Re-Examination of the Ex-Dividend Day Behaviour of Canadian Stock Prices

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Abstract

We examine the ex-dividend day price and volume behaviour in the Canadian stock market and show evidence on the co-existence of both the tax and short-term trading effects. By examining the abnormal returns as well as abnormal volumes around ex-day we find strong evidence of short-term trading which is consistent the presence of dividend-capturing activities around the ex-dividend day. By examining the abnormal returns before (after) the ex-dividend day, we also find evidence of the buying (selling) pressure created by short-term traders.

JEL Classification: G35

Key words: Ex-Dividend Day, Tax Effect, Short Term Trading.

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1. Introduction

The explanation for the price drop relative to the amount of dividends at and around the ex-dividend date has revolved around three schools of thought. [1] The first explanation relies on the existence of the tax differential between capital gains and dividend taxation which can also indirectly reveal the identity and the tax status of the marginal investor. The second school has relied on the market microstructure such as tick size. The third school has relied on the existence of the arbitrage by short-term traders (Elton *et. al.* 2002) to explain the relative price drop. In this paper, we show evidence that both the tax and short-term trading effects co-exist and are complementary to each other in explaining the ex-dividend day price drop.

The paper is organized as follows: In Section 2 we review the existing literature by reviewing the three schools of thoughts and present our hypotheses. Next, in Section 3 we present the methodology used in this paper to investigate the details of the price drop in relation to dividends. In Section 4 we describe our sample. In Section 5 we present our empirical results. In Section 6, we summarize our results and present our conclusions.

2. Related Literature

[1] Typically, the ratio will be less than one if dividends are taxed more heavily than capital gains and vice-versa.

In a tax less world, on a stock's ex-dividend day, ignoring the time value of the money in the short period between the ex-date and the dividend payment date, the stock price must drop by the value of the dividend in order to prevent arbitrage.

However, in one the earliest published studies on ex-dividend day pricing, Campbell and Beranek (1955) observed that the average ex-day stock price drop is slightly less than the dividend. Elton and Gruber (1970) (E&G hereafter) put forward a tax based argument and stated that the ex-day share prices are set in such a way that marginal long-term investors are indifferent between buying and/or selling before and after the ex-day. As a consequence, the ex-day drop relative to dividends should reflect the differential taxation of dividends and capital gains of these long-term investors, and the magnitude could indicate the identity and possibly the tax status of the long-term investor. Since dividends have been generally taxed at a higher rate than long-term capital gains, the stock price need not actually drop by the full amount of the dividend on the ex-day. Furthermore, they also find evidence that allows them to conclude that investors in higher tax brackets prefer stocks with lower dividend yields, while investors in lower brackets prefer stocks with high dividend yields, thus supporting the "dividend clientele" idea of Miller and Modigliani (1961) - M&M hereafter.[2]

Since the M&M hypothesis is one of the key tenets of modern finance in terms of dividend relevance and dividend clientele effects, the E&G results have been either

[2] See also Elton, Gruber, and Rentzeler (1984).

challenged or confirmed using different time periods in the U.S. market or following the same methodology for non-US markets.[3]

More specifically, the market microstructure based studies by Bali and Hite (1998) and Frank and Jagannathan (1998) relate ex-day premium to market microstructure effects and suggest that ex-day premium may deviate from one even in the absence of taxes to reflect tick size and bid-ask bounce. In addition, Frank and Jagannathan (1998) find that price discreteness has similar effect on observed price behaviour as would be the case if prices were determined by long-term traders. These studies suggest that behaviour of share prices on the ex-dividend dates may be unrelated to taxes but can better be explained by market microstructure.

Similarly, some of the earlier studies also question the E&G conjecture that ex-day share prices are set by long-term investors. For Example, Kalay (1982) cannot explain why the imputed tax rates vary with dividend yield. Miller and Scholes (1982) extend Kalay's argument and caution the researchers against interpreting any estimated relation between short-run dividend yields and returns as evidence for tax-clienteles effects. Heath and Jarrow (1988) relax Kalay's assumption of risk neutrality and show that ex-day share prices are not likely to be set by any category of investors. On the other hand, Koski and Scruggs (1998) analyze the identity of traders around ex-dividend days and find strong

[3] See, for example, Booth and Johnson (1984), Poterba and Summers (1984 and 1985), Poterba (1986), Barclay (1987), Robin (1991), Lamdin and Hiemstra (1993), Green and Rydqvist (1999), Bhardwaj and Brooks (1999), Koski (1996), McDonald (2001), Bell and Jenkinson (2002), Graham, Michealy and Roberts (2002), and Green (2002)).

evidence of dividend capture trading by security dealers, some evidence of corporate dividend capture trading, but little evidence of tax clientele trading.

Recently, by analyzing ex-day pricing under different tax regimes of two mutual funds, Elton, Gruber and Blake (2002) conclude that microstructure explanation for the price drop is wrong and provide new evidence of the tax explanation of ex-dividend day behaviour:

> "*All of the microstructure arguments state that the fall in stock price should be less than the dividend. By testing ex-dividend effects on a sample of funds where dividends are tax-advantaged, we find that taxes should and do cause the fund price to fall by more than the amount of the dividend. This is consistent with a tax argument and inconsistent with a microstructure argument. Examining the sample of tax-free dividends, we find that the E&G and return measures change across the two regimes exactly as the theory suggests they should if taxes mattered."* (Elton, Gruber and Blake, 2002, page 18)

Recently, Graham, Michaely and Roberts (2003) also examined the microstructure argument by comparing ex-day returns before and after decimalization in the US. Their results are also not consistent with the price discreetness or transaction costs effects and they show that reduction in capital gains tax rate in 1997 has affected ex-day prices as postulated by E&G. In one of the non-U.S. studies, Bauer *et al* (2002) using Canadian data conclude that neither the tax differential nor the tick size explain the price drop and ask "While short term trading may be a factor in the market and this effect is not directly

examined, it would still leave the main question unanswered: why don't ex-day prices fully adjust to start with?"[4]

Given the strong evidence of Elton, Gruber and Blake (2002) it is hard to refute that taxes do not influence ex-dividend day price. On the other hand, the high presence of dividend-capturing traders or arbitragers around ex-dividend day as observed by Koski and Scruggs (1998) also indicates the influence of short-term trading activity in determining price drop to dividend ratio. However, the short-term trading theory alone fails to explain the price drop to dividend ratio completely. So one of the main objectives of this paper is to determine whether these two hypotheses can co-exist and can collectively explain the relative price drop. Accordingly, we develop the following hypotheses to investigate the issue systematically.[5]

2.1 The Study Hypotheses

From the preceding discussions we have seen that the central focus of the ex-dividend day price behaviour research remains on the explanation of price drop to dividend ratio. So our first hypothesis is to test whether the drop should be more pronounced for high dividend yielding stocks. Accordingly, our first hypothesis as follows:

[4] They also investigate the market micro structure argument and find evidence contrary to the Bali and Hite (1998) conjecture. Therefore, we do not test for it in this paper.

