g., Kahle (2002)). Nevertheless, the advantage of Compustat repurchase data is that they are not systematically understated and provide the least biased estimate of true repurchases (Banyi, Dyl, and Kahle (2008)). Using Compustat data to calculate the number of shares repurchased each quarter, we divide the total dollar amount spent on repurchases during a quarter by the average monthly stock price.

The sample of SEOs is from the Securities Data Company (SDC) new issues database. We look only at primary issues of common stock. Although the SDC database provides the exact stock issuance date, we use the last day of the calendar month as the issuance date in calculating the one-year and three-year stock returns after an SEO. This procedure ensures that post-SEO stock returns are directly comparable to post-repurchase returns.

We also compute the new equity issuances using the changes in the number of shares outstanding. Similar to the calculation of our repurchase measure, we track the increases in the total number of shares each month. The advantage of this measure is that it captures, in addition to SEOs, other ways in which firms sell shares. According to Fama and French
(2005), the issuance of stock through SEOs constitutes only a small fraction of the total issuance activity, and is smaller in magnitude than the issuance of stock due to mergers financing. For example, Fama and French (2005) report that approximately 86% percent of all firms issued some form of equity over the period 1993 to 2002. This number contrasts sharply with the low frequency of SEOs over the same period. It may be argued that M&A activity financed by stock is one of the ways in which firms time the equity market. For example, Shleifer and Vishny (2003) present a model showing how rational managers can use stock as a means of payment in mergers and acquisitions to take advantage of stock mispricing, and Loughran and Vijh (1997) find evidence of negative long-run abnormal returns for bidders making stock acquisitions.

However, a disadvantage of this measure is that it includes the issuance of shares that is not triggered by the firm, but occurs because firm investors chose a particular action and thereby cause the equity issuance. For example, convertible debt holders can choose to convert their debt into equity. Similarly, firm employees can buy the company stock through employee stock purchase plans or exercise their stock options, which leads to an increase in the number of outstanding shares. There are two reasons why such items should not be included in the total share issuance. First, since investor-initiated issuance is not directly triggered by the firm manager, we cannot infer whether the manager intended to time the market. Second, the benefits from market timing of employee stock option exercises and other similar investor actions do not accrue to firm shareholders, but benefit employees, bondholders, or other parties. Therefore, the wealth transfers induced by market timing would be different than those we discussed in the context of the model. To mitigate these concerns, we follow McKeon (2013) and exclude equity issuance with monthly proceeds below 1% of market value of equity.\footnote{McKeon (2013) works with quarterly data and classifies issuances that are greater than 3% of the market value of equity as firm-initiated. Since we use monthly data, we chose a 1% cutoff.}

Our measures of profit from market timing aim to capture the additional abnormal return earned by a shareholder with a fixed number of shares because of equity market timing. For each month, we calculate the proportion of equity repurchased during a month, $\alpha_t$, and then
multiply it by either one- or three-year post-repurchase risk-adjusted returns, \( r_i \). We then sum the resulting measures over the 12 months of the year to obtain the total,

\[
\text{Repurchase timing} = \sum_{i=1}^{12} \alpha_i r_i.
\]  

(34)

For example, if a manager buys back 5% of the firm’s outstanding shares in May, and shares appreciate by 10% from June to May of the following year, the measure of repurchase timing will be equal to 0.5%. Prior to calculating the market timing measures, we adjust the raw stock returns for risk using the Fama and French 100 portfolios formed on size and book-to-market deciles. Each month, we match firms in our sample to the comparable size and book-to-market portfolios based on the break points available on Kenneth French’s web site and calculate the difference in buy-and-hold returns for our firms and these portfolios.\(^{15}\) Using a risk-adjustment measure is justified by our theoretical model, in which mispricing is based on firm-specific information and therefore is cross-sectional by design. Note, however, that the risk adjustment necessarily removes the aggregate component, or “whole-market” mispricing, from our timing measure. Therefore, such measures cannot be used to identify whether executives can predict the long-term market trends.

Sales timing is defined in a similar manner to repurchase timing, with the difference that we track the proportion of equity sold each month, \( s_i \),

\[
\text{Sales timing} = -\sum_{i=1}^{12} s_i r_i.
\]  

(35)

Note that timing measures can be positive or negative, with larger positive values indicating more successful timing by the firm. We also calculate repurchase and sales timing measures using quarterly data. Appendix C provides further detail on the construction of timing measures and their link to theory.

C. Empirical Results for Profit from Market Timing

Panel A of Table 2 presents the summary statistics for the total profit from market timing, calculated as the additional return earned by shareholders when the company sells or

\(^{15}\)This method is preferred over risk adjustment using the market model since using cumulative abnormal returns over a long period may yield positively biased test statistics (Barber and Lyon (1997)).
repurchases a fraction of its stock.

It appears from the table that, on average, firms time the market well. For example, the average additional return from timing equity sales and repurchases is positive 0.24% over a one-year period (t-stat = 13.79) and the corresponding number for a three-year period is 0.65% (t-stat = 18.62). Since many firm-years do not have a single repurchase, SEO, or equity sale, we also present the summary statistics only for those observations that have a timing event (Panel B of Table 2). Naturally, when we condition on these events, the profit from market timing becomes larger. We find that timing with repurchases and sales provides an additional return of 0.40% over a one-year period, which means that an average firm trading 10% of its equity earns 4% in abnormal returns for the following year.

We next analyze whether profit from market timing comes primarily through share repurchases or issuances. As is evident from Table 3, the profit from stock repurchases appears to be considerably smaller than the profit from SEOs and other equity sales. For example, the average profit from repurchase timing is only 0.04% per year (t-stat = 4.78) when we use the CRSP-based measure, and 0.05% (t-stat = 6.11) when we use the Compustat-based measure, whereas the average profit is 0.36% (t-stat = 2.38) for SEO timing. Since SEOs represent only a small proportion of newly issued equity, we also repeat the estimation using the measure based on general equity sales (increases in the number of outstanding shares). This measure produces similar results, with robust evidence of successful market timing of equity sales with one- and three-year horizons. Specifically, the profit from timing equity sales is 0.62% per year and is statistically different from zero (t-stat = 12.84). The difference between profit from repurchase and profit from issuance timing appears even more striking if we compare the medians instead of the means.

In Panel B of Table 3, we present the formal tests for the difference in means (t-test) and medians (non-parametric Wilcoxon sum rank test) between the profit from repurchase timing and issuance timing. We observe that both the average and median profits from issuance timing are significantly different from those from repurchase timing. This result does not depend on whether we measure issuance using the seasoned equity offerings from SDC or
equity sales based on the increases in shares outstanding. Overall, we find that issuance timing is more profitable than repurchase timing. In conjunction with our theory, this implies that managers act as if they were maximizing value for current shareholders: they repurchase too often and issue equity selectively.

D. Empirical Results for Post-Event Returns and Volume

We next present the summary statistics for the post-event abnormal stock returns (Panel A of Table 4). Firms in our sample experience 1.51% in abnormal returns the year after the repurchase and 3.36% three years after the event.\textsuperscript{16} SEOs tend to be followed by a larger magnitude of abnormal stock returns, earning -2.11% the following year or -12.57% over three years. Following equity sales, the risk-adjusted returns are also negative, on average, at -1.71% in the year following the event.

