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Corporate Financial Strategy and Stock Price Behavior in a Noise Trader Model with Limited Arbitrage

Nobuyuki Isagawa
Katsuhiko Okada

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Corporate Financial Strategy and Stock Price Behavior in a Noise Trader Model with Limited Arbitrage

Nobuyuki Isagawa [*]

Katsuhiko Okada [**]

Abstract

In this paper, we attempt to explain the stock price decreases following equity offerings and stock price increases following stock repurchases, both of which have been identified by empirical studies. By examining corporate financial strategies in the limited arbitrage-noise trader model presented by Shleifer and Vishny (1990, 1997), we can explain those anomalies. When a market with an optimistic noise overvalues stock prices, a firm can earn capital gains by selling new shares at the overvalued price. On the other hand, when the pessimistic market undervalues stock prices, a firm can enjoy capital gains by buying its shares at the bargain price. In the event that a noise disappears, a firm issuing shares experiences the continual stock price decrease, and a firm repurchasing its shares experiences the continual stock price increase.

Keywords: noise trader model, equity offering, stock repurchase, stock price anomaly

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[*] Nobuyuki Isagawa, Graduate School of Business Administration, Kobe University, 2-1, Rokkodai, Nada, Kobe, Hyogo, 657-8501, Japan. Phone & Fax: +81-78-803-6907, e-mail: isagawa@rose.rokkodai.kobe-u.ac.jp

[**] Katsuhiko Okada, IZ company ltd., 4-2-26 Minooka-Dori, Nada, Kobe, Hyogo, 657-0812, Japan. Phone: +81-78-882-7872, e-mail: katsuokada@kcc.zaq.ne.jp

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1. Introduction

The purpose of this paper is to examine corporate financial strategy, especially stock issue and repurchase, and stock price behavior in the noise trader model with limited arbitrage presented by Shleifer and Vishny (1990, 1997).[1] Several phenomena and empirical findings that seem difficult to explain using the efficient markets approach have been reported.[2] Among these, we focus on two anomalies: abnormal stock price declines following equity offerings, and abnormal stock price increases following open market stock repurchases.

Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), and Teoh, Welch, and Wong (1998) find that firms have experienced significant negative stock returns after executing equity offerings. Ikenberry, Lakonishok, and Vermaelen (1995) find that stock prices have continued to increase abnormally after firms repurchases their shares on the open market. As suggested by Loughran and Ritter (1995, pp.46-47), Spiess and Affleck-Graves (1995, p.265), Teoh, Welch, and Wong (1998, p.64), and Ikenberry, Lakonishok, and Vermaelen (1995, p.183), these phenomena are consistent with markets that do not revalue stock prices appropriately when equity offerings or stock

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[1] Shleifer and Vishny (1990) analyze corporate investment strategies; Shleifer and Vishny (1997) go on to argue agency problems between arbitrageurs and their investors. By contrast, we examine corporate financial strategies in a noise trader model with limited arbitrage.

[2] See Campbell and Kyle (1993), Redding (1996), Pontiff (1996), Morgan (1997), Shleifer and Vishny (1997), Barberis, Shleifer, and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998).

repurchases occur. In other words, neither continual stock price increases following equity offerings nor stock price decreases following stock repurchases should be observed in the efficient markets, which instantaneously adjust stock prices to their fundamental values.

We analyze corporate stock issue and repurchase in a limited arbitrage-noise trader framework based upon the model presented by Shleifer and Vishny (1990, 1997). In a noise trader model with limited arbitrage, market mispricing would not be eliminated until the noise disappears. In our model, an overvalued firm issues new shares, whereas an undervalued firm buys back its outstanding shares. As the number of shares supplied by a firm changes, the stock price changes. An equity offering that increases the number of outstanding shares decreases the stock price. In contrast, a stock repurchase decreasing the number of shares increases the stock price. Thus, a firm's financial behavior partially resolves market mispricing, and brings its stock price close to the fundamental value. In this sense, it can be interpreted that a firm provides smart money via financial behavior.