[5] They also investigated some market microstructure issue such as tick size, but failed to establish any relationship between market microstructure and price drop to dividend ratio. However, they did not directly examine the short term trading impact around the ex-dividend dates.

Hypothesis 1a. Price of dividend paying stock would drop on ex-dividend day and the drop will increase with the dividend yield.

Our second hypothesis investigates the presence of short term trading around ex-dividend day and its plausible relationship to the "below one" value of the price drop to dividend ratio. The rationale behind this hypothesis is as follows. If there is a consistent relationship between dividend yield and price drop, then the short-term traders would not need to pay any capital gain tax and the trading activity will be driven by dividend income, dividend tax rate and expectation of a price drop. This leads to our next hypothesis:

Hypothesis 1b. Price drop to dividend ratio at ex-dividend day is governed by tax effect and driven by short-term trading.

Though the above hypothesis points out the role of short-term trading, it does not elaborate the motive of short-term traders in doing so. As Koski and Scruggs (1998) point out, two types of traders have incentives to implement short-term, dividend-related trading strategies. The first type of traders are securities dealers who generally have very low transaction costs. If the expected price drop differs from the dividend amount by more than their transaction costs, securities dealers will trade to profit from the difference. A second type of trader is a taxable corporation which has a strong incentive to capture dividend income because of the preferential tax treatment of dividend income

relative to capital gains.[6] Ideally, it can also be assumed that short-term traders are likely to be interested in high dividend yielding stock due to two reasons: (i) high dividend yielding stocks are likely to give more arbitrage opportunity and (ii) to capture higher dividend income. However, there might not be enough opportunity for short-term traders to trade in high dividend yielding paying stocks as these high dividend paying stocks are generally held by corporations and low tax paying individuals who are generally infrequent traders. Accordingly we develop the following hypothesis:

Hypothesis 1c. Short-term traders are more interested in high dividend yielding stocks, but are not likely to be active in highest dividend yielding stock category.

Our next set of hypotheses focuses on the abnormal return behaviour on the ex-dividend day. Eades *et. al.* (1984) and Kato and Loewenstein (1995) have argued that ex-day abnormal return would depend on the level of dividend yield and the difference between dividend tax and capital gain tax. Accordingly, we test the following hypotheses:

Hypothesis 2a. Abnormal return on the ex-dividend will be positive and less than dividend yield.

Hypothesis 2b. Abnormal return on the ex-dividend day will be higher for the high dividend yielding stocks.

3. Methodology

[6] Note that individual investors in the low tax brackets are also inclined towards high dividend yielding stocks in order to capture the dividend income (Lakonishok and Vermaelen, 1986) but they are generally infrequent traders (Booth and Johnston, 1984).

We use a number of approaches to analyze stock price drop around the ex-dividend day by using a carefully constructed sample of ex-dividend dates in Canada. First we investigate the ex-dividend day price using the following ratio: Price of cum-dividend stock to ex-dividend stock: $\frac{P_{cum}}{P_x}$

Second, following Elton and Gruber (1970), we calculated the price-drop-to-dividend ratio on the ex-day:

$$\frac{Pcum - P_x}{D}$$

To investigate whether the relative price drop varies across dividend yield levels, all these ratios are calculated for the full sample as well as for five categories (quintiles) of high to low dividend-paying stocks.

We also conduct a standard event study methodology and use the market model to calculate abnormal returns on ex-dividend days and then we regress these excess returns against relevant explanatory variables discussed below. [7] If short term trading exists, we expect the abnormal return to be positive and significant before the ex-day because of buying pressure, and to be negative and significant afterwards because of selling pressure. To further investigate the presence of short-term trading around the ex-dividend day, we also analyze volume data, using a similar technique. We compare trading volumes around our event period (the ex-dividend day) with normal volume levels prior to the event period. Significant abnormal volume around the ex-day will be a clear

[7] We have used market model as ex-dividend days are typically clustered in Canadian context (Brown and Warner, 1985; Kato and Loewenstein, 1995)

evidence of presence of short-term trading activities. In order to have the ease of following the analysis and arguments we have presented various methodologies more elaborately in hypothesis testing, results and discussions section below (section 5).

4. Data

Our sample includes all dividend-paying stocks listed on the Toronto Stock Exchange (TSX) between 1996 and 2003. The ex-dividend dates and the amounts of dividends are obtained from TSX dividend database. We ignore special dividends, monthly dividends, dividends labelled in foreign currency, and dividends less than \$0.175.[8] We have considered only quarterly, semi-annual and annual dividends. Our final sample consists of 1407 ex-dividend dates (after deletion) for the entire period. The corresponding stock prices and volumes data are obtained from CFMRC database. The data include daily closing prices and daily trading volume. 'Market capitalization', 'number of outstanding shares', 'revenue' and 'total asset' data are collected from the StockGuide Database.

[8] The Baur et al sample spanned January 1, 1986 to December 31, 1999 and (as per our interpretation of their section on data) use all ex-dividend dates including monthly dividend paying stocks. We do not know whether this inclusion of regular dividends in the sample has any implications for their results. In this study, we exclude monthly dividends to avoid contamination effect when employing the event studies. Excluding observations with dividend less than \$0.175 ensure that the results won't be dominated by the very small dividend paying stocks and due to outliers when calculating the Price Drop Dividend Ratio. Even though, these exclusions have reduced our sample substantially, they enable us to avoid interferences from other effects on the ex- day price and volume behaviour.

