

New Evidence on the Behavior of Canadian Stock Prices in the Days Surrounding the Ex-Dividend Day

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This study tests the clienteles and short-term traders hypotheses employing a modified version of the model of delay and acceleration of trade for Canadian data over different tax and transactions cost regimes from 1970 to 1984. The evidence supports the modified model of delay and acceleration of trade and is consistent with the short-term traders hypothesis. Short-term traders transact around the ex-dividend days with the intention of capturing or avoiding dividends subject to the prevailing tax and transaction cost regime. This gives rise to abnormal returns on dividend-paying stocks in the days surrounding the ex-dividend days. Moreover, the higher the stock's dividend yield, the greater is the abnormal return during these days.

INTRODUCTION

Ever since Elton and Gruber (1970) used the ratio of the ex-dividend day price change to the dividend per share to infer the typical investor's marginal tax rate and advanced the dividend (tax) clientele hypothesis there has been considerable debate about the interpretation of their results.¹ Miller and Scholes (1982) and Kalay (1982) have challenged Elton and Gruber's dividend clientele hypothesis. They argue that the Elton and Gruber analysis ignores the short-term trades by members of the exchange and by tax-exempt investors whose activities tend to eliminate abnormal returns around the ex-dividend day. The findings of Lakonishok and Vermaelen (1986) support Kalay's short-term trading hypothesis in that trading volume increases around the ex-dividend day, particularly in the period following the introduction of negotiable commissions in 1975. Karpoff and Walkling (1988) provide further support for the short-term trading hypothesis. Their study of stock returns on the ex-dividend day shows that short-term traders are the marginal investors in high yield stocks on the NYSE, particularly since the advent of negotiated commissions. Short-term trading, however, is not evident in low yield stocks at any time.

Foster and Oldfield (1986), on the other hand, find that transactions costs are large enough to limit the ability of short-term traders to effect particular price adjustments. Heath and Jarrow (1988) demonstrate that the ex-dividend day stock price may differ arbitrarily from the dividend for each individual stock; therefore, short-term traders cannot

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¹ See, for example, Miller and Scholes (1982), Kalay (1982), Green (1980), Eades, Hess, and Kim (1984), Grundy (1985), Michaely (1991), Robin (1991).

generate riskless arbitrage profits. As a result, ex-dividend stock returns must include a risk premium. Their argument does not rely on transactions costs, but on risk considerations.

Lakonishok and Vermaelen (1983) and Booth and Johnston (1984) have performed similar studies using Canadian data. Lakonishok and Vermaelen examine the ex-dividend day behavior of Canadian stock prices around the introduction of a tax reform in 1972 and conclude that the Elton and Gruber tax clientele hypothesis is invalid. Booth and Johnston, on the other hand, investigate the ex-dividend day behavior using the Elton and Gruber methodology over four distinct tax regimes between 1970 and 1980. They find that the marginal tax rate implied by the ratio of the ex-dividend day price change to the dividend is greater than the maximum marginal tax rate payable. The only firm conclusion they are able to reach is that the ex-dividend day price changes for stocks interlisted on Canadian and U.S. exchanges are determined by U.S. rather than by Canadian investors.

Green (1980) extends the Elton and Gruber analysis by introducing costs of delaying or accelerating a transaction. His work sets the theoretical foundation for the development of the model of delay and acceleration of trade in response to different tax rates. Grundy (1985) extends and tests Green's model by examining the extent to which investors accelerate or delay trades in response to the payment of the dividend. He argues that a tax-induced incentive to either delay or accelerate trades would result in specific patterns of abnormal returns around the ex-dividend day. He shows that when capital gains are taxed on realization rather than accrual, the stock price behavior is affected not only on the ex-dividend day, but also during a few days around it. His empirical results lead him to conclude that the evidence is consistent with the predictions of the model of delay and acceleration of trade and the existence of dividend clienteles.

This study tests the clienteles and short-term traders hypotheses employing a modified version of the model of delay and acceleration of trade to Canadian data over different tax and transactions cost regimes from 1970 to 1984. There were significant differences between the structure of tax rates and transactions costs in Canada and in the U.S. over the period studied. In addition, there were several different tax regimes in effect in Canada between 1970 and 1984, each of which had different implications for the taxation of dividends and capital gains. Between 1970 and 1984 there were six major changes in the taxation of dividends and capital gains. Over the same period there were also regulatory changes in transactions costs that started in 1976 and led to initially lower transactions costs for large trades and then to fully negotiable commissions in 1983. If taxed investors are the marginal traders, as in the Elton and Gruber model, then stock prices around the ex-dividend days should be affected only by tax changes, not by the reduction in transactions costs. If transactions costs changes impact stock prices around ex-dividend days, however, then taxed investors will not be the marginal traders; hence, the Elton and Gruber tax clienteles argument is invalid. Canada, therefore, provides an excellent testing ground for the clienteles and short-term traders hypotheses that otherwise may be difficult to detect.

This paper, based on the argument that untaxed/short-term investors² are the dominant and marginal traders, develops and tests hypotheses on how abnormal returns should behave under both the clientele and short-term traders hypotheses over the different tax and transactions cost regimes in Canada between 1970 and 1984. The evidence supports the modified model of delay and acceleration of trade and is consistent with the short-term traders hypothesis. Short-term traders/untaxed investors are shown to transact around the ex-dividend days with the intention of capturing or avoiding dividends subject to the prevailing tax and transactions cost regime in order to maximize their after tax returns. This gives rise to abnormal returns on dividend paying stocks in the days surrounding the ex-dividend days. Moreover, the higher the stock's dividend yield, the greater is the abnormal return during these days.

THE CANADIAN TAX AND TRANSACTIONS COST REGIMES

CANADIAN TAX RATES AND TAX REGIMES³

Canada's tax system is unusual in at least two respects. Dividends have been given special treatment in order to minimize the effects of double taxation since 1949, and capital gains taxes were introduced only at the beginning of 1972.⁴ As a result, the difference between the tax on dividends and that on capital gains was larger in Canada than in the U.S. before 1972. The situation was reversed, however, subsequently.

Dividends in Canada have been taxed according to the following formula:⁵

$$(1) \quad \begin{array}{ll} \text{Pre-1972:} & T = t_{fp} - C_{fp} \\ \text{Post-1971:} & T = (1 + G) (t_f - C) (1 + t_p) \end{array}$$

where:

T = Tax payable per dollar of dividend;

G = Gross-up factor;⁶

² The terms *untaxed investors* and *short-term traders* are used interchangeably in this paper to mean investors who are indifferent between dividends and capital gains.

³ A more extensive description of the Canadian tax system can be found in Booth and Johnston (1984).

⁴ It is also worth noting that regular income (e.g., from employment or interest receipts) was taxed at a higher rate than either dividends or capital gains at all times. In addition, the Canadian tax law makes no distinction between short- and long-term capital gains.

⁵ This is true in all provinces of Canada except Quebec which operates its own taxation system.

