Repurchasing Shares on a Second Trading Line*

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Abstract: This paper studies a unique buyback method allowing firms to reacquire their own shares on a separate trading line where only the firm is allowed to buy shares. This temporary trading platform is opened concurrently with the original trading line on the stock exchange. This share repurchase method is called the *Second Trading Line* and has been extensively used by Swiss companies since 1997. This type of repurchase is unique for two reasons. First, unlike open market programs, the repurchasing company does not trade under the cover of anonymity. Second, all transactions made by the repurchasing firm are publicly available in real time to every market participant. This is a case of instantaneous disclosure which contrasts sharply with other markets characterized by delayed or no disclosure. Using actual repurchase data from all buybacks implemented through second trading lines, we document that the daily repurchase decision is statistically associated with short-term price changes and the release of firm-specific news. We also find that repurchases on the second trading line have a beneficial impact on the liquidity of repurchasing firms (i.e., higher trading volumes, smaller bid-ask spreads, and thicker total depths). Exchanges and regulators may consider the second trading line an attractive share reacquisition mechanism because of its transparency and positive liquidity effects.

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Repurchasing Shares on a Second Trading Line

1. Introduction

The vast majority of buybacks are implemented through open market programs, in which listed companies directly buy their own shares in the stock market. This buyback method represents 90% of all repurchase programs in the US (Stephens and Weisbach, 1998) and 87% of all repurchase programs in the rest of the world (Vermaelen, 2005). The main features of the open market programs are that (1) the repurchasing firm trades anonymously in the stock market and (2) the actual number of repurchased shares and the repurchase price are not always disclosed.[1] An implication of this opaque environment is that open market programs may lower the liquidity of repurchasing firms. Indeed, the presence of informed managers in the stock market increases the adverse selection component of the bid-ask spread (Barclay and Smith, 1988). This assertion has been recently corroborated by Brockman and Chung (2001) in their empirical study of actual buyback data from the Hong Kong stock market. They find that spreads increase on average by more than 10% on repurchase days. A similar conclusion is reached by Ginglinger and Hamon (2005) using French data. Another implication of the lack of information on open market programs is that little is known about the actual implementation of stock repurchase programs. In the U.S. stock market, since most companies repurchase their shares through open market programs with no disclosure requirement, researchers are forced to use monthly or quarterly proxies for share repurchase activity (Stephens and Weisbach, 1998) or questionnaires returned by repurchasing companies (Cook, Krigman and Leach, 2003, 2004).[2]

We present in this paper an alternative repurchase method. This technique allows firms to reacquire shares on a separate market segment, called *second trading line*, where the repurchasing company is the only entity authorized to acquire shares. This temporary trading platform is opened concurrently with the original trading line on the stock exchange. The second trading line technique has been used by Swiss companies since 1997 and is now the

[1] Stephens and Weisbach (1998) show that most of the U.S. companies do not complete their buybacks, 10% of the firms repurchase less than 5% of the number of shares targeted, and a substantial number of firms reacquire no share at all.

[2] Current research has investigated actual buyback implementation in countries with more stringent disclosure requirements such as Canada (Ikenberry, Lakonishok and Vermaelen, 2000), Hong Kong (Brockman and Chung, 2001, Zhang, 2005), Japan (Zhang, 2002), and France (Ginglinger and Hamon, 2005).

most popular share acquisition method in Switzerland. This type of repurchase is unique for two reasons. First, unlike open market programs, the repurchasing company does not act under the cover of anonymity. As a result, this institutional design creates a natural experiment to study the effect of buybacks on the liquidity of the original trading line as shareholders know that they will not be trading directly with the company (see Barclay and Smith, 1988). Second, these separate trading lines are a great resource for analyzing the actual implementation of share repurchases. Indeed, all transactions made by the repurchasing firm on a second trading line are recorded by the Swiss stock exchange and are instantaneously disclosed to all market participants.[3]

There are other important features of the second trading line. The price paid by the firm on the second trading line can differ from the concurrent price on the standard first trading line. The premium on the second trading line is limited by law to 5% and turns out to be rather small in practice. As a result, this type of repurchase fulfills the principle of equal treatment of all shareholders, i.e., those who participate in the buyback program and those who do not. Indeed, unlike Dutch auction offers or tender offers, there is no damaging dilution effects on non-selling shareholders caused by substantial premia paid to selling shareholders.[4] With second trading lines, no disclosure requirements are needed since market participants and financial regulatory authorities can follow in real time the firm's repurchases. Furthermore, the second trading line is a tax-driven innovation allowing repurchasing companies to collect the withholding tax that has to be transferred to the Swiss tax authorities in every buyback leading to the cancellation of the shares.

The first objective of this paper is to study the timing of stock repurchases. We investigate whether the daily repurchase decision is related to stock price changes and the release of firm-specific news. Although our first objective is similar to the one in Cook, Krigman and Leach (2004), the information environment we deal with, as well as our findings, are drastically different. They find little evidence that NYSE firms (and no evidence that NASDAQ firms) repurchase more shares on the open market after price drops. They also report that firms'

[3] This contrasts greatly with the U.S. market where there is no disclosure requirement, or even with countries with compulsory periodic disclosures where information on actual repurchases is delayed.

[4] In Dutch auction offers, shareholders submit to the firm quantities and prices at which they are willing to sell their shares (Comment and Jarrell, 1991). The share price eventually paid is the minimum one allowing the repurchasing firms to reacquire the targeted number of shares. Tender offers are fixed-price offers (Vermaelen, 1984). When the number of tendered shares exceeds the targeted number of shares, the company can either expand its offer or buy shares proportionally.

repurchases are not related to future price changes. Finally, they show that firms refrain from repurchasing around public announcements. In this paper, we analyze the daily repurchase decision within a regression framework contrasting pre- and post-announcement periods. We uncover evidence that the daily repurchase decision is strongly associated with past and contemporaneous returns, as well as future returns. While the first two pieces of evidence are consistent with the price-support hypothesis, the last one strongly contrasts with U.S. evidence reported by Cook, Krigman and Leach (2004). We claim that this unusual result is caused by the very nature of the second trading line method. Indeed, as transactions on second trading lines are instantaneously disclosed, market participants can interpret a repurchase as a positive signal revealing company management's belief that the company is undervalued (Vermaelen, 1981). We also uncover evidence that repurchasing firms are more active after a public announcement and less active prior to a public announcement. This general reluctance to trade before a news release is particularly strong prior to quarterly and annual earnings announcements. This last point supports the idea that Swiss companies strictly conform to Swiss regulation prohibiting repurchasing prior to earnings announcements or to the release of any price-sensitive information. Our findings are not surprising considering the legal restriction and that everyone instantaneously knows the company is in the market. A regulatory implication is that having a second trading line makes monitoring of corporate insider trading less costly.

Our second objective is to analyze the impact of share buybacks on the liquidity of the repurchasing firm on the first trading line. As second trading lines are open concurrently with first trading lines in the Swiss stock exchange, it is likely that this parallel trading affects in some way the liquidity of the underlying stock. When share buybacks take place on a separate trading line, existing theories linking buybacks and market liquidity do not straightforwardly apply. Repurchasing firms do not compete directly with the liquidity providers on the first trading line (Barclay and Smith, 1988, and Cook, Krigman, and Leach, 2004). Furthermore, this type of repurchase does not increase the probability of trading with an informed trader on the first trading line (Barclay and Smith, 1988, and Brockman and Chung, 2001). In this paper, we posit that the impact of firms' repurchases on the liquidity of the underlying stock is generated in part by the information effect of actual buybacks. Since actual buybacks are instantaneously disclosed to all market participants, the firm sends a positive signal to the market every time the firm completes a repurchase transaction. We hypothesize that this signal attracts more investors to the market in reaction to firms' repurchases and consequently

improve market liquidity. Furthermore, the expected impact of repurchases on stock market liquidity also depends on the identity of the sellers. First, if second trading lines capture a substantial part of the trading volume of institutional investors, that otherwise would have taken place on the first trading line, the liquidity on the first trading line is likely to worsen. Second, if most transactions on second trading lines are made by arbitrageurs, who simultaneously buy on the first trading line and resell to the firm, the liquidity of the underlying stock is likely to improve. Indeed, arbitrage activity maintains a minimum price in the stock market, which tends to raise trading volumes and lower bid-ask spreads. Our empirical results confirm that repurchases on the second trading line have an important impact on the liquidity of repurchasing firms. Specifically, the repurchasing firms' trading volumes and total depths on the first trading line tend to be higher on repurchase days and bid-ask spreads tend to be smaller on repurchase days. The evidence confirms that this unique parallel trading mechanism improves the liquidity of the underlying stock.

To the best of our knowledge, our paper is the first to analyze share repurchases implemented on an exchange with instantaneous buyback disclosure. While the second trading line is a financial innovation that gets around a specific tax problem, it can be of interest for exchanges and regulators in other countries because of its transparency and positive liquidity effects. The remainder of the paper proceeds as follows. Section 2 describes the institutional and legal setting of stock repurchases in Switzerland, along with the participation rules for all types of stock market participants. Section 3 provides a detailed description of the dataset. We study the timing of share repurchases in Section 4. We analyze the liquidity effects of stock repurchases in Section 5. Finally, Section 6 offers some concluding comments.