5. Hypotheses Testing, Results and Discussions

5.1 Hypothesis 1a

Although there have been changes in the tax rates over the sample period, in general, it is expected that there will be a price drop on ex-dividend day and it will increase with dividend yield – higher the dividend payment more should be the price drop. In Table 1 we present the Price on cum day to Price on ex-dividend (Pcum/Px) ratio.

Table 1 about Here

We can see that mean value of this ratio is consistently more than one, which supports hypothesis 1a. Also we can see that this ratio is increasing with dividend yield that supports the rational behaviour of investors around ex-dividend day. Because of this price drop, short term traders will not be subjected to capital gain tax and their trading decisions will be governed by dividend income, dividend tax and expected price drop.

5.2 Hypothesis 1b

Consider an investor X holding a known number of dividend-paying shares bought at unit price P_p. Let P_c be the price at which an investor can sell his shares on the cum-day, t_g be the capital gains tax rate. If $P_c > P_p$, and the seller has held the stock long enough for the sale to be classified as capital gain, then, ignoring time value of money and assuming risk neutrality, her after-tax cash flow from selling cum equals $P_c - (P_c - P_p)(t_g)$. On the other hand, if the seller waits till the ex day to sell the price she receives is P_x. Ceteris paribus,

after-tax valuation of the cash flows now equals $P_x - (P_x - P_p)(t_g) + D(1 - t_d)$, where t_d is the investor's marginal tax rate on current income.

Elton and Gruber (1970) claim that the equilibrium around the ex day is such that the marginal stockholders are indifferent between selling cum or ex, therefore we should have:

$$P_c - (P_c - P_p)(t_g) = P_x - (P_x - P_p)(t_g) + D(1 - t_d) \qquad (1)$$

Simplifying, the drop price to dividend ratio equals;

$$\frac{P_c - P_x}{D} = \frac{1 - t_d}{1 - t_g} \qquad (2)$$

E&G argue that since the dividend tax rate is higher than the capital gain tax rate, then we should expect the ratio of the price drop to be less than one.

However, these arguments are not so obvious in Canadian context. In Canada, during the 1990-1999 period, dividends were taxed preferentially; however since 2000 the situation has been reversed. (See Appendix 1) Especially in the 1994 federal budget, the lifetime exemption on capital gains introduced in 1985 was dropped. In 2000, the federal budget lowered the taxable portion of capital gains from 75 to 50 percent that may make a marginal investor to prefer capital gains to dividend income. Bauer *et. al.* (2002) report that price drop to dividend ratio is consistently less than one during the period 1986-1999, irrespective of tax treatment to capital gain or dividend income. Though it is hard to refute that taxes influence investor behaviour, Bauer *et. al.* 's (2002) apparently puzzling results compel us to look into the Canadian ex-dividend day price drop

behaviour more critically by investigating the trading patterns at and around the ex-dividend day..

Notice that E&G ratio has been derived from the perspective of sellers who are long-term investors at the same time. Let us see the situation from the short-term trader's viewpoint. If an investor Y decides to buy investor X's shares at the 'cum day', then, ignoring transaction costs, she will be paying the price P_c per share. However if dividend capturing is the main motive of the short-term trader and if she decides to sell the shares at the ex-dividend day, then, ignoring transaction costs, her net inflow per share will be $P_x + D(1-t_d)$. Since in general $P_c > P_x$ short-term traders do not need to pay any capital gains tax.[9] From this viewpoint, under the equilibrium condition around the ex-dividend day that defines arbitrage opportunity, we can write that: $P_c = P_x + D(1-t_d)$

Solving for the price drop dividend ratio:

$$\frac{P_c - P_x}{D} = 1 - t_d \qquad (3)$$

For non-tax exempt investors, the above ratio should be less than one. This shows that, as dividends are taxed, the price drop to dividend ratio should be less than one, and it need not only be due to the different level of taxation between capital gain and dividend incomes as argued by E&G; it can be due to the presence of short term trading.

Tables 2 and 3 about Here

[9] We assume away the potential reduction in capital gains tax that could be offset by the capital loss since $P_c > P_x$. This actually makes our derivation a conservative one.

Table 2 presents the mean values of price drop to dividend ratio for the period 1996-2003 by year, by dividend yield quintiles and for the entire period. It shows that mean price drop to dividend ratio is consistently less than one irrespective of preferential dividend tax (evident in 1996-1999) or preferential capital gain tax (evident in 2000-2003).

Table 3 presents the event analysis in terms of abnormal return and abnormal volume behaviour around the ex-dividend day. We can see that there is significant abnormal volume around ex-dividend day (as suggested by Lakonishok and Vermalean, 1986; and Karpoff and Walking, 1990). This is consistent in 1996-1999 period (dividend tax preference), 2000-2003 period (capital gain tax preference) and the overall period (1996-2003). This provides support for hypothesis 1b that there is significant short-term trading around ex-dividend day. As predicted, we also observe positive abnormal return before the ex-day (though not quite statistically significant) and negative abnormal return after the ex-day. This signifies buying pressure before the ex-dividend day and selling pressure after the ex-dividend day and implies that short-term traders are buying the stocks prior to ex-dividend day and selling the stocks afterwards. Results presented in Table 2 and 3 jointly support our hypothesis 1b that price drop to dividend ratio is less than one because of dividend tax impact and it is driven by short-term trading.

From Table 2 we can also see that in general, price drop to dividend ratio is increasing with dividend yield. This is consistent with the dividend clientele effect as argued by Miller and Modigliani (1961). According to dividend clientele effect, investors with low marginal tax would invest in stocks with high dividend yield and hence the price drop to

dividend ratio will be relatively higher. Alternatively, investors in high tax brackets will hold low dividend yield stocks to reduce their tax liability. Whether we take E&G's long-term investors' perspective (equation 2) or short-term trading perspective (equation 3), price drop to dividend ratio should increase as tax on dividend income decreases. This implies that high dividend paying stocks are held by investors with low marginal tax and hence are subjected to higher price drop to dividend ratio.

