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EX-DIVIDEND DAY BEHAVIOUR OF STOCK PRICES IN FINLAND IN 1989-90 AND 1993-97

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ABSTRACT: We document that stock prices fall by 70 to 75 per cent of the dividend amount on ex-dividend days in Finland in 1989-90 and 1993-97. This suggests that domestic individuals were marginal investors in the former period and foreign investors in the latter. There is weak evidence in favour of a tax clientele effect in 1989-90, which is a new finding in the Finnish stock market. A portfolio of stocks with abnormally high dividend yields and liquidity exhibits abnormally high trading volumes on cum and ex-days and abnormally low volumes on the following two trading days in 1993-97. These abnormal volumes are not matched by simultaneous abnormal returns. This evidence is consistent with long-term traders timing their trades around ex-days and inconsistent with short-term trading of any importance.

JEL classification codes: *G12, G35*

KEY WORDS: Dividends, Stock prices, Taxation

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TIIVISTELMÄ: Osakkeiden hinnat laskivat Helsingin arvopaperipörssissä osinkolipun irrotessa keskimäärin 70-75 prosentilla osingon määrästä vuosina 1989-90 ja 1993-97. Tulos viittaa siihen, että kotimaiset luonnolliset henkilöt olivat marginaalisia sijoittajia ensiksi mainitulla periodilla ja ulkomaiset sijoittajat jälkimmäisellä. Jonkin verran saatiin tukea clientele-efektille ajanjaksolla 1989-90. Ajanjaksolla 1993-97 havaittiin, että osakevaihto oli tavanomaista suurempi yhtiökokouspäivänä ja osinkolipun irtoamispäivänä sekä tavanomaista pienempi kahtena seuraavana kaupankäyntipäivänä sellaisilla osakkeilla, jotka ovat keskimääräistä likvidimpiä ja joilla on keskimääräistä korkeampi osinkotuotto. Tavallisuudesta poikkeavia päivätuottoja ei näinä päivinä kuitenkaan havaittu. Tulokset puoltavat sitä, että lyhytaikainen kaupankäynti osinkojen maksun läheisyydessä ei ole merkittävää.

1 INTRODUCTION

Elton and Gruber (1970) show that ex-dividend day behaviour of stock prices can be used to infer the tax bracket of the marginal long-term investor without having to assume any particular asset pricing model. This is a convenient result. Long run taxes are important, because they appear in share valuation models and affect company cost of capital, the level of investment, and financial and dividend policies (see King (1977)). If long-term investors face higher tax rates on dividend income than on capital gains, the tax hypothesis predicts that stock prices fall on ex-dividend days by less than the amount of dividend, or equivalently, ex-dividend day returns are positive because investors require a tax premium as compensation for the higher dividend taxes. Elton and Gruber also suggest that investors may form dividend clienteles, based on their tax brackets. The basic idea is that stocks with high dividend yield attract investors with low dividend tax rates and vice versa.

Evidence in favour of the tax hypothesis is provided for example by Campbell and Beranek (1955), Durand and May (1960), Dorsman and Verboven (1990), Barclay (1987), Robin (1991), Booth and Johnston (1984), Poterba and Summers (1984), Hietala (1990) and Sorjonen (1988). Strongest evidence against the tax hypothesis is provided by Eades, Hess and Kim (1984) who find abnormal ex-dividend day return behaviour not only for taxable dividends but for non-taxable distributions as well. Hence, factors other than taxes may also influence ex-day return behaviour. One such factor in stock prices may be risk premiums (see Grammatikos (1989) and Fedenia and Grammatikos (1993)).

Another explanation for ex-day stock price behaviour is given by Kalay (1982). He argues that dividend capture or dividend avoidance activities of short-term investors, whose tax rates are sufficiently different from those of long-term investors, may determine stock prices around ex-dividend days. This would make it impossible to detect the tax rates of long-term investors. In many countries dividends and short-term capital gains are taxed at the same rate. In that case the short-term trading hypothesis predicts that if short-term traders set prices around ex-days, stock prices fall approximately by the full amount of the dividend, or equivalently, that no tax premium can be observed in ex-day returns. Kalay shows that profitability of short-term trading increases with dividend yield and decreases

with transaction costs. Among others, Lakonishok and Vermaelen (1983) and Michaely (1991) find that short-term trading is important around ex-days. Karpoff and Walkling (1988), Karpoff and Walkling (1990) and Lakonishok and Vermaelen (1986) present evidence for the view that the tax explanation and the short-term trading hypothesis are complementary rather than competing hypotheses. Short-term trading is important among stocks with high yield, low bid-ask spread (transaction costs) and high liquidity, whereas long-term traders seem to determine ex-day prices of stocks with opposite characteristics.

This paper examines the effect of capital income taxation on ex-dividend day stock price behaviour at the Helsinki Stock Exchange (HeSE) in two periods, 1989-90 and 1993-97.[1] In the beginning of 1991 Finland replaced her former two-rate tax system by an imputation system under which recipients of dividend income get full credit for the taxes paid by the dividend distributing firm. Later, in the beginning of 1993, while maintaining the imputation system, Finland introduced a uniform capital income tax rate which was first set at 25 per cent and raised at 28 per cent in 1996. Due to full credit of the corporate tax in dividend taxation, personal dividend tax rates became zero. This implies that stock prices should fall on ex-dividend days by more than 130 per cent of the dividend amount. If stocks are priced by tax free investors or investors with zero effective tax rate on capital gains prices should fall by the full dividend amount. In 1989-90 the treatment of capital income in personal taxation was rich in detail. We expect that prices should fall on ex-days by less than the dividend amount.

In the first subperiod, 1989-90, foreign stock ownership was restricted in Finland. Foreign investors were allowed to hold only unrestricted stocks, while domestic investors were allowed to hold both unrestricted and restricted stocks.[2] We examine the price behaviour of restricted stocks in 1989-90. The results are therefore not contaminated by the tax treatment of foreign investors' equity income. In the second subperiod all stocks are unrestricted and therefore the tax treatment foreign investors may affect ex-day price behaviour.

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[1] Several earlier studies, including Barclay (1987), Booth and Johnston (1984), Grammatikos (1989), Lakonishok and Vermaelen (1983), Michaely (1991), Poterba and Summers (1984) and Robin (1991), examine the effect of a major tax reform on the behaviour of stock prices around ex-dividend days.

[2] The restriction on foreign ownership was removed January 1 1993. For pricing restricted and unrestricted stocks in Finland, see Hietala (1989).

Our empirical results show that the average ex-ratio is roughly 0.7 - 0.75 in both periods, suggesting a preference for capital gains over dividends. The result is consistent with the tax treatment of dividends and capital gains of domestic investors in 1989-90 and inconsistent with that in 1993-97. Our interpretation of these findings is that the marginal investor was a domestic individual in 1989-90 and a foreign investor in 1993-97. A similar finding for 1994-97 has previously been reported by Hedvall, Liljeblom and Löflund (1998).

To test the existence of tax based clienteles in the Finnish stock market we extend the ex-ratio model and estimate a systematically varying parameter model which assumes that the dividend tax rate falls linearly with dividend yield. The empirical evidence gives no support for a clientele effect in 1993-97 and weak support in favour of a clientele effect in 1989-90. Previous studies of Hietala (1990) and Sorjonen (1988) find no evidence of tax clienteles in Finland while Hedvall, Liljeblom and Löflund (1998) suggest in a footnote that there might be one in 1994-97.

Finally, to examine the importance of short-term trading around ex-days we construct a portfolio of stocks of higher than average dividend yield and liquidity. This portfolio exhibits abnormally high trading volume on cum and ex-days and abnormally low trading volume on the following two trading days. There is no evidence of abnormal returns around ex-days. The ex-day abnormal return is positive but not statistically significant. The average ex-ratio of this portfolio, 0.78, is in accordance with our previous results. These results imply that short-term trading around ex-dividend days is not important in the Finnish stock market. Unfortunately, we were unable to perform the same test for 1989-90 because the size of the high yield high liquidity portfolio was far too small for a meaningful test. Due to a stamp duty levied on stock sales and purchases trading costs were higher in 1989-90 than in 1993-97 and therefore short-term trading was probably unimportant.