Recall from Proposition 6 that if managers maximize current shareholder value, we would expect to see smaller post-event returns (in absolute magnitude) following repurchases than following issuances. In general, we find that to be the case, but the difference does not appear to be statistically significant, with exception of the difference in average returns after SEOs and repurchases over a one-year period (Panel B of Table 4). However, we do find that in all cases the difference in median abnormal returns following an event is both statistically and economically significant. Overall, our results are broadly consistent with current shareholder value maximization.

A potential alternative explanation for these return dynamics comes from the investment literature. Specifically, it is known that sales of equity often precede new capital investment and can be used to finance the exercise of real options (see, e.g., DeAngelo, DeAngelo, and Stulz (2010)). In turn, the exercise of real options may decrease the systematic risk of the firm and result in lower expected returns. This could be because options are exercised in anticipation of the low cost of capital (Cochrane (1991)) or because the exercise transforms riskier options into less risky assets in place (Carlson, Fisher, and Giammarino (2006)).

\textsuperscript{16}The abnormal returns after the repurchases in our sample are not directly comparable to those in previous studies (e.g., Ikenberry, Lakonishok, and Vermaelen (1995) because we look at actual repurchases rather than at announcements of intent to buy back the stock).
if we fail to adjust properly for the change in expected returns, we may mistakenly attribute the evidence of post-issuance abnormal returns to mispricing. Although the risk-adjustment technique that we employ does not match firms on investment rates, we anticipate that the bias associated with risk adjustment due to the exercise of real options is small. First, the connection between investment and returns may be pronounced for equity issuance, but it is more difficult to build a similar risk-based explanation for stock repurchases. Second, as Lyandres, Sun, and Zhang (2008) explain, new investment is often financed by methods other than SEOs, such as initial public offerings (IPOs), straight debt, and convertible debt.

To see whether our results for equity sales and SEOs are driven by different real investment dynamics in these firms, we sort all firms in our sample by their investment rates, defined as capital expenditures in the year of the SEO divided by the beginning-of-year book assets. Table 5 shows our results. The pattern that timing with general equity sales results in a higher profit than timing with share repurchases is evident across all groups of investment rates, and the difference does not vary consistently with investment rates. Similarly, profit from SEO timing is larger than the profit from repurchase timing in the lowest and highest investment samples. For stock returns, investment also does not appear to be a major explanation. This suggests that our results are unlikely to be driven solely by expected return dynamics due to investment.

Next, we show the statistics for volume and frequency of stock repurchases and issuances (see Table 6). Perhaps unsurprisingly, few firms conduct an SEO in a given year; the average frequency of these events is 4.03%. Consistent with Fama and French (2005), general equity sales are much more common, with the average firm having a 35.80% propensity to sell equity during a year. Stock repurchases, however, occur more frequently than both SEOs and general equity sales, with the probability of a buyback at 36.86% per year. Likewise, the average annual inflation-adjusted volume of repurchases is larger than that of SEOs ($26.94 million vs. $5.95 million). However, the volume of general equity sales is also large at $42.23 on average. In sum, the evidence on volume of issuances and repurchases is mixed, whereas the frequency of events of the two types is consistent with managers acting in the interest of
current shareholders.

IV. Conclusion

We examine the conflicts of interest between shareholders and new investors in a firm’s market timing decisions. By recognizing that a firm’s shareholders are affected by stock mispricing even in the absence of share repurchases and equity sales by the firm, we disentangle the effects of exogenous mispricing and firm actions on existing shareholders. Using this insight, we show theoretically that a market timing strategy that exploits under- and over-pricing of a firm’s stock can reduce the wealth of the current shareholders. Additionally, current shareholders are relatively better off with share repurchase timing than with share issuance timing.

According to the theory developed in this paper, if managers act in the interest of existing shareholders, share repurchases should be more frequent than equity sales, repurchases should be followed by a lower magnitude of abnormal returns, and shareholders will earn a smaller profit from repurchase timing than from issuance timing. Our empirical findings provide support for these predictions, which suggests that most managers in the United States appear to be looking out for their firms’ current shareholders.
References


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Appendix A. Proposition Proofs

Proof of Proposition 1.
Applying the projection theorem for a normal distribution, we obtain the conditional mean of $P_2$ given a managerial signal

$$E(P_2|v) = \mathcal{P} + \frac{\sigma_p^2}{\sigma_p^2 + \sigma_z^2} (v - \mathcal{P}). \quad (36)$$

We conjecture that the equilibrium price is as follows

$$P_1 = \mathcal{P} + \beta F, \quad (37)$$

and solve for parameter $\beta$ in the equilibrium. Substituting the conjecture for $P_1$ into the manager’s problem (8), and taking the first-order condition with respect to $F$, yields

$$F^* = \frac{E(P_2|v) - \mathcal{P}}{2\beta} = \gamma (v - \mathcal{P}), \quad (38)$$

where

$$\gamma = \frac{\sigma_p^2}{\sigma_p^2 + \sigma_z^2} \frac{1}{2\beta}. \quad (39)$$

The second-order condition is satisfied whenever $\lambda$ (proportion of firms that repurchase or sell stock for information reasons) is less than $\frac{1}{2}$. Whenever $\lambda > 1/2$, the linear equilibrium does not exist. For individuals who observe firm’s trade $F$, the conditional mean of $P_2$ is

$$E(P_2|F) = \lambda E(P_2|F, \text{info}) + (1 - \lambda) E(P_2|F, \text{no info}) = \mathcal{P} + 2\lambda \beta F. \quad (40)$$

The equilibrium price is set by the market clearing condition. Using $\sum_{i=1}^{n+m} Q_i = 0$ and the individual demand functions (7), we can write this condition as

$$F + \sum_{i=1}^{n+m} X_i^* = F + (n + m) \frac{E(P_2|F) - P_1}{\theta} = 0. \quad (41)$$

It follows that the individual investors share the extra demand from the firm equally, i.e.,

$$X_i^* = Q_i - \frac{F}{n + m}. \quad (42)$$

Substituting (40) into condition (41), we obtain the market clearing price

$$P_1 = \mathcal{P} + \left( \frac{\theta}{n + m} + 2\lambda \beta \right) F. \quad (43)$$
Comparing this expression to conjecture (37), we can solve for parameter $\beta$

$$\beta = \frac{\theta}{(n + m)(1 - 2\lambda)}.$$  \hfill (44)

Finally, we solve for parameters $\mu_u$ and $\sigma_u^2$, such that the distribution of demand by informed managers is identical to that by managers who repurchase or issue equity for exogenous reasons. Specifically, the mean and variance of the demand by uninformed managers solve a fixed-point problem

\begin{align*}
\text{Var}(F^*|\mu_u, \sigma_u^2) &= \sigma_u^2, \quad (45) \\
\text{E}(F^*|\mu_u, \sigma_u^2) &= \mu_u.
\end{align*}

Using (38), we obtain

\begin{align*}
\mu_u &= 0, \quad (46) \\
\sigma_u^2 &= \frac{(n + m)^2(1 - 2\lambda)^2 \sigma_p^4}{4\theta^2(\sigma_p^2 + \sigma_e^2)}. \quad (47)
\end{align*}

Therefore, given any observed value $F$, the individuals will attribute probability $\lambda$ that the firm is informed and probability $1 - \lambda$ that it is uninformed.