5.3 Hypothesis 1c

As discussed earlier, short-term trading is motivated by either arbitrage opportunity or dividend capturing activity. In both cases high dividend yielding stocks would be preferred as they leave more room for speculation in terms of the price drop and provide more dividend income. However as pointed out earlier, because of the dividend income motive and low dividend income tax liability, very high dividend yielding stocks are most likely to be held by corporations and individual long term investors with marginal tax rate. This has been also empirically supported in the section above that provides evidence for dividend tax clientele effect. Hence, short term trading might not be very prominent for the stocks with very high dividend yield.

Accordingly, to investigate the trading behavior prior to the ex-dividend day for different category of dividend yielding stocks we conducted event study for each of the dividend yield quintiles separately. These results are presented in Table 4.

Table 4 about Here

From Table 4a we can see that there is significant abnormal trading volume at immediate pre- and post-ex-dividend day period for all groups but for group 1 (highest dividend yield group) for 1996-2003 periods. We see similar results for 1996-1999 and 2000-2003 period (Table 4a and 4b respectively). This supports Hypothesis 1C partially that short-term trading is not prominent in highest dividend yielding stock group. However, we do see that lowest dividend yield group is equally active in terms of short-term trading activity and hence we do not find support for the lower interest by short-term traders in lower dividend yielding stocks. We need to interpret these results cautiously though, as we have excluded very low dividend paying stocks from our sample.

5.4 Hypotheses 2a and 2b

Kato and Loewenstein (1995), and Eades *et al.* (1984) have argued that if the marginal investor's tax rate on dividend income is greater than the present value of the capital gains tax rate, the investor will demand a tax premium in the form of a higher pre-tax return on the ex-dividend day. Consequently, the expected pre-tax rate of return from holding a security going ex is equal to its non ex-day expected rate of return (R) plus a tax premium (Eades *et. al.* 1984). Eades *et. al.* have shown that if expected after-tax rates of return are constant over time, the observed returns on the ex-dividend day can be expressed as (for detail derivation please refer to Eades *et. al.* 1984, page 5):

$$R_{ex} = R + \frac{D}{P_{cum}}\left(\frac{t_d - t_g}{1 - t_g}\right) \qquad (4)$$

where **R** is the observed returns on any day other than the ex-dividend day and **Rex** is the observed return on ex-dividend day. Both of them are pre-tax returns. The difference

between Rex and R can be seen as the abnormal return on the ex-dividend day. In the Canadian context, we have seen that prices around ex-dividend day are driven by short-term trading. In such situation capital gain tax does not play any vital role in trading decision and equation (4) reduces to:

$$R_{ex} = R + \frac{D}{P_{cum}} \times t_d \qquad (5)$$

For, $t_d > t_g$ (as in equation 4) or $t_d > 0$ (as in equation 5) excess returns should be positive, but much lower than the dividend yield if the dividend-related tax hypothesis is supported by the evidence. Also the ex-day abnormal return should be increasing with dividend yield.

From Table 3, we have already seen that abnormal return on ex-dividend day is positive and significant (for overall period it is 0.0039). The results presented in Table 4a, 4b and 4c also show that the ex-day abnormal return is higher for the high dividend yield categories (group 1 and 2) in comparison with low dividend yield categories (group 4 and 5). Table 5 results show that this abnormal return is much smaller than the dividend yield in each year as well as in each dividend yield quintile and thus provide further support for hypothesis 2a.

Table 5 about Here

In order to further investigate the relationship between dividend yield and ex-day abnormal return we perform the following regression analysis.

$$\text{ARex} = \beta_0 + \beta_1 * \text{DYIELD} + \beta_2 * \text{YRPRE00} \qquad (6)$$

Where ex-day abnormal returns, ARex, is the dependent variable and DYIELD is dividend yield, and YRPRE00 is a dummy variable to detect in the difference in the pre-2000 period (1996-1999) and the post-2000 period (2000-2003).

Table 6 about Here

Results of the regression analyses are presented in Table 6. From Table 6 we can see that dividend yield has a positive and significant impact on Ex-day abnormal return. The coefficient of dummy variable is also positive and significant, implying that effect on dividend yield on Ex-day abnormal return is stronger in 1996-1999 periods when dividend income tax was treated preferentially. These observations support hypothesis 2b that dividend yield has positive and significant relationship with Ex-day abnormal return.

6. Summary and Conclusions

In this study we analyse the stock price behaviour around the ex-dividend day in Canada for the period 1996-2003. Between 1996-1999 dividend income received a preferential tax treatment over capital gain and in 2000-2003 capital gain received the favourable tax treatment.

Major conclusions of our study are as follows: First, Canadian market behaves rationally around ex-dividend day as stock price drops on ex-dividend day and the drop is more pronounced for high dividend yielding stocks. Second, the price drop to dividend ratio is consistently less than one in each year and this behaviour is governed by dividend tax rate but is also driven by short-term trading activities. Third, Short-term trading activities

are not prominent in the highest dividend yielding stock group. Fourth, there is significant abnormal return on ex-dividend day, which is less than dividend yield and that dividend yield has positive and significant relationship with Ex-day abnormal return.

Overall, our results indicate that irrespective of the differential tax treatment, the price drop to dividend ratio is consistently less than one in all years. Thus, we argue that the E&G theory alone is not sufficient in explaining such behaviour and that the short-term trading around the ex-dividend day could be the missing link in explaining the ex dividend day price change.

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Appendix 1: Tax Regimes for Ordinary Investor, 1982-2000*

Period	Break-Even Tax Rate (%)[a]	Top Tax Bracket (%)	Maximum Tax Rate (%)	Taxed-Based Preference
1982-84	34.0	34	34.0	indifferent
1985	34.0	34	35.7	capital gains
1986/1 – 1986/6	22.7/34.0[b]	34	40.6	capital gains
1986/7 – 1986/12	22.7/34.0[b]	34	35.0	capital gains
1987	16.7/34.0	34	35.0	capital gains
1988	13.3/28.6[b]	29	29.9	capital gains
1989	13.3/28.6[b]	29	30.6	capital gains
1990	33.3	29	30.5	dividends
1991	33.3	29	31.9	dividends
1992	33.3	29	31.8	dividends
1993-98	33.3	29	31.3	dividends
1999	33.3	29	30.9	dividends
2000/1 – 2000/2	33.3	29	30.5	dividends
2000/2 – 2000/10	28.6	29	30.5	capital gains
2000/10 – 2000/12	22.2	29	30.5	capital gains

*** Based on Table 1, Bauer *et. al.* 2002**

[a] Dividends are preferred when the break-even rate is more than the maximum rate.
[b] Lifetime capital gains exemption exhausted.