2. Share Repurchases in Switzerland

2.1. Institutional and Legal Setting

The first share repurchase program implemented by a company listed on the Swiss stock exchange took place in 1993 and since then 129 programs have been carried out (see Figure 1, upper graph). Swiss firms buy their own shares using four different buyback methods: open market, distribution of tradable European put options to all shareholders, tender offers, and

repurchases on a second trading line. This last repurchasing technique was initiated in 1997 and has become very popular since then (see Figure 1, lower graphs).[5]

< Insert Figure 1 >

Swiss corporate law states that, when shares are repurchased on a second trading line, share buybacks should not exceed 10% of the votes and firm's issued share capital, they should not take place ten days prior to the earnings announcement date, and the premium paid on a second trading line should not exceed 5% of the price prevailing in the stock market at the same time. Moreover, the firm shall interrupt repurchases if it is in possession of price sensitive information. Furthermore, any repurchase program exceeding 2% of the share capital has to get the approval of the Swiss Takeover Board since a buyback program is considered as a takeover of the company of its own shares. Once approval is granted, the program can be implemented on the stock exchange, typically under the operational control of an investment bank. According to Swiss exchange regulations, when a second trading line is open, off-exchange transactions are prohibited. When the program is completed, the cancellation of shares (if any) has to be approved by the shareholders during the following annual general meeting (see Appendix for an example).

As an illustration, we present in Figure 2 the concurrent order books on the first and second trading lines for UBS recorded on July 11, 2005 at 4:40 p.m. Both trading lines are open on Virt-X, which is a fully electronic, order-driven trading platform.[6] Orders are entered into the trading system by the various participants and automatically routed to a central order book. Execution of the orders takes place in keeping with the principle of price-time priority. Market participants can submit different types of orders: market orders, limit orders, hidden orders, and fill-or-kill orders. The observation of the two order books illustrates different aspects of this share repurchase mechanism. First, as expected, the firm is the only buyer on the second trading line. Second, first trading lines are much more active than second trading lines and, as a consequence, spreads tend to be wider on second trading lines. Third and unlike on first trading lines, posted orders are round lots on second trading lines. This is due

[5] The interruption in the use of put options between 1994 and 1999 is due to the fact that put options used to be taxed twice: first when granted and later when exercised. In 2000, the highest court in Switzerland ruled that options should only be taxed at the exercise date.

[6] Virt-X, a separate trading platform for Swiss blue chip companies, was launched on June 25, 2001. Swiss firms are listed either on SWX Swiss Exchange or Virt-X.

the fact that only professional investors are selling shares on the second line as will be shown in the next subsection.

< Insert Figure 2 >

The growing popularity of the second trading line is mostly due to its great flexibility. Unlike distributions of put options or tender offers, second trading line programs do not commit the firm to acquire a specified number of shares at a fixed price. The length of the program also offers some flexibility since a given program implemented on a second trading line can easily be extended. Finally, trading on the first trading line is not interrupted. As a result, any investor willing to sell her shares can, in theory, trade on both market segments. However, we will see that for tax reasons this choice may in some cases only be on paper.

Before discussing the tax treatment of share repurchases in Switzerland, a few basic tax principles have to be explained. Generally, share buybacks are taxed as capital gains in countries where individuals are subject to taxes on capital gains and as dividends elsewhere (for an excellent review of the relevant issues, see Vermaelen, 2005). In Switzerland, capital gains are not taxed for individual investors, while dividends are taxed as income. Technically speaking, when paying dividends a company retains 35% of the amount (i.e., the withholding tax), which are directly paid to the tax authorities. As long as the shareholder declares the dividend as income, she is able to reclaim her withholding tax in full.[7] The dividend will then be taxed as ordinary income for individual investors. On the other hand, institutional investors are taxed on both dividends and capital gains.[8] At the end of the fiscal year, institutional investors are also entitled to full reimbursement of the withholding tax.

The tax treatment of share buybacks depends on their purpose. If companies repurchase shares to hold them as treasury stock, then no withholding taxes are levied and stock repurchases are considered ordinary sales.[9] This situation is encountered for instance when shares are repurchased to finance stock option plans, to guarantee the execution of convertible

[7] For foreign investors, the portion that can be reclaimed is determined by bilateral tax treaties. For instance, U.S. and British investors are eligible for a 20 percent points tax return.
[8] Some institutional investors, such as pension funds and holdings, are totally exempted from taxes on dividends and capital gains, although the withholding tax is still required.
[9] Swiss companies can hold treasury stocks for a limited time period only (i.e., two years for the first part of our sample period and six years for the second part). However, if at the end of this period the shares have not been resold in the market, the firm will have to pay the withholding tax.

bonds, or to prepare future acquisitions. In this case, open market buyback is the most flexible repurchase method. Otherwise, if companies repurchase shares to cancel them, then the difference between the repurchase price and the nominal value, or par value, of the stock is treated as a liquidation dividend.[10] The withholding tax is then equal to $0.35 \times (P_{2,t} - V)$, where $P_{2,t}$ is the stock price on the second trading line and V is the nominal value of the stock. The repurchasing company has to transfer the withholding tax to the tax authorities. When the firm is not able to identify the seller of the stock, the firm is responsible for paying the withholding tax. As fiscal authorities consider that the amount paid to shareholders was reduced by the withholding tax amount, the company bears a 53.85% tax rate, i.e., $0.35 \times (1 / 0.65) = 0.5385$. This specific tax regime called for the creation of a new share acquisition mechanism allowing the firm to pay only the net price to the shareholders. The goal for the firm is to be able to collect immediately the withholding tax when the stock is tendered while keeping a flexible "open-market type" program.[11] Actually, on a second trading line, participating shareholders only get the price net of the withholding tax so that the company does not bear the risk of paying additional taxes. From the firm's perspective, the use of a second trading line is a tax-efficient way of cancelling shares.

2.2. Buyback Participation Rules

In order to better understand the functioning of the second trading line buybacks from a tax point of view, we study the conditions under which a given market participant may take part in a second trading line repurchase program. In particular, we wonder by which percentage (i.e., premium) the price on the second trading line has to exceed the current stock price to make the second trading line attractive to this participant. We consider successively individual investors, institutional investors, and arbitrageurs. We compute the reserve premium of each participant, which is defined as the premium for which the after-tax price on the second trading line is equal to the after-tax price on the first trading line. Consequently, when the actual premium p exceeds the reserve premium, the investor is better off selling her shares on the second trading line rather than in the stock market.[12]

[10] Typically, for Swiss companies, the nominal value is less than 1% of the current market stock price.
[11] Tender offers or put option-based repurchase programs also allow the company to pay only the net price but with much less flexibility since both the price and the number of shares are fixed.
[12] The following analysis remains valid for foreign investors but they usually would not be entitled to a full refund of the withholding tax. As a result, their reserve premium is higher than the one of their domestic counterparts.

When an individual investor sells some shares in the stock market at the current stock price, no taxes are paid since capital gains are tax free for individual investors. If the same investor tenders her shares on the second trading line, she receives today the second trading line price net of the withholding tax. At the end of the fiscal year, she will be entitled to a full refund of the withholding tax and the difference between the repurchase price and the nominal value of the stock will be taxed as income. Therefore, an individual investor would prefer the second trading line if and only if:

$$P < \underbrace{P(1+p) - [P(1+p) - V]0.35}_{\text{2nd trading line price less withholding tax}} + \underbrace{[P(1+p) - V]0.35d}_{\text{Present value of withholding tax refund}} - \underbrace{[P(1+p) - V]t_I d}_{\text{Present value of income tax}}$$

or equivalently,

$$p > \frac{0.35(1-d)\left(1-\frac{V}{P}\right) + t_I d\left(1-\frac{V}{P}\right)}{0.65 + 0.35d - t_I d} = p^* \qquad (1)$$

where p^* is the reserve premium for an individual investor, P is the market stock price, and t_I is the marginal income tax rate. The discount factor d is defined as $(1 + r)^{-t}$ where r is the risk-free rate with a t maturity and t is the time period from the transaction day to the end of the fiscal year.

When an institutional investor sells some shares in the stock market, capital gains are taxed at the effective marginal rate t_G. If the same investor tenders her shares on the second trading line, she receives today the second trading line price minus the withholding tax. At the end of the fiscal year, she will be entitled to a full refund of the withholding tax and the difference between the repurchase price and the acquisition price will be taxed as capital gains. Therefore, an institutional investor would prefer the second trading line if and only if:

$$\underbrace{P - (P - A)t_G d}_{\text{After-tax stock market price}} < \underbrace{P(1+p) - [P(1+p) - V]0.35}_{\text{2nd trading line price less withholding tax}} + \underbrace{[P(1+p) - V]0.35d}_{\text{Present value of withholding tax refund}} - \underbrace{[P(1+p) - A]t_G d}_{\text{Present value of capital gain tax}}$$

$$p > \frac{0.35(1-d)\left(1-\frac{V}{P}\right)}{0.65 + 0.35d - t_G d} = p^{**} \qquad (2)$$

where p^{**} is the reserve premium for an institutional investor and A is the acquisition price of the stock. Notice that, since the acquisition price does not appear in the expression for the reserve premium, the latter is independent of the investor's capital gains or loss. In the

eventuality that the institutional investor is exempted from capital gain tax, the participation rule becomes:

$$P < \underbrace{P(1+p) - [P(1+p) - V]0.35}_{\text{2nd trading line price less withholding tax}} + \underbrace{[P(1+p) - V]0.35d}_{\text{Present value of withholding tax refund}}$$

$$p > \frac{0.35(1-d)\left(1-\frac{V}{P}\right)}{0.65+0.35d} = p^{***} \qquad (3)$$

where p^{***} is the reserve premium for a tax-exempted institutional investor. As expected the reserve premium is smaller when the institutional investor is exempted from taxes on capital gains.