The plan of the paper is the following. Section 2 discusses the Finnish tax system and the ex-day model. Empirical tests are reported in section 3. Section 4 concludes.

2 TAX TREATMENT OF DIVIDENDS AND CAPITAL GAINS IN FINLAND

Finland has experienced two major capital income tax reforms in the 1990's. First, in the beginning of 1991 the two-rate system was replaced by an imputation system, and second, in the beginning of 1993, while still maintaining the imputation system, a uniform capital income tax rate was introduced. The major features of these tax systems are the following. First, under the two-rate system corporations were effectively taxed at a lower rate on distributed than retained profits. The treatment of capital income in personal taxation was rich in detail. Second, under the imputation system recipients of dividend income get full credit for the taxes paid by the dividend distributing firm. Thus they deduct the corporate tax from their own dividend tax liability and pay (or obtain) the difference. Since 1993 there has been a uniform capital income tax rate. The same tax rate is applied to taxing corporate income, dividends, capital gains and interest and rental income. It was first set at 25 per cent and raised at 28 per cent in 1996. Due to full credit of the corporate tax in dividend taxation, personal dividend tax rates are zero.

2.1 Tax discrimination between dividends and capital gains

We start by discussing the workings of the two-rate and imputation systems.[3] Let D denote the dividend announced by the firm, D_{at} the net dividend after both corporate and personal taxes, τ_d the shareholder's personal tax rate on dividends and G the gross dividend. The gross dividend is the dividend after corporate taxes but before personal taxes, so that $G = D_{at}/(1-\tau_d)$. Let τ be the tax rate on undistributed profit or as a basic rate of corporation tax. τ is the tax rate the firm would face if it paid no dividends at all. Assume that there is 1 markka inside the company after the corporation tax but before shareholders' personal taxes, which is paid out to shareholders in the form of dividends. Define θ as the amount of money the shareholder gets after paying the personal dividend tax. Then $1-\theta$ is the personal dividend tax. θ can be viewed as the opportunity cost of

[3] The discussion follows King (1974 and 1977), Poterba and Summers (1985) and Ylä-Liedenpohja (1993), who employ models that distinguish between various corporate tax systems by comparing their treatment of retained earnings (capital gains to the shareholder) versus distributed earnings (dividends).

retaining 1 markka of earnings in terms of net dividends, D_{at}, foregone, or, as a rate of tax discrimination between retaining earnings and paying out dividends.

Assume that capital gains are taxed at rate τ_g on accrual basis and let γ denote the market value of a unit of retentions.[4] Then a unit of retained earnings leaves the shareholder with an after tax capital gain of $(1-\tau_g)\gamma$. Further assume stocks are priced in such a way that investors are indifferent between capital gains and dividends at the margin. Setting the after-tax capital gain equal to the after-tax dividend, that is, $(1-\tau_g)\gamma = \theta$, and solving for γ yields

$$\gamma = \frac{\theta}{1-\tau_g}. \tag{1}$$

Define the total tax liability, T, of the firm and its shareholders, as the sum of the corporation tax on undistributed profit and the additional taxes the company or its shareholders have to pay on distributed profit as

$$T = \tau Y + \frac{1-\theta}{\theta} D_{at} \tag{2}$$

or

$$T = \tau Y + \frac{(1-\theta)(1-\tau_d)}{\theta} G. \tag{3}$$

Under the two-rate system retained and distributed profits are taxed at different rates. Usually distributed profit is taxed at a lower rate than retained profit.[5] The total tax liability under the two-rate system is

$$T = \tau(Y-G) + \tau_{div} G + \tau_d G \tag{4}$$

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4 γ is the appreciation of stock value resulting from retaining a unit of earnings after corporate taxes.

5 In Finland a lower tax rate on corporate distributions was brought by a dividend deduction in state taxation. 60 per cent (in 1984-1988 and 40 per cent in 1989) of the distributed profit in excess of tax free dividends received was tax deductible. In practise a corporation was entitled to the dividend deduction only if it distributed more dividends than it received, because dividends received from another domestic corporation were not taxable income. In addition, 100 per cent of dividends paid on new equity were deductible from profits in state taxation in the year of the share issue and the next five years, after which the normal 40 or 60 per cent rule was applied.

where τ and τ_{div} are corporate tax rates on undistributed and distributed profit. θ for the two-rate system can be solved by reorganising terms in (4) and setting the coefficient of G equal to the coefficient of G in equation (3). We obtain for θ and γ (see also Table 1)

$$\theta = \frac{1-\tau_d}{1-(\tau-\tau_{div})} \tag{5}$$

$$\gamma = \frac{1-\tau_d}{(1-\tau_g)[1-(\tau-\tau_{div})]}. \tag{6}$$

Under the imputation system corporations are taxed at a flat corporate tax rate, an equal rate for retentions and distributions. Investors are taxed on their dividend income at the marginal tax rate, but they get at least partial credit for the tax paid by the company. Hence, shareholders are regarded as already having paid dividend taxes at rate u, the imputation rate. [6] The total tax liability under the imputation system is

$$T = \tau Y + \tau_d G - uG. \tag{7}$$

Again, θ can be solved by reorganising terms in (7) and setting the coefficients of G equal to the coefficient of G in equation (3). Solving for θ and γ yields [7]

$$\theta = \frac{1-\tau_d}{1-u} \tag{8}$$

and

$$\gamma = \frac{1-\tau_d}{(1-\tau_g)(1-u)}. \tag{9}$$

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[6] Assume that the announced cash dividend is, say, 6 and the imputation rate 40 per cent. The grossed-up dividend is 10. If the shareholder's marginal tax rate is greater than the imputation rate he or she must pay more taxes on the cash dividend at a rate which is the difference between the marginal and imputation rates. For example, if the marginal tax rate is 50 per cent the shareholder's dividend tax is 5 but because 4 is already paid in advance the additional tax liability is 1. If the marginal tax rate is less than the imputation rate, the shareholder gets a tax refund for excess taxes paid.

[7] An intuitive explanation is the following. Assume that the dividend after corporate taxes (and before personal taxes) is 1. The taxable dividend income for the shareholder is the grossed-up dividend $1/(1-u)$ [Note that for the imputation system $G = D_{at}/(1-\tau_d) = D/(1-u)$. Hence, the relation between D and D_{at} is given by $D_{at} = D(1-\tau_d)/(1-u)$. For the two-rate system $G = D = D_{at}/(1-\tau_d)$]. The personal dividend tax is then $\tau_d/(1-u)$ of which the dividend paying firm has already paid $u/(1-u)$. The personal dividend tax rate is given by $(\tau_d-u)/(1-u)$. The dividend after personal taxes is $\theta = 1-(\tau_d-u)/(1-u)$, or $\theta = (1-\tau_d)/(1-u)$. The value of a unit of retentions to the shareholder is $(1-\tau_g)\gamma$. Setting the after-tax amounts equal and solving for γ yields (9).

γ takes both corporate and personal taxes into account. It is therefore a measure of total tax discrimination between distributed and retained profit. If γ is less than one the tax system discriminates dividends in favour of capital gains, while γ greater than one implies that capital gains are taxed more heavily than dividends. Thus, γ, earlier defined as the market value of a unit of retentions, measures the relative value of after-tax dividends in terms of after-tax capital gains. [8]

Poterba and Summers (1985, p.245) define still another tax variable, α, which takes only personal taxes into account. This investor tax preference ratio is given by

(10) $$\alpha = \frac{1-\tau_d}{1-\tau_g}$$

for the two-rate system and

(11) $$\alpha = \frac{1-\tau_d}{(1-\tau_g)(1-u)}$$

for the imputation system. It measures the relative value of a gross dividend of 1 markka and an increase of 1 markka in the stock price.