⁶ To encourage investments in equities and as part of the scheme to integrate corporate and shareholder income and eliminate double taxation of dividends, dividend income earned by Canadian individuals from taxable Canadian corporations is afforded a special treatment. Investors include $(1 + G)$ percent of such dividends received in their computation of taxable income. The incremental G percent was called *gross-up*, a term invented by the Department of Finance. Federal tax was computed on this grossed-up amount. From the federal tax, the investors then subtract a dividend tax credit equal to C percent of the dividend. Provincial tax is calculated on the residual net federal tax payable.

t_f = Marginal federal tax rate;

C = Dividend tax credit;

t_p = Marginal provincial tax as a (constant) percentage of the federal tax payable;⁷

t_{fp} = Combined federal/provincial marginal tax rate;

C_{fp} = Combined federal/provincial dividend tax credit.

Realized capital gains have been taxed as follows:⁸

Pre-1972: $CG = 0$

(2)

Post-1971: $CG = \left(\frac{t_f}{2}\right)(1 + t_p)$

where:

CG = Tax paid per dollar of capital gain.

In the period 1970 through mid-1984 six separate regimes have existed, each of which had different tax rates for dividends and capital gains. The details of each, the maximum rates at which dividends and capital gains were taxed, and the federal marginal tax rate at which dividends and capital gains received equal treatment for the top tax bracket investor in the province of Ontario are shown in Table 1.⁹

Examination of the columns labeled T , CG , and $T-CG$ (or $(1-T)/(1-CG)$) reveals that the tax differential for the top marginal bracket investor between dividends and realized capital gains steadily declined (or, equivalently, the marginal rate of substitution between

⁷ t_p is the marginal provincial tax rate which is stated as a constant percentage of the basic federal tax owed. This constant percentage differs between provinces from a 1984 low of 43 percent for Northwest Territories to a high of 60 percent for Newfoundland. Ontario, with a tax rate of 48 percent, had the eighth (among the 12 provinces) highest provincial tax rate in Canada.

⁸ Capital gains taxes can be deferred until death when all such gains are deemed to be realized and the estate incurs a tax liability (or deduction against other realized capital gains).

⁹ As indicated in footnote 7, Ontario had the eighth highest provincial tax rate in Canada in 1984. Therefore, the tax rates reported in Table 1 are not the top marginal rates in Canada. Investors in the provinces of Newfoundland, New Brunswick, P.E.I., Quebec, Saskatchewan, Nova Scotia, and Manitoba had top marginal tax rates higher than Ontario's.

Table 1—Canadian Dividend and Capital Gains Tax Rates, 1970 to 1984

Period	Maximum Rates						Equivalent Rates	
	G	^a t_p	^b t_f	C	T	CG	T - CG	$\frac{(1-T)}{(1-CG)}$ t_f^c T = CG
1970 to 1971 ^d	0.0000	N/A	0.8075 ^e	0.2000 ^f	0.6075	0.0000	0.6075	0.3925
1972 to 1976	0.3333	0.305	0.4700	0.2000	0.4698	0.3067	0.1631	0.7647
1977	0.3333	0.440	0.4300	0.1875	0.4656	0.3096	0.1560	0.7740
1978 to 1980	0.5000	0.440	0.4300	0.2500	0.3888	0.3096	0.0792	0.8853
1981	0.5000	0.460	0.4300	0.2500	0.3942	0.3139	0.0803	0.8830
1982 to 1984	0.5000	0.480	0.3400	0.2267	0.2516	0.2516	0.0000	1.0000
								0.2000
								0.3200
								0.3000
								0.3750
								0.3750
								0.3400
								0.0000
								0.2088
								0.2160
								0.2700
								0.2738
								0.2516

Notes:

G = Gross-up factor

C = Federal tax credit

T = Tax payable per dollar of dividend

CG = Tax payable per dollar of capital gain

^aProvincial tax rates (t_p) apply to an investor in Ontario^bFederal marginal tax rates (t_f) apply to the top marginal bracket investor. Hence, $(1 + t_p)t_f$ is the top marginal bracket for an investor in the province of Ontario^cFederal marginal tax rate at which dividends and capital gains receive equal treatment^dTax rates shown for 1970 to 1971 are the average for the two years and include tax surcharges^e t_f for 1970 to 1971 includes provincial taxes^fC for 1970 to 1971 includes provincial tax credit

dividends and capital gains increased)^{10, 11} from 1970 to 1984. By 1982 the top tax bracket investor was indifferent between receiving dividends and realized capital gains, whereas dividends were taxed at a more favorable rate than realized capital gains for all other investors.¹²

One additional quirk in Canadian tax regulations is worth noting. The proceeds from short sales generally are treated as regular income and, therefore, taxed at a higher rate than either dividends or capital gains. An arbitrage operation that involves short selling will be less attractive than one that requires a long position as a result; therefore, a certain asymmetry is introduced into the system.

Finally, although there have been six separate tax regimes in the 1970 to 1984 period, as Table 1 shows, the changes that occurred in 1977 and 1981 were so small that these two years could be incorporated into the periods preceding them. Consequently, the analysis that follows is subdivided into four time periods reflecting the four basic tax regimes in force.

CANADIAN TRANSACTIONS COST REGIMES

Prior to 1983 commissions in Canada were fixed, and Canadian exchanges had tough rules on what services a broker could provide to a client for commission business. Despite the fixed commission regime prevailing in Canada, however, there were a number of developments which, following the introduction of negotiable commissions in the U.S. (May 1975), resulted in reduced commissions in Canada in the post-1975 periods vis-à-vis earlier ones. Two major changes were initiated by Canadian exchanges and regulatory authorities in an attempt to become competitive with U.S. exchanges, where many Canadian stocks were interlisted:

- Investors could negotiate on transactions in excess of \$500,000;
- Traders who sold a stock within 45 days from buying it could get a discount on the selling commission of up to 50 percent.

Finally, on April 1, 1983 commissions became fully negotiable in Canada. The era of negotiated commissions generally was associated with the introduction of discount brokerage firms into the Canadian securities brokerage field, a new set of commission policies or guidelines for full service brokerage firms, and soft dollar arrangements.

¹⁰ For low marginal tax bracket investors, the tax differential between dividends and capital gains always has favored dividends. Moreover, dividends' attractiveness grew over time. From 1982 to 1984, in particular, all investors in Ontario, with the exception of the top bracket investors, preferred dividends to capital gains (Table 1).

¹¹ T/CG and $(1-T)/(1-CG)$ convey the same information about the attractiveness of dividends versus that of capital gains. Therefore, although it may be more accurate as far as the model tested in this paper is concerned to talk about $(1-T)/(1-CG)$, the term T/CG is used for conceptual reasons.

¹² Tax neutrality was achieved only for Ontario investors in 1982 to 1984, but not for the investors of most other provinces whose top bracket investors still preferred capital gains to dividends by a wide margin.

THEORETICAL PATTERNS OF ABNORMAL RETURNS

A MODEL OF ACCELERATION AND DELAY OF TRADE

The model to be developed below draws on the work of Green (1980) and Grundy (1985), but has been modified to reflect Canadian tax regulations and the trading behavior of both investors who trade to capture the dividend (Lakonishok and Vermaelen, 1986) and investors (taxed and untaxed) who trade irrespective of the dividend. Consider a situation where there are only untaxed investors. Under these circumstances an investor will be indifferent between receiving a dividend (selling the stock on the ex-dividend day) and realizing a corresponding capital gain (selling before the ex-dividend day) only if the change in the price on the ex-dividend day is equal to the dividend or

$$(3) \theta_u = \frac{\Delta P}{D} = 1$$

where:

θ_u = Price change per dollar of dividends for the untaxed investor.