**Proof of Proposition 2.**

(i) The probability of a stock repurchase minus the probability of an equity sale is

$$\Pr(F^* > 0) - \Pr(F^* < 0) = \int_{0}^{\infty} f(x) \, dx - \int_{-\infty}^{0} f(x) \, dx = 0.$$

where $x = v - \bar{F}$ and $f(x)$ is the normal distribution density function with zero mean and variance $\sigma^2 \equiv \sigma_p^2 + \sigma_e^2$. Similarly, we can calculate the difference in total volume

$$\text{Volume(Rep)} - \text{Volume(Iss)} = E[F|F^* > 0] \Pr(F^* > 0) - E[-F|F^* < 0] \Pr(F^* < 0) = \int_{0}^{\infty} \gamma x f(x) \, dx - \left( -\int_{-\infty}^{0} \gamma x f(x) \, dx \right) = 0.$$  \hfill (49)

(ii) Using (36)-(38), we can write the manager’s trading profit conditional on signal as

$$\Pi(x) = \beta \gamma^2 x^2.$$  \hfill (50)
Profit from repurchases minus profit from equity sales is then
\[
\frac{\int_{-\infty}^{\infty} \Pi (x) f (x) \, dx}{\int_{-\infty}^{\infty} f (x) \, dx} - \frac{\int_{-\infty}^{0} \Pi (x) f (x) \, dx}{\int_{-\infty}^{0} f (x) \, dx} = 2 \beta \gamma^2 \left( \int_{0}^{\infty} x^2 f (x) \, dx - \int_{-\infty}^{0} x^2 f (x) \, dx \right). \tag{51}
\]

Because of the symmetry of the normal distribution, the expression above is equal to 0.

(iii) The expected post-event price drift given managerial signal can be written as
\[
R (x) = E (P_2 | v) - P_1 = \beta \gamma x. \tag{52}
\]

The absolute value of the expected price drift after a repurchase minus that after an equity issuance is
\[
\left| \frac{\int_{0}^{\infty} R (x) f (x) \, dx}{\int_{0}^{\infty} f (x) \, dx} - \frac{\int_{-\infty}^{0} R (x) f (x) \, dx}{\int_{-\infty}^{0} f (x) \, dx} \right| = 2 \beta \gamma \left( \int_{0}^{\infty} xf (x) \, dx + \int_{-\infty}^{0} xf (x) \, dx \right) = 0. \tag{53}
\]

Proof of Proposition 3.

(i) Note that any repurchase or equity issuance represents a zero-sum game between the firm’s current shareholders and new investors. Thus it suffices to prove that new investors can profit from equity issuance timing. From (6), the wealth of new investor \( i \) who holds no shares initially is
\[
W_i \equiv X_i \left( P_2^i - P_1^i \right). \tag{54}
\]

Recall that the manager issues shares \( (F < 0) \) during the overpricing \( (v < P) \). Given a particular signal of the manager \( v \), the change in expected wealth of all new investors after stock issuance by the firm is
\[
\sum_{i=n+1}^{n+m} E \left[ W_i^{F<0} - W_i^{F=0} | v \right] = \sum_{i=n+1}^{n+m} E \left[ X_i \left( P_2^i - P_1^i \right) - Q_i (P_2 - P) | v \right]. \tag{55}
\]

To prove that current shareholders are worse off, we need to show that the sum above is positive. Using the expression for the long-term price (4), we obtain
\[
\sum_{i=n+1}^{n+m} E \left[ W_i^{F<0} - W_i^{F=0} | v \right] = \sum_{i=n+1}^{n+m} E \left[ X_i \left( P_2 + \frac{F (P_2 - P_1)}{N - F} - P_1 \right) - Q_i (P_2 - P) | v \right]. \tag{56}
\]
Substituting the equilibrium price $P_1$, individual demand functions $X_i$, and conditional expectation $E [P_2|v]$, and using notation for mispricing $x = v - \overline{P} < 0$, we can rewrite
\[
\sum_{i=n+1}^{n+m} E \left[ W_i^{F<0} - W_i^{F=0} | x \right] = \frac{\beta \gamma x}{N - \gamma x} \left[ 2 \gamma x (Q^+ - \overline{Q}) - Q^+ N \right],
\]
where $Q^+$ is the aggregate demand of new investors and $\overline{Q}$ is given by (18). The expression (57) is positive (current shareholders are worse off) when
\[
2 \gamma x (Q^+ - \overline{Q}) < Q^+ N.
\]
Since $x < 0$ and $Q^+ < \overline{Q}$, the condition above is satisfied when mispricing is not too large. Therefore, we establish that current shareholders are worse off with equity issuance timing by an informed manager (and the new investors are better off) when
\[
\tau < v < P,
\]
where
\[
\tau \equiv P + \frac{Q^+ N}{2 \gamma (Q^+ - \overline{Q})}.
\]
(ii) For the case of share repurchases of undervalued equity, the expression for change in wealth of new investors is given by (57) with $x > 0$. Since $Q^+ < \overline{Q}$, it is negative. Therefore, according to the zero-sum argument the current shareholder value always increases.

(iii) To establish that current shareholders prefer share repurchases to equity issues, we write the difference between new investors’ wealth with repurchase timing and issuance timing, for a given magnitude of mispricing, $|x| = |v - \overline{P}|$, and show that it is negative. Specifically,
\[
\sum_{i=n+1}^{n+m} E \left[ W_i^{F>0} - W_i^{F=0} | v, v > \overline{P} \right] - \sum_{i=n+1}^{n+m} E \left[ W_i^{F<0} - W_i^{F=0} | v, v < \overline{P} \right] = \frac{\beta \gamma |x|}{N - \gamma |x|} \left[ 2 \gamma |x| (Q^+ - \overline{Q}) - Q^+ N \right] - \frac{\beta \gamma |x|}{N + \gamma |x|} \left[ 2 \gamma |x| (Q^+ - \overline{Q}) + Q^+ N \right].
\]
The expression above is negative when
\[
2 \gamma^2 x^2 (Q^+ - \overline{Q}) < Q^+ N^2.
\]
The last condition is true because $Q^+ < \overline{Q}$. 
(iv) To see that market timing increases current shareholder value in expectation, it is sufficient to show that the new investors’ wealth, averaged over all possible values of mispricing \( x \), decreases. Integrating (57) over states \( x \) gives the expected change in wealth from market timing for new investors

\[
Z_{1} = \frac{1}{N - \gamma x} \int_{-\infty}^{\infty} 2 (\gamma x)^2 (Q^+ - \overline{Q}) - Q^+ N \gamma x f(x) \, dx.
\]  

(63)

Using the symmetry of the normal distribution, we can rewrite this value as

\[
Z_{1} = \frac{2}{N - \gamma x} \int_{0}^{\infty} \left( \frac{2 (\gamma x)^2 (Q^+ - \overline{Q}) + Q^+ N \gamma x}{N + \gamma x} + \frac{2 (\gamma x)^2 (Q^+ - \overline{Q}) - Q^+ N \gamma x}{N - \gamma x} \right) f(x) \, dx
\]

\[
= 2N \beta \int_{0}^{\infty} (\gamma x)^2 \frac{(Q^+ - 2\overline{Q})}{(N + \gamma x)(N - \gamma x)} f(x) \, dx.
\]  

(64)

Since \( Q^+ < \overline{Q} \), it is negative. Therefore, it must be that current shareholder value increases.