Table 1

Definitions of Tax Discrimination and Dividend Variables

	Two-Rate System	**Imputation System**
θ	$\frac{1-\tau_d}{1-(\tau-\tau_{div})}$	$\frac{1-\tau_d}{1-u}$
α	$\frac{1-\tau_d}{1-\tau_g}$	$\frac{1-\tau_d}{(1-\tau_g)(1-u)}$
γ	$\frac{1-\tau_d}{(1-\tau_g)[1-(\tau-\tau_{div})]}$	$\frac{1-\tau_d}{(1-\tau_g)(1-u)}$
Dividend announced	$D = G$	$D = (1-u)G$
Net dividend	$D_{at} = (1-\tau_d)G = (1-\tau_d)D$	$D_{at} = (1-\tau_d)G = \frac{1-\tau_d}{1-u}D$

[8] Imagine that a dividend payment of 1 (after the corporation tax) is cancelled and the money retained within the firm. Under the two-rate system the shareholder returns $1-\tau_d$, the tax authorities return $\tau_d+\tau_{div}$ to the firm, and the firm pays a tax of τ on the undistributed profit. The firm retains an amount of $1-(\tau-\tau_{div})$ with an after-tax value of $(1-\tau_g)[1-(\tau-\tau_{div})]\gamma$ to the shareholder. Since $(1-\tau_g)[1-(\tau-\tau_{div})]\gamma$, is equal to $1-\tau_d$, γ must be the value of after tax dividends in terms after-tax capital gains.

In a seminal paper Elton and Gruber (1970) show that ex-dividend day stock prices can be used to estimate α. Let P_{cum} and P_{ex} denote the cum-dividend and ex-dividend day stock prices. Define the before-tax and after-tax ex-day returns as

$$r_{ex} = \frac{P_{ex} - P_{cum} + D}{P_{cum}} \tag{12}$$

and

$$r_{ex}^{at} = \frac{(1-\tau_g)(P_{ex} - P_{cum}) + (1-\tau_d)D}{P_{cum}} \tag{13}$$

where D is the dividend announced by the firm. The dividend is non-zero on ex-dividend days and zero otherwise. Manipulating (13) yields

$$r_{ex} = \frac{r_{ex}^{at}}{1-\tau_g} + (1-\alpha)\frac{D}{P_{cum}} \tag{14}$$

where $\alpha = (1-\tau_d)/(1-\tau_g)$ is the tax preference ratio discussed above and D/P_{cum} is dividend yield. Equation (14) implies that stock returns on non-ex-days are simply after-tax returns grossed-up by the capital gains tax rate. Letting $\bar{r} = r_{ex}^{at}/(1-\tau_g)$ equation (14) can be rewritten as

$$r_{ex} = \bar{r} + (1-\alpha)\frac{D}{P_{cum}} \tag{15}$$

Further manipulation of (15) yields the familiar result of Elton and Gruber (1970)

$$\frac{P_{cum}(1+\bar{r}) - P_{ex}}{D} = \alpha . \tag{16}$$

Equations (15) and (16) suggest that ex-day returns depend on the tax treatment of dividends and capital gains. If dividends are taxed more (less) heavily than capital gains in personal taxation, the tax preference ratio is less (greater) than one, and we expect, firstly, that prices on ex-dividend days fall by less (more) than the amout of the dividend, and secondly, that ex-day stock returns are positively (negatively) related to dividend yield.

2.2 The 1990 and 1992 tax reforms

This section examines how the 1990 and 1992 tax reforms changed the tax treatment of shareholders' dividend income and capital gains. Table 2 summarises the discussion below.

(a) Foundations and mutual funds

Private foundations and mutual funds are tax free institutions, and therefore pay no taxes on dividends and capital gains. Before 1991 these institutions paid no taxes on the gross dividend, G, and thus $G = D_{at}$. After 1991 the gross dividend was effectively taxed at the imputation rate, u, at the corporate level and therefore foundations and mutual funds received the announced dividend, D, on which no additional taxes were due. On the other hand, they were not entitled to a tax refund for the dividend tax withheld by the dividend paying firm and therefore $D_{at} = D$. Hence, the dividend tax rate, on the dividend announced, remained zero for foundations and mutual funds after 1991. The capital gains tax rate also remained zero. Therefore we expect that the tax preference ratio, α, of foundations and mutual funds is equal to one in 1989-97.

Table 2

The Tax Treatment of Dividend Income and Capital Gains in Finland°
(Periods 1989-90, 1991-92 and 1993-97)

		Effective marginal tax rate		
	Investor	1989-90	1991-92	1993-97
Dividends°	Individuals	$0, 0.5\tau_p, \tau_p$	$(\tau_p - u)/(1 - u)$	0
	Ordinary corporations	0	0	0
	Banks, insurance companies and stock brokers	τ	0	0
	Foundations and mutual funds	0	0	0
Capital gains	Individuals	$\tau_p, 0.8\tau_p, 0.4\tau_p$	$\tau_p, 0.8\tau_p, 0.5\tau_p$	τ_g
	Ordinary corporations	τ	τ	τ
	Banks, insurance companies and stock brokers	τ	τ	τ
	Foundations and mutual funds	0	0	0

° Dividend stands here for the dividend announced, which is equal to the dividend after corporate taxes. In 1989-90 the dividend announced is the gross dividend, G, while in 1991-97 it is the dividend without tax credit, $(1-u)G$.

(b) Corporations

Capital gains are fully taxable for all corporations at the corporate tax rate, τ. [9] The dividend tax rate of ordinary corporations was zero in 1989-90, while dividends of other

[9] Since 1989 only 60 per cent of the capital gain was taxable after a five year holding period if shares owned by an ordinary corporation are classified as fixed assets.

corporations (banks, insurance companies and stock brokers) were taxed at τ. [10] In 1991 the personal dividend tax rate became $(\tau\text{-}u)/(1\text{-}u)$ for all corporations. The imputation rate, u, was set equal to τ. Therefore, while gross dividends were taxed at the imputation rate, the effective marginal tax rate, $(\tau\text{-}u)/(1\text{-}u)$, on cash dividends, D, was zero for all corporations. Thus, the dividend tax rate of ordinary corporations remained zero from 1989 to 1997, while that of banks, insurance companies and stock brokers fell from τ in 1989-90 to zero in 1991-97.

The tax preference ratio, α, of ordinary corporations is equal to $1/(1\text{-}\tau)$ in 1989-97, whereas the tax preference ratio of banks, insurance companies and stock brokers is equal to unity in 1989-90 and $1/(1\text{-}\tau)$ in 1991-1997. A casual look at table 3 suggests that the tax preference ratios of corporations remain almost unchanged over time. This is not true, because the corporate tax rate changed several times in 1989-1997. Using statutory tax rates [11] we estimate that α of ordinary corporations was 1.85 in 1989-90, 1.33 in 1993-1995 and 1.39 in 1996-97. The estimates are identical for other corporations with the exception that $\alpha = 1$ in 1989-90.

(c) Individuals

In 1989-90 the effective marginal dividend tax rate for individuals was 0, $0.5\tau_p$ or τ_p.[12] [13] In the following we refer to individuals in the zero dividend tax bracket as 'group 1', those

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[10] Before 1991 dividends received by a domestic corporation from another domestic corporation were tax free with one important exception. Dividend income was fully taxable at the corporate tax rate, τ, for banks, insurance companies, pension funds and stock brokers. Dividends were tax free for them only if the shares were classified as fixed assets in the balance sheet. Shares in fixed assets can be regarded as long-term or strategic investments that yield regular income. While banks are major shareholders in Finland, it is very doubtful that these potentially large blocks of shares were traded around ex-dividend days. Finally, for holding companies dividends were tax free only to the extent that they were redistributed to the company's own shareholders, which merely illustrates the chain principle that only the final recipient of the dividend should be taxed.