The same condition will apply in the case where all investors are taxed at the same rate on dividends and capital gains.¹³ Investors who are taxed at different rates on dividends and capital gains will be indifferent between receiving a dividend and realizing a capital gain if the following condition holds:

$$(4) \theta_t = \frac{\Delta P}{D} = \frac{1 - t_d}{1 - t_c}$$

where:

θ_t = Price change per dollar of dividend for the taxed investors; and

t_d and t_c = Tax rates on dividend income and capital gains, respectively.

With $t_d > t_c$, it is clear that θ_t will be less than one. Equation (4), unfortunately, does not tell the whole story because it only applies to taxable sellers who realize their capital gains immediately. Buyers can defer the realization indefinitely; therefore, θ_t is lower for these investors. The correct conditions are given by:¹⁴

¹³ Investors who attempt to capture the dividend in the conventional sense by executing two way trades around the ex-dividend day also will fall into this category and, therefore, will behave like untaxed investors.

¹⁴ The development of equation (5) can be found in Booth and Johnston (1984, pp. 458-459).

$$(5) \frac{1 - t_d}{1 - t_c} = \theta_{ts} > \theta_{tb} = \frac{1 - t_d}{1 - \frac{t_c}{(1 + k)^n}}$$

where:

Subscripts s and b = Sellers and buyers, respectively;

k = The appropriate risk-adjusted discount rate; and

n = The investor's expected holding period.

If n is large, the present value of the capital gains tax approaches zero and $\theta_{tb} \rightarrow 1 - t_d$.

In practice, however, both taxed and untaxed investors interact and trade among themselves and are aware of the relationships in equations (3) and (5). *Ex ante*, therefore, the expected price on the ex-dividend day should lie somewhere between the prices defined by equations (3) and (5). The *ex ante* expected price change per dollar of dividend θ^* will be given by:

$$\theta^* = w_u + \sum_{i=1}^n w_{tbi} \theta_{tbi} + \sum_{i=1}^n w_{tsi} \theta_{tsi},$$

(6)

$$\text{with } w_u + \sum_{i=1}^n w_{tbi} + \sum_{i=1}^n w_{tsi} = 1$$

w_u , w_{tbi} , and w_{tsi} are the expected weights associated with the relevant price change to dividend ratios and will depend on several factors, including the expected relative trading volume of taxed versus untaxed investors, the number of different tax brackets, the difference between the dividend and capital gains tax rates, the effect of margin requirements on the ability to short sell and the existence of transactions costs. In other words, w_u , w_{tbi} , and w_{tsi} reflect the probability that each investor group or investor i will be the marginal trader in any given stock around the ex-dividend day.

Ex post, the situation is more complex because the marginal trader may be an untaxed investor, a taxed buyer, or a taxed seller, each of whom would be willing to trade at a different price. Aggregating over a large number of securities, however, a relationship similar to equation (6) must hold, on average, although for any specific security its price will be determined by the tax status of the marginal trader. Therefore, the average price drop ratio should be similar to that defined in equation (6).¹⁵

¹⁵ Observed prices in this model may not be in equilibrium due to the existence of marginal investors that belong to nonhomogeneous tax brackets (Lakonishok and Vermaelen, 1983, footnote 7). As a result, abnormal returns may be observed. Heath and Jarrow (1988) also suggest that the difference between the price drop and the dividend reflects the equilibrium considerations of long-term traders, taxes, and risk aversion. If this difference exceeds the required risk premium then *ex ante* abnormal profits can be earned.

Untaxed investors will wish to receive the dividend because they not only will receive the dividend, but also can sell, on the ex-dividend day, at a price that is higher than the one they would have been willing to accept.¹⁶ Buyers, therefore, will attempt to purchase securities prior to the ex-dividend day, accelerating their trades if necessary, while sellers will attempt to dispose of securities on or after the ex-dividend day, delaying their sales if required.

Taxed investors, on the other hand, will conclude that they will earn a negative after tax return if they receive the dividend. By eschewing the dividend, taxed investors avoid the higher taxes and, at the same time, can purchase the securities at a lower price than the one they would have been willing to pay. Buyers, therefore, will delay purchases until the ex-dividend day or after, and sellers will attempt to dispose of securities (or short-sell) prior to the ex-dividend day.¹⁷

Table 2 summarizes the preferred position for each type of investor. If the desired trading volume generated by each of the two groups is approximately equal and both are equally able to adjust their pattern of trades, there should be no excess supply or demand either before or after the ex-dividend day. There also should be no abnormal returns around the ex-dividend day. If one group tends to generate a higher trading volume and/or is better able to adjust its trading pattern, however, there will be excess demand or supply and abnormal returns will be observed around the ex-dividend day.

The following factors suggest that it should be the untaxed investors who determine the pattern of abnormal returns around the ex-dividend day:

- Untaxed investors consist largely of institutions, such as pension and Registered Retirement Savings Plan-eligible mutual funds, that are more likely to hold and trade dividend-paying stocks than individual (taxed) investors;
- Institutions are predominantly liquidity traders (i.e., to invest inflows, meet expected outflows or rebalance portfolios) for whom the cost of shifting trades around the ex-dividend day is low;
- Institutions are better able to play the dividend catching game due to superior technology, better trading arrangements, and lower transactions costs;
- Taxed investors are believed to be primarily information traders who face substantial opportunity costs if accelerating or delaying their trades means that they are unable to realize the full value of their information (Green, 1980). Consequently, investors must be compensated for these opportunity costs before they will consider shifting from their preferred trading position;
- Taxed investors face difficulties when trying to arbitrage away abnormal returns because of the asymmetric tax treatment of dividends from long and short positions¹⁸ and because profits from short sales are treated as regular income.

¹⁶ *Ex post*, this will only be true on average. In the case of individual securities the recorded price will depend on the tax status of the marginal investor.

¹⁷ The discussion in this paragraph is based on the assumption that $t_d > t_c$ and that the weights W_u , W_{ib} , and W_{is} are such that $1 > \theta^* > \theta_s$.

¹⁸ In a long position the dividend gets preferential tax treatment. In a short position the dividend payouts affect the adjusted cost base and, hence, the size of the capital gain.

Table 2—Summary of Preferred Trading Times for Different Classes of Investors

Investor Class	Cum-Dividend	Ex-Dividend
Untaxed	Purchase	Sell
Taxed	Sell	Purchase

It is anticipated, therefore, that the untaxed investors will generate excess demand on cum-dividend days and excess supply on ex-dividend days. Excess demand (supply) will be generated because the number of taxed investors willing to sell (buy) will be exhausted before the market has cleared. In order to satisfy the remaining demand (supply), either information traders will have to be induced to sell (buy) before their desired time and will have to be compensated for foregoing their information-based returns or transactions will have to be effected with the market maker at the ask (bid).¹⁹

Prices, therefore, will rise on the cum-dividend day and fall on the ex-dividend day. While there will be a downward pressure on ex-dividend day prices, however, the calculated returns on the ex-dividend day may be positive due to the inclusion of dividends in calculating returns and movements in trading between the bid and ask prices. Figure 1 illustrates this point.