As the firm's shares are traded concurrently on two parallel market segments, arbitrageurs may seek to exploit any significant price difference. A professional arbitrageur will accept to buy one share on the first trading line and to sell it on the second trading line if and only if her arbitrage profit is strictly positive:

$$-P + \underbrace{P(1+p) - [P(1+p) - V]0.35}_{\text{2nd trading line price less withholding tax}} + \underbrace{[P(1+p) - V]0.35d}_{\text{Present value of withholding tax refund}} - \underbrace{[P(1+p) - P]t_G d}_{\text{Present value of capital gain tax}} > 0 .$$

By simplifying the inequality above, we get Equation (2). Therefore, the reserve premium for an arbitrageur is equal to the reserve premium for an institutional investor.

The three reserve premia obtained above share a common structure. The numerator is the same in Equations (2) and (3) and this term also appears in Equation (1). This term corresponds to the opportunity cost of the withholding tax to the investor. Of course, the actual reserve premia will depend on the marginal tax rate of the different types of investors. In two particular cases this opportunity cost is equal to zero. First, if the withholding tax was immediately returned to the seller (d = 1), which is equivalent to no withholding tax, the reserve premium of any institutional investor or arbitrageur would boil down to zero ($p^{**} = p^{***} = 0$). In the case where d = 1, the reserve premium for an individual investor would remain strictly positive ($p^* > 0$). This is due to the fact that an individual investor needs to be compensated for the income tax she has to pay on the difference between V and P when selling on a second trading line. Second, if the current stock price and the nominal value of the stock were equal (V / P = 1), the reserve premium of all market participants would be

zero. This would correspond to the case where there would be no tax basis for paying the withholding tax. This result emphasizes the central role played by the V / P ratio in determining the magnitude of the premium.

We plot in Figure 3 the reserve premia for different market participants. For each market participant, we plot the associated reserve premium for a time period until the end of the fiscal year (t) ranging from 0 to 1 year, different risk-free interest rate levels, r = 1%, 3%, and 5%, and different income tax rates (t_I) or capital gain tax rates (t_G), 30% and 50%. The value of the current stock price (P) is assumed to be 100 and the nominal value of one share (V) is assumed to be 1. The reserve premium of an individual investor turns out to be very large, regardless of the magnitude of the key parameters. Since the premium is limited by law to 5%, we conclude that it is never optimal for an individual investor to sell shares on a second trading line. On the other hand, the reserve premium of institutional investors and arbitrageurs always remain below the legal threshold. As a result, the other market participants may accept to participate in a second trading line buyback program. In particular, if $p^{**} < p$, institutional investors and arbitrageurs may sell shares on the second trading line, and if $p^{***} < p < p^{**}$, only tax-exempted institutional investors may sell shares on the second trading line. The bottom line is that the tax treatment of second line trading makes it attractive for institutional and professional investors only.

< Insert Figure 3 >

3. Characterizing Repurchase Trading

Our sample contains all buybacks implemented by firms listed on the Swiss stock exchange (SWX) or Virt-X through a second trading line between its introduction in December 1997 and August 2004. For each of the 55 programs, we obtained from SWX the daily transaction price on the second trading line and the Swiss Franc repurchase, which is the total amount spent in repurchasing shares by the firm on a given day. Our sample contains a total of 11,742 day/program observations. In addition, we collect from the Swiss Takeover Board website (www.copa.ch), the start and the end dates, the maximum cost and the percentage issued share capital reduction of each program, along with the main motives for repurchasing shares claimed by each firm. We also retrieve contemporaneous daily stock prices on the first trading line for all repurchasing companies from Thomson Financial Datastream. Furthermore, we

collect from the same source the market capitalizations and book-to-market value ratios of the repurchasing companies during all programs.

Within a given repurchase program *i*, we measure the trading activity using four different variables, which capture different facets of stock repurchases. The first variable is a binary variable that is assigned a value of one if the company repurchases any stock on day *t*, and 0 otherwise:

$$Buyback_{i,t} = 1 \text{ if } SR_{i,t} > 0 \quad \text{and} \quad Buyback_{i,t} = 0 \text{ if } SR_{i,t} = 0 \tag{4}$$

where SR_i is the Swiss Franc repurchase. The second variable captures the intensity of the repurchase activity and is defined as the fraction of the announced program size repurchased on day *t*:

$$Intensity_{i,t} = SR_{i,t} / Program\ Size_i \tag{5}$$

where $Program\ Size_i$ is the maximum cost of program *i* announced and authorized prior to the program implementation. The third variable is the percentage premium paid on the second trading line on a given day:

$$Premium_{i,t} = (P_{2,i,t} - P_{1,i,t}) / P_{1,i,t} \tag{6}$$

where $P_{1,i}$ is the stock price on the first trading line while $P_{2,i}$ is the stock price on the second trading line. The fourth variable is the completion rate, which is the percent of the program completed to date:

$$Completion_{i,t} = \sum_{s=t_i^{start}}^{t} SR_{i,s} / Program\ Size_i \tag{7}$$

where t_i^{start} is the start date of program *i*.

Table 1 presents some descriptive statistics on repurchasing and non-repurchasing firms. A salient feature of our dataset is that repurchasing firms tend to be larger and have larger market-to-book value ratios (growth firms) than non-repurchasing firms. Among repurchasing firms, the largest caps primarily use the second trading line or the open market methods. Typically, these buyback programs last between six months and a year. Regardless of the selected technique, each program targets a significant portion of the firms' share capital

ranging from 4% to 12%. As expected all second trading line programs aim at canceling the repurchased shares.

< Insert Table 1 >

During our sample period, all programs conducted on a second trading line amounted to a total cost of 56.5 billion Swiss Francs (hereafter CHF). While repurchase programs exhibit great diversity in their size, the average program size is slightly above CHF1 billion (see Table 2). The average share capital reduction is 6.70%, which is comparable with the target percentage of shares in the US (Cook, Krigman, and Leach, 2004). The typical completion rate of 70% is slightly below the figures reported by Stephens and Weisbach (1998) for U.S. firms, which range from 74% to 82%. Firms acquiring shares on a second trading line pay an average premium of 0.78% on top of the stock market price. On average, firms buy 28.81% of the trading days, but repurchasing frequencies vary considerably across firms. Swiss companies tend to repurchase shares more aggressively at the beginning of the buyback program but do not seem to favor any particular day of the week.

< Insert Table 2 >

We also report in Table 2 two measures of relative repurchase cost. The first measure (RC_1) is defined as the ratio of the actual cost of the program to the average cost of a buyback plan that yields the same number of reacquired shares.[13] Our second measure (RC_2) is obtained by dividing the actual cost of the program by the average cost of a buyback plan that yields the same number of reacquired shares except that the average price is computed over the period following a given repurchase day. [14] This new measure of relative repurchase cost is consistent with the fact that a buyback program is an option owned by the firm to buyback stock, as suggested in Ikenberry and Vermaelen (1996). Indeed, open market and second trading lines programs give managers the opportunity – but not the obligation – to buyback shares during a given time period. Consistent with this analogy between buybacks and financial options, RC_2 compares on each repurchase day the price paid by the firm (i.e., the "strike price") to the average price during the rest of the buyback program (i.e., during the

[13] Applying this approach to data from the Hong Kong stock exchange, Brockman and Chung (2001) find that managers pay on average less than the average cost of a random repurchase strategy leading to the same number of reacquired shares.
[14] We thank Theo Vermaelen for suggesting the idea underlying this second measure.

"remaining life of the repurchase option").[15] We show in Table 2 that the actual repurchase cost on average does not differ significantly from the average price during the reference period. However in our sample, some companies repurchase shares at a very low price (see maximum RC_1 and RC_2), while other repurchase shares at a very high price (see minimum RC_1 and RC_2).

As shown in the lower panel of Table 2, firms report that they set up second trading lines to reduce share capital and, at the same time, distribute excess cash to the shareholders. One reason for cancelling shares is that a heavy tax penalty would be levied if firms keep the reacquired shares as treasury stock beyond a specified period (see Section 2.1). Furthermore, under Swiss law, companies may only hold treasury stock up to 10 percent of the issued share capital. These two reasons explain why Swiss firms, unlike U.S. firms, systematically cancel repurchased shares.

Figure 4 displays the daily repurchase activity of Swiss Re, Swatch Group, UBS, and Schindler. We clearly see in this figure that these firms adopt a variety of execution styles. For instance, Swiss Re and Schindler concentrate their repurchase activity during a single short period following a strong bearish period for the companies. This trading pattern is consistent with the price-support hypothesis. Both firms have been able to repurchase shares at the lowest possible price during their buyback.[16] In contrast, actual repurchases of Swatch Group and UBS are more evenly spread out during the course of their program. UBS repurchase between 0.5% and 1.5% of the program on a daily basis with only two blackout periods preceding the firm's earnings announcements.

Figure 5 presents the premia paid by Helvetia and Ciba Specialty Chemicals on the second trading line, along with the cumulative percentage of the program completed by Novartis and Credit Suisse Group. While the premia always remain below the 5% legal threshold, the ones paid by Helvetia tend to be larger than the ones paid by Ciba Specialty Chemicals. This is mainly caused by the drop in the Swiss risk-free interest rate from 3% in June 2001 to 0.5% in August 2003. The lower graphs in Figure 5 present one firm (Novartis) that fully completes

[15] Since the stock price on the second trading line, P_2, is only observed when a transaction takes place on this market segment, we replace each missing P_2 by the concurrent price on the first trading line times one plus the average premium paid during this program.

