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# EX-DIVIDEND DAY PRICE BEHAVIOUR: A REVIEW OF THE ISSUES

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**Abstract**

The aim of this paper is to review the literature relating to the ex-dividend day price behaviour of securities, for both the US and UK Stock Markets.

Two major hypotheses have been developed that attempt to explain the cause and magnitude of the price drop-off, relative to the dividend, on the ex-dividend day. These are: (i) the long-term trading hypothesis, which argues that ex-day pricing reflects the marginal tax rates prevailing on that date, and (ii) the short-term trading hypothesis that argues that ex-day prices are determined by the arbitrage activity of short-term traders. Depending on who we assume to be the dominant trader around the ex-dividend day, we obtain different predictions about the ex-day price behaviour.

There exists some further research, however, that suggests that both the above models offer an insufficient description of what in fact goes on on the ex-dividend day, because they ignore the existence of buying pressure both before and after the ex-day and risk considerations.

The implications of the current UK tax regime on ex-day pricing will be examined, with particular reference to specific investor groups. In addition to this, we will consider how the institutional changes brought about by the Big Bang of 27th October 1986, might influence the ex-day price behaviour.

## 1. Introduction

The ex-dividend date is the date which the share is traded without the dividend. An individual purchasing the security before the ex-dividend date will receive the current dividend, whereas an individual purchasing on or after the ex-dividend day will not receive the dividend. Hence, the stock

price should fall on the ex-dividend day to reflect this reduction in cash flows.

The empirical work on the ex-dividend day price behaviour of securities was initiated by Campbell and Beranek (1955). Menyah (1993) observes that: "The empirical finding of Campbell and Beranek (1955) that ex-dividend equity prices on average decline by less than the amount of the dividend, unearthed a puzzle in asset pricing which is yet to be completely resolved for the major capital markets of the world".

Prior to the paper by Campbell and Beranek, it was generally believed that the price of a share of stock should, and did, fall by the full amount of the dividend on the ex-dividend day. The proponents of this belief usually state that since the assets per share fall by the amount of the dividend, the price per share should also fall by this amount. However, published empirical work on the ex-dividend day price behaviour of securities indicated that the price fell by less than the amount of the dividend. This was attributed to a tax differential favouring capital gains over dividend income, resulting thus in a market preference for capital gains.

Since then, the ex-day price behaviour of securities has been analysed in numerous studies which have tried to explain the effect of taxation and short-term trading on security valuation.

Elton and Gruber (1970), developed a model which attempts to explain the equilibrium price behaviour of securities on the ex-dividend day by using the marginal tax rates prevailing on that date. This model has become known as **the long-term trading hypothesis.** Elton and Gruber documented, using US data, that on average stock prices fell by less than the amount of the dividend on the ex-dividend day, a finding which is consistent with the predictions they made using their model and the tax rates in force at that time. Furthermore, they found evidence consistent with a tax induced clientele effect, i.e. the ex-dividend day price ratio (defined as the ratio of the ex-day price change to the devident) was found to be positively correlated with the dividend yield (defined as the ratio of the dividend to the share price), which would be expected if investors in high tax brackets held low dividend yield stocks and, vice-versa.

The long-term trading hypothesis model was challenged by Kalay (1982). Kalay noted that there is no obvious reason why the equilibrium price should be determined by long-term investors if the market also includes

short-term traders for whom the tax rate on dividends equals the tax rate on capital gains. He pointed out that if the ex-day price change to dividend ratio is significantly different from one, an arbitrage opportunity exists which might be exploited by investors having low transaction costs. If this is the case, the equilibrium ex-day price ratio should reflect the marginal investors transaction costs and any excess returns on the ex-day will be eliminated by the short-term trading activity of arbitrageurs. Kalay also argued that the higher the dividend yield of the stock, the closer to the full amount of the dividend should the drop in stock prices be in order to prevent a profit opportunity from arising for short-term traders. This suggests that the so called "tax clientele effect" may in fact be the result of short-term trading activity and not investors tax clienteles. The arguments set out by Kalay (1982 and 1984) form the basis of the **short-term trading hypothesis.**

Karpoff and Walkling (1988), suggested that the long-term and short-term trading hypotheses are not competing but are complementary. Investors trading for reasons unrelated to the dividend have an incentive to time their trade so as to maximise after tax returns as implied by the long-term trading hypothesis. The resulting positive ex-day returns attract short-term traders who eliminate the positive returns up to their marginal transaction costs. This in turn implies that for securities with active short-term trading, ex-day abnormal returns are positively related to transaction costs.