A firm, however, never sells or buys its shares to the extent that its stock price is equal to the fundamental value, because it would lose opportunities to enjoy capital gains by doing so. The market mispricing caused by noise remains, even after a firm executes stock issue (repurchase), and stock price continues to decrease (increase) until the optimistic (pessimistic) noise disappears. Therefore, a firm selling (buying) its shares at an overvalued price (bargain price) can earn capital gains by using market mispricing. From the viewpoint of stock price behavior, a firm experiences an abnormal stock price decline following an equity offering, and an abnormal stock price rise following a stock repurchase. This prediction is consistent with the empirical findings introduced in above-referenced works.

The remainder of this paper is organized as follows. In section 2, we analyze a firm's financial strategy in a noise trader model with limited arbitrage. In section 3, we

examine the stock price behavior. Section 4 presents our conclusions.

2. Financial Strategy in a Limited Arbitrage-Noise Trader Model

Consider an all-equity firm that operates for one period. Throughout the paper, t=0 represents the beginning of the period, and t=1 represents the end of the period. Prior to t=0, the total number of the firm's outstanding shares is one. The firm generates operating returns, V>0, at t=1. For simplicity, we assume that all participants are risk-neutral and that the interest rate is zero.

The structure of the market follows Shleifer and Vishny (1990, 1997). The market evaluates the firm's stock with a noise, S, at t=0, where S>0 means an optimistic noise and S<0 means a pessimistic noise.[3] Arbitrage is limited so that the stock price of the firm may be somewhat mispriced until t=1, at which time the noise disappears (S=0).[4] The market demand schedule for the firm's stock is given by

$$q_t = (V + S) / p_t \text{, } t=0, 1, \qquad (1)$$

where p_t represents the stock price at t. The stock price is determined by the market clearing condition that the total demand must be equal to the number of outstanding shares. Thus, without additional supply of shares, the firm's stock is undervalued if the market has a pessimistic noise (S<0), and overvalued if the market has an optimistic noise (S>0).

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[3] Barberis, Shleifer, and Vishny (1998), and Daniel, Hirshleifer, and Subrahmanyam (1998) develop the way in which investor sentiment, based on psychological theory, leads to market mispricing.

[4] Shleifer and Vishny (1990, pp.149-150) summarize fundamental risk and noise trader risk by which arbitrage is limited. Pontiff (1996) shows that variety costs make arbitrage limited.

The goal of the firm is to maximize its stock price at t=1. For example, one can consider the situation in which the manager's compensation scheme is based on the stock price at the end of the period (t=1). If the firm does not do anything, then its stock price is V at t=1. Under (1), however, the firm can raise its future stock price higher than V by selling its shares at an overvalued price or by buying shares at a bargain price. Let the number of shares that the firm additionally issues at t=0 be denoted by n, where n>0 means an equity offering and n<0 means a stock repurchase. Since the maximum number of shares that the firm can buy back on the market is 1, n>-1 must be held. It follows from the market clearing condition, i.e., q_t=1+n, that the stock price at t=0 is given by

$$p_0(n) = (V+S)/(1+n). \tag{2}$$

In order to ensure that the stock price is positive, we assume that V+S>0.

For analytical simplicity, it is assumed that the firm can lend and/or borrow at an interest rate of zero. Since the total cash flow is V+np_0, the stock price at t=1 is given by

$$p_1(n) = \frac{V+np_0}{1+n} = \frac{V+n(2V+S)}{(1+n)^2}. \tag{3}$$

The firm chooses the n that maximizes (3). Let the solution be denote by n^*.

The first-order derivative and the second order-derivative of (3) are given by

$$\frac{dp_1(n)}{dn} = \frac{S-(2V+S)n}{(1+n)^3},$$

and

$$\frac{d^2p_1(n)}{dn^2} = \frac{2[(2V+S)n-(V+2S)]}{(1+n)^4},$$

respectively. Therefore,

$$n^* = S/(2V+S). \tag{4}$$

Note that n^*>-1 holds under the restriction of V+S>0.

We now obtain the next proposition.