[16] The relative repurchase cost measures RC_1 are the following: Swiss Re 1.333, Swatch Group 1.025, UBS 1.001, and Schindler 1.471.

its buyback program and one company (Credit Suisse Group) that stops repurchasing after completing only 20% of its buyback program. While both companies seem to favor the first portion of the program to reacquire shares, Novartis keeps buying shares until the very end of its program.

< Insert Figures 4 and 5 >

4. Repurchase Timing

In this section, we study the daily repurchase decision of repurchasing firms. Specifically, we test to what extent daily repurchases are related to stock price changes and to the release of firm-specific news. Analyzing the behavior of managers around corporate announcements is of primary importance since they are potentially better informed about the company than the rest of the market. Their actions may however be restricted by guidelines or safe harbor's bounds established by stock exchanges, or even blackout periods preceding earnings disclosures. Cook, Krigman and Leach (2003) use questionnaires returned by U.S. repurchasing firms to document claimed and actual compliance to the Securities and Exchange Commission (SEC) guidelines. They show that virtually all sample firms violate at one time or at another the safe harbor's bounds advised by the SEC. Using the same sample, Cook, Krigman and Leach (2004) show that repurchase activity is significantly curtailed around firm-specific information releases. They conclude that trading on private information is not evident in their sample.

We pool all the programs and estimate the following PROBIT regression model:

$$Buyback_{i,t} = a + b_1 R_{i,t-5,t-1} + b_2 R_{i,t} + b_3 R_{i,t+1,t+5} + g_1 News_{i,t-5,t-1} + g_2 News_{i,t} + g_3 News_{i,t+1,t+5} + d_{1-5} Controls_{i,t} + e_{i,t} \quad (8)$$

where $Buyback_i$ is a binary variable equal to one if the firm repurchases some shares and zero otherwise and R_i is the return of firm i on a given day. The variable *News* is a binary variable set to one if the firm makes a public announcement on a given day and zero otherwise. We retrieve every news item using the Dow Jones & Reuters Factiva database.[17] We break down

[17] We limit the search to news items announced by the *Swiss News Agency* (ATS). We only consider firm-specific news items and do not include general news items in which a company is only mentioned. In the eventuality that the release takes place after the closing time of the stock market, we use the following day as the announcement day.

the period surrounding a firm-specific information release into a five day pre-release period, a release day, and a five day post-release period. *Controls* represents a set of control variables including the firm's market capitalization and market-to-book ratio, the program length and percentage share capital reduction, and the buyback completion rate up to date.

We report in Table 3 the parameter estimates for all programs. We find that firms repurchase more frequently in days following price drops ($\hat{b}_1 < 0$). This result is consistent with U.S. and Canadian evidence reported by Stephens and Weisbach (1998) and Ikenberry, Lakonishok and Vermaelen (2000) using quarterly and monthly data, respectively. It is also consistent with the few studies using daily repurchase data (Cook, Krigman and Leach, 2004 and Zhang, 2005). Furthermore, we find that firms repurchase more frequently when the contemporaneous return on the stock is negative ($\hat{b}_2 < 0$). These first two pieces of evidence are consistent with the price-support hypothesis.

Unlike previous empirical studies, we find that repurchasing firms appear to consistently repurchase in advance of price increases ($\hat{b}_3 > 0$). One potential interpretation of this result is that Swiss managers can anticipate future price changes. Instead, we claim that this unusual result is caused by the very nature of the second trading line method. Indeed, as transactions on second trading lines are instantaneous public information, market participants can interpret a repurchase as a positive signal revealing company management's belief that the stock is undervalued. Overall we conclude that the firms included in our sample are price-sensitive repurchasers.

< Insert Table 3 >

In our sample, we find that repurchasing firms are more active after a public announcement and less active prior to a public announcement. This general reluctance to trade before a news release is particularly strong prior to quarterly and annual earnings announcements. This last point supports the idea that Swiss companies strictly conform to Swiss regulation prohibiting repurchasing during the 10-day period preceding earnings announcements or the release of any price-sensitive information. Our findings is not surprising considering that it is illegal and considering that everyone instantaneously knows that the company is in the market. Note that such an instantaneous disclosure is a very effective monitor as investors can file complaints if

they see the company engages in insider trading. A major regulatory implication is that having a second trading line makes monitoring of corporate insider trading less costly.

The findings regarding control variables are generally consistent with expectations. For instance, large firms, which have been very active in repurchasing shares over our sample period, tend to trade more frequently, everything else being constant. Moreover, the daily repurchase decision turns out to be negatively related to the length of the program and positively related to the relative size of the buyback program.

5. Trading Activity and Corporate Liquidity

While in the previous section we intended to answer the question "When do firms repurchase?", we now consider the related question "Is the liquidity on the first trading line different when firms repurchase?". Two competing hypotheses have been developed in the literature to explain the liquidity effect of open market share buybacks. Barclay and Smith (1988) posit that a repurchasing company can narrow the bid-ask spread by maintaining a minimum price on the market, and thus tends to increase the market liquidity. Alternatively, Barclay and Smith (1988) suggest that the presence of a repurchasing firm with superior information may widen spreads, and thus decrease the stock market liquidity, because the probability of trading with an informed trader increases. The empirical evidence on the effects of open market repurchases on stock market liquidity is conflicting. On one hand, Franz, Rao and Tripathy (1995), and Cook, Krigman and Leach (2004) conclude that open market repurchases by U.S. firms positively contribute to market liquidity by narrowing bid-ask spreads. On the other hand, Barclay and Smith (1988), Brockman and Chung (2001), and Ginglinger and Hamon (2005) find that open market repurchases in the US, Hong Kong, and France respectively, have a detrimental effect on liquidity. Other studies, such as Wiggins (1994), Singh, Zaman and Krishnamurti (1994), and Miller and McConnell (1995), however find no significant impact on the bid-ask spread of repurchasing firms.

As far as second trading lines are concerned, the two aforementioned hypotheses do not straightforwardly apply. Indeed, when trading on a separate trading line, the company is not competing directly with the liquidity providers and the probability of trading with an informed trader is not affected. We claim that the existence of the second trading line affects the

liquidity of the first trading line through (1) the information effect of actual buybacks and (2) the identity of the sellers on the second trading line.

The information effect works as follows. Since actual buybacks on the second trading line are instantaneously disclosed to all market participants, the firm sends a positive signal to the market every time the firm completes a repurchase transaction. If the firm's managers are assumed to be better informed than the rest of the market, the positive signal from the firm attracts more investors on the first trading line which ceteris paribus tends to increase trading activity and improve liquidity.

The impact of second trading line programs on the stock market liquidity also depends on the identity of the sellers on the second trading line. First, if second trading lines capture a substantial part of the trading volume of institutional investors, that otherwise would have taken place in the stock market, stock market liquidity is likely to deteriorate. Second, if most of the trading on second trading lines is made by arbitrageurs, who simultaneously buy in the stock market and resell on the second trading line, stock market liquidity is likely to benefit from this parallel trading. Indeed, arbitrage activity maintains a minimum price in the stock market, which tends to raise trading volumes and lower bid-ask spreads. As shown in Section 2.2, institutional investors and arbitrageurs are equally likely to participate in a second trading line program since their reserve premium are equal. We then conduct an empirical analysis to see which scenario is born out by the data.

We first analyze the effects of actual buybacks on the repurchasing firms' trading volumes on the first trading line. The key variable is the firm's trading volume measured in number of shares. Daily trading volumes, opening prices, and closing prices are collected from Thomson Financial Datastream. In order to contrast the trading activity during repurchase days and non-repurchase days, we compare the average and median trading volumes when the company does repurchase with the average level of the variable when the company does not repurchase.[18] We find that, on average, trading volumes are higher on repurchase days than on

[18] In order not to give an excessive weight to firms with large trading volumes, we scale the liquidity measures in each sample by the firm's unconditional average liquidity measure. As an illustration, consider firms A and B. Let firm A's average trading volume be 100 (in million CHF), average trading volume on repurchase days be 120, and average trading volume on non-repurchase days be 80. Let firm B's average trading volume be 15 (in million CHF), average trading volume on repurchase days be 20, and average trading volume on non-repurchase days be 10. The scaled average trading volume on repurchase days is 1.20 for firm A and 1.33 for firm B and the scaled average trading volume on non-repurchase days is 0.80 for firm A and 0.66 for firm B.

non-repurchase days. Around 84.6% of the firms in our sample experience a rise in average trading volumes on the buyback execution dates. Moreover, standard univariate tests show that this increase is statistically significant for average trading volumes (Student Test p-value = 0.052) and median trading volumes (Kruskal-Wallis Test p-value = 0.000).

To investigate further the effects of repurchases on trading volumes, we estimate the following regression model:

$$Volume_{i,t} = a + b\ Buyback_{i,t} + d_1\ Price_{i,t} + d_2\ Volatility_{i,t} + d_3\ Market\ Capitalization_{i,t} + e_{i,t} \quad (9)$$

where *Volume* represents the daily number of shares traded on the first trading line. The parameter estimate that captures any systematic effect of buybacks on trading activity is the one associated with the *Buyback* variable, which is a binary variable equal to one if the firm repurchases some shares and zero otherwise. Note that we also use the *Intensity* variable in replacement of the *Buyback* variable to check whether our conclusions depend on the portion of buyback program reacquired on a given day. The control variables used in our regression model are rather standard: *Price* denotes the closing price of the stock, *Volatility* is the absolute open-close return of the stock, and *Market Capitalization* is the market value of the firm.