[11] The corporate tax rate was 46 per cent in 1989-90, 25 percent in 1993-95 and 28 percent in 1996-97.

[12] The effective marginal tax rate on dividends (capital gains) is the taxable proportion of dividend income (capital gain) times the marginal tax rate. For example, if only 50 per cent of dividend income is taxable, the effective dividend tax rate is $0.5\tau_d$.

[13] Individuals were allowed to make a capital income deduction from interest, dividend and rental income. The first FIM 2000 was tax free. 50 per cent of the dividends and interest income between FIM 2001 and FIM 18000 (FIM 38000 in 1990) were taxable at the marginal tax rate, τ_p. Dividends beyond FIM 18000 (FIM 38000) were fully taxable at τ_p. The capital income deduction was removed in 1991 when the imputation system was adopted.

in the $0.5\tau_p$ bracket as 'group 2' and those in the τ_p bracket as 'group 3'. Dividend tax rates of all individuals decreased after the adoption of the imputation system in 1991. Dividends were taxed at the marginal income tax rate, τ_p, with full imputation of the corporate tax. The personal dividend tax rate $(\tau_p\text{-}u)/(1\text{-}u)$ became negative for low tax bracket individuals ($\tau_p < u$), either negative or positive for individuals in the middle tax brackets, and remained positive for high tax bracket individuals ($\tau_p > u$).[14] Later, in 1993, as the uniform capital income tax rate was adopted and set equal to the imputation rate and the corporate tax rate, the effective dividend tax rate, $(\tau_d\text{-}u)/(1\text{-}u)$, of all individuals became equal to zero. This reform raised the dividend tax rate of group 1 and decreased that of group 3. The effect on group 2 is unclear.

The tax treatment of individuals' capital gains was fairly complicated in 1989-92.[15] Capital gains were taxed at the personal income tax rate. They were fully taxable for holding periods less than 4 years, and 80 per cent taxable for a 4-5 year holding period. For holding periods over 5 years only 40 (50 in 1992) per cent was taxable after a tax free amount of FIM 200 000 (FIM 210 000 in 1990). Thus, the marginal capital gains tax rate was τ_p, $0.8\tau_p$ or $0.5\tau_p$ ($0.4\tau_p$ in 1992).[16] Since 1993 all capital gains have been fully taxable at the uniform capital income tax rate.

The implications of the two tax reforms on individuals' tax preference ratios are not straightforward. To get some idea of the probable size of tax preference ratios we computed ballpark values under different assumptions of the identity of the marginal investor and the length of the holding period.[17] The formula used in computing the ratios is

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[14] $(\tau_d - u)/(1 - u)$ is smaller than τ_d as long as $\tau_d < 1$.

[15] For an excellent survey of individuals' capital gains taxation in Finland, see Kukkonen (1992).

[16] In addition, the taxable capital gain was calculated using as the purchase price the larger of the original purchase price and a given percentage (25 or 50 per cent) of the sales price. Thus only part of the capital gain was taxable when an asset was sold at a price many times as high as the original purchase price.

[17] In computing values for the tax preference ratios we make the following assumptions. First, the imputation rate is 25 per cent in 1993-95 and 28 per cent in 1996-97 and equal to the corporate tax rate. In 1989-90 the corporate tax rate used is 46 per cent, a simple average of approximate corporate tax rates of 50 per cent in 1989 and 42 per cent in 1990. Second, we assume that the marginal tax rates of group 1, group 2 and group 3 individuals are 30, 50 and 63 per cent, respectively. Third, the dividend income of a group 1 individual is, by our definition, not more than FIM 2000. It follows that if the dividend yield of the group 1 individual's portfolio is very low, say 0.5 per cent, the value of the portfolio can not exceed

$$\alpha = \frac{1 - f - \left(\frac{(b\tau_d - f) - u}{1 - u} \right)(1+r)^{-l}}{1 - c\tau_g (1+r)^{-(h+l)}} \tag{17}$$

where f is the immediate witholding tax rate[18], b and c are the taxable proportions of dividends and capital gains, u is the imputation rate, r is the interest rate used in discounting future taxes, h is the length of the holding period (in years), and l is the time lag between realization of taxable capital income and the actual tax payment[19]. The parameter values used are collected in Table 3 and the results are reported in Table 4.

Table 3

Parameter Values

	τ_p	u	f	b	c	h	l
1989-90							
Individuals: Group 1	0.3	0	0	0	0	0, 1, 4, 5	1.5
Individuals: Group 2	0.5	0	0.25	0.5	1, 0.8, 0.4	0, 1, 4, 5	1.5
Individuals: Group 3	0.63	0	0.5	1	1, 0.8, 0.4	0, 1, 4, 5	1.5
Ordinary corporations	0.46	0	0	0	1	0, 1, 3, 5	0
Banks, insurance companies and stock brokers	0.46	0	0	1	1	0, 1, 3, 5	0
Foundations and mutual funds	0	0	0	0	0	0	0
1993-95 / 1996-97							
All individuals	0.25 / 0.28	0.25 / 0.28	0	1	1	0, 1, 4, 5	1.5
All corporations	0.25 / 0.28	0.25 / 0.28	0	1	1	0, 1, 3, 5	0
Foundations and mutual funds	0	0	0	0	0	0	0

τ_p = the capital income tax rate or the corporate tax rate, u = the imputation rate, f = the immediate witholding tax rate, b = the taxable proportion of dividends, c = the taxable proportion of capital gains, h is the length of the holding period (in years), and l is the time lag between realization of taxable capital income and the actual tax payment. For a seller $h = 0$. The interest rate used is 6% for 1989-90, 5% for 1993-95 and 3% for 1996-97.

FIM 400 000. For a higher dividend yield the value of the portfolio has to be even lower. It is therefore very unlikely that capital gains of group 1 individuals would exceed FIM 200 000, the tax free amount of capital gains. Hence, we assume that group 1 individuals have a zero capital gains tax rate. Finally, if the holding period is less than four years, we assume that it is exactly two years. If the holding period is from four to five years, we assume that it is exactly four years. If the holding period is more than five years, a holding period of exactly five years is assumed.

[18] In practice, after the tax free capital income FIM 2000, there was an immediate 25 per cent dividend tax on receipt of the next FIM 16000 (FIM 36000 in 1990) which was later taken into account in computing the final tax. Beyond FIM 18000 (or FIM 38000) the immediate dividend tax was 50 per cent.

[19] Dividends are paid annually in Finland, usually during the first six months of the year with most dividend payments taking place in March or April. The final tax on dividends is paid in December the next year. Therefore, if the average dividend payment takes place in April, there is on average a 20 month lag between the dividend receipt and the tax payment. The lag with capital gains tax payments is slightly different. Capital gains realised today are reported to the tax authorities by January next year and the tax is due in December. The lag between the realisation of the gain and the tax payment therefore varies between 12 and 24 months. To simplify things, we assume a lag of 18 months applies to the taxation of both dividends and capital gains. The lag is valid for individuals only, because corporations pay at least part of their tax liability in advance.