Figure 1 shows the potential impact close-to-open and close-to-close prices may have on returns around ex-dividend days under the assumption that the *ex post* θ^* of the portfolio is less than one, on average, over a large number of stocks. If close-to-open prices are employed, Panel A shows that stock prices will appear to change from x_0 to x_1 to x_3 . If close-to-close prices are used, however, the path stock prices will seem to follow will be from x_0 to x_1 to x_6 (Panel B).

When dividends are added to either price scenario to calculate returns, two different abnormal returns paths can be drawn. Under the Panel A scenario, positive abnormal returns on the cum-dividend day (i.e., from x_0 to x_1) will be calculated, followed by potentially zero abnormal returns on the ex-dividend day (i.e., from x_1 to x_2).

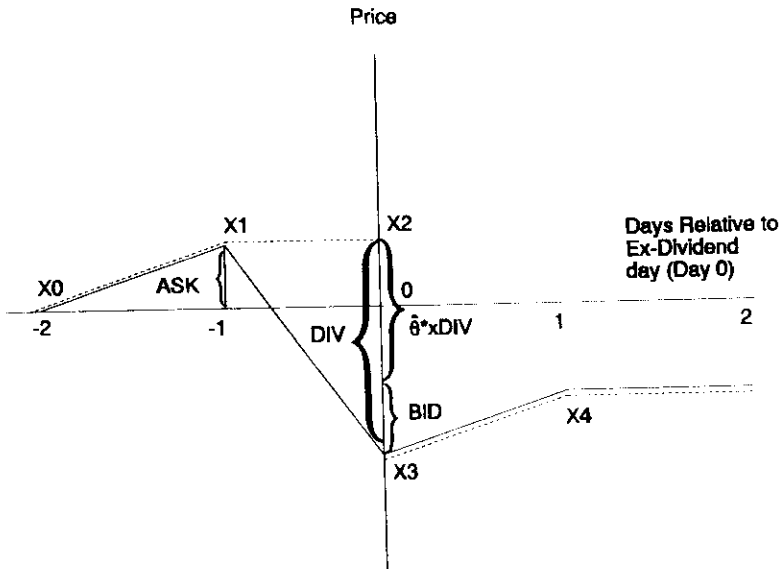
Under the Panel B scenario, the positive abnormal returns on the cumdividend day also will be followed by positive abnormal returns on the ex-dividend day (i.e., from x_1 to x_5). Under both scenarios the stock price will return to equilibrium (x_4 in Figure 1) the day after the ex-dividend day. A positive abnormal return then will appear to be calculated (i.e., from x_3 to x_4) in Panel A and a zero abnormal return (i.e., from x_6 to x_4) in Panel B.

The conjecture being made here, namely that stocks will be trading at the ask by the close on the cum-dividend day and at the bid at the opening on the ex-dividend day, with prices moving toward equilibrium by the close on the ex-dividend day, is supported by

¹⁹ What appears to be an excess return actually will reflect the bid-ask spread. When there is excess demand or supply some trades will be completed by the market maker. On the Toronto Stock Exchange, however, registered traders are not required to satisfy all trades not crossed on the floor. Therefore, other traders will have to be given an incentive to sell or buy under these conditions.

Figure 1—Diagrammatic Presentation of Initial (First Pass, i.e., Assumes no Delay or Acceleration of Trade) Reaction of Stock Prices Around the Ex-Dividend Day

Panel A
Close-to-Open



recent ex-dividend day research on market microstructure analysis by Choe and Masulis (1992) and Koski (1992).

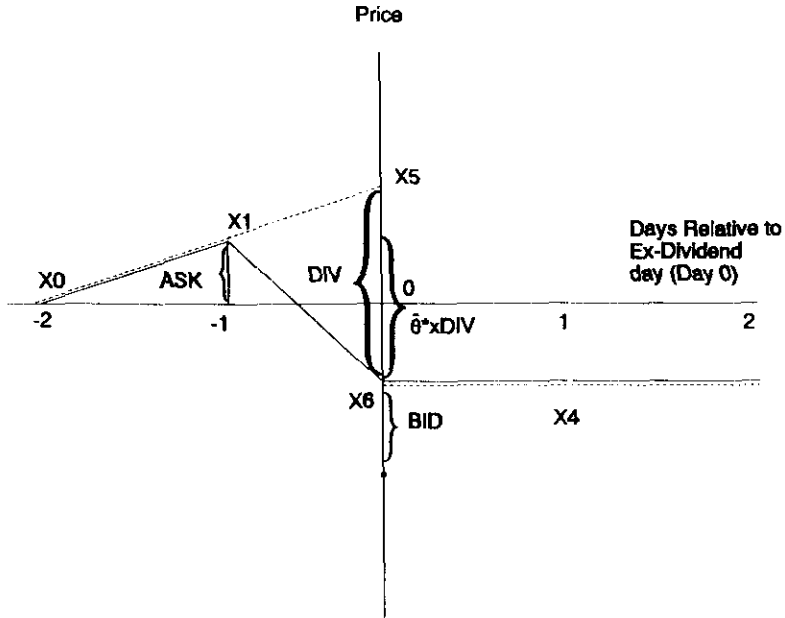
If untaxed investors expect stock prices to behave as described in Figure 1, they will find that they are buying at the peak and selling in the trough and will attempt to accelerate purchases further and delay sales to avoid trading at disadvantageous prices.^{20,21} Positive abnormal returns, therefore, will appear a few days prior to cum-dividend day. Downward price pressure also will be transferred partly from the ex-dividend day to subsequent days. As a result, there will be a positive return (including the dividend) on the ex-dividend day followed by negative returns on one or more days following, as x_6 should

²⁰ Infrequent trading, a distinct possibility in Canada (Fowler, Rorke, and Jog, 1980), makes it even more likely that untaxed investors trading prior to ex-dividend day will accelerate purchases to ensure that the trade is completed on time.

²¹ There is a limit, however, to the extent to which this can be accomplished because institutional cash flows are not totally flexible and because the compensation required by information traders increases the more the timing of their trades diverges from their desired position.

Figure 1 (continued)—Diagrammatic Presentation of Initial (First Pass, i.e., Assumes no Delay or Acceleration of Trade) Reaction of Stock Prices Around the Ex-Dividend Day^a

Panel B
Close-to-Close



Notes:

ASK = Premium paid for buying at the ask price;

BID = Discount accepted for selling at the bid price (ASK=BID);

DIV = Size of the dividend added back to compute returns;

$\hat{\theta}^* \times \text{DIV}$ = Fall in stock price (on average over a large number of stocks) on the ex-dividend day (a fraction of DIV); $\hat{\theta}^*$ is *ex post* θ^* ;

———— = Path followed by stock prices;

----- = Path followed by the dollar amount used to compute returns.