Depending on who we assume to be the dominant trader around the ex-dividend day, we obtain different predictions about ex-day price behaviour. It is an empirical matter to ascertain whether it is short-term traders or ordinary investors, trading for portfolio reasons, who dominate security pricing on the ex-day. On balance, US evidence supports the Elton and Gruber analysis. For the UK, the presence of tax effects is well documented by prior empirical research. However, when it comes to the tax induced clientele hypothesis and the short-term trading hypothesis, the evidence is conflicting.

The rest of this paper is organised as follows: Section two outlines the process by which dividends are distributed and analyses the two major hypotheses (i.e. the long-term and short-term trading hypotheses) which attempt to explain the possible magnitude of the ex-day price ratio, through a review of the literature relating to the ex-dividend price behaviour of securities. Section three presents the current UK tax system and adjusts the two above hypotheses to take into account the particularities of the UK tax

regime, with particular reference to the implication of the tax regime on individuals, corporations, pension funds and life insurance companies. Section four outlines the changes in the structure of the London Stock Exchange, brought about by the Big Bang of 1986 and considers the effect these changes might have on the ex-day price behaviour. The conclusions are in section five.

## 2. Security Pricing, the Dividend Payment Procedure and Literature Review

Standard text book theory (for example Ross, Westerfield and Jaffe, 1993, Corporate Finance) suggests that shares are close substitutes of one another. This implies that investors should only be interested in the stream of cash flows a share will give them without being concerned with whether the cash flows are from the company or another. The value of a share is determined thus by the rights to future cash flows which it comprises. More formally, the value of a share should equate the Net Present Value of cash flows from owing the share.

A stock provides two kinds of cash flows:

i) Dividends, which represent a return on capital directly or indirectly contributed by shareholders.

ii) The sale price when the stock is finally sold.

Therefore, under the assumption that the stock will be held for only one period the value of the stock is equal to the discounted present value ($PV_0$) of the sum of next period's dividend ($DIV_1$) plus next period's stock price **($P_1$)·**

$$\text{i.e. } PV_o = \frac{DIV_1}{1+r_s} + \frac{P_1}{1+r_s} \qquad (1)$$

where $r_s$ = required rate of return by shareholders.

In equation 1, the next period's stock price ($P_1$) is determined by the discounted present value ($PV_1$) of the sum of next period's dividend (DIV2) plus next period's stock price (P2). Similarly, $P_2$ is determined by the dividend and stock price at the end of period three. This process can be repeated ad nauseam. At the end, equation 1 is restated as the discounted present

value of all future dividends, resulting in what is known as the **long run dividend discount model** which is given by:

$$PV_o = \frac{DIV_1}{1+r_s} + \frac{DIV_2}{(1+r_s)^2} + \frac{DIV_3}{(1+r_s)^3} + \ldots = \sum_{t=1}^{\infty} \frac{DIV_1}{(t+r_s)^t} \qquad (2)$$

It is obvious from equation 2 that dividend income is the major factor used in establishing a security's price.

In order to focus the discussion it is important to clarify the sequence of events that take place in the dividend payment process. These are:

a) **Declaration Date:** date at which directors meet to declare the regular dividend. For an interim dividend, approval by the board of directors is sufficient, but for a final dividend, approval must be granted by the body of shareholders at the Annual General Meeting.

b) **Date of Record:** date at which the company closes its stock transfer books and makes up lists of the shareholders as of that date. Shareholders on the date of record will be the ones to receive the declared dividend.

c) **Ex-dividend Date:** the date after which the share is traded without the dividend, i.e. the date after which the seller is entitled to keep the dividend. The ex-dividend date is defined to be the fourth business day before the date of record.

d) **Payment Date:** day on which the company actually mails the checks to the shareholders of record.