Table 4

Estimates of the Investor Tax Preference Ratio (α) for Some Long-Term Investors

	Holding period (years)	1989-1990		1993-1995		1996-1997	
		Seller	Buyer	Seller	Buyer	Seller	Buyer
Individuals: Group 1	1	1	1	1.30	1.28	1.37	1.35
	4	1	1	1.30	1.24	1.37	1.31
	5	1	1	1.30	1.22	1.37	1.30
Individuals: Group 2	1	1.38	1.32	1.30	1.28	1.37	1.35
	4	1.18	1.06	1.30	1.24	1.37	1.31
	5	0.92	0.87	1.30	1.22	1.37	1.30
Individuals: Group 3	1	0.90	0.84	1.30	1.28	1.37	1.35
	4	0.71	0.60	1.30	1.24	1.37	1.31
	5	0.50	0.46	1.30	1.22	1.37	1.30
Ordinary corporations	1	1.85	1.77	1.33	1.31	1.39	1.37
	3	1.85	1.63	1.33	1.28	1.39	1.34
	5	1.85	1.52	1.33	1.24	1.39	1.32
Banks, insurance companies and stock brokers	1	1	0.95	1.33	1.31	1.39	1.37
	3	1	0.88	1.33	1.28	1.39	1.34
	5	1	0.82	1.33	1.24	1.39	1.32
Foundations and mutual funds		1	1	1	1	1	1

2.3 Implications for ex-dividend day stock price behaviour

The range of tax preference ratios for 1989-90 in Table 4 is quite wide, suggesting that ex-ratios can vary a lot depending on the identity of the marginal investor. We argue that ex-ratios can not reflect very large or very small tax preference ratios. First note that α is the amount of capital gain that makes the investor indifferent after taxes with a dividend of 1. Each figure in Table 4 gives the size of the ex-ratio that makes a given investor indifferent between selling cum and ex (the column marked 'seller'), and buying cum and ex (the column marked 'buyer'). If an investor expects that the ex-ratio will deviate from these values, he will find it profitable to accelerate or delay his sales or purchases. For example, if the expected ex-ratio is smaller (larger) than the investor's own tax preference ratio, he will find it profitable to sell the stock ex (cum). A similar argument can be made for investors wishing to time their stock purchases around ex-days. If the expected ex-ratio is smaller (larger) than the investor's own tax preference ratio, he would find it profitable to buy the stock cum (ex). Second, when the expected ex-ratio is very small, only few investors are willing to sell cum and buy ex, while others are willing to do the reverse. The stock price tends to rise on the cum-day and fall on the ex-day which increases the ex-ratio. Respectively, when the expected ex-ratio is very large, only few investors are

willing to buy cum and sell ex, while others are willing to do the reverse. Thus, the ex-ratio tends to fall because the stock price falls on the cum-day and rises on the ex-day. Hence, it is unlikely that ex-ratios reflect very small or very large tax preference ratios. Therefore investors with very small or very large tax preference ratios are not likely marginal investors.

Ignoring the extreme tax preference ratios, Table 4 suggests that ex-ratios are less than or equal to unity in 1989-90. Very small and large tax preference ratios are not a problem in 1993-97. We expect that ex-ratios are equal to unity in 1993-97 if the marginal investor is a taxfree institution and approximately 1.3 if the marginal investor is someone else. Therefore, we predict that ex-ratios in 1993-97 are at least as large as in 1989-90.

Table 5

Estimates of the Investor Tax Preference Ratio (α) when the Effective Tax Rate on Capital Gains is Zero

	1989-90	1993-95	1996-97
Individuals: Group 1	1	1	1
Individuals: Group 2	0.75	1	1
Individuals: Group 3	0.38	1	1
Ordinary corporations	1	1	1
Banks, insurance companies and stock brokers	0.54	1	1
Foundations and mutual funds	1	1	1

Table 4 assumes that capital gains taxes can not be avoided. In practise, however, the effective tax rate on capital gains may be close to zero if investors have enough losses to offset gains.[20] Miller and Scholes (1982) suggest that capital gains taxes can be postponed forever. One can realize losses today by selling shares, buy them back tomorrow to keep the composition of one's portfolio unaltered, and then use the losses to offset the capital gains. Table 5 shows the tax preference ratios when the effective capital gains tax rate is zero.[21] Our previous prediction that ex-ratios in 1993-97 are at least as large as in 1989-90 remains.

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[20] The Finnish stock market boomed in the late 1980's and the market index rose more than 220 per cent from 1985 to 1989. In the autumn of 1989 the market turned from bull to bear and by autumn 1992 almost 70 per cent of the market value of stocks vanished. The sudden market decline may have turned a large part of the capital gains accumulated in the late 1980's gradually into capital losses. As short-term capital gains can be offset by short-term capital losses for tax purposes, the effective marginal capital gains tax rate may have been low in 1993.

[21] Dividend taxes are not a problem because they can not be avoided neither in the old system nor in the new system.

3 EMPIRICAL TESTS

3.1 Methodology

The starting point for empirical analysis is equation (15), which is reproduced here for convenience

(15') $$r_i = \bar{r}_i + (1-\alpha)\frac{D_i}{P_i}$$

The empirical version of (15') is

(18) $$r_i = \gamma_0 + \gamma_1 d_i + \gamma_2 \bar{r}_i + \varepsilon_i \qquad \varepsilon_i \sim N(0,\sigma_i^2)$$

where γ_1 = 1-α is the tax parameter we are interested in, γ_0 is expected to be zero, and γ_2 equal to 1. If γ_2 indeed equals unity, estimating (18) is equivalent to estimating

(19) $$r_i - \bar{r}_i = \gamma_0 + \gamma_1 d_i + \varepsilon_i$$

where the left-hand side can be written as

(20) $$r_i - \bar{r}_i = \left[P_{i,ex} - (1+\bar{r}_i)P_{i,cum} + D_i\right] / P_{i,cum} .$$

Thus adjusting the cum-day price by the normal return amounts to the same as deducting the normal return from the ex-day return. The residual, ε_i, in (18) measures the unexpected ex-day return. Residual variance is non-constant, because stock returns have different volatilities and therefore the model in (18) is heteroskedastic. To correct for heteroskedasticity both sides of (18) must be divided by σ_i so that the model becomes

(21) $$\frac{1}{\sigma_i}\frac{P_{i,ex} - P_{i,cum} + D_i}{P_{i,cum}} = \gamma_0 \frac{1}{\sigma_i} + \gamma_1 \frac{d_i}{\sigma_i} + \gamma_2 \frac{\bar{r}_i}{\sigma_i} + \eta_i$$

where $\eta_i = \varepsilon_i/\sigma_i$ has a constant variance. Equation (21) is very close to the *GLS* estimator of the ex-ratio first proposed by Michaely (1991). To see the connection, let $\gamma_0 = 0$ and $\gamma_2 = 1$, and use γ_1 = 1-α. Some manipulation of (21) yields

$$(22) \qquad \frac{d_i}{\sigma_i}\frac{P_{i,cum}-P_{i,ex}}{D_i} = \alpha\frac{d_i}{\sigma_i} - \frac{\bar{r}_i}{\sigma_i} + \eta_i$$

and after rearranging terms

$$(23) \qquad \frac{d_i}{\sigma_i}\frac{P_{i,cum}\left(1+\bar{r}_i\right)-P_{i,ex}}{D_i} = \alpha\frac{d_i}{\sigma_i} + \eta_i .$$

The *GLS* estimator in (23) weights the individual ex-ratios by factor $w_i = d_i/\sigma_i$ to make the residual term homoskedastic. The model we actually estimate is (22) which we can write as

$$(24) \qquad \frac{d_i}{\sigma_i}\frac{P_{i,cum}-P_{i,ex}}{D_i} = \beta_0 + \beta_1\frac{d_i}{\sigma_i} + \beta_2\frac{\bar{r}_i}{\sigma_i} + \eta_i \qquad \varepsilon_i \sim N\left(0,\sigma^2\right).$$

We expect that $\beta_0 = 0$, $\beta_1 = \alpha$ and $\beta_2 = 1$.[22] Capital income taxes affect the pricing of shares if $\beta_1 \neq 1$.

3.2 Data

Our data set includes all companies listed at the Helsinki Stock Exchange (HeSE) that had at least one ex-dividend day during the periods 1989-90 and 1993-1997, were traded on both the last cum-day and the first ex-day, and paid strictly positive dividends.[23] Before Jan 1 1993 foreign investors were allowed to purchase unrestricted stocks only, while Finnish investors were allowed to purchase both restricted and unrestricted stocks. We use data of only restricted stocks in 1989-90 for two reasons. First, the number of unrestricted stocks is small, and second, restricted shares allow us to examine the effect of capital income taxation of domestic investors on returns of shares that only domestic investors can hold. Since 1993 all shares are unrestricted and therefore our sample for 1993-97 includes all stocks.