**Proof of Proposition 4.**

(i) We show in the proof of Proposition 3 that current shareholder wealth decreases with the timing of equity issuance when

\[
\frac{\sum_{i=n+1}^{n+m} E[W^F_{i<0} - W^F_{i=0}|x]}{N - \gamma x} = \frac{\beta \gamma x}{N - \gamma x} \left[ 2\gamma x (Q^+ - \overline{Q}) - Q^+ N \right] > 0.
\]  

(65)

Because for issuance \( x < 0 \) (overvaluation), current shareholders are worse off when

\[
2\gamma x (Q^+ - \overline{Q}) < Q^+ N,
\]

which is satisfied since \( Q^+ > \overline{Q} \).

(ii) For share repurchases of undervalued stock, we have \( x > 0 \). From (57), the current shareholder value decreases with repurchase timing if

\[
2\gamma x (Q^+ - \overline{Q}) > Q^+ N.
\]  

(66)

Since \( Q^+ > \overline{Q} \), this condition is satisfied when mispricing is large, i.e., \( v > \overline{v} \), where

\[
\overline{v} = \overline{P} + \frac{Q^+ N}{2\gamma (Q^+ - \overline{Q})}.
\]  

(67)
(iii) For new investors, the expected change in wealth from market timing is given by (64), and it is positive when $Q^+ > 2\overline{Q}$. Therefore, it must be that current shareholder value is lower with market timing.

**Proof of Proposition 5.**

The problem of maximizing current shareholder value is equivalent to minimizing value for new investors with respect to $F$. Using expression for $P_0$, we have

$$
\min_F \sum_{i=n+1}^{n+m} E \left[ X_i (P'_2 - P_1) \right] = \min_F N \sum_{i=n+1}^{n+m} X_i \left( \frac{E(P_2|v) - P_1}{N - F} \right). \tag{68}
$$

We start with a linear conjecture for the equilibrium price schedule

$$
P_1 = \mathcal{P} - \alpha + \beta F. \tag{69}
$$

It is easy to check that the solution exists only if

$$
(2\overline{Q} - Q^+) \left( N - 2\gamma x - \frac{\alpha}{\beta} \right) > 0. \tag{70}
$$

Using (69) and demand functions for individual investors (11), the objective function (68) can be simplified to

$$
\min_F \left( Q^+ - \frac{Fm}{n + m} \right) \left( \frac{2\gamma x + \frac{\alpha}{\beta} - F}{N - F} \right) \simeq \min_F \left( Q^+ - \frac{Fm}{n + m} \right) \left( \frac{2\gamma x + \frac{\alpha}{\beta} - F}{N} \right). \tag{71}
$$

Solving for optimal demand by the manager gives

$$
F^* = \frac{n + m}{2m} Q^+ + \gamma x + \frac{\alpha}{2\beta}. \tag{72}
$$

For individuals who observe the firm’s trade $F$, the conditional mean of $P_2$ is

$$
E(P_2|F, \text{info}) = \mathcal{P} - \alpha - \beta Q^+ \frac{n + m}{m} + 2\beta F, \tag{73}
$$

$$
E(P_2|F) = \lambda E(P_2|F, \text{info}) + (1 - \lambda) E(P_2|F, \text{no info}) \tag{74}
$$

$$
= \mathcal{P} - \lambda \alpha - \lambda \beta Q^+ \frac{n + m}{m} + 2\lambda \beta F.
$$

The equilibrium price is found from the market clearing condition, which can be written as

$$
P_1 = \frac{\theta F}{n + m} + E(P_2|F) = \left( \frac{\theta}{n + m} + 2\lambda \beta \right) F + \mathcal{P} - \lambda \alpha - \lambda \beta Q^+ \frac{n + m}{m}. \tag{75}
$$
We compare the expression above to the price conjecture (69) and solve for $\alpha$ and $\beta$

\[
\beta = \frac{\theta}{(n + m)(1 - 2\lambda)} > 0, \quad (76)
\]

\[
\alpha = \frac{\lambda \theta Q^+}{(1 - \lambda)(1 - 2\lambda)m} > 0. \quad (77)
\]

Substituting parameters in (72) yields

\[
F^* = \overline{F} + \gamma (v - \overline{P}), \quad (78)
\]

\[
\overline{F} = \frac{Q^+ n + m}{1 - \lambda}. \quad (79)
\]

Since new investors on average buy the stock, $Q^+ > 0$, it follows that $\overline{F} > 0$. Finally, using the fixed-point argument we derive the parameters $\mu_u$ and $\sigma_u^2$ consistent with the conditional probability $\lambda$ of the signal coming from the informed manager. Following the same steps as in the first proposition, we obtain

\[
\mu_u = \frac{Q^+ n + m}{1 - \lambda}, \quad (80)
\]

\[
\sigma_u^2 = \frac{(n + m)^2 (1 - 2\lambda)^2 \sigma_p^4}{4\theta^2 (\sigma_p^2 + \sigma_e^2)}. \quad (81)
\]

**Proof of Proposition 6.**

(i) The probability of a stock repurchase is larger than the probability of an equity sale because

\[
\Pr(F^* > 0) - \Pr(F^* < 0) = \int_{-\infty}^{\infty} f(x) \, dx - \int_{-\infty}^{-\frac{\overline{F}}{\gamma \sigma}} f(x) \, dx = 1 - 2\Phi(-\frac{\overline{F}}{\gamma \sigma}) > 0, \quad (82)
\]

where $f(x)$ is the normal distribution density function with zero mean and variance $\sigma^2 \equiv \sigma_p^2 + \sigma_e^2$. Similarly, we show that the difference in total volume of stock repurchases and equity sales is positive

\[
\text{Volume(Rep)} - \text{Volume(Iss)} = E[F|F^* > 0] \Pr(F^* > 0) - E[-F|F^* < 0] \Pr(F^* < 0)
\]

\[
= \int_{-\infty}^{\infty} (\overline{F} + \gamma x) f(x) \, dx + \int_{-\infty}^{-\frac{\overline{F}}{\gamma \sigma}} (\overline{F} + \gamma x) f(x) \, dx
\]

\[
= \overline{F} > 0, \quad (83)
\]
where the last result is by symmetry of $x$ probability distribution function.

(ii) A manager’s trading profit when she maximizes current shareholder value is

$$\Pi (v) = E [(P_2 - P_1) F|v]$$

Substituting the expressions for the firm’s optimal demand for shares, $F^*$, and the equilibrium price schedule, $P_1$, we have

$$\Pi (x) = \beta \left( \gamma^2 x^2 + 2\lambda \gamma F x - F^2 (1 - 2\lambda) \right),$$

From Proposition 5, we know that the firm will repurchase shares if and only if $x > -\frac{F}{\gamma}$. We need to show that expected profit from timing repurchases minus expected profit from timing equity sales is negative, i.e.,

$$\frac{\int_{-\frac{F}{\gamma}}^{\infty} \Pi (x) f (x) \, dx}{\int_{-\infty}^{\infty} f (x) \, dx} - \frac{\int_{-\infty}^{-\frac{F}{\gamma}} \Pi (x) f (x) \, dx}{\int_{-\infty}^{-\frac{F}{\gamma}} f (x) \, dx} < 0.$$  

Note that for standard normal distribution with cumulative density function $\Phi (x)$ we have

$$\int_{A}^{B} x^2 f (x) \, dx = \frac{\sigma^2}{\sqrt{2\pi}\sigma^2} \left( -Be^{-\frac{A^2}{2\sigma^2}} + Ae^{-\frac{B^2}{2\sigma^2}} \right) + \sigma^2 \left( \Phi (B/\sigma) - \Phi (A/\sigma) \right),$$

$$\int_{A}^{B} x f (x) \, dx = -\frac{\sigma^2}{\sqrt{2\pi}\sigma^2} \left( e^{-\frac{A^2}{2\sigma^2}} - e^{-\frac{B^2}{2\sigma^2}} \right),$$

$$\int_{A}^{B} f (x) \, dx = \Phi (B/\sigma) - \Phi (A/\sigma),$$

therefore, substituting (85), it is easy to show that (86) is satisfied for $\lambda < 1/2$.