So, an individual purchasing the security before the ex-dividend date will receive the current divident, whereas an individual purchasing the security on or after the ex-dividend date will not receive the dividend. Hence, the stock price should fall on the ex-dividend day to reflect this reduction in cash flows. This drop is an indication of market efficiency as the market rationally attaches value to a cash dividend.

Campbell and Beranek (1955), were the first to establish that long-term investors trading for reasons unrelated to the dividend, had an incentive to time the sale or purchase of securities around the ex-dividend day because of the differential tax treatment of dividends and capital gains. They argued that if stocks really dropped by the full amount of the dividend, tax conscious

individuals would have an incentive to sell with dividend (i.e. cum-dividend) while buy ex-dividend (this argument is based on the tax system in force at that time where the tax rate on ordinary income was greater than the tax rate on capital gains). Such buying and selling would exert market pressure to reduce the amount of the drop-off in share prices on the ex-dividend day. They presented statistical evidence on 399 dividend payments, from period 1949-50 and 1953 on US data, that indicated a tendency for the stock prices to drop-off by less than the amount of the dividend. In fact, they found that the average stock price drop-off on the ex-dividend days tended to be about 90% of the amount of the dividend.

### 2.1. The Long-Term Trading Hypothesis

Elton and Gruber (1970) (hereafter EG), developed a model which attempts to explain the equilibrium price behaviour of securities on the ex-dividend day by using the marginal tax rates prevailing on that date.

Their model assumes that:

i) investors are risk neutral;

ii) there are no transaction costs;

iii) no restrictions on short sales;

iv) no short-term traders exist;

v) all investors wish to maximise their after tax wealth;

vi) all investors are subject to the same tax rates;

vii) tax rate on ordinary income (to) differs from the tax rate on capital gains ($t_c$).

An individual who has already decided to sell a share around the ex-dividend day for reasons unrelated to the dividend, faces a timing decision of whether to sell on the last cum-dividend day or on the ex-dividend day. If he sells on the day prior to the ex-day, he receives the cum-dividend price ($P_c$), which incorporates most or all of a forthcoming dividend, and pays a tax at the capital gains rate ($t_c$) on the excess of the cum-dividend price over the original purchase price of the stock ($P_o$). If he sells ex-dividend, he receives the dividend (D) and the ex-dividend price ($P_{ex}$), and pays tax on both the dividend, at the dividend tax rate (which is the tax rate **on**

ordinary income = to) and on the excess of the ex-dividend price over the original purchase price of the stock at the capital gains rate ($t_c$).

In equilibrium, market prices are determined so that the marginal shareholder is indifferent between selling before or after the stock goes ex-dividend. Thus, in equilibrium, the after tax wealth from selling at the end of the last cum-dividend day should equal the after tax wealth from selling at the beginning of the ex-dividend day. This can be expressed as:

$$P_c - t_c (P_c - P_0) = P_{ex} - t_c (P_{ex} - P_0) + D (1 - t_0) \quad (3)$$

where: $P_o$: original purchase price of the stock

$P_{ex}$: expected price per share ex-dividend

$P_c$: price per share cum-dividend

D: amount of the dividend per share

$t_c$: capital gains tax rate

$t_o$: tax rate on ordinary income

$P_c - t_c (P_c - P_o)$ — cash flow selling before the ex-dividend day i.e. all profits taxed as capital gains

$P_{ex} - t_c (P_{ex} - P_o) + D(1 - t_o)$ = represents cash flows from selling the stock ex-dividend

Rearranging equation 3, we obtain $\frac{P_c - P_{ex}}{D} = \frac{1 - t_o}{1 - t_c}$ (4)

which implies that to make an individual indifferent between selling on the ex-dividend day rather than on the last cum-dividend day, the ex-dividend day price ratio $\left(\frac{P_c - P_{ex}}{D}\right)$ must reflect his tax rates on dividends and capital gains. The fraction $\frac{1 - t_0}{1 - t_c}$ can be thought of as the marginal rate of substitution between dividend income and capital gain income. If we assume that there are many such sellers in the market, with different tax rates, who determine the ex-day price behaviour of securities, equation 4 shows that in equilibrium the ex-dividend day ratio reflects the marginal seller's tax rates on dividends and capital gains and thus one should be able to infer these tax rates by observing the ex-day price ratio.