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[22] Multilying both sides by σ_i/d_i and ignoring the normal return yields the traditional ex-ratio of Elton and Gruber, that is, $(P_{i,cum} - P_{i,ex}) / D_i = \alpha - \varepsilon_i/d_i$.

[23] Stocks were excluded if a share issue began on the ex-dividend day. Some firms were excluded because their 1990 dividend payments were taxed according to the 1991 imputation system. Also some Swedish firms were excluded because they announce their dividends in Swedish Crowns.

The data set contains closing and opening prices, and both the number of stocks traded and the trading volume. We measure the ex-day price drop from cum close to either ex open or ex close. Since not all price and volume information is available for all stocks the number of ex-day observations available depends on the choice of prices.[24] For all stocks we use closing, opening and average prices, defined as the trading volume divided by the number of stocks traded, to compute three sets of returns for days -55,...,-6 relative to the ex-dividend day (= day 0). Returns are defined as logarithmic price differences. We choose the set of returns that offers the highest number of observations and use these returns to estimate the normal return and the standard deviation of returns. If the number of observations is the same for all alternatives we use closing prices. At least 15 return observations are required, otherwise the stock is excluded. The normal return is measured as both the mean and median return during the 50 day period. Stocks fulfilling these requirements form the narrow sample. We also form a broad sample which differs from the narrow one in that no return history is required.

3.3 Results

First we estimate (24) for both the broad and the narrow sample. The heteroskedasticity correction requires information of σ_i. For the narrow sample we estimate σ_i as the standard deviation of stock returns in days -55,...,-6. For the broad sample information of average returns and return volatility is not available. Therefore we use ex-day market returns (WI-index) as proxies for normal return and set $\sigma_i = 1$ for all i. Thus, with the broad sample (24) reduces to (18).

We expect that the coefficient of normal return is close to one. The results show something else. Correlations between ex-day returns and estimates of normal return are close to zero (with 1989-90 data the correlation coefficient is actually negative) and the regression coefficients are both small and insignificantly different from zero. We obtain the same result with both samples and all measures of normal return. These findings

[24] Some authors form portfolios of stocks going ex-dividend on the same calendar date and treat each daily portfolio as one ex-day observation. We treat every stock going ex on the same date as a separate observation.

suggest that either the return adjustment is incorrect or there is no need for one. Therefore we simplify the empirical model by excluding the normal return altogether. The new model is

$$\frac{d_i}{\sigma_i}\frac{P_{i,cum}-P_{i,ex}}{D_i}=\beta_0+\beta_1\frac{d_i}{\sigma_i}+\eta_i \tag{25}$$

where the constant is expected to capture the normal non-ex-day return.

Graphical inspection of the data suggests that some observations are very different from the majority of observations. After a closer look a total of 6 observations are excluded in 1989-90 and one observation in 1993-97. Even after that we find evidence of extremely high residual non-normality and heteroskedasticity. The Bera-Jarque normality tests show values 10 times the critical value of 5.99 (5 per cent significance level).[25] This suggests the possibility of influential observations, or outliers, which indicates that our knowledge of ex-day price behaviour is restricted. Our simplistic models can explain only a relatively small part of ex-day returns with taxes and dividend yield leaving a lot of room for improvement. On the other hand, some outliers are created by the heteroskedasticity correction from observations with an unusually small or large d_i/σ_i .

Since our purpose is to study how stock prices on average behave on ex-days, it is important to identify the unusual observations. To detect influential observations we compute two measures of influence for each observation, leverage and standardised residual (see Chapter 22 in Judge et al. (1988) for robust estimation). The standardised (or studentized) residual measures large errors. The residual for the *i*th observation is computed by estimating the model without this observation. It is then standardised by the estimated residual standard deviation. Standardised residuals less than 2 in absolute value are regarded as acceptable. Leverage measures the distance between an individual observation and the majority (average) of observations. Observations very far from the majority of observations may have a strong influence on the regression coefficients and their standard deviations. With one regressor, observations are regarded as influential if leverage exceeds $2/N$ or $3/N$ (N is the sample size). In our data set high leverage values are

[25] The Bera-Jarque normality test is a joint test of whether estimates of skewness and excess kurtosis are significantly different from zero. The test statistic has an asymptotic χ^2 distribution with 2 degrees of freedom. For details, see Judge et al. (1988) pp. 890-892.

not common. The very few exceptions exceeding $6/N$ or $8/N$ are dropped out. Large standardised residuals, few exceeding 5, several exceeding 2, are more common. Again we remove observations with standardised residuals very different from other observations. In some cases we set the limit at 2.2, but usually higher. The total number of excluded observations is small and in general the effect on parameter estimates is small.

The average ex-ratios are reported in table 6, when ex-day price drops are measured from cum-day closing to ex-day opening, and in table 7 when only closing prices are used. These tables report the results for both the broad and narrow samples. Panel (a) of table 6 shows that the results for the two periods bear a remarkable resemblance. The constant terms are not different from zero as we expected and forcing them to zero has little impact on the slope coefficients. In both periods the average ex-ratio is close to 0.7. The difference between the two periods is statistically insignificant and alternates with sign depending whether the constant is included in the regression. In both periods the tax parameter is (at least marginally) significantly smaller than one, although the reliability of this conclusion is undermined by evidence of residual heteroskedasticity in the latter period.

If the estimates are taken at face value they suggest the following. First, an average ex-ratio equal to 0.7 implies a roughly 30 percent dividend tax rate and a zero tax on capital gains. Alternatively, if the capital gains tax rate is positive, the dividend tax rate must exceed 30 percent. Second, in 1989-90 the marginal investor is an individual who has a lot of capital income (see Tables 4 and 5 for the tax preference ratios). Third, since tax preference ratios of domestic investors can not be less than one in 1993-97 the marginal investor must be a foreign investor.[26] A more frightening explanation is that the marginal investor is a domestic investor with a zero tax rate on capital gains, believing that his or her marginal dividend tax rate is 28 percent even though it is zero in reality. The narrow sample confirms these results for 1993-97. The results for 1989-90 are not quite the same as in the broad sample case, possibly because the sample size is much smaller, only 42 observations compared to 63 in the broad sample.

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[26] Hedvall, Liljeblom and Löflund (1998) report a similar result for 1994-97. The result is consistent with Hietala and Keloharju (1995) who find that ex-day price behaviour of restricted and unrestricted stocks is different because the capital income tax treatment of domestic and foreign investors is different.

Table 6

Ex-Dividend Day Ratios in 1989-90 and 1993-97

Cum Close - Ex Open

Panel (a) Broad sample

	N	β_0	β_1	R^2	*BP*	*BJ*
1989-90	63	-0.002 (0.486)	0.734 (1.936)	0.318	0.615 [0.433]	2.923 [0.232]
	63		0.676 (4.655)	0.315	1.074 [0.300]	3.233 [0.199]
1993-97	206	-0.001 (0.243)	0.723 (2.909)	0.221	4.885 [0.027]	5.565 [0.062]
	206		0.703 (6.559)	0.221	5.027 [0.025]	5.159 [0.076]

Panel (b) Narrow sample

	N	β_0	β_1	R^2	*BP*	*BJ*
1989-90	42	-0.148 (0.356)	0.608 (1.750)	0.155	0.000 [0.993]	3.237 [0.072]
	42		0.537 (4.514)	0.153	0.002 [0.963]	3.328 [0.189]
1993-97	148	0.029 (0.238)	0.729 (3.058)	0.317	8.533 [0.003]	3.566 [0.059]
	148		0.747 (5.219)	0.316	8.256 [0.004]	4.301 [0.116]

t-values are in parentheses below parameter estimates. The *t*-tests are H_0: $\beta_0 = 0$ and H_0: $\beta_1 = 1$. *BP* is the Breusch-Pagan test of heteroskedasticity. $BP = N*R^2$, where R^2 is from the regression of squared residuals on the explanatory variables. *BJ* is the Bera-Jarque test for normality of residuals. p-values are in brackets below *BP* and *BJ*.