Table 1. Pcum/Pex ratios

Panel A. Means of P_{cum}/P_{ex} ratio per year and for the entire period.

Ratio\ Year	1996	1997	1998	1999	2000	2001	2002	2003	1996-2003
P_{cum} / P_{ex}	1.0091	1.0090	1.0080	1.0184	1.0431	1.0070	1.0052	1.0076	1.0142
No. observations	195	192	173	188	199	185	135	140	1407

Notes: P_{cum} is the share price on the day before the ex-day and P_{ex} is the share price on the ex-day.

Panel B. Means of P_{cum}/P_{ex} ratio arranged by dividend yield.

Group\ Year	1996	1997	1998	1999	2000	2001	2002	2003	1996-2003
Highest 1	1.0275	1.0273	1.0292	1.0675	1.2024	1.0166	1.0116	1.0213	1.0537
2	1.0107	1.0053	1.0081	1.0115	1.0057	1.0111	1.0038	1.0072	1.0081
3	1.0041	1.0050	1.0031	1.0078	1.0047	1.0015	1.0049	1.0051	1.0045
4	1.0005	1.0042	1.0002	1.0046	1.0035	1.0032	1.0035	1.0013	1.0027
Lowest 5	1.0028	1.0020	1.0004	1.0005	1.0020	1.0026	1.0023	1.0025	1.0020

Note: The sample is dividend into quintiles from highest to lowest dividend yield group.

Table 2. Means of the price drop to dividend ratio: $(P_{ex}-P_{cum})/D$

	1996	1997	1998	1999	2000	2001	2002	2003	1996-2003
Entire Sample	0.4903	0.5164	0.3559	0.5332	0.3863	0.5202	0.4575	0.6025	0.4803
Highest 1	0.7710	0.7407	0.5666	0.4298	0.4651	0.7236	0.4941	0.9911	0.6498
2	0.7890	0.4076	0.7931	0.8503	0.3630	0.9244	0.3186	0.7028	0.6489
3	0.3842	0.5251	0.3430	0.7454	0.3744	0.1117	0.6120	0.6086	0.4531
4	0.0409	0.5441	0.0490	0.5462	0.3790	0.4185	0.4835	0.1840	0.3321
Lowest 5	0.4664	0.3528	0.0546	0.1194	0.2944	0.4226	0.3796	0.3974	0.3182

Note: D is the dividend amount.

Table 3. Abnormal return and abnormal volume around ex-days for dividend paying securities from 1996 to 2003

Panel A. Abnormal return and abnormal volume from 1996 to 2003

Event Day	AR	t-stat	AV	t-stat
-10	0.0000	0.0167	162568.6	5.7569
-9	0.0007	0.6236	113387.8	4.0153
-8	0.0010	0.8212	113833.3	4.0311
-7	0.0013	1.0784	158447.9	5.6109
-6	0.0008	0.6558	176646.8	6.2554
-5	0.0007	0.6032	120327.1	4.2610
-4	-0.0005	-0.4069	107133.1	3.7938
-3	0.0003	0.2751	157761.7	5.5866
-2	0.0022	1.8453	202045.4	7.1548
-1	0.0014	1.1944	128730.4	4.5586
Ex-day	0.0039	3.2690	96934.0	3.4326
1	-0.0027	-2.2653	132264.0	4.6837
2	-0.0005	-0.4088	167999.0	5.9492
3	-0.0049	-4.1820	129266.2	4.5776
4	-0.0013	-1.0757	83059.4	2.9413
5	-0.0009	-0.7883	143540.8	5.0831
6	-0.0010	-0.8226	175023.3	6.1979
7	-0.0009	-0.7223	123449.2	4.3716
8	-0.0022	-1.8335	67633.3	2.3950
9	-0.0005	-0.4044	121379.3	4.2983
10	0.0001	0.0861	159505.2	5.6484

Note: AR and AV stand for abnormal return and abnormal volume respectively. We employ a standard event study methodology and use the market model to calculate abnormal returns. We employ the mean-adjusted model to analyze volume data by comparing the trading volume around the ex-day with normal volume levels for the securities in our sample. Normal volume levels are computed as average volumes of a 60 day-window prior to an event period of [-15, +15].

Panel B. Abnormal return and abnormal volume from 1996 to 1999

Event Day	AR	t-stat	AV	t-stat
-10	-0.0007	-0.5365	25070.4	1.8108
-9	0.0009	0.6704	38934.8	2.8123
-8	0.0003	0.1980	78638.9	5.6801
-7	0.0016	1.1603	48922.0	3.5336
-6	0.0011	0.7904	51612.1	3.7279
-5	0.0001	0.0478	63415.0	4.5804
-4	-0.0002	-0.1441	56333.0	4.0689
-3	0.0012	0.8507	45948.0	3.3188
-2	0.0010	0.7564	56338.2	4.0693
-1	0.0007	0.5451	63412.5	4.5803
Ex-day	0.0052	3.8495	40079.9	2.8950
1	-0.0024	-1.7804	24076.2	1.7390
2	-0.0004	-0.3259	30145.6	2.1774
3	-0.0013	-0.9550	40505.9	2.9257
4	-0.0007	-0.5252	38333.3	2.7688
5	-0.0016	-1.1611	56334.5	4.0690
6	-0.0008	-0.6164	52574.3	3.7974
7	-0.0009	-0.6343	50995.2	3.6834
8	-0.0026	-1.9324	41173.0	2.9739
9	-0.0011	-0.7814	31409.3	2.2687
10	0.0008	0.5780	21361.8	1.5430

Note: AR and AV stand for abnormal return and abnormal volume respectively. We employ a standard event study methodology and use the market model to calculate abnormal returns. We employ the mean-adjusted model to analyze volume data by comparing the trading volume around the ex-day with normal volume levels for the securities in our sample. Normal volume levels are computed as average volumes of a 60 day-window prior to an event period of [-15, +15].