^a As this study employs close-to-close daily stock prices, the ex-dividend day effective price decline should be closer to $\hat{\theta}^* \times \text{DIV}$ (Panel B) than the $(\hat{\theta}^* \times \text{DIV} + \text{BID})$ (Panel A). The opposite would be true if close-to-open stock prices were used. Excess supply and trading at the bid price should occur at the opening of markets on the ex-dividend. This is unlikely to hold true, however, for the rest of the day, especially when markets close. (For evidence supporting this conjecture, see Choe and Masulis, 1992; Koski, 1992.)

be higher and x_4 lower than the positions shown in Panel B of Figure 1, for example, which assumes no delay or acceleration of trade.

The abnormal stock price behavior described above is consistent with the findings of Eades, Hess, and Kim (1984, Table 5) and Lakonishok and Vermaelen (1986, Figure 2). As both of these studies use close-to-close stock prices to arrive at abnormal returns, the

discussion above should help resolve the "puzzling" (according to Eades, Hess, and Kim, 1984) behavior of stock prices around ex-dividend days.

Clientele effects are also possible. The abnormal positive returns around the ex-dividend day will be larger for high dividend paying stocks than for low, if the following three conditions hold:

- Untaxed investors are the principal (largest) holders of high dividend yield stocks;
- These investors are better able to adjust the timing of their trades than the taxed group; and
- Low dividend yield stocks are primarily held by taxed investors.

IMPLICATIONS OF THE CANADIAN TAX AND TRANSACTIONS COST REGIMES: TESTABLE HYPOTHESES

IMPLICATIONS OF THE CANADIAN TAX SYSTEM:

CLIENTELES-RELATED TESTABLE HYPOTHESES

The desire for untaxed investors who wish to receive the dividend and for (top bracket) taxed investors to avoid it is greater the more θ^* diverges from one. This occurs when $t_d - t_c$ becomes larger. The 1970 to 1971 period when dividends were taxed but capital gains were not therefore provides the largest incentive for dividend receipt/avoidance. It is to be expected that positive abnormal returns will be observed on and before the ex-dividend day and negative returns after in all subperiods, but that the magnitude of these abnormal returns will be reduced as the differential tax rates between dividends and capital gains are reduced. Moreover, the trading volume around the ex-dividend day should decline, as there is less incentive to trade in order to receive or avoid a dividend.

The above comments apply equally to dividend clienteles. Untaxed investors are probably the principal traders and holders of high dividend yield stocks. These investors have a greater incentive to purchase on the cum-dividend day and sell on the ex-dividend day the higher is the dividend yield. The combination of these two effects ought to lead to large positive abnormal returns on and before the ex-dividend day and substantial negative abnormal returns thereafter. Taxable investors should not have a significant presence. The taxed investors' presence, however, should have a greater impact on lower dividend yield stocks. For these stocks, therefore, the positive abnormal returns on and before the ex-dividend day should decline and the small negative abnormal returns after the ex-dividend day should level (or even become positive) as high dividend tax regimes give way to lower ones.

Based on the arguments developed above, the following hypotheses will be tested:

H_0 : No abnormal returns before or after the ex-dividend day;²²

H_1^{cl} : Positive abnormal returns prior to and on the ex-dividend day and negative abnormal returns thereafter. The size of the positive and negative

²² This is the familiar no-arbitrage argument based on market efficiency. If enough well-financed arbitrageurs who do not face any of the decisions and constraints the taxed and untaxed investors do are able to trade around the ex-dividend day at low cost, they should eliminate any abnormal returns in the days surrounding the ex-dividend day.

abnormal returns around the ex-dividend day should decline between 1970 and 1984.

In testing for dividend clienteles, H_1 should incorporate, in addition, the subsidiary hypothesis that within any one subperiod high dividend yield stocks should exhibit larger abnormal returns than low dividend yield stocks.

IMPLICATIONS OF THE CANADIAN TRANSACTION COST REGIMES: SHORT-TERM TRADERS-RELATED TESTABLE HYPOTHESES

The liberalization of brokerage commissions in Canada on April 1, 1983 brought significant reduction in transactions costs across all investor classes. Trades that were less profitable or not profitable in earlier years became profitable. The era of negotiable commissions benefitted both taxed and untaxed investors (Lakonishok and Vermaelen, 1986). In addition, untaxed investors in Canada also benefitted from the indirect effect of the liberalization of commissions in the U.S. in May 1975.

Therefore, the increased profit opportunities resulting from the reduced transactions costs faced by untaxed investors in 1978 to 1981 and in 1982 to 1984 must have induced more trading despite the increased disincentive to trade resulting from the differential tax regimes over time. This should lead to prices of dividend-paying stocks experiencing upward pressure around ex-dividend days in 1978 to 1981 and in 1982 to 1984 after the downward pressure experienced between 1970 to 1971 and 1972 to 1977. Consequently, for transactions costs to be important and for the short-term traders hypothesis to be valid, the following hypothesis has to hold:

- H_1^{STT} : Positive abnormal returns prior to and on the ex-dividend day and negative abnormal returns thereafter. The size of the positive and negative abnormal returns around the ex-dividend days should decline between 1970 to 1971 and 1972 to 1977 and rise thereafter. This should be more pronounced in high dividend yield stocks.

METHODOLOGY

ANALYTICAL METHODS

A standard event study was performed for 21 days around the ex-dividend day from ten days before to ten days after, a period outside the influence of earnings announcement effects.²³ The market-adjusted returns model was used to calculate abnormal returns (residuals) in the conventional way by first calculating a raw stock return and subtracting the return on a market index (Brown and Warner, 1985).

Two issues need to be addressed in this connection: clustering of events and non-synchronous trading. It is well-known that the majority of firms go ex-dividend in the first five weeks of each quarter. This could result in a substantial number of firms going ex-dividend on the same day. Because residuals tend to be correlated cross-sectionally, this clustering could give rise to biased residuals. An analysis of the data showed that no more

²³ Analysis with Canadian data (not reported here) shows that more than 80 percent of Canadian companies reported earnings outside the event window from 1970 to 1984.

than 5.5 percent of firms went ex-dividend on the same day at any time. Clustering, therefore, would not appear to be a problem with this study.

Canadian markets exhibit the well-known thin trading problem. This caused no difficulties in this study despite the use of daily data because the thinnest stocks were eliminated as described below and because trading tends to be more vigorous around the ex-dividend day. There were, therefore, few days in the test periods with missing observations.

The market-adjusted returns model was used because it is effective²⁴ and also avoids many of the problems associated with nonsynchronous trading (Dimson, 1979; Scholes and Williams, 1977).

THE DATA BASE

The database used, provided on a computer tape by the Financial Research Foundation of Canada,²⁵ consists of all common stocks listed on the Toronto Stock Exchange (TSE) from January 1, 1970 to June 30, 1984 and includes prices, dividends, volumes, and stock splits. The market return used for adjustment is an equally weighted index of returns on the 365 stocks that were listed continuously throughout the 1970 to 1984 period.²⁶

The following types of stocks were excluded from the database:

- Thinly traded securities (i.e., those that traded less than 70 percent of the time they were listed over the period studied). This eliminates all stocks that paid tax-deferred dividends in the mid-1970s (Bailey, 1988);
- Interlisted securities.²⁷ Booth and Johnston's (1984) evidence strongly suggests that the ex-dividend day behavior of these stocks is determined by U.S. investors;
- Stocks with prices of \$5 or higher and dividends less than \$0.125. Stocks with prices less than \$5 and dividends less than \$0.05. This takes care of the rounding problem (Kalay, 1982) and prevents domination of the sample by small stocks (Booth and Johnston, 1984).