Table 4 presents the OLS parameter estimates and associated p-values for Equation (9). Consistent with the univariate tests, we find that repurchasing on a second trading line contributes to increase trading activity in the stock market (p-value = 0.001). We reach a similar conclusion when the portion of the buyback program reacquired on a given day, *Intensity*, is used in place of the repurchase-day binary variable, *Buyback*. Furthermore, the signs of the coefficient estimates associated with the control variables are consistent with microstructure theory. Moreover, the subperiod analysis indicates that our results are robust over time.

< Insert Table 4 >

To study the liquidity effects of actual buybacks on the first trading line, we compile bid-ask spread and depth measures using trade and quote data over a 21-month period from October 1, 2002 to June 30, 2004. Seventeen of our buyback programs occurred during this period. We

collect detailed intraday data for this subset of firms from the Bloomberg financial information network. For each firm over each trading day, we obtain the median measures across all trades on three liquidity variables: relative bid-ask quoted spread, total depth in number of shares, and total depth in value. Relative bid-ask quoted spread is the quoted spread (i.e., difference between the lowest ask price and highest bid price) divided by the bid-ask midpoint. Total depth is the number of shares offered at the highest bid price plus the number of shares offered at the lowest ask price. Total depth in value is the number of shares at the bid and ask multiplied by their respective prices. Following prior research, we also use price, volatility and volume as control variables in our analysis. Price is the median transaction price across all trades during the day, volatility is the intraday volatility of trade-by-trade logarithmic returns across all trades, and volume is the daily trading volume in number of shares.

We examine the liquidity effects using the following regression:

$$Liquidity_{i,t} = a + b\ Buyback_{i,t} + d_1\ Price_{i,t} + d_2\ Volatility_{i,t} + d_3\ Volume_{i,t} + e_{i,t} \qquad (10)$$

where *Liquidity* represents alternatively the relative bid-ask quoted spread, total depth in number of shares, and total depth in value. As in the *Volume* regression in Equation (9), we also use the *Intensity* variable in replacement of the *Buyback* variable. Table 5 presents the OLS parameter estimates and associated p-values for Equation (10). When the explained variable is *Relative Spread*, the estimated coefficient associated with the *Buyback* binary variable or the *Intensity* variable is negative and highly significant. This suggests that the spreads on the first trading line tend to be smaller when the company repurchases on the second trading line. When the explained variable is *Total Depth* or *Total Depth in Value*, the estimated coefficient associated with the *Buyback* binary variable or the *Intensity* variable is positive and highly significant. This result also indicates that buyback activity on the second trading line have a beneficial effect on the firm liquidity on the first trading line. Furthermore, the estimated coefficients on the control variables have the expected sign. In particular, higher volumes are associated with higher firm liquidity and higher volatility is associated with lower liquidity. Furthermore, as expected, price is positively correlated with spread and depth measures that are expressed in value.

< Insert Table 5 >

Results presented in Tables 4 and 5 are clear and provide unambiguous evidence that repurchases on second trading lines improve the liquidity of the repurchasing firms. We find that when one controls for the key variables affecting stock liquidity, trading volumes and total depth on the first trading lines are significantly higher on repurchase days and bid-ask spreads are significantly smaller on those days. Our results are consistent with the presence of arbitrageurs taking simultaneous positions on both market segments. The evidence is also supportive of the beneficial impact on market liquidity resulting from new investors entering the market in reaction to the firms' actual repurchases.

6. Conclusion

This paper studies a unique buyback method allowing firms to reacquire shares on a separate trading line where only the firm is allowed to buy shares. This temporary trading platform is opened concurrently with the original trading line on the stock exchange. This method is called the Second Trading Line and has been extensively used by Swiss companies since 1997. We theoretically derive the buyback participation rules for every type of stock market participant and we show that it is never optimal for an individual investor to sell her shares on a second trading line. Using actual repurchase data from all buyback programs implemented through a second trading line on the Swiss stock market, we find that the daily repurchase decision is statistically associated with short-term price changes. In particular, we find that firms increase repurchasing in days following price drops and in advance of price increases. We also report that repurchasing firms are more active after a public announcement and less active prior to a public announcement, which suggest that Swiss companies strictly conform to Swiss regulation.

Since the second trading lines eliminate the adverse selection problem inherently associated with trading directly with the company, the Swiss setting offers a unique opportunity to test the impact of buybacks on the liquidity of repurchasing firms. We empirically show that repurchases on second trading lines do have a beneficial impact on the liquidity of the underlying stock. We find that, after controlling for the key variables affecting stock liquidity, trading volumes and total depths on the first trading line are significantly higher and bid-ask spreads are significantly smaller on repurchase days.

Second trading lines offer many attractive features to financial regulatory authorities and market participants. The key advantage for regulatory bodies is that firms' actual repurchases can be tracked in real time, which makes disclosure requirements totally unnecessary. In particular, having a second trading line makes monitoring of corporate insider trading less costly, as all market participants can observe the repurchase activities. Furthermore, second trading lines offer alternative trading platforms for all market participants, provide arbitrage opportunities, and allow investors to capture some undervaluation signals sent by the firms. Second trading lines also reduce the pernicious effects of information asymmetry caused by the presence of an informed trader (i.e., the repurchasing firm). Given that open market buybacks are predominantly used to repurchase shares and that recent studies have documented detrimental effects on stock market liquidity (Brockman and Chung, 2001 and Ginglinger and Hamon, 2005), second trading lines may become an attractive trading platform for exchanges around the world.

While the optimal level of information disclosure in financial markets remains a highly debatable issue, recent changes in the regulation of repurchase activity in the US call for more disclosure. Indeed, according to the newly mandated disclosure rule (SEC Rule 10b-18), the number of shares and the average price paid by the repurchasing firms are required in quarterly and annual reports for periods ending after March 15, 2004. With this change in regulation, the U.S. buyback information environment evolves from one with no disclosure requirement (a level 0 requirement) to a compulsory delayed disclosure environment (a level 1 disclosure). This higher level of disclosure requirement is found for instance in Canada, France, Hong Kong, and Japan. As exposed in this paper, a level 2 requirement would be the instantaneous disclosure implemented through second trading lines. Conceptually, an even more stringent information disclosure requirement (a level 3 requirement) would require a firm commitment and systematic preannouncement of the size and timing of the buyback, which is known as "Sunshine Trading" (Admati and Pfleiderer, 1991).

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Table 1: Summary Statistics on Repurchasing and Non-Repurchasing Firms

	Repurchasing Firms				**Non-Repurchasing Firms**
	2nd Trading Lines	*Open Market*	*Tender Offers*	*Put Options*	
Number of Firms	31	8	20	13	189
Number of Programs	55	15	40	19	-
Market Capitalization (CHF Mio)	27,254.4	25,379.0	1,850.2	4,419.8	1,651.4
Market-to-Book	3.39	3.47	2.83	2.37	2.20
Program Length (trading days)	214.5	336.8	12.6	19.0	-
Share Capital Reduction (%)	6.70	4.23	11.77	8.27	-
Share Cancellation Programs (%)	100.0	0.0	77.5	100.0	-

Note: This table presents some summary statistics for all of the companies that have repurchased shares (*Repurchasing Firms*) on the Swiss stock market between January 1993 and August 2004. Buyback programs are implemented either through a second trading line, open market, tender offer, or distribution of tradable European put options. *Non-Repurchasing Firms* is a control sample that contains all of the firms included in the Swiss Performance Index that did not repurchase any shares over the sample period. *Market Capitalization*, *Market-to-Book*, *Program Length*, and *Share Capital Reduction* are the average values for each acquisition method and, when applicable, for the control sample. *Share Cancellation Programs* indicates the portion of programs leading to the cancellation of the shares. CHF stands for Swiss Francs.

Table 2: Summary Statistics on Second Trading Line Programs

Repurchase Programs on a Second Trading Line			
	Mean	Minimum	Maximum
Program Size (CHF Mio)	1,026.54	21.5	6,000
Final Completion Rate (%)	69.96	17.70	109.50
Average Premium (%)	0.78	0.00	5.09
Repurchase Days (%)	28.81	0.19	77.42
First Quintile (%)	35.52	0.00	100.00
Last Quintile (%)	17.36	0.00	64.52
Monday (%)	17.55	0.00	27.78
Tuesday (%)	21.55	0.00	66.67
Wednesday (%)	21.75	0.00	100.00
Thursday (%)	19.88	0.00	50.00
Friday (%)	19.27	0.00	100.00
Relative Repurchase Cost 1	1.022	0.695	1.535
Relative Repurchase Cost 2	1.016	0.671	1.646

Claimed Reasons for Repurchasing Shares on a Second Trading Line							
Capital	100.00%	EPS	16.36%	P/E	9.09%	Acquisitions	3.64%
Cash	74.55%	Structure	16.36%	Signal	5.45%	Value	1.82%

Note: This table presents some summary statistics for all buyback programs conducted on a second trading line between January 1993 and August 2004. *Program Size* is the maximum cost announced and authorized prior to the program implementation in millions of Swiss Francs, *Final Completion Rate* is the percentage of the program that has been repurchased at the end of the program, *Average Premium* is the weighted-average premium paid on the second trading line, *Repurchase Days* is the percentage of trading days with repurchase activities during the life of the program, and *First Quintile* and *Last Quintile* are the percentage of trading days with repurchase activities during the first and final 20% of the program, respectively. *Monday* denotes the percentage of repurchase days that are Mondays, and so forth for the other days of the week. *Relative Repurchase Cost 1 (RC_1)* and *Relative Repurchase Cost 2 (RC_2)* are two measures of repurchase cost. RC_1 is obtained by dividing the actual cost of the program by the average cost of a buyback plan that yields the same number of reacquired shares. RC_2 is obtained by dividing the actual cost of the program by the average cost of a buyback plan that yields the same number of reacquired shares except that the average price is computed over the period following a given repurchase day. The reasons claimed by the repurchasing firms to motivate the buybacks are *Capital* (reduce share capital), *Cash* (distribute excess cash flows), *EPS* (increase the earning-per-share ratio), *Structure* (optimize the capital structure), *P/E* (increase the price-earning ratio), *Signal* (signal undervaluation), *Acquisitions* (get shares to finance future acquisitions), and *Value* (create more value for shareholders). Firms can claim more than one reason at a time.