Panel C. Abnormal return and abnormal volume from 2000 from 2003

Event Day	AR	t-stat	AV	t-stat
-10	0.0009	0.5232	324775.3	5.4240
-9	0.0005	0.3252	201963.4	3.3729
-8	0.0018	1.0592	156031.3	2.6058
-7	0.0009	0.5608	289148.7	4.8290
-6	0.0004	0.2646	325941.9	5.4435
-5	0.0014	0.8646	188471.8	3.1476
-4	-0.0008	-0.4788	167245.2	2.7931
-3	-0.0006	-0.3728	292754.0	4.8892
-2	0.0035	2.0918	378128.0	6.3150
-1	0.0022	1.3005	207430.6	3.4643
Ex-day	0.0023	1.3881	164827.8	2.7528
1	-0.0030	-1.7819	261734.7	4.3712
2	-0.0005	-0.3177	333832.5	5.5753
3	-0.0090	-5.4595	235101.4	3.9264
4	-0.0019	-1.1410	136449.3	2.2788
5	-0.0002	-0.1261	246944.7	4.1242
6	-0.0011	-0.6752	321020.1	5.3613
7	-0.0008	-0.5069	209864.5	3.5049
8	-0.0016	-0.9853	99297.5	1.6583
9	0.0002	0.1124	229403.4	3.8312
10	-0.0007	-0.4115	326524.8	5.4532

Note: AR and AV stand for abnormal return and abnormal volume respectively. We employ a standard event study methodology and use the market model to calculate abnormal returns. We employ the mean-adjusted model to analyze volume data by comparing the trading volume around the ex-day with normal volume levels for the securities in our sample. Normal volume levels are computed as average volumes of a 60 day-window prior to an event period of [-15, +15].

Table 4. Abnormal Return and Abnormal volume around ex-dividend day for dividend yield quintiles

Panel A. Abnormal Return and Abnormal volume from 1996 to 2003

Dividend yield	Highest				Group 2				Group 3				Group 4				Lowest			
Event Day	AR	t-stat	AV	t-stat	AR	t-stat	AV	T-stat	AR	t-stat	AV	t-stat	AR	t-stat	AV	t-stat	AR	t-stat	AV	t-stat
-10	0.001	0.362	-9613	-0.419	0.000	-0.029	170208	3.739	0.002	1.044	196029	4.112	-0.002	-1.016	334238	5.623	-0.001	-0.319	113534	2.239
-9	0.003	1.334	31153	1.359	0.000	-0.244	88072	1.935	0.000	-0.070	165282	3.467	0.001	0.350	275090	4.628	0.000	0.061	2339	0.046
-8	0.002	0.672	27658	1.206	0.000	0.156	22257	0.489	0.001	0.772	149310	3.132	0.001	0.749	238317	4.009	0.000	0.091	120724	2.381
-7	0.005	1.785	-9772	-0.426	0.000	0.328	84149	1.849	0.000	-0.167	182859	3.835	0.001	0.667	295236	4.967	0.001	0.269	224739	4.433
-6	0.003	1.225	3053	0.133	0.000	-0.175	146716	3.223	0.002	1.113	249800	5.239	0.000	0.138	359566	6.049	-0.001	-0.570	113330	2.235
-5	-0.001	-0.346	28414	1.239	0.000	-0.109	116375	2.557	0.001	0.764	125330	2.629	0.002	1.100	264135	4.443	0.001	0.570	62569	1.234
-4	-0.002	-0.695	28554	1.245	0.001	0.712	71593	1.573	0.001	0.398	154636	3.243	-0.002	-1.252	161597	2.718	0.000	0.063	115912	2.286
-3	-0.004	-1.569	9611	0.419	0.002	1.253	125176	2.750	0.002	1.017	246520	5.171	0.003	1.531	238955	4.020	-0.001	-0.356	154923	3.056
-2	0.007	2.835	10279	0.448	0.001	0.681	180914	3.975	0.001	0.296	236266	4.956	0.002	0.930	424171	7.136	0.000	0.198	153167	3.021
-1	0.002	0.578	40805	1.779	0.000	-0.085	109515	2.406	0.001	0.728	130695	2.741	0.003	1.485	286253	4.816	0.002	0.758	71697	1.414
Ex-day	0.008	2.991	31436	1.371	0.002	1.690	34112	0.749	0.005	2.765	179140	3.757	0.004	1.957	104937	1.765	0.001	0.397	130385	2.572
1	-0.007	-2.857	-10622	-0.463	-0.002	-1.668	89908	1.975	-0.003	-1.833	192356	4.035	-0.001	-0.565	214199	3.603	0.000	0.185	161876	3.193
2	-0.002	-0.700	-4155	-0.181	-0.001	-0.463	175356	3.852	0.000	-0.273	146404	3.071	0.000	-0.136	370787	6.238	0.001	0.338	145422	2.868
3	-0.008	-2.980	17161	0.748	-0.001	-0.974	70609	1.551	0.000	-0.240	159715	3.350	-0.009	-4.495	318276	5.354	-0.007	-3.175	74367	1.467
4	-0.002	-0.870	39221	1.710	-0.001	-0.392	44223	0.972	0.000	-0.063	106670	2.237	-0.001	-0.684	122242	2.056	-0.002	-1.058	99140	1.955
5	-0.003	-0.988	4191	0.183	0.001	0.393	97666	2.146	0.000	0.264	196366	4.119	-0.001	-0.330	195086	3.282	-0.002	-1.208	209764	4.137
6	-0.002	-0.676	-22081	-0.963	-0.001	-0.519	194329	4.269	0.000	0.132	173031	3.629	-0.002	-1.101	338415	5.693	-0.001	-0.299	173669	3.425
7	-0.002	-0.720	18536	0.808	-0.001	-0.872	171944	3.778	0.000	-0.070	108805	2.282	-0.001	-0.607	251467	4.230	0.000	-0.016	60914	1.201
8	-0.006	-2.151	42878	1.870	-0.001	-0.679	10187	0.224	-0.001	-0.468	120071	2.518	0.000	-0.171	88200	1.484	-0.003	-1.610	74433	1.468
9	0.000	-0.035	-10871	-0.474	-0.001	-0.809	116920	2.569	-0.001	-0.726	157406	3.302	0.001	0.454	157288	2.646	-0.001	-0.383	173020	3.412
10	0.000	-0.140	-23228	-1.013	-0.001	-0.795	193999	4.262	0.001	0.561	142922	2.998	0.001	0.288	322076	5.418	0.000	0.174	150096	2.960

Note: AR and AV stand for abnormal return and abnormal volume respectively. We employ a standard event study methodology and use the market model to calculate abnormal returns. We employ the mean-adjusted model to analyze volume data by comparing the trading volume around the ex-day with normal volume levels for the securities in our sample. Normal volume levels are computed as average volumes of a 60 day-window prior to an event period of [-15, +15].