(iii) The expected post-event price drift given managerial signal $v$ is

$$R (x) = E (P_2|v) - P_1 = \beta \left( \gamma x - \frac{F}{\gamma} (1 - 2\lambda) \right).$$

Recall that the manager repurchases when $x > -\frac{F}{\gamma}$. Therefore, the expected stock returns conditional on issuance and repurchase are, respectively,

$$\frac{\int_{-\frac{F}{\gamma}}^{\infty} R (x) f (x) \, dx}{\int_{-\infty}^{\infty} f (x) \, dx} = -\frac{\beta \gamma \sigma}{\sqrt{2\pi}} e^{-\frac{1}{2} \left( \frac{F}{\gamma \sigma} \right)^2} / \Phi \left( -\frac{F}{\gamma \sigma} \right) - \beta \frac{F}{\gamma} (1 - 2\lambda),$$

$$\frac{\int_{-\infty}^{-\frac{F}{\gamma}} R (x) f (x) \, dx}{\int_{-\infty}^{-\frac{F}{\gamma}} f (x) \, dx} = \frac{\beta \gamma \sigma}{\sqrt{2\pi}} e^{-\frac{1}{2} \left( \frac{F}{\gamma \sigma} \right)^2} / \left( 1 - \Phi \left( -\frac{F}{\gamma \sigma} \right) \right) - \beta \frac{F}{\gamma} (1 - 2\lambda).$$
The expected stock return following a stock issuance is always negative, while it can be positive or negative following a repurchase. Since $\bar{F} > 0$, it must be that $\Phi(-\frac{\bar{F}}{\gamma\sigma}) < 1/2$ and we have

$$1 - \Phi(-\frac{\bar{F}}{\gamma\sigma}) > \Phi(-\frac{\bar{F}}{\gamma\sigma}).$$

Therefore, the absolute value of expected price drift following a repurchase is always smaller than the value of expected price drift following equity issuance.
Appendix B. Current Shareholders’ Welfare Analysis

Here we discuss the implications of a symmetric market timing strategy for the welfare of current shareholders measured by their objective function (5). We then analyze the optimal market timing strategy of an informed manager who aims to maximize this objective function.

Recall that an equity issue of overvalued stock can decrease shareholder value. We show below that a similar claim can be made for the expected utility of shareholders. Specifically, we decompose the change in current shareholders’ expected utility into a change in their expected wealth and a change in costs associated with deviation from desired positions

\[ \sum_{i=1}^{n} E[U_i^{F<0} - U_i^{F=0}|v] = \sum_{i=1}^{n} E[W_i^{F<0} - W_i^{F=0}|v] - \sum_{i=1}^{n} E\left[\frac{\theta}{2} (X_i - Q_i)^2 |v\right]. \] (94)

As we show in Proposition 3, the first term is negative when the stock overpricing is small. To see that the change in utility is negative as well, note that by timing a firm creates additional disutility for current shareholders because their demands deviate from the initial preferences, i.e., \( X_i \neq Q_i \) if \( F \neq 0 \). Therefore, the second term is negative, and current shareholders are worse off from equity issuance of overvalued stock. Using a similar line of reasoning, one can show that all claims of Proposition 4 also hold if we consider shareholders’ utility function instead of wealth.

Next we show that when the share turnover is low, current shareholders prefer share repurchase timing over issuance timing. From the proof of Proposition 3, we have the following relation between the current shareholders’ expected wealth changes with repurchase and issuance timing

\[ \sum_{i=1}^{n} E[W_i^{F>0} - W_i^{F=0}|v, v > \overline{P}] > \sum_{i=1}^{n} E[W_i^{F<0} - W_i^{F=0}|v, v < \overline{P}]. \] (95)

Note also that the costs incurred by shareholders, \( \frac{\theta}{2} (X_i - Q_i)^2 \), are symmetric with respect to mispricing, \( v - \overline{P} \); that is

\[ E\left(\frac{\theta}{2} (X_i - Q_i)^2 |v\right) = \frac{\theta \gamma^2 (v - \overline{P})^2}{2(n + m)^2}. \] (96)

Therefore, when we subtract the respective costs from both sides of (95), the inequality
remains unchanged, and we have
\[
\sum_{i=1}^{n} E[U_i^F > 0 - U_i^F = 0 | v, v > \bar{P}] > \sum_{i=1}^{n} E[U_i^F < 0 - U_i^F = 0 | v, v < \bar{P}].
\] (97)

We now analyze the optimal market timing strategy of a manager who wants to maximize the expected utility of shareholders. This objective function is equivalent to minimizing the sum of the wealth of new investors and costs of suboptimal trades for current shareholders
\[
\min_{F} N \sum_{i=n+1}^{n+m} E[P_2 | v] - E[P_1] + \frac{\theta F^2}{2(n+m)^2}.
\] (98)

Using the linear conjecture for the equilibrium price schedule
\[
P_1 = \bar{P} - \alpha + \beta F,
\] (99)
we can further rewrite the objective function as
\[
\min_{F} \left( Q^+ \frac{F}{n+m} + \frac{2\gamma \beta x + \alpha - \beta F}{N} \right) + \frac{\theta F^2}{2(n+m)^2}.
\] (100)

Taking the first-order condition with respect to $F$, we obtain
\[
F^* = \frac{\alpha + \frac{n+m}{m} Q^+ \beta + 2\gamma \beta x}{2\beta + \frac{\theta N}{m(n+m)}} \equiv \hat{F} + \hat{\gamma} x.
\] (101)

Since the manager’s demand is linear in mispricing, we have
\[
E(P_2 | F) = \bar{P} - \lambda \alpha - \lambda \beta Q^+ \frac{n+m}{m} + F \left( 2\beta \lambda + \frac{\lambda \theta N}{m(n+m)} \right).
\] (102)

The equilibrium price is found from the market clearing condition
\[
P_1 = \frac{\theta F}{n+m} + E(P_2 | F) = \left( \frac{\theta}{n+m} + 2\lambda \beta + \frac{\lambda \theta N}{m(n+m)} \right) F + \bar{P} - \lambda \alpha - \lambda \beta Q^+ \frac{n+m}{m}. \] (103)

We now compare this expression with the price conjecture (69) and solve for $\alpha$ and $\beta$
\[
\beta = \frac{\theta (1 + \frac{\lambda N}{m})}{(1 - 2\lambda)(n+m)} > 0, \] (104)
\[
\alpha = \frac{\lambda Q^+ \theta (1 + \frac{\lambda N}{m})}{(1 - \lambda)(1 - 2\lambda) m} > 0. \] (105)

Substituting the solution back into (101) yields
\[
\hat{F} = F \frac{m + \lambda N}{m + \frac{1}{2} N} < \bar{F}, \] (106)
\[
\hat{\gamma} = \gamma \frac{m + \lambda N}{m + \frac{1}{2} N} < \gamma, \] (107)
where $\bar{F}$ is given by (79). Note that $\hat{F} > 0$. 