When the ex-day price drop is computed using closing prices (Table 7) the results become less clear. One explanation is that intra-ex-day returns produce noise which the constant term alone can not remove. Two of the constants are marginally significant. When the constants are forced to zero, average ex-ratios for 1993-97 are again close to 0.7. Average ex-ratios for 1989-90 are more dispersed, potentially because of small number of observations, and therefore difficult to interpret.

Table 7

Ex-Dividend Day Ratios in 1989-90 and 1993-97

Cum Close - Ex Close

Panel (a) Broad sample

	N	β_0	β_1	R^2	BP	BJ
1989-90	49	-0.006 (1.151)	0.667 (2.002)	0.255	0.002 [0.961]	2.260 [0.323]
	49		0.505 (5.596)	0.234	0.000 [0.991]	2.389 [0.303]
1993-97	203	-0.005 (1.904)	0.901 (0.935)	0.264	6.039 [0.014]	0.324 [0.851]
	203		0.724 (5.384)	0.251	6.276 [0.012]	0.231 [0.891]

Panel (b) Narrow sample

	N	β_0	β_1	R^2	BP	BJ
1989-90	31	-0.698 (1.885)	0.773 (1.132)	0.340	2.498 [0.114]	3.608 [0.058]
	31		0.441 (5.667)	0.259	1.677 [0.121]	11.570 [0.121]
1993-97	147	-0.145 (0.922)	0.772 (1.985)	0.237	21.120 [0.000]	10.040 [0.002]
	147		0.683 (5.017)	0.233	22.200 [0.000]	6.099 [0.047]

t-values are in parentheses below parameter estimates. The *t*-tests are H_0: $\beta_0 = 0$ and H_0: $\beta_1 = 1$. *BP* is the Breusch-Pagan test of heteroskedasticity. $BP = N*R^2$, where R^2 is from the regression of squared residuals on the explanatory variables. *BJ* is the Bera-Jarque test for normality of residuals. p-values are in brackets below *BP* and *BJ*.

The tax clientele hypothesis of Elton and Gruber (1970) predicts a positive relation between ex-dividend ratios and dividend yield. The argument is that investors with low dividend tax rates prefer a large proportion of their portfolio returns in the form of dividends and therefore invest in high yield stocks, while investors with high dividend tax rates prefer a large proportion of their portfolio returns in the form of capital gains and

therefore invest in low yield stocks. Normally this hypothesis is tested by grouping stocks into deciles according to dividend yield after which the average ex-ratio is computed for each decile. Studies that employ U.S. stock price data often have several hundred observations per yield decile, but unfortunately we do not have that luxury. To test the existence of a tax based clientele effect in the Finnish stock market we extend our previous model and estimate a systematically varying parameter model which allows ex-ratios vary continuously with dividend yield.

We start from (25), ignoring the constant for a while

$$\frac{d_i}{\sigma_i}\frac{P_{i,cum}-P_{i,ex}}{D_i}=\frac{1-\tau_d}{1-\tau_g}\frac{d_i}{\sigma_i}+\eta_i. \tag{25'}$$

The tax clientele hypothesis predicts that the dividend tax rate decreases with dividend yield. We specify a linear relationship between the dividend tax rate and dividend yield

$$\tau_d=\gamma_0-\gamma_1 d_i. \tag{26}$$

This specification suggests that γ_0 is the dividend tax rate of an investor who invests in stocks that do not pay dividends. We expect that $\gamma_0 > 0$ and $\gamma_1 > 0$. There is no error term in (26), which means that the linear relationship between the dividend tax rate, τ_d, and dividend yield is assumed to hold exactly. Inserting (26) into (25') yields

$$\frac{d_i}{\sigma_i}\frac{P_{i,cum}-P_{i,ex}}{D_i}=\frac{1-\gamma_0}{1-\tau_g}\frac{d_i}{\sigma_i}+\frac{\gamma_1}{1-\tau_g}\frac{d_i^2}{\sigma_i}+\eta_i. \tag{27}$$

The model we estimate is thus

$$\frac{d_i}{\sigma_i}\frac{P_{i,cum}-P_{i,ex}}{D_i}=\beta_1\frac{d_i}{\sigma_i}+\beta_2\frac{d_i^2}{\sigma_i}+\eta_i \tag{28}$$

where $\beta_1 = (1-\gamma_0)/(1-\tau_g)$ is the tax preference ratio of an investor who does not invest in dividend paying stocks, and $\beta_2 = \gamma_1/(1-\tau_g)$.

Table 8

Ex-Dividend Day Ratios in 1989-90 and 1993-97

Cum Close - Ex Open

	N	β_1	β_2	R^2	*BP*	*BJ*
1989-90	63	0.324 (3.307)	8.192 (1.827)	0.340	0.108 [0.947]	2.548 [0.280]
	41	0.308 (2.551)	5.616 (0.735)	0.116	6.507 [0.039]	1.328 [0.515]
1993-97	206	0.614 (3.190)	2.426 (0.793)	0.219	5.835 [0.054]	6.611 [0.037]
	148	0.772 (1.715)	-1.133 (0.308)	0.211	9.471 [0.009]	2.034 [0.362]

t-values are in parentheses below parameter estimates. The *t*-tests are H_0: $\beta_1 = 1$ and H_0: $\beta_2 = 0$. *BP* is the Breusch-Pagan test of heteroskedasticity. $BP = N*R^2$, where R^2 is from the regression of squared residuals on the explanatory variables. *BJ* is the Bera-Jarque test for normality of residuals. p-values are in brackets below *BP* and *BJ*.

The results are shown in Table 8. There is no evidence of a tax clientele effect in 1993-97. Estimates of β_2 are statistically insignificant and only the broad sample produces the correct sign. This is consistent with marginal investors at all dividend yield levels having the same tax preference ratio, which is estimated by β_1. Estimates of β_1 are also reasonably close to the previous estimates in tables 6 and 7 thus corroborating our earlier findings. Results for 1989-90 are quite different. Estimates of β_1 suggest that investors investing in very low yield stocks have a tax preference ratio of close to 0.3. Assuming that the tax rate on capital gains is zero, this implies a dividend tax rate of almost 70%. The broad sample produces a marginally significant estimate of β_2 of size 8.2 which suggests that an increase of 0.01 in dividend yield is matched by a decrease of 0.08 in the dividend tax rate. The dividend tax rate of an investor investing in stocks yielding 5% would then be approximately 27%. The narrow sample does not confirm this result. This evidence gives weak support for the presence of a tax clientele effect in the Finnish Stock market in 1989-90. This result contradicts the previous findings of Hietala (1990) and Sorjonen (1988).

Kalay (1982) argues that ex-ratios can not be used to derive the tax rate of a long-term investor if short-term trading, that is, dividend motivated trading, around ex-days is

important. Buying shares before they go ex and selling afterwards is profitable if the dividends more than cover transaction costs and the price drop, taking taxes into account. Selling shares short before they go ex and buying back afterwards is profitable if the gain from price depreciation more than covers transaction costs and the dividend amount that must be returned to the owner of the shares, taking taxes into account. Profitability of dividend trading falls with transaction costs and increases with dividend yield. If dividend trading is important, it continues as long as marginal profits become zero. At that point ex-day price drops exactly reflect the tax preference ratio and transaction costs of dividend traders and not the tax rates of long-term traders.