Table 3: Repurchases, Stock Performance, and News

		All Public Announcements	Earnings Announcements
Intercept	a	-0.3679*** (0.000)	-0.3423*** (0.000)
5-day Lagged Return	b_1	-1.1280*** (0.001)	-1.0658*** (0.001)
Return	b_2	-2.3872*** (0.002)	-2.5824*** (0.001)
5-day Lead Return	b_3	0.8625*** (0.006)	0.9310*** (0.003)
After News-Announcement Day	g_1	0.1288*** (0.001)	0.2235*** (0.001)
News Announcement Day	g_2	0.0530 (0.460)	0.0092 (0.951)
Before News-Announcement Day	g_3	-0.1539*** (0.000)	-0.9154*** (0.000)
Market Capitalization	d_1	0.5110***,a (0.000)	0.5170***,a (0.000)
Market-to-Book	d_2	-0.0592*** (0.000)	-0.0604*** (0.000)
Program Length	d_3	-0.0026*** (0.000)	-0.0026*** (0.000)
Share Capital Reduction	d_4	3.9381*** (0.000)	3.9515*** (0.000)
Completion Rate	d_5	0.0493 (0.403)	0.0503 (0.392)
McFadden R^2		0.144	0.152
Number of Observations		11,742	11,742

Note: This table presents the parameter estimates computed from a pooled-sample PROBIT regression:

$$Buyback_{i,t} = a + b_1 R_{i,t-5,t-1} + b_2 R_{i,t} + b_3 R_{i,t+1,t+5} + g_1 News_{i,t-5,t-1} + g_2 News_{i,t} + g_3 News_{i,t+1,t+5} + d_{1-5} Controls_{i,t} + e_{i,t}$$

$Buyback_i$ is a binary variable equal to one if the firm repurchases some shares and zero otherwise and R_i is the return of firm i. The variable *News* is a binary variable set to one if the firm makes a public announcement on a given day and zero otherwise. In the last column, the news variable is defined using earnings related news only. *Controls* represents a set of control variables including the firm's market capitalization and market-to-book ratio, the program length and share capital reduction (in %), and the buyback completion rate up to date. The p-values presented in parentheses have been computed using Huber-White heteroskedasticity-consistent standard errors. [a] indicates that the coefficient estimate has been multiplied by 10^5. * (**, ***) indicates coefficients significantly different from zero at the 10% (5%, 1%) confidence level.

Table 4: Effects of Repurchases on Trading Activity

		Whole Sample		First Half of the Sample		Second Half of the Sample	
Intercept	a	103.0065*** (0.000)	114.8083*** (0.000)	196.1122*** (0.000)	213.1616*** (0.000)	-18.0689*** (0.251)	-12.3362*** (0.468)
Buyback	b	132.5404*** (0.001)	-	163.0468** (0.013)	-	118.7559** (0.012)	-
Intensity	b	-	51.7541*** (0.001)	-	46.9570** (0.015)	-	64.7796*** (0.010)
Price	d_1	-0.4382*** (0.000)	-0.4617*** (0.000)	-0.5460*** (0.000)	-0.5882*** (0.000)	-0.2971*** (0.000)	-0.3021*** (0.000)
Volatility	d_2	3.6155*** (0.000)	3.6161*** (0.000)	2.9935*** (0.000)	3.3126*** (0.000)	6.5988*** (0.000)	6.2686*** (0.000)
Market Capitalization	d_3	0.0410*** (0.000)	0.0411*** (0.000)	0.0400*** (0.000)	0.0401*** (0.000)	0.0421*** (0.000)	0.0422*** (0.000)
Adjusted R^2		0.702	0.703	0.635	0.636	0.785	0.786
Number of Observations		11,742	11,742	6,597	6,597	5,145	5,145

Note: This table presents the parameter estimates computed from a pooled-sample OLS regression:

$$Volume_{i,t} = a + b\ Buyback_{i,t} + d_1\ Price_{i,t} + d_2\ Volatility_{i,t} + d_3\ \ Market\ Capitalization_{i,t} + e_{i,t}$$

Volume represents the daily number of shares traded on the first trading line. $Buyback_i$ is a binary variable equal to one if the firm repurchases some shares and zero otherwise. *Intensity* is the fraction of the announced program size repurchased on a given day and is used in replacement of the *Buyback* variable. *Price* denotes the bid-ask midpoint price of the stock, *Volatility* is the absolute open-close return of the stock, and *Market Capitalization* is the firm market value. The first half of the sample covers the 1997-2001 periods (first 26 programs) and the second part of the sample covers the 2001-2004 period (last 27 programs). The p-values presented in parentheses have been computed using White heteroskedasticity-consistent standard errors. * (**, ***) indicates coefficients significantly different from zero at the 10% (5%, 1%) confidence level.

Table 5: Effects of Repurchases on Corporate Liquidity

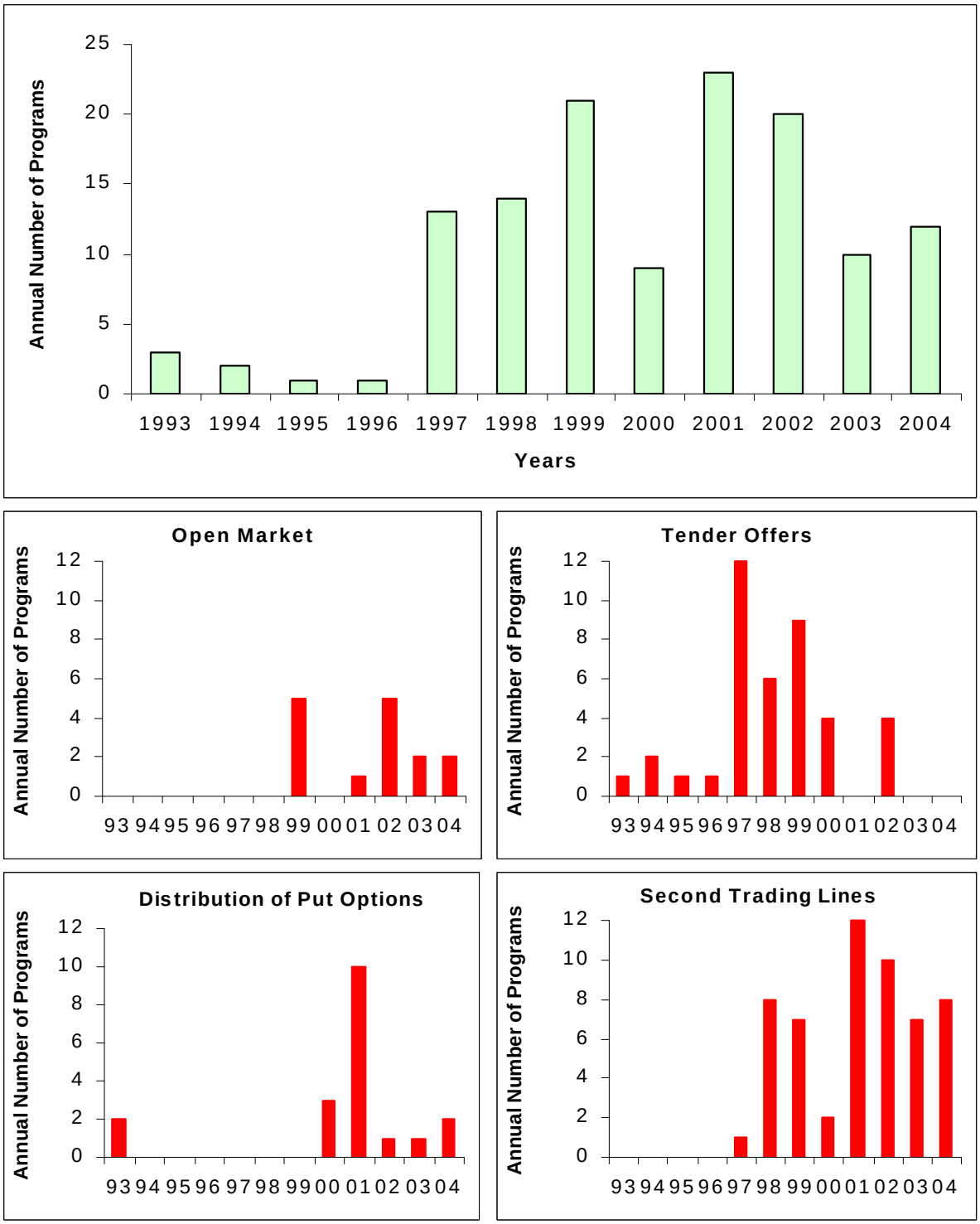
		Relative Spread		Total Depth		Total Depth in Value	
Intercept	a	0.0013*** (0.000)	0.0012*** (0.000)	2.0640*** (0.000)	2.2501*** (0.000)	256.0238*** (0.000)	289.8825*** (0.000)
Buyback	b	-0.0007*** (0.000)	-	1.2777*** (0.000)	-	268.1900*** (0.000)	-
Intensity	b	-	-0.0194*** (0.001)	-	9.9383 (0.566)	-	5241.6060*** (0.000)
Price	d_1	0.0386^{**,a} (0.033)	0.0435^{***,a} (0.000)	-0.0021*** (0.000)	-0.0022*** (0.000)	0.1714*** (0.000)	0.1539*** (0.000)
Volatility	d_2	0.0051*** (0.000)	0.0051*** (0.000)	-1.1049*** (0.000)	-1.1937*** (0.000)	-207.5131*** (0.000)	-223.7126*** (0.000)
Market Capitalization	d_3	-0.0001^{***,a} (0.000)	-0.0001^{***,a} (0.000)	0.6070^{***,a} (0.000)	0.6070^{***,a} (0.000)	0.0003*** (0.000)	0.0003*** (0.000)
Adjusted R^2		0.530	0.528	0.651	0.650	0.503	0.494
Number of Observations		7,324	7,324	7,324	7,324	7,324	7,324