²⁴ Brown and Warner (1980, 1985) found the market-adjusted returns model to be as good and, in many cases, better in event studies than other more complicated models. See also Lakonishok and Vermaelen (1986, footnote 14).

²⁵ The same database was used by Bailey (1988). The current study was terminated in 1984 for two reasons. First, the tax changes that occurred after 1984 are not as clear cut as those before 1985. For example, the presence of the alternative minimum tax (introduced in 1986) distorts the calculation of marginal tax rates. From 1985 on the provinces and the federal government introduced and levied a series of surtaxes that further distorted the calculation of marginal tax rates. Finally, starting in 1985, individual taxpayers were allowed a lifetime exemption of initially \$500,000 in taxable capital gains, which started at \$20,000 in 1985 and eventually was capped at \$100,000 in 1987. Depending, therefore, on whether a taxed investor had exhausted his or her exemption, he paid no taxes on capital gains. All these tax changes made the development of hypotheses less clear after 1984.

Second, 1985 to 1989 was a period of heightened dividend capture activities by Japanese insurance companies and other nonstandard settlement traders, and their activities may have contaminated the results (Koski, 1992).

²⁶ Constructing an index of daily returns presents a number of difficulties. A universal index would be plagued by severe thin trading problems. In order to reduce these, an index of securities listed throughout the whole data period was used. The trade-off is that a measure of postselection bias is introduced that is far less severe than the thin trading problems. An equally weighted index was used because the database did not include the number of shares outstanding.

²⁷ Interlisted stocks are those stocks listed on both U.S. and Canadian exchanges.

Table 3—Dividend Yield Ranges (% per Quarter)

Period	Quartiles			
	Q1-Lowest	Q2	Q3	Q4-Highest
1970/71	< 0.87	0.87 - 1.08	1.08 - 1.41	1.41 <
1972/77	< 0.960	0.96 - 1.60	1.60 - 1.89	1.89 <
1978/81	< 1.06	1.06 - 1.35	1.35 - 1.67	1.67 <
1982/84	< 0.87	0.87 - 1.23	1.23 - 1.77	1.77 <

In order to test for clientele effects, the stocks were partitioned into quartiles based on dividend yield. Because of the abnormal returns surrounding the ex-dividend day (Eades, Hess, and Kim, 1984), the dividend yield was calculated by dividing the dividend by the price 55 days prior to the ex-dividend day.

The partition into quartiles was based on the quarterly dividend yield and not the average dividend yield for the whole subperiod. After stocks had been grouped into quartiles, the low dividend yield groups were aggregated for each subperiod; the high dividend yield groups then formed another quartile for each subperiod, and so on. As a result, a company's membership in a quartile could vary from quarter to quarter because of dividend and/or stock price changes. This approach differs from other methods of forming dividend yield groups and is based on the assumption that investors are interested not so much in specific companies but rather in quarterly dividend yields. The dividend yield ranges for each quartile are shown in Table 3.

The sample of companies per subperiod varied from 76 to 117. The number of companies in specific dividend yield quartiles varied more widely, however, due to the procedure used in forming the groups. (See notes to Table 4.)

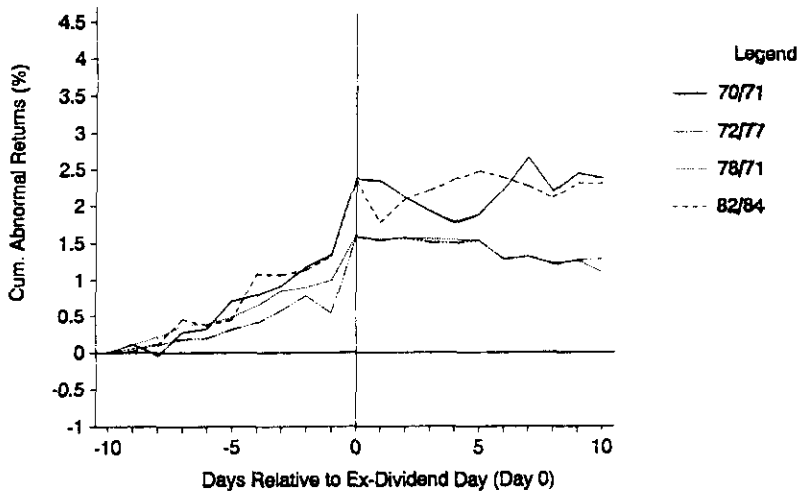
RESULTS

The results for the total sample, subdivided by time period, are shown in Figure 2. All periods' results are consistent with the alternative hypothesis H_{1T}^{ST} . Positive abnormal returns are observed from five days prior to and on the ex-dividend day and are followed by negative abnormal returns for several days thereafter.²⁸ Moreover, the size of abnormal returns before and after the ex-dividend day first declines and then rises as the tax differential between the tax rate on dividends and capital gains initially declines sharply, in a fixed transaction cost regime, and continues to decline moderately in an environment of increasingly diminishing transactions costs. Abnormal returns decline up to the 1972 to 1977 period and rise thereafter, especially, for the high dividend yield stocks. This evidence is consistent with the modified model of delay and acceleration of trade as applied to the short-term traders hypothesis.

Figures 3 through 6 show the pattern of abnormal returns around the ex-dividend day by period, subdivided into dividend yield quartiles.²⁹ The results are consistent across all time periods. The highest dividend yield quartile (Q4) invariably shows the highest cumu-

²⁸ Eades, Hess, and Kim (1984) and Lakonishok and Vermaelen (1986) also find abnormal returns that behave in a similar fashion around ex-dividend days in the U.S.

²⁹ The returns of the dividend-yield quartiles are based on equally weighted portfolios.