To examine the importance of short-term trading we form a portfolio of stocks with high dividend yield and high liquidity. Liquidity is measured by normal trading volume which we define as the average number of shares traded during trading days -55,...,-6 relative to the ex-day. Stocks accepted in this portfolio are required to have higher than average (median) dividend yield, higher than average (median) normal trading volume, and recorded trades in at least 48 days during days -55,...,-6. In 1993-97 a total of 28 stocks fulfill these requirements. The average dividend yield in this sample is 2.8 % and the average normal daily trading volume is 114895 shares. The respective numbers for the entire narrow sample are 2.2% and 49072 shares. An identical selection procedure produces a sample of only three stocks for 1989-90, which makes any meaningful analysis impossible.[27] Therefore, in the following, we examine short-term trading only in 1993-97.

We use daily closing prices and trading volumes to compute the abnormal returns and volumes for days -5,...,-1,0,+1,...,+5. The normal daily return is computed as the average daily return during days -50,...,-6. The abnormal trading volume is defined as the relative deviation from the normal volume. The abnormal daily portfolio returns and volumes are computed as arithmetic averages of abnormal daily returns and volumes of the 28 stocks in the portfolio.

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[27] We have reason to believe that short-term trading was not important in 1989-90. The only way to trade the dividend was to buy shares cum and sell ex. The profitability of dividend trading was further limited by a 1 per cent stamp duty (.5 per cent of the trading price for both the seller and the buyer) levied on stock trades. In May 1 1992 the stamp duty was removed, which lowered the cost of buying cum and selling ex.

We expect that short-selling is unimportant during our data period, because it became possible in Finland as late as in May 1995 with the beginning of securities lending.[28] [29] Since ex-dividend days are mostly scattered on March and April short-selling around ex-days did not take place before before spring 1996. Unfortunately, our sample size is too small for examining years 1996 and 1997 separately. Also our finding that (see Table 6) the average ex-ratio is less than one suggests that ex-day returns are generally positive and increase with dividend yield which is inconsistent with short-selling. However, dividend capture related trading around ex-days can be important. If it is we expect that the portfolio of liquid high yield stocks exhibits positive abnormal returns before ex-days, negative abnormal returns after ex-days, and abnormally high trading volume both before and after ex-days.

Table 9 reports the average abnormal returns and trading volumes for the high yield high liquidity portfolio during the ex-dividend day period. It shows that for the majority of stocks trading volumes are higher than normal on cum-days and ex-days (days -1 and 0) and lower than normal on other days. At the portfolio level we find statistically significant positive abnormal trading volume on both days -1 and 0 followed by at least marginally significant negative abnormal volumes on days +1 and +2. These abnormal trading volumes are not matched by simultaneous abnormal returns. We find evidence of negative abnormal returns on day -5, but otherwise the return behaviour reveals no abnormalities. The lack of abnormal return behaviour around ex-days suggests that short-term trading is not important at the HeSE. The positive abnormal volumes on days -1 and 0 are consistent with long-term investors timing there trades.

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[28] Daily data of securities lending volume is not available. Hedvall, Liljeblom and Löflund (1998) find that monthly securities lending volumes are generally low with much higher volumes on dividend paying months. This evidence indirectly supports the view that there is dividend trading activity around ex-days even though we do not know to what extent securities lending is used for short-selling purposes.

[29] Securities lending also allowed a route to tax arbitrage which did not involve trading the shares at all. For a couple of years tax free institutions and taxable investors were able to engage in mutually beneficial securities lending and borrowing during ex-day periods. Tax free investors, who were not entitled to the dividend tax credit, lent shares to taxable investors who then claimed both the dividend and the tax credit. The shares and a commission (a sum of money corresponding to the dividend amount and a premium) were returned to the tax free investor. Both parties gained because securities lending provided a means for transferring tax credits for investors who were entitled to them from those who were not. There is reason to believe that a considerable part of this activity was based on bilateral agreements outside the stock exchange. Since shares are not traded, stock price and volume data are not useful in assessing the importance of this activity. These deals are no longer profitable because payers of the commissions, or dividends-in-kind, are liable to pay a tax equal to the tax credit.

The ex-day abnormal return, measured from cum close to ex close, is not different from zero. However, measured from cum close to ex-open the average abnormal return is larger, 0.004, but statistically insignificant (t-value 1.670). Dividing this average abnormal return by the average dividend yield, 0.028, we obtain the tax premium per unit of dividend yield, 0.143, which implies an average ex-ratio of 0.86. This ratio differs somewhat from the estimates in table 6, suggesting that the ex-day price behaviour of this subsample may be different from that of other stocks in the data set. To check this we estimated the average ex-ratio for this subsample using (28). The average ex-ratio is 0.784 which is very well in line with our previous results.

Table 9

Abnormal Ex-Dividend Day Period Returns and Trading Volumes of High Yield High liquidity Stocks in 1993-97 [1]

		Abnormal return			Abnormal volume		
Day	N	> 0 (%)	Median	Mean	> 0 (%)	Median	Mean
-5	28	35.7	-0.004	-0.005 (-2.216)	28.6	-0.472	-0.073 (-0.367)
-4	28	60.7	0.009	0.006 (1.704)	35.7	-0.378	0.092 (0.387)
-3	28	60.7	0.002	0.002 (0.633)	17.9	-0.424	-0.273 (-1.908)
-2	28	46.4	-0.002	0.002 (0.527)	25.0	-0.366	0.306 (0.866)
-1	28	53.6	0.003	0.003 (1.087)	82.1	1.087	2.352 (2.484)
0	28	50.0	0.001	0.002 (0.622)	71.4	0.733	0.982 (3.722)
+1	28	60.7	0.002	0.003 (1.569)	17.9	-0.483	-0.295 (-1.988)
+2	28	50.0	0.000	0.003 (0.850)	21.4	-0.519	-0.315 (-2.263)
+3	28	35.7	-0.003	-0.006 (-1.139)	28.6	-0.338	0.087 (0.261)
+4	27	48.1	-0.001	0.002 (0.633)	32.1	-0.588	0.095 (0.294)
+5	27	51.9	0.004	0.003 (1.414)	32.1	-0.408	0.020 (0.081)

[1] The expected daily stock returns and normal trading volumes are estimated as the average stock return and average number of shares traded on days -55,...,-6 relative to the ex-days.

4 CONCLUSIONS

We examine the behaviour of stock prices around ex-dividend days in Finland during two periods, 1989-90 and 1993-97. These periods provide a convenient test of ex-day price behaviour. In 1989-90 the tax treatment of dividends and capital gains was rather complicated. We expect that the average ex-ratio should be at most one. In 1993-97 the effective tax rate on dividends was zero, while the statutory capital gains tax rate was zero for tax free institutions and 25-28 % for other investors. We expect that the average ex-ratio is at least one in 1993-97. The intermediate period 1991-92 does not provide enough data for a meaningful analysis.

In 1989-90 we use data of unrestricted stocks that only domestic investors can hold and data of unrestricted stocks that anyone can buy in 1993-97. The average ex-ratio is in the range of 0.7 to 0.75 in both periods. The result suggests that in 1989-90 the marginal investor is an individual and in 1993-97 a foreign investor. To test the existence of tax based clienteles we use a systematically varying parameter model assuming that the dividend tax rate of the marginal investor falls with dividend yield. The empirical results give weak support for a clientele effect in 1989-90 and contradict the results obtained in previous studies of Hietala (1990) and Sorjonen (1988) that use Finnish data. There is no evidence of tax clienteles in 1993-97.

Finally, to examine the importance of short-term trading around ex-days we examine the return and volume behaviour of a portfolio of stocks with higher than average dividend yield and normal trading volume. The results show that in 1993-97 trading volume is abnormally high on cum and ex days and abnormally low on the two following trading days. We do not find evidence of abnormal returns except on ex-days. This evidence is consistent with long-term investors timing their trades around ex-days and inconsistent with short-term trading of any importance. For the period 1989-90 we are unable to perform this analysis because of small sample size. Short-term trading is however unlikely because of high transaction costs, including a stamp duty, and absence of short-selling possibilities.

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