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Appendix C. Market Timing Profit Measure

Although the construction of measures of profit from market timing may seem intuitive, let us explain why it makes sense from a theory perspective. Intuitively, the additional return earned on one share of stock as the result of market timing is given by the difference between the realized stock return and the return if the firm not issued or repurchased any stock. The latter return is unobservable, but it can be inferred from the realized return and the cash going out of the firm (into the firm) at the time of stock repurchase (stock issuance).

Specifically, consider a manager who repurchases a fraction $\alpha$ of her firm’s stock at today’s price $P_1$, expecting the stock to appreciate to $P_2$ in the future. Even if the manager’s expectation were correct, the future price will change as a result of the repurchase itself. We denote this actual future price with $P'_2$. If the real policy of the firm is independent of repurchases and issuances, then the non-arbitrage relation between prices implies

$$ (1 - \alpha)P'_2 = P_2 - \alpha P_1. \quad (108) $$

Empirically, we observe the actual price, $P'_2$, but not what the price would be had the manager not repurchased any shares. Therefore, we infer $P_2$ using the expression (108) and obtain the additional return from repurchase as

$$ \text{Repurchase timing} = \frac{P'_2 - P_2}{P_1} = \alpha \left( \frac{P'_2 - P_1}{P_1} \right). \quad (109) $$

Note that a similar argument can be made for the calculation of market timing with SEOs or general equity sales.
Table 1. Net Sales of Shares by Current Shareholders.

The sample is obtained from the institutional holdings database (Thomson Reuters), which collects data from 13F filings and covers the period from January 1980 to January 2014. Panel A shows the total number of observations, the number of observations with net sales by institutions, and the proportion of observations with net sales at the quarterly and annual frequency. We measure net sales based on the changes in the raw number of shares held by institutions and also based on the changes in the normalized holdings (shares held/total shares outstanding). For each firm-period, we consider all institutions with non-zero holdings of the security in the previous period, and then subtract their previous-period holdings from their current-period holdings to obtain the change. We then sum changes for all institutions in a given firm-period. A positive number for a given firm-period means that the current (institutional) shareholders buy the security as a group during this period, while a negative number indicates that they sell the security as a group (counted as a “net seller” in Panel A). Panel B shows the summary statistics for the normalized holdings and the change in the normalized holdings by institutions.
### Panel A. Proportion of firms where current shareholders are net sellers

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
<th>Net sellers</th>
<th>Net sellers/total</th>
<th>Total</th>
<th>Net sellers</th>
<th>Net sellers/total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm-quarters</td>
<td>1,162,924</td>
<td>908,065</td>
<td>0.781</td>
<td>1,028,120</td>
<td>837,447</td>
<td>0.815</td>
</tr>
<tr>
<td>Firm-years</td>
<td>294,758</td>
<td>239,764</td>
<td>0.813</td>
<td>259,509</td>
<td>227,716</td>
<td>0.877</td>
</tr>
</tbody>
</table>

### Panel B. Normalized holdings and change in normalized holdings by current shareholders

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>St. dev.</th>
<th>10th</th>
<th>Median</th>
<th>90th</th>
<th>T-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normalized holdings (firm-quarters)</td>
<td>1,028,120</td>
<td>0.268</td>
<td>0.326</td>
<td>0.002</td>
<td>0.153</td>
<td>0.732</td>
<td>N/A</td>
</tr>
<tr>
<td>Normalized holdings (firm-years)</td>
<td>259,509</td>
<td>0.270</td>
<td>0.321</td>
<td>0.002</td>
<td>0.155</td>
<td>0.734</td>
<td>N/A</td>
</tr>
<tr>
<td>Change in normalized holdings (firm-quarters)</td>
<td>1,028,120</td>
<td>-0.038</td>
<td>0.127</td>
<td>-0.110</td>
<td>-0.007</td>
<td>0.004</td>
<td>-304.68***</td>
</tr>
<tr>
<td>Change in normalized holdings (firm-years)</td>
<td>259,509</td>
<td>-0.090</td>
<td>0.188</td>
<td>-0.249</td>
<td>-0.032</td>
<td>0.001</td>
<td>-243.94***</td>
</tr>
</tbody>
</table>
Table 2. Summary Statistics on Total Profit from Market Timing.

The sample covers the period 1982-2010. Panel A presents statistics for all firm-years with non-missing data, where the firm-years with no timing events (share repurchase, equity sale, or SEO) are coded as zero. Panel B displays the summary statistics only for those firm-years where there was at least one timing event. The numbers in the table are the additional returns (in %) earned by a shareholder with a fixed number of shares because of market timing efforts by the firm. Timing SEOs and repurchases is equal to the sum of (1) the post-SEO risk-adjusted return in %, calculated over a period of one or three years, and multiplied by the proportion of newly issued equity (as identified in the SDC New Issues database) and (2) the post-repurchase risk-adjusted return in %, calculated over a horizon of one or three years after a decrease in shares outstanding (as identified in the CRSP monthly database), and multiplied by the fraction of equity repurchased. Timing sales and repurchases is equal to the sum of (1) the risk-adjusted return in %, calculated over a period of one or three years after an increase in shares outstanding (as identified in the CRSP monthly database; following McKeon (2013), only observations with a monthly increase in shares outstanding over 1% are considered), and multiplied by the fraction of equity issued and (2) the post-repurchase risk-adjusted return in %, calculated over a horizon of one or three years after a decrease in shares outstanding (as identified in the CRSP monthly database), and multiplied by the fraction of equity repurchased. The last column in the table gives t-test statistics for the difference of the mean from zero.
### Panel A. Total profit from market timing (all firm-years)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>St. dev.</th>
<th>10&lt;sup&gt;th&lt;/sup&gt;</th>
<th>Median</th>
<th>90&lt;sup&gt;th&lt;/sup&gt;</th>
<th>T-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing repurchases and SEOs (1-year)</td>
<td>130,578</td>
<td>0.030</td>
<td>2.498</td>
<td>-0.334</td>
<td>0</td>
<td>0.288</td>
<td>4.39***</td>
</tr>
<tr>
<td>Timing repurchases and SEOs (3-year)</td>
<td>104,309</td>
<td>0.130</td>
<td>4.519</td>
<td>-0.712</td>
<td>0</td>
<td>0.514</td>
<td>9.29***</td>
</tr>
<tr>
<td>Timing repurchases and sales (1-year)</td>
<td>130,578</td>
<td>0.239</td>
<td>6.254</td>
<td>-1.262</td>
<td>0</td>
<td>2.325</td>
<td>13.79***</td>
</tr>
<tr>
<td>Timing repurchases and sales (3-year)</td>
<td>104,309</td>
<td>0.657</td>
<td>11.397</td>
<td>-2.051</td>
<td>0</td>
<td>4.530</td>
<td>18.62***</td>
</tr>
</tbody>
</table>

### Panel B. Total profit from market timing (firm-years with timing events)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>St. dev.</th>
<th>10&lt;sup&gt;th&lt;/sup&gt;</th>
<th>Median</th>
<th>90&lt;sup&gt;th&lt;/sup&gt;</th>
<th>T-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing repurchases and SEOs (1-year)</td>
<td>52,023</td>
<td>0.076</td>
<td>3.948</td>
<td>-1.718</td>
<td>-0.003</td>
<td>2.083</td>
<td>4.39***</td>
</tr>
<tr>
<td>Timing repurchases and SEOs (3-year)</td>
<td>40,282</td>
<td>0.337</td>
<td>7.267</td>
<td>-3.537</td>
<td>-0.015</td>
<td>4.580</td>
<td>9.29***</td>
</tr>
<tr>
<td>Timing repurchases and sales (1-year)</td>
<td>77,306</td>
<td>0.403</td>
<td>8.124</td>
<td>-3.040</td>
<td>0.017</td>
<td>5.226</td>
<td>13.80***</td>
</tr>
<tr>
<td>Timing repurchases and sales (3-year)</td>
<td>59,677</td>
<td>1.149</td>
<td>15.049</td>
<td>-5.221</td>
<td>0.058</td>
<td>10.514</td>
<td>18.65***</td>
</tr>
</tbody>
</table>
Table 3. Profit from Market Timing with Equity Issuances and Share Repurchases.