Proposition 1. If the market has an optimistic noise ($S>0$), then the firm issues its shares ($n^*>0$). If the market has a pessimistic noise ($S<0$), then the firm repurchases its shares ($n^*<0$).

Proposition 1 states that whether the firm issues new shares or repurchases its outstanding shares will depend on the market noise. The firm issues its new shares when its stock price is overvalued by market optimistic noise.[5] Conversely, the firm buys back its outstanding shares when its stock price is undervalued by market pessimistic noise.

By substituting (4) into (2), the equilibrium stock price at $t=0$ is given by

$$p_0(n^*) = (V+S)/(1+n^*) = V + (S/2). \quad (5)$$

Recall that, at $t=0$, the stock price is $V+S$ if $n=0$. It is clear that market mispricing is partially eliminated by the firm's financial behavior. In this sense, it can be interpreted that the firm supplies smart money via an equity offering or a stock repurchase.

The firm, however, never issues or repurchases its shares to the extent that market mispricing is fully eliminated, because the firm loses an opportunity to earn capital gains from market mispricing if it supplies a sufficient number of shares to bring the stock price to its fundamental value at $t=0$.[6] To demonstrate this, we calculate the stock price at $t=1$. By substituting (4) into (3) and somewhat rearranging the equation, we obtain

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[5] Our result is consistent with the interpretation of Teoh, Welch, and Wong (1998, p.94), that the market is too optimistic when an equity offering is executed.

[6] For stock repurchases, Ikenberry, Lakonishok, and Vermaelen (1995, p.183) stress that the most commonly cited reason of repurchases, undervaluation or good investment, is not supported unless firms can repurchase their shares at the undervalued prices.

$$p_1(n^*) = \frac{V + n^* p_0}{1 + n^*} = \frac{(2V + S)^2}{4(V + S)} = V + \frac{S^2}{4(V + S)}. \qquad (6)$$

That is, the equilibrium stock price of the firm is higher than its fundamental value, V, at t=1. The difference between $p_1(n^*)$ and V can be interpreted as capital gains that the firm can earn by implementing financial strategy.

3. Stock Price Behavior

In this section, we examine the stock price behavior during the period between t=0 and t=1. It follows from (5) and (6) that the rate of return, R, is given by

$$R \equiv \frac{p_1(n^*) - p_0(n^*)}{p_0(n^*)} = \frac{-S}{2(V + S)}.$$

Since V+S>0, the sign of R is identical to the sign of S. Therefore, we can obtain the following proposition.

Proposition 2. The stock price goes down (R<0) following an equity offering (S>0), and goes up (R>0) following a stock repurchase (S<0).

Thus, our model predicts that the stock price continues to decrease after the firm issues new shares, and continues to increase after the firm executes a stock repurchase. The former prediction is consistent with the empirical finding of Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), and Teoh, Welch, and Wong (1998). The latter is consistent with the finding of Ikenberry, Lakonishok, and Vermaelen (1995).

By differentiating R with V, we obtain

$$\frac{dR}{dV} = \frac{S}{2(V + S)^2}.$$

That is, R is increasing with V when S>0, and decreasing with V when S<0. The

operating returns of V can be interpreted as the firm size. Thus, the above relation means that the larger the firm size is, the larger (less) the firm experiences its stock return following an equity offering (a stock repurchase). Spiess and Affleck-Graves (1995, p.259) report that the smaller firms tend to experience more severe underperformance than do larger firms.

5. Conclusion

In this paper, we analyzed corporate financial strategy in the noise trader model with limited arbitrage presented by Shleifer and Vishny (1990, 1997). When the market has an optimistic noise, the firm can earn capital gains by issuing new equity at the overvalued price. On the other hand, when the market has a pessimistic noise, the firm can enjoy capital gains by repurchasing its outstanding shares at the bargain price. From the viewpoint of stock price behavior, our model predicts that the firm experiences a continual stock price decrease following an equity offering, and a continual stock price increase following a stock repurchase. These predictions are consistent with empirical findings that seem difficult to explain using the efficient markets framework.

[2003.4.30 648]

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