Panel B. Abnormal Return and Abnormal volume from 1996 to 1999

Dividend yield	Highest				Group 2				Group 3				Group 4				Lowest			
Event Day	AR	t-stat	AV	t-stat	AR	t-stat	AV	T-stat	AR	t-stat	AV	t-stat	AR	t-stat	AV	t-stat	AR	t-stat	AV	t-stat
-10	-0.006	-2.309	-3682	-0.159	0.001	0.650	-22374	-0.697	0.001	0.351	24924	0.988	0.000	0.074	114578	3.719	0.001	0.310	14628	0.489
-9	0.007	2.397	5337	0.231	-0.001	-0.796	15026	0.468	0.000	-0.077	44413	1.761	-0.001	-0.370	122484	3.976	0.000	0.039	9178	0.307
-8	0.000	0.096	-7057	-0.306	0.000	0.138	18454	0.575	0.000	-0.035	41468	1.644	0.002	0.956	268704	8.722	-0.001	-0.350	70692	2.363
-7	0.006	2.041	-11555	-0.500	0.000	-0.044	-28014	-0.872	0.001	0.449	25504	1.011	0.001	0.672	163893	5.320	0.000	0.006	94062	3.144
-6	0.006	2.071	15637	0.677	-0.001	-0.947	-27406	-0.853	0.002	0.681	92221	3.657	0.001	0.380	117387	3.810	-0.001	-0.519	60339	2.017
-5	-0.001	-0.496	-10940	-0.474	0.000	0.041	27113	0.844	0.000	0.082	52066	2.065	0.001	0.406	146265	4.747	0.001	0.213	102661	3.432
-4	-0.002	-0.640	-21888	-0.948	0.001	0.608	36155	1.126	0.002	0.738	38724	1.536	-0.004	-1.722	133879	4.345	0.002	0.632	94976	3.175
-3	-0.004	-1.403	-3797	-0.164	0.002	1.703	5924	0.184	0.001	0.374	65949	2.615	0.006	2.730	126682	4.112	0.001	0.259	35012	1.170
-2	0.003	1.135	12684	0.549	0.001	0.408	-584	-0.018	0.000	-0.102	68526	2.717	0.001	0.638	145568	4.725	0.000	0.119	56973	1.904
-1	-0.001	-0.422	12817	0.555	0.001	0.454	30940	0.963	0.001	0.468	79542	3.154	0.003	1.459	129877	4.216	0.000	0.029	64411	2.153
Ex-day	0.012	4.288	6165	0.267	0.002	1.845	6905	0.215	0.004	1.801	20521	0.814	0.005	2.145	146234	4.746	0.003	1.054	20957	0.701
1	-0.007	-2.558	-14405	-0.624	-0.002	-1.344	-14570	-0.454	-0.003	-1.084	6524	0.259	-0.001	-0.647	79500	2.580	0.001	0.199	61399	2.052
2	-0.001	-0.403	-17549	-0.760	0.000	-0.174	-10140	-0.316	-0.001	-0.230	11212	0.445	-0.001	-0.626	76641	2.488	0.001	0.349	88254	2.950
3	-0.004	-1.456	-25905	-1.122	-0.002	-1.617	-14211	-0.442	-0.001	-0.424	36462	1.446	-0.001	-0.363	106906	3.470	0.001	0.495	98846	3.304
4	0.000	0.121	-9616	-0.416	-0.001	-0.616	35054	1.091	0.001	0.512	23702	0.940	-0.002	-0.964	106423	3.454	-0.002	-0.795	36978	1.236
5	-0.002	-0.881	20857	0.903	-0.002	-1.853	10362	0.323	0.000	0.080	30252	1.200	0.001	0.247	140190	4.550	-0.004	-1.337	79562	2.660
6	-0.001	-0.365	-14786	-0.640	0.001	0.757	18412	0.573	0.000	-0.040	28321	1.123	-0.004	-1.996	106855	3.468	0.000	0.000	121050	4.046
7	-0.001	-0.362	-32449	-1.405	-0.002	-1.250	116727	3.635	0.000	0.006	-7530	-0.299	-0.003	-1.187	75897	2.463	0.001	0.306	99243	3.317
8	-0.005	-1.931	-12112	-0.524	-0.002	-1.157	-3382	-0.105	-0.002	-0.774	56883	2.256	0.000	0.226	77776	2.524	-0.005	-1.762	83841	2.803
9	-0.001	-0.416	-19011	-0.823	-0.004	-2.700	19990	0.622	0.000	0.134	10913	0.433	0.001	0.320	89646	2.910	-0.001	-0.532	53445	1.787
10	0.002	0.552	-34514	-1.494	-0.002	-1.807	11409	0.355	0.003	1.113	-94	-0.004	0.000	0.105	80172	2.602	0.002	0.708	47579	1.590

Note: AR and AV stand for abnormal return and abnormal volume respectively. We employ a standard event study methodology and use the market model to calculate abnormal returns. We employ the mean-adjusted model to analyze volume data by comparing the trading volume around the ex-day with normal volume levels for the securities in our sample. Normal volume levels are computed as average volumes of a 60 day-window prior to an event period of [-15, +15].