Panel A presents the summary statistics for timing measures; Panel B displays the two-sample t-test for the difference in means and the non-parametric Wilcoxon rank-sum test for the difference in medians. Timing SEOs is equal to the post-SEO risk-adjusted return in %, calculated over a period of one or three years and multiplied by the proportion of newly issued equity (as identified in the SDC New Issues database). Timing sales is equal to the risk-adjusted return in %, calculated over a period of one or three years after an increase in shares outstanding (as identified in the CRSP monthly database), and multiplied by the fraction of equity issued. Following McKeon (2013), only observations with a monthly share increase over 1% are considered. Timing repurchases is equal to the post-repurchase risk-adjusted return in %, calculated over a period of one or three years after a decrease in shares outstanding (as identified in the CRSP monthly database), and multiplied by the fraction of equity repurchased. Timing repurchases Compustat is equal to the post-repurchase risk-adjusted stock return in %, calculated over a period of one or three years and multiplied by the fraction of equity repurchased (as identified from the Compustat quarterly database).
### Panel A. Profit from market timing by type (firm-years with timing events)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>St. dev.</th>
<th>10th</th>
<th>Median</th>
<th>90th</th>
<th>T-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing SEOs (1-year)</td>
<td>5,244</td>
<td>0.365</td>
<td>11.106</td>
<td>-9.025</td>
<td>0.660</td>
<td>10.382</td>
<td>2.38**</td>
</tr>
<tr>
<td>Timing SEOs (3-year)</td>
<td>3,892</td>
<td>2.542</td>
<td>18.560</td>
<td>-14.090</td>
<td>2.811</td>
<td>21.430</td>
<td>8.55***</td>
</tr>
<tr>
<td>Timing sales (1-year)</td>
<td>46,748</td>
<td>0.623</td>
<td>10.496</td>
<td>-5.652</td>
<td>0.297</td>
<td>8.636</td>
<td>12.84***</td>
</tr>
<tr>
<td>Timing sales (3-year)</td>
<td>35,704</td>
<td>1.817</td>
<td>19.573</td>
<td>-9.126</td>
<td>0.799</td>
<td>17.054</td>
<td>17.55***</td>
</tr>
<tr>
<td>Timing repurchases (1-year)</td>
<td>48,128</td>
<td>0.043</td>
<td>1.951</td>
<td>-1.343</td>
<td>-0.004</td>
<td>1.281</td>
<td>4.78***</td>
</tr>
<tr>
<td>Timing repurchases (3-year)</td>
<td>37,351</td>
<td>0.098</td>
<td>4.650</td>
<td>-3.049</td>
<td>-0.022</td>
<td>2.647</td>
<td>4.07***</td>
</tr>
<tr>
<td>Timing repurchases (Compustat) (1-year)</td>
<td>37,718</td>
<td>0.054</td>
<td>1.718</td>
<td>-1.309</td>
<td>-0.007</td>
<td>1.314</td>
<td>6.11***</td>
</tr>
<tr>
<td>Timing repurchases (Compustat) (3-year)</td>
<td>29,919</td>
<td>0.127</td>
<td>4.000</td>
<td>-2.907</td>
<td>-0.037</td>
<td>2.770</td>
<td>5.49***</td>
</tr>
</tbody>
</table>

### Panel B. Difference in profit from market timing (firm-years with timing events)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Diff. in means</th>
<th>Diff. in medians</th>
<th>T-test for diff. in means</th>
<th>Wilcoxon z-statistic for diff. in medians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing SEOs minus repurchases (1-year)</td>
<td>0.322</td>
<td>0.664</td>
<td>5.62***</td>
<td>16.77***</td>
</tr>
<tr>
<td>Timing SEOs minus repurchases (3-year)</td>
<td>2.445</td>
<td>2.833</td>
<td>20.11***</td>
<td>28.86***</td>
</tr>
<tr>
<td>Timing sales minus repurchases (1-year)</td>
<td>0.581</td>
<td>0.301</td>
<td>12.27***</td>
<td>42.16***</td>
</tr>
<tr>
<td>Timing sales minus repurchases (3-year)</td>
<td>1.720</td>
<td>0.821</td>
<td>16.50***</td>
<td>52.24***</td>
</tr>
</tbody>
</table>
Table 4. Risk-Adjusted Stock Returns Following Equity Issuances and Share Repurchases.

The numbers in the table are the risk-adjusted returns in %, calculated over a period of one or three years after the timing event. To make the adjustment for risk, we use the Fama and French 100 portfolios formed on size and book-to-market deciles. Each month, we match firms in our sample to the comparable size and book-to-market portfolios based on the break points available on Kenneth French’s web site and calculate the difference in buy-and-hold returns for our firms and these portfolios. The last column in the table gives t-test statistics for the difference of the mean from zero.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>St. dev.</th>
<th>10th</th>
<th>Median</th>
<th>90th</th>
<th>T-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk-adjusted returns after SEO (1 year)</td>
<td>5,244</td>
<td>-2.116</td>
<td>45.297</td>
<td>-51.622</td>
<td>-6.449</td>
<td>48.184</td>
<td>-3.38***</td>
</tr>
<tr>
<td>Risk-adjusted returns after SEO (3 year)</td>
<td>3,892</td>
<td>-12.568</td>
<td>83.001</td>
<td>-97.556</td>
<td>-25.653</td>
<td>80.028</td>
<td>-9.45***</td>
</tr>
<tr>
<td>Risk-adjusted returns after sale (1 year)</td>
<td>46,748</td>
<td>-1.710</td>
<td>53.189</td>
<td>-56.923</td>
<td>-8.396</td>
<td>55.414</td>
<td>-6.95***</td>
</tr>
<tr>
<td>Risk-adjusted returns after sale (3 year)</td>
<td>35,704</td>
<td>-2.696</td>
<td>109.43</td>
<td>-103.93</td>
<td>-23.092</td>
<td>110.89</td>
<td>-4.65***</td>
</tr>
<tr>
<td>Risk-adjusted returns after repurchase (1 year)</td>
<td>48,128</td>
<td>1.513</td>
<td>45.720</td>
<td>-46.967</td>
<td>-3.488</td>
<td>50.380</td>
<td>7.26***</td>
</tr>
<tr>
<td>Risk-adjusted returns after repurchase (Compustat) (1 year)</td>
<td>37,718</td>
<td>0.945</td>
<td>43.439</td>
<td>-44.809</td>
<td>-3.746</td>
<td>47.971</td>
<td>4.24***</td>
</tr>
<tr>
<td>Risk-adjusted returns after repurchase (Compustat) (3 year)</td>
<td>29,919</td>
<td>1.624</td>
<td>99.554</td>
<td>-95.368</td>
<td>-13.488</td>
<td>104.84</td>
<td>2.82***</td>
</tr>
</tbody>
</table>
## Panel B. Difference in stock returns after market timing