Note: This table presents the parameter estimates computed from a pooled-sample OLS regression:

$$Liquidity_{i,t} = a + b\ Buyback_{i,t} + d_1\ Price_{i,t} + d_2\ Volatility_{i,t} + d_3\ Volume_{i,t} + e_{i,t}$$

Liquidity alternatively represents the acquiring firm's relative bid-ask quoted spread (quoted bid-ask spread divided by midpoint price), total depth in number of shares, and total depth in value on the first trading line. The depth variables are expressed in thousands. The alternative liquidity measures are the median values across all trades during the day. $Buyback_i$ is a binary variable equal to one if the firm repurchases some shares and zero otherwise. *Intensity* is the fraction of the announced program size repurchased on a given day and is used in replacement of the *Buyback* variable. *Price* denotes the median transaction price across all trades during the day, *Volatility* is the intraday volatility of trade-by-trade logarithmic returns across all trades during the day, and *Volume* is the daily trading volume in number of shares. The p-values presented in parentheses have been computed using White heteroskedasticity-consistent standard errors. [a] indicates that the coefficient estimate has been multiplied by 10^5. * (**, ***) indicates coefficients significantly different from zero at the 10% (5%, 1%) confidence level.

Figure 1: Share Buybacks in Switzerland



Note: In the upper graph, the bars present the annual number of repurchase programs implemented by companies listed on the Swiss stock exchange between January 1993 and August 2004. The lower graphs show the popularity of the different repurchase methods: Open market, tender offers, distributions of European put options, and repurchases on a second trading line.

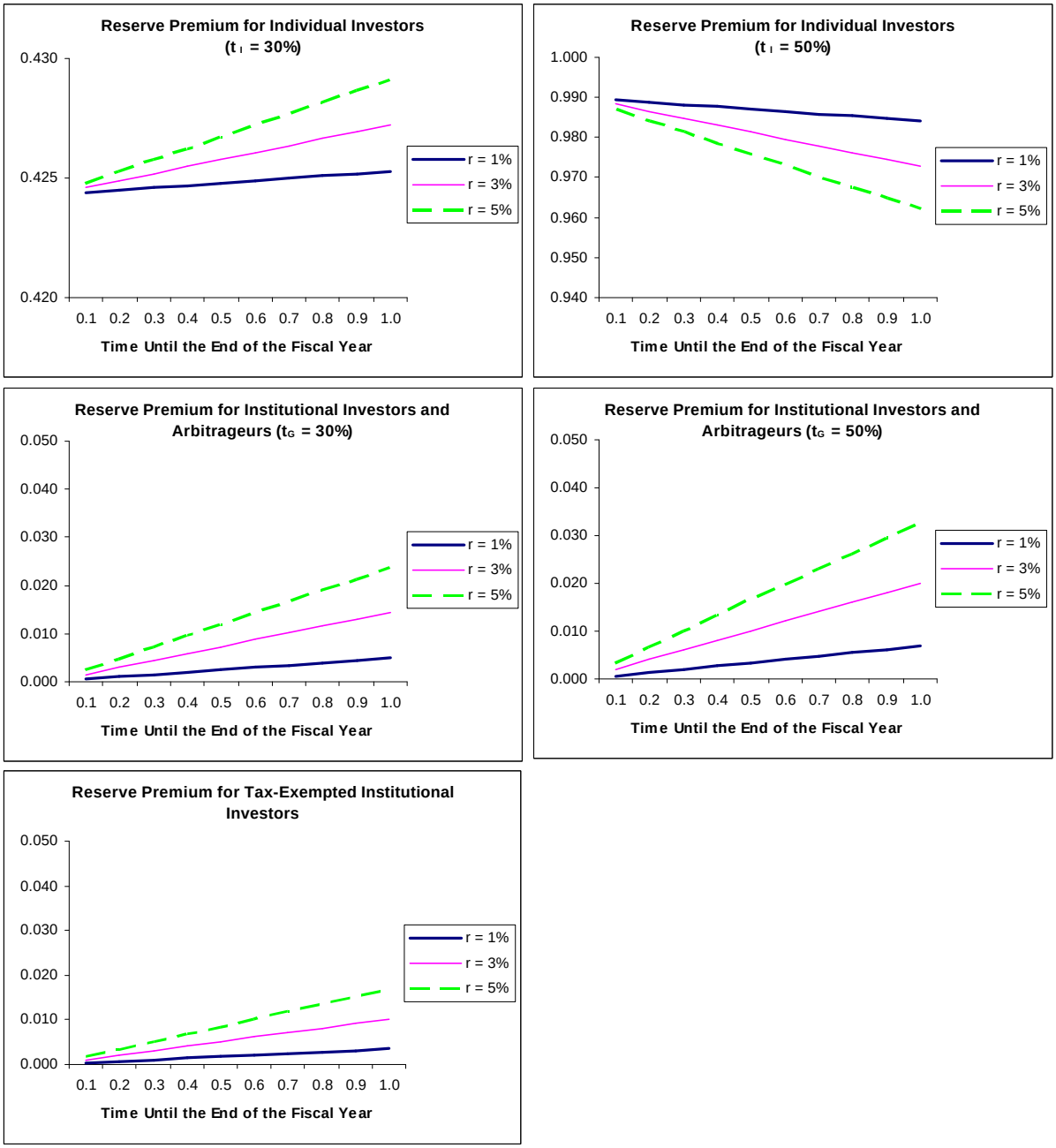
Figure 2: Order Books on the First and Second Trading Lines for UBS

		First Trading Line		
		1654 Sellers		
		Price	Size	Time
		103.60	8455 (7)	09:45:52
		103.50	47413 (40)	14:04:14
		103.40	11956 (13)	11:07:19
		103.30	14016 (10)	11:28:35
		103.20	23160 (11)	10:50:27
		103.10	23365 (8)	16:35:25
		103.00	151000 (205)	16:36:46
		102.90	74449 (35)	16:36:17
		102.80	43600 (13)	16:37:03
		102.70	9187 (7)	16:37:29
16:37:45	33407 (13)	102.60		
16:30:04	82361 (7)	102.50		
15:41:51	13061 (3)	102.40		
16:36:17	17400 (5)	102.30		
14:21:42	13308 (4)	102.20		
15:56:12	30249 (6)	102.10		
12:57:02	33927 (13)	102.00		
12:22:01	15757 (4)	101.90		
08:43:17	9000 (3)	101.80		
12:53:15	22028 (4)	101.70		
Time	Size	Price		
662 Buyers				

		Second Trading Line		
		12 Sellers		
		Price	Size	Time
		-	-	-
		-	-	-
		-	-	-
		-	-	-
		-	-	-
		103.30	35000 (2)	09:34:28
		103.20	35000 (2)	09:34:23
		103.10	30000 (3)	15:55:33
		103.00	45000 (3)	15:55:25
		102.90	20000 (2)	16:37:51
16:35:32	5000 (1)	102.60		
-	-	-		
-	-	-		
-	-	-		
-	-	-		
-	-	-		
-	-	-		
-	-	-		
-	-	-		
Time	Size	Price		
1 Buyer				