Panel C. Abnormal Return and Abnormal volume from 2000 to 2003

Dividend yield	Highest				Group 2				Group 3				Group 4				Lowest 5			
Event Day	AR	t-stat	AV	t-stat	AR	t-stat	AV	T-stat	AR	t-stat	AV	t-stat	AR	t-stat	AV	t-stat	AR	t-stat	AV	t-stat
-10	0.010	2.525	-17429	-0.400	-0.001	-0.480	398694	4.233	0.003	1.399	391773	4.145	-0.004	-1.467	573075	4.495	-0.002	-0.761	230638	2.211
-9	0.000	-0.051	65006	1.492	0.001	0.246	176727	1.876	0.000	-0.025	302590	3.201	0.002	0.772	443194	3.476	0.000	0.046	-5923	-0.057
-8	0.004	0.880	74722	1.715	0.000	0.105	26795	0.284	0.003	1.395	275415	2.914	0.001	0.274	204103	1.601	0.002	0.487	179634	1.722
-7	0.003	0.869	-7423	-0.170	0.001	0.448	219126	2.327	-0.002	-0.888	366649	3.879	0.001	0.386	444441	3.486	0.001	0.371	376323	3.607
-6	0.000	0.077	-14398	-0.331	0.001	0.403	349617	3.712	0.002	1.096	431525	4.565	0.000	-0.121	628233	4.928	-0.001	-0.282	176150	1.688
-5	0.000	-0.089	81250	1.865	0.000	-0.166	223341	2.371	0.003	1.233	208977	2.211	0.003	1.208	394897	3.098	0.002	0.592	13748	0.132
-4	-0.002	-0.463	94759	2.175	0.001	0.494	112842	1.198	0.000	-0.220	282320	2.987	-0.001	-0.357	193085	1.515	-0.002	-0.568	141408	1.355
-3	-0.004	-1.080	28126	0.646	0.001	0.431	269694	2.863	0.003	1.310	455529	4.819	0.000	-0.089	366255	2.873	-0.002	-0.763	296722	2.844
-2	0.012	3.082	7114	0.163	0.001	0.596	401411	4.262	0.001	0.655	428905	4.538	0.002	0.782	746997	5.859	0.000	0.159	270139	2.589
-1	0.004	1.125	78039	1.791	-0.001	-0.419	204973	2.176	0.001	0.682	188241	1.992	0.002	0.888	467064	3.664	0.003	1.041	80545	0.772
Ex-day	0.003	0.786	63801	1.464	0.002	0.900	67117	0.713	0.005	2.562	360064	3.809	0.003	0.976	57511	0.451	-0.002	-0.515	261526	2.507
1	-0.008	-1.957	-5613	-0.129	-0.003	-1.219	218092	2.316	-0.004	-1.834	401238	4.245	-0.001	-0.259	367841	2.885	0.000	0.059	281492	2.698
2	-0.003	-0.653	13307	0.305	-0.001	-0.478	398263	4.229	0.000	-0.185	303227	3.208	0.001	0.338	709643	5.566	0.000	0.122	214480	2.056
3	-0.012	-3.005	74582	1.712	0.000	-0.125	173960	1.847	0.000	0.121	297758	3.150	-0.017	-6.047	556485	4.365	-0.016	-5.041	45384	0.435
4	-0.005	-1.294	103153	2.368	0.000	-0.072	55586	0.590	-0.002	-0.758	204125	2.160	0.000	-0.168	140055	1.099	-0.002	-0.687	169825	1.628
5	-0.003	-0.680	-17459	-0.401	0.004	1.802	204370	2.170	0.001	0.364	386211	4.086	-0.002	-0.672	255558	2.005	-0.001	-0.365	363924	3.488
6	-0.003	-0.655	-31268	-0.718	-0.003	-1.228	421168	4.472	0.001	0.283	339913	3.596	0.000	0.082	593492	4.655	-0.001	-0.421	235625	2.258
7	-0.003	-0.722	84956	1.950	-0.001	-0.246	240375	2.552	0.000	-0.129	239913	2.538	0.000	0.114	447773	3.512	-0.001	-0.328	15107	0.145
8	-0.006	-1.474	112497	2.582	0.000	-0.066	26976	0.286	0.000	0.164	191412	2.025	-0.001	-0.437	100279	0.787	-0.002	-0.477	63112	0.605
9	0.001	0.273	88	0.002	0.002	0.867	238083	2.528	-0.003	-1.446	321203	3.398	0.001	0.378	234593	1.840	0.000	0.004	313640	3.006
10	-0.003	-0.637	-8762	-0.201	0.001	0.249	420662	4.466	-0.001	-0.446	310355	3.284	0.001	0.325	598538	4.695	-0.001	-0.476	275117	2.637

Note: AR and AV stand for abnormal return and abnormal volume respectively. We employ a standard event study methodology and use the market model to calculate abnormal returns. We employ the mean-adjusted model to analyze volume data by comparing the trading volume around the ex-day with normal volume levels for the securities in our sample. Normal volume levels are computed as average volumes of a 60 day-window prior to an event period of [-15, +15].

Table 5: Dividend Yield Quintiles 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003	1996 - 2003
Entire Sample	0.0158	0.0138	0.0123	0.0189	0.0286	0.0113	0.0099	0.0101	0.0156
Highest 1	0.0406	0.0339	0.0329	0.0586	0.1065	0.0261	0.0203	0.0212	0.0444
2	0.0131	0.0122	0.0098	0.0126	0.0144	0.0114	0.0100	0.0103	0.0119
3	0.0104	0.0094	0.0083	0.0101	0.0105	0.0085	0.0080	0.0080	0.0093
4	0.0088	0.0074	0.0067	0.0081	0.0078	0.0065	0.0067	0.0066	0.0074
Lowest 5	0.0063	0.0051	0.0045	0.0049	0.0055	0.0042	0.0045	0.0044	0.0050
No. observations	195	192	173	188	199	185	135	140	1407

Table 6: Dividend Yield Impact on Ex-date Abnormal Return

	Coefficient	t-stat	Sig.
(Constant)	-0.002	-1.844	0.065
DYIELD	0.162	2.330	0.020
YRPRE00	0.002	2.872	0.004

Dep. Variable: Abnormal Return on Ex-Dividend Date

Note: Dividend payment cases between 1996 and 2003 are considered in the above regression. DYIELD = dividend yield, calculated as dividend payment divided by price of cum-dividend stock. YRPRE00 is a dummy variable. The value of the dummy variable is 1, if dividend is paid between 1996 and 1999 and 0 otherwise. Dependent variable is the Abnormal Return on Ex-dividend date.