<table>
<thead>
<tr>
<th>Variable</th>
<th>Diff. in means</th>
<th>Diff. in medians</th>
<th>T-test for diff. in means</th>
<th>Wilcoxon z-statistic for diff. in medians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk-adjusted returns after SEOs versus repurchases (1-year)</td>
<td>-0.603</td>
<td>-9.936</td>
<td>-0.91</td>
<td>-14.58***</td>
</tr>
<tr>
<td>Risk-adjusted returns after SEOs versus repurchases (3-year)</td>
<td>-9.206</td>
<td>-11.884</td>
<td>-5.41***</td>
<td>-23.50***</td>
</tr>
<tr>
<td>Risk-adjusted returns after sales versus repurchases (1-year)</td>
<td>-0.196</td>
<td>-38.895</td>
<td>-0.61</td>
<td>-36.25***</td>
</tr>
<tr>
<td>Risk-adjusted returns after sales versus repurchases (3-year)</td>
<td>0.667</td>
<td>-36.333</td>
<td>0.85</td>
<td>-44.15***</td>
</tr>
</tbody>
</table>
Table 5. Investment Patterns and Market Timing.

The numbers in the table are the risk-adjusted returns in %, calculated over a horizon of one or three years after the timing event. To make the adjustment for risk, we use the Fama and French 100 portfolios formed on size and book-to-market deciles. Each month, we match firms in our sample to the comparable size and book-to-market portfolios based on the break points available on Kenneth French’s web site and calculate the difference in buy-and-hold returns for our firms and these portfolios. The last column in the table gives t-test statistics for the difference of the mean from zero.

<table>
<thead>
<tr>
<th>Timings</th>
<th>Low investment rate</th>
<th>Medium investment rate</th>
<th>High investment rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
<td>T-test</td>
</tr>
<tr>
<td>Timing SEOs (1-year)</td>
<td>0.500</td>
<td>0.701</td>
<td>1.87*</td>
</tr>
<tr>
<td>Timing SEOs (3-year)</td>
<td>2.442</td>
<td>2.604</td>
<td>4.62***</td>
</tr>
<tr>
<td>Timing sales (1-year)</td>
<td>0.892</td>
<td>0.366</td>
<td>8.93***</td>
</tr>
<tr>
<td>Timing sales (3-year)</td>
<td>2.108</td>
<td>0.919</td>
<td>10.71***</td>
</tr>
<tr>
<td>Timing repurchases (1-year)</td>
<td>0.032</td>
<td>-0.007</td>
<td>1.97**</td>
</tr>
<tr>
<td>Timing repurchases (3-year)</td>
<td>0.074</td>
<td>-0.034</td>
<td>1.69*</td>
</tr>
<tr>
<td>Timing repurchases (Compustat) (1-year)</td>
<td>0.059</td>
<td>-0.009</td>
<td>3.80***</td>
</tr>
<tr>
<td>Timing repurchases (Compustat) (3-year)</td>
<td>0.127</td>
<td>-0.052</td>
<td>3.11***</td>
</tr>
<tr>
<td></td>
<td>Low investment rate</td>
<td>Medium investment rate</td>
<td>High investment rate</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------</td>
<td>------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
<td>T-test</td>
</tr>
<tr>
<td>Risk-adjusted returns after SEO (1 year)</td>
<td>-3.000</td>
<td>-6.225</td>
<td>-3.13***</td>
</tr>
<tr>
<td>Risk-adjusted returns after rep. (1 year)</td>
<td>1.406</td>
<td>-4.725</td>
<td>3.71***</td>
</tr>
<tr>
<td>Risk-adjusted returns after repurchase (Compustat) (1 year)</td>
<td>0.968</td>
<td>-4.062</td>
<td>2.57***</td>
</tr>
<tr>
<td>Risk-adjusted returns after repurchase (Compustat) (3 year)</td>
<td>0.908</td>
<td>-14.653</td>
<td>0.94</td>
</tr>
</tbody>
</table>
Table 6. Volume of Equity Issuances and Share Repurchases.

The table presents summary statistics for volume and frequency of stock repurchases and equity sales over the period 1982-2010. All firm-year observations are included in the sample. Fraction of firm-years with SEOs (sales, repurchases) is the number of firm-year observations with at least one SEO event (with equity sale identified from the CRSP monthly, with share repurchase identified from the CRSP monthly), divided by the total number of firm-year observations. Dollar volume is adjusted for inflation using CPI index and the numbers are presented in 2010 dollars. Fraction of equity issued in SEO is calculated using the SDC New Issues database, with only primary issues included. Fraction of equity issued in sale is calculated using the increases in shares outstanding, as identified in the CRSP monthly database. Following McKeon (2013), only observations with a monthly share increase over 1% are considered. Fraction of equity issued is calculated using decreases in shares outstanding, as identified in the CRSP monthly database.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>St. dev.</th>
<th>10th</th>
<th>Median</th>
<th>90th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraction of firm-years with SEOs (%)</td>
<td>130,578</td>
<td>4.034</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Fraction of firm-years with sales (%)</td>
<td>130,578</td>
<td>35.800</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Fraction of firm-years with repurchases (%)</td>
<td>130,578</td>
<td>36.858</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Annual volume of SEOs (in 2010 $M')</td>
<td>130,578</td>
<td>5.953</td>
<td>57.156</td>
<td>0</td>
<td>0</td>
<td>37.639</td>
</tr>
<tr>
<td>Annual volume of sales (in 2010 $M')</td>
<td>130,578</td>
<td>42.230</td>
<td>209.50</td>
<td>0</td>
<td>0</td>
<td>61.027</td>
</tr>
<tr>
<td>Annual volume of repurchases (in 2010 $M')</td>
<td>130,578</td>
<td>26.938</td>
<td>159.401</td>
<td>0</td>
<td>0</td>
<td>22.456</td>
</tr>
<tr>
<td>Annual volume of repurchases (Compustat) (in 2010 $M')</td>
<td>130,578</td>
<td>33.382</td>
<td>218.168</td>
<td>0</td>
<td>0</td>
<td>18.261</td>
</tr>
<tr>
<td>Annual fraction of equity issued in SEO (%)</td>
<td>130,578</td>
<td>1.215</td>
<td>45.720</td>
<td>-46.967</td>
<td>-3.488</td>
<td>50.380</td>
</tr>
<tr>
<td>Annual fraction of equity issued in sale (%)</td>
<td>130,578</td>
<td>5.104</td>
<td>102.71</td>
<td>-94.620</td>
<td>-13.241</td>
<td>109.98</td>
</tr>
<tr>
<td>Annual fraction of repurchased equity (%)</td>
<td>130,578</td>
<td>0.803</td>
<td>43.439</td>
<td>-44.809</td>
<td>-3.746</td>
<td>47.971</td>
</tr>
</tbody>
</table>