Figure 2—Cumulative Abnormal Returns^a, Total Sample by Tax Regime

^aThe figure is constructed on the basis of Table 5

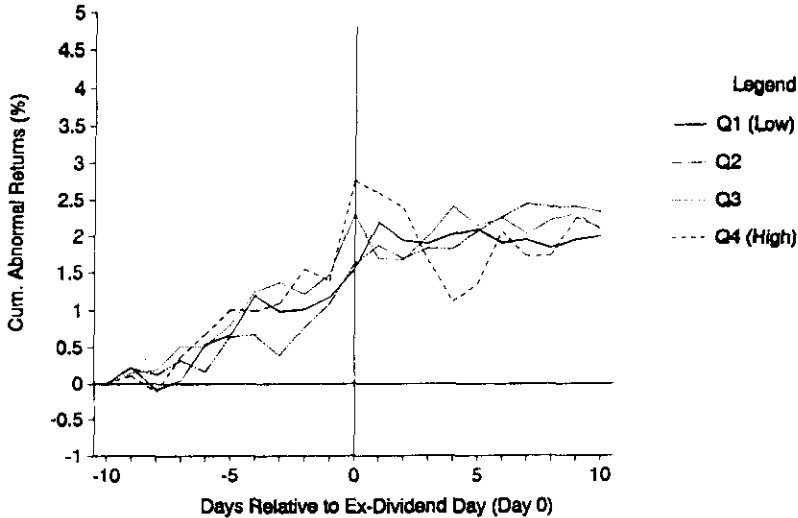
Figure 3—Cumulative Abnormal Returns, 1970 to 1971, By Dividend Yield Quartile

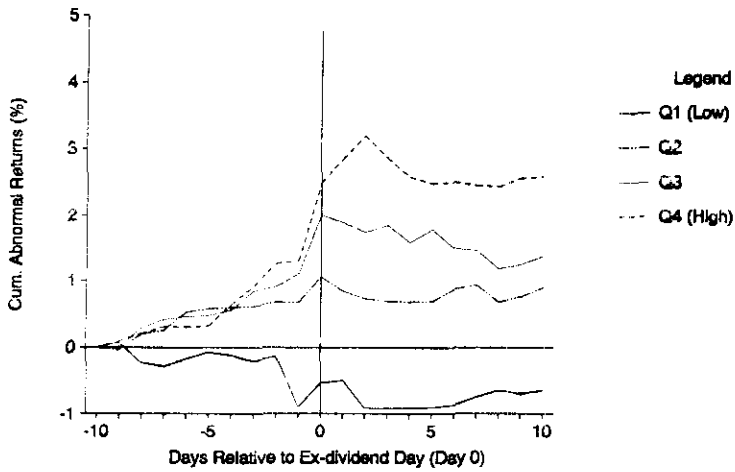
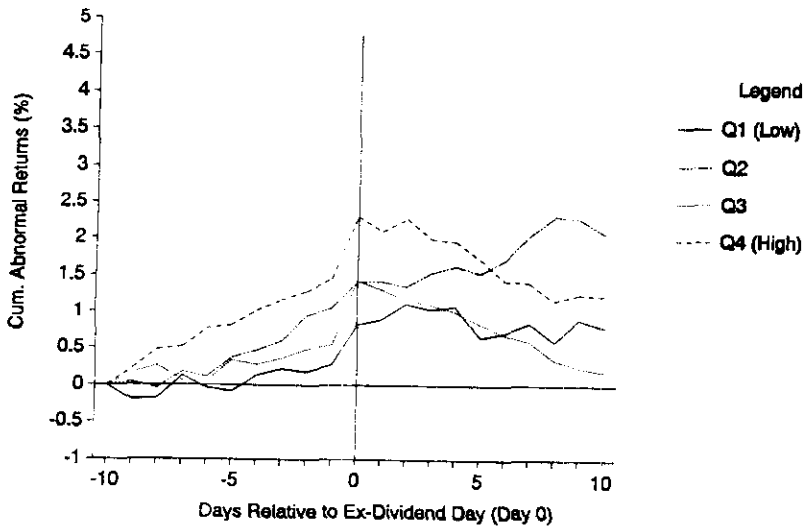
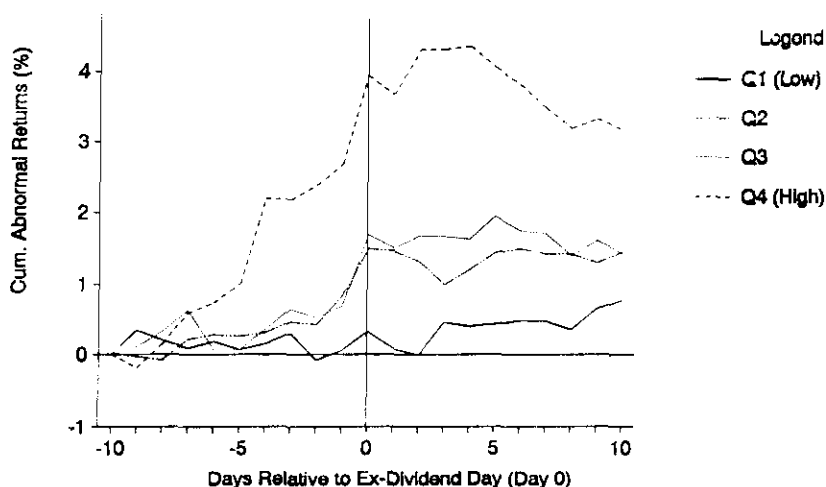
Figure 4—Cumulative Abnormal Returns, 1972 to 1977, By Dividend Yield Quartile**Figure 5—Cumulative Abnormal Returns, 1978 to 1981, By Dividend Yield Quartile**

Figure 6—Cumulative Abnormal Returns, 1982 to 1984, By Dividend Yield Quartile

lative abnormal returns (CARs)³⁰ up to the ex-dividend day, and the lowest dividend yield quartile always shows the lowest CAR. Figure 6 indicates that the prices of the highest dividend yield stocks in 1982 to 1984 were bid up considerably, as most investors wished to capture the dividend in an environment of declining taxation of dividends and transactions costs, leading to CARs for Q4 which were as high as in 1970 to 1971.

Statistical significance tests also were performed.³¹ Table 4 shows the CARs and associated t-statistics for the total sample by subperiod. Significantly positive abnormal returns are observed several days prior to and on the ex-dividend day. The highest t-statistics are associated with the first subperiod which is consistent with the hypothesis that the abnormal returns will be largest when the difference between the tax rates on dividends and capital gains are greatest.

Table 5, on the other hand, shows that there is no significant difference between the CARs across subperiods on either day -1 or day 0.

For the dividend yield quartiles in day -1 only those in the fourth quartile are consistently significantly different from zero. Those in the third quartile are significant in the first three subperiods only. Within each quartile the level of significance could be expected to decline through time. This is only true for the first quartile. The relevant figures are presented in Table 6. The t-statistics for day 0 follow essentially the same pattern as those

³⁰ See Table 4, footnote a for a detailed definition and derivation of CARs.

³¹ Details of the significance tests are available from the authors on request.