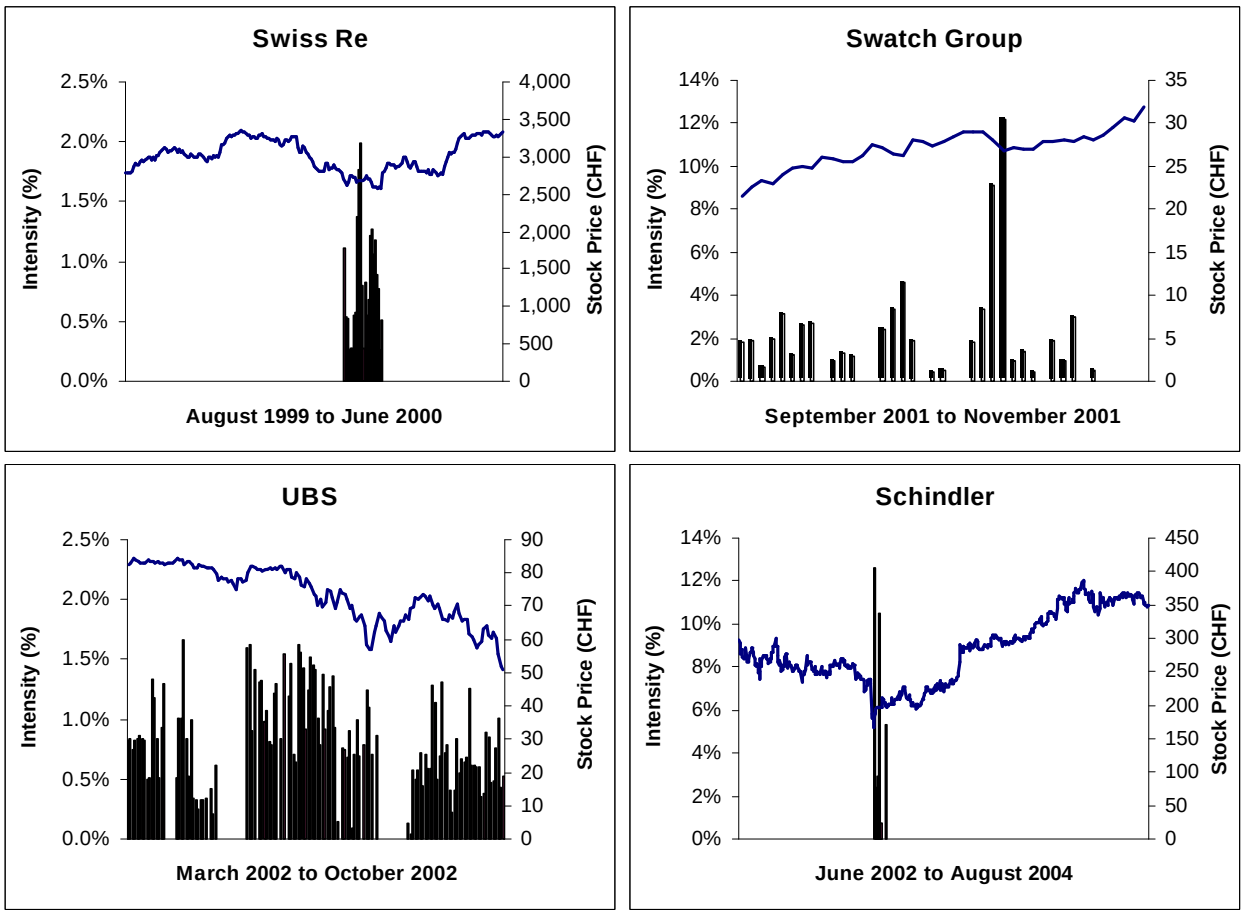
Note: This figure displays the concurrent order books on the first and second trading lines for UBS. The order books have been recorded on July 11, 2005 at 4:40 p.m. The first trading line is the standard trading line (ticker: UBSN) and the second trading line (ticker: UBSNE) is a temporary trading line established by the firm to repurchase shares in a tax-efficient way. Both trading lines are open on the Virt-X. Each order book contains the selling orders in the upper part and the buying orders in the lower part. For each price (*Price*), we know the number of shares (*Size*), the number of orders for each price (indicated in parentheses), and the time when the order has been entered into the trading system (*Time*).

Figure 3: Reserve Premia for Different Market Participants



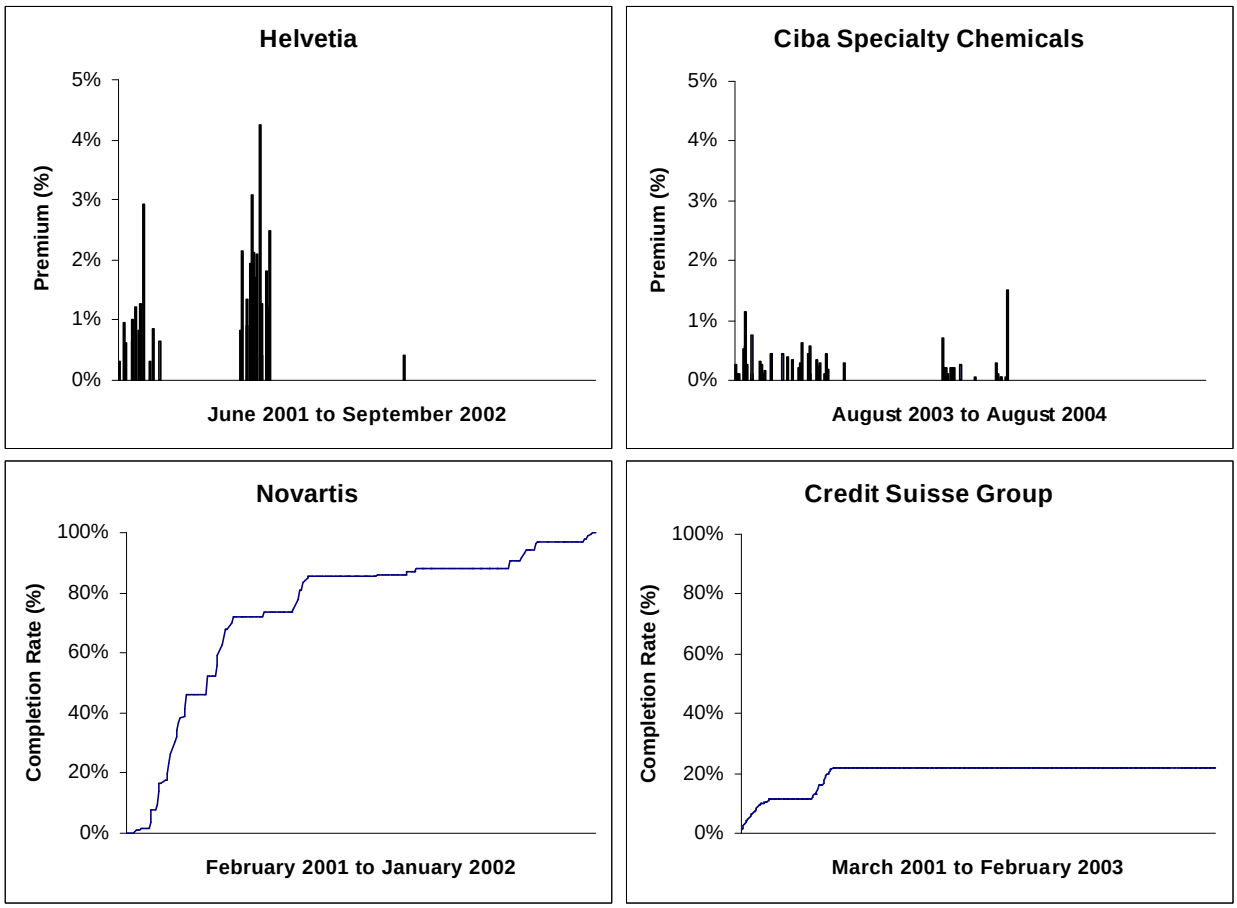
Note: These graphs represent the reserve premia for individual investors (upper graphs), institutional investors and arbitrageurs (medium graphs), and tax-exempted institutional investors (lower graph). The reserve premium is defined as the percentage premium for which a given market participant is indifferent between tendering her shares on a second trading line program or directly selling them in the stock market. The exact expressions for the reserve premia are presented in Equations (1), (2), and (3), respectively. For each market participant, we plot the associated reserve premium for a time period until the end of the fiscal year (t) ranging from 0 to 1 year, different risk-free interest rate levels, r = 1%, 3%, and 5%, and different income tax rates (t_I) or capital gain tax rates (t_G), 30% and 50%. The value of the current stock price (P) is assumed to be 100 and the nominal value of one share (V) is assumed to be 1.

Figure 4: Repurchase Activity



Note: The four graphs present the daily *Intensity* of a buyback program, which is the fraction of the announced program size repurchased on a given day (vertical bars, left axis) and the daily current *Stock Price* in the stock market (line, right axis) for Swiss Re, Swatch Group, UBS, and Schindler.

Figure 5: Premium and Completion Rate



Note: The two upper graphs present the daily percentage *Premium* paid on the second trading line by Helvetia and Ciba Specialty Chemicals. The percentage premium is the difference between the prices on the first and second trading lines divided by the stock price on the first trading line. The two lower graphs plot the daily *Completion Rate* or percent of the program completed to date by Novartis and Credit Suisse Group.

Appendix: Chronology of a Typical Repurchase Program on a Second Trading Line

Repurchasing firm: **UBS**
Repurchase method: Second trading line on the Virt-X exchange
Investment bank in charge of the program: UBS Warburg
Board of Directors decision of initiating a repurchase program: February 11, 2003
Swiss Takeover Board authorizes the program: February 12, 2003
Expected number of shares to be repurchased: 85,000,0000
Maximum issued share capital reduction: 6.8%
Maximum cost of the program: CHF5,000,000,000

Starting date of the program: March 6, 2003
First repurchase: March 6, 2003
Last repurchase: January 26, 2004
End date of the program: March 5, 2004
Length of the program: 262 trading days
Number of days with some repurchase (%): 108 trading days (41.2%)

Actual repurchases: During this program, 59,482,000 shares were repurchased at an average price of CHF75.93 for a value of CHF4,500,000,000. At the April 2004 annual general meeting, shareholders accepted to cancel the repurchased shares on July 2004. Consequently, the number of UBS shares has decreased to 1,125,400,202.

Sources: Swiss Takeover Board (www.copa.ch) and UBS (www.ubs.com) websites and SWX Swiss Exchange.