Table 4—CARs* & t-Statistics^b for Ten Days Around Ex-Dividend Day, Total Sample by Subperiod

Period Day	1970 to 1971		1972 to 1977		1978 to 1981		1982 to 1984	
	CAR(%) ^c	t-stat ^d	CAR(%) ^e	t-stat ^f	CAR(%) ^g	t-stat ^h	CAR(%) ⁱ	t-stat ^j
-5	0.71	2.29	0.31	0.86	0.48	1.62	0.44	1.11
-4	0.80	2.27	0.40	1.36	0.64	1.77	1.09	2.24
-3	0.93	2.43	0.58	1.85	0.86	2.10	1.07	2.09
-2	1.19	2.93	0.79	2.87	0.90	2.06	1.14	2.14
-1	1.35	3.17	0.55	2.37	1.00	2.20	1.33	2.38
0 (Ex-Day)	2.38	5.23	1.59	4.98	1.60	2.87	2.35	3.32
1	2.35	4.97	1.54	4.76	1.55	2.79	1.78	2.38
2	2.12	4.25	1.57	4.16	1.57	2.81	2.09	2.73
3	1.93	3.59	1.51	3.82	1.56	2.74	2.22	2.80
4	1.78	3.08	1.50	3.38	1.55	2.67	2.36	2.94
5	1.88	3.18	1.54	3.33	1.54	2.43	2.48	2.95

Notes:

*CAR stands for cumulative abnormal return and is calculated as follows:

$$AR_{jth} = (R_{jth} - R_{mth}) \times 100, \quad \bar{AR}_{jth} = \frac{1}{N} \sum_{j=1}^N AR_{jth}, \quad \bar{AR}_t = \frac{1}{h^*} \sum_{j=1}^{h^*} \bar{AR}_{jth}, \quad CAR_t^* = \sum_{t=1}^{T-K} \bar{AR}_t$$

where:

 R_{jth} and R_{mth} = Daily return of stock j and the market portfolio, respectively, on day t and quarter h within a subperiod; $\bar{AR}_{jth}$ = Abnormal return for stock j on day t in quarter h ; $\bar{AR}_{jth}$ = Average abnormal return for day t in quarter h ; $\bar{AR}_t$ = Average abnormal return over all quarters h^* per subperiod; and CAR_t^* = Cumulative abnormal return for days T to $T+k$ within a subperiod^bTwo-tailed test to determine whether CARs per subperiod are significantly different from zero

^e429 ex-dividend days, 76 companies

^dAll t-values are statistically significant at 5 percent level of significance

^e1763 ex-dividend days, 108 companies

^fAll but the first three days' t-values are statistically significant at 5 percent level of significance

^g1708 ex-dividend days, 117 companies

^hAll but the first two days' t-values are statistically significant at 5 percent level of significance

ⁱ707 ex-dividend days, 103 companies

^jAll but the first day's t-values are statistically significant at 5 percent level of significance

Table 5—Comparison of CARs (%) Across Subperiods, Total Sample, Days -1 to 0 (Ex-Day), t-Statistics^a Reported

Period	1972/77	1978/81	1982/84
Panel A			
Day -1			
1970/71	-1.53	0.36	-0.14
1972/77	-	1.30	1.10
1978/81	-	-	-0.44
Panel B			
Day 0 (Ex-Day)			
1970/71	-1.80	-0.12	-0.28
1972/77	-	0.96	1.03
1978/81	-	-	-0.11

Note:

^aTwo-tailed test to determine whether CARs (defined in Table 4, footnote a) between subperiods are statistically significant from each other

for day -1 except that the levels are higher, which is not surprising. Table 7 shows that in three of the four subperiods the first dividend yield quartile is significantly different from the fourth on both day -1 and day 0, with the latter exhibiting a somewhat more pronounced effect. Surprisingly, the difference is smallest in the earliest subperiod when the tax differentials are greatest. No other pairs of quartiles are consistently significantly different from one another.

CONCLUSIONS

The model of delay and acceleration of trade was modified to conform to Canadian tax and transactions cost regimes and to trading both due to and irrespective of dividends and tested using Canadian data on regular cash dividend paying stocks from 1970 to 1984. The evidence rejects the no-arbitrage argument of market efficiency and shows that the delay and acceleration of trade hypothesis as applied to short-term traders hypothesis is a valid one. The Elton and Gruber model and the delay and acceleration of trade hypothesis as developed by Green (1980) and Grundy (1985) are not supported by the data.

Untaxed investors seem to dominate trading on dividend-paying stocks in the days surrounding the ex-dividend day, particularly in the trading of high dividend yield stocks and during periods in which there was a high tax differential between dividends and capital gains or in periods in which transactions costs were at the lowest. It appears that investors transact around the ex-dividend day with the intention of capturing or avoiding dividends based on tax and transactions costs considerations. The results provide evidence that short-term trading exists in Canada and influences stock price behavior in the days surrounding the ex-dividend day. Dividend capture trading is as prevalent in Canada as in the U.S. (Koski, 1992).

Finally, this paper provides an argument that potentially justifies the admittedly anomalous positive abnormal returns around the ex-dividend days evidenced in the finance

Table 6—t-Statistics^a for CARs (%) for Dividend-Yield Quartiles by Subperiod, Days -1 and 0 (Ex-Day)

Period	First (Lowest)		Second		Third		Fourth (Highest)	
	Day -1	Day 0	Day -1	Day 0	Day -1	Day 0	Day -1	Day 0
1970 to 1971	1.81	2.25 ^b	1.93 ^b	2.70 ^b	2.57 ^b	3.81 ^b	1.98 ^b	3.76 ^b
1972 to 1977	-2.11 ^b	-1.47	1.88	2.77 ^b	2.72 ^b	4.25 ^b	3.64 ^b	6.09 ^b
1978 to 1981	0.56	1.62	2.43 ^b	3.12 ^b	2.57 ^b	3.66 ^b	3.45 ^b	5.22 ^b
1982 to 1984	0.12	0.63	1.69	2.92 ^b	1.24	2.98 ^b	4.11 ^b	5.44 ^b

Notes:

^aTwo-tailed test to determine whether CARs (defined in Table 4, footnote a) for dividend-yield quartiles by subperiod are statistically significant from zero^bStatistically significant at 5 percent level of significance

Table 7—Comparison of CARs (%) Across Dividend Yield Quartiles Within Subperiods, Days -1 and 0 (Ex-Day), t-Statistics^a Reported

1970 to 1971

Quartile	Day -1			Quartile	Day 0 (Ex-Day)		
	2	3	4		2	3	4
1	-0.51	0.19	-0.62	1	-0.32	0.69	1.60
2	0.74	1.14 ^b	2	-	1.08	2.00 ^b	
3	-	0.47	3	-	-	1.02	

1972 to 1977

Quartile	Day -1			Quartile	Day 0 (Ex-Day)		
	2	3	4		2	3	4
1	3.06 ^b	3.09 ^b	4.09 ^b	1	3.15 ^b	3.69 ^b	5.19 ^b
2	-	0.14	1.01	2	-	0.70	2.28 ^b
3	-	-	0.92	3	-	-	1.53

1978 to 1981

Quartile	Day -1			Quartile	Day 0 (Ex-Day)		
	2	3	4		2	3	4
1	1.39	1.25	1.74	1	1.07	0.86	2.18 ^b
2	-	0.49	0.67	2	-	0.02	1.41
3	-	-	0.88	3	-	-	0.83

1982 to 1984

Quartile	Day -1			Quartile	Day 0 (Ex-Day)		
	2	3	4		2	3	4
1	1.23	0.85	3.22 ^b	1	1.71	1.30	4.08 ^b
2	-	-0.80	2.17 ^b	2	-	-0.26	2.67 ^b
3	-	-	2.78 ^b	3	-	-	2.85 ^b

Notes:

^aTwo-tailed test to determine whether CARs (defined in Table 4) between dividend yield quartiles per sub-period are statistically significant from each other

^bStatistically significant at 5 percent level of significance

literature and the empirically documented average drop in stock prices over the cum-ex-day interval that is less than the dividend.

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