EG documented (using US data) that on average stock prices fell by less than the amount of the dividend on the ex-days, a result consistent with the view that investors valued dividend less than capital gains because of the differential taxation of dividend income and capital gains causing dividend aversion. Furthermore, their results were consistent with a tax induced clientele effect, i.e. the ex-day price ratio was positively correlated with the dividend yield, which could be expected if investors in high tax brackets hold low dividend yield stocks and vice-versa. This tax induced dividend clientele hypothesis was firstly suggested by Miller and Modigliani (1961) who argued that it would characterise investor behaviour in an environment of differential taxation of dividends and capital gains.

From the EG model we can also derive a relationship that links ex-day returns to the dividend yield, which is obtained by rearranging equation 3 to get:

$$\text{Ex-day Returns} = R = \frac{P_{ex} + D - P_c}{P_c} = \frac{t_o - t_c}{1 - t_c} \frac{D}{P_c} = \frac{D}{P_c}\left[1 - \frac{1 - t_o}{1 - t_c}\right] \qquad (5)$$

where $\frac{D}{P_c}$ is defined to be the divident yield.

By combining equations 4 and 5, one can make the following predictions about ex-day price behaviour, depending on the relative size of the tax rates:

i) for $t_o = t_c$ (including a tax exempt institution) the ex-dividend day price drop-off ($\Delta P = P_c - P_{ex}$) will be equal to the amount of the dividend, resulting in an ex-dividend day price ratio $\left(\frac{\Delta P}{D}\right)$ of unity. This is equivalent to ex-day returns of zero. In this case the investor is indifferent between dividend income and capital gains.

ii) for $t_o > t_c$ => $\Delta P < D$ or $\Delta P/D < 1$. This is equivalent to positive ex-day returns and a positive relationship between ex-day returns and dividend yield. In this case investors prefer capital gains over dividend income.

iii) for $t_o < t_c$ => $\Delta P > D$ or $\Delta P/D > 1$ which is equivalent to negative ex-day returns and a negative relationship between ex-day returns and

dividend yield. In this case investors will prefer dividend income over capital gains.

A similar argument to the one established above for the marginal seller and which resulted in equations 4 and 5 can be established for the marginal buyer. Of course, in order for both buyer and seller to be simultaneously indifferent about the timing of their transaction, they must have the same valuation of dividends relative to capital gains.

It should be noted that the EG equations stated above relate to the classical system of taxation used in the US. These equations will be adjusted in section three to take into account the effect of the imputation system used in the UK. (This also applies to the short-term trading formulas that follow).

The results established by EG are also supported by the empirical findings of other researchers. For example, Barclay (1987) compared ex-dividend day price ratios (and returns) before and after the introduction of the US Federal income tax in 1913 and found support for the tax effect as wel as the tax induced divident clientele hypotheses. Specifically he found a mean ex-dividend price ratio $\left(\frac{\overline{\Delta P}}{D}\right)$ - not significantly different from one before 1913, implying that investors in the pre-tax period valued dividend income and capital gains as perfect substitutes, and significantly below one in the post tax period he examined, which covered years 1962 - 1985. He concluded that higher taxes on dividends after 1913 caused a market preference for capital gains income over dividend income.

However, there exists a major problem in Barclay's study: his two samples are separated by a time interval of 60 years. In this time not only the tax code has changed, but also many other variables, affecting asset returns and individuals' behaviour.

Notice that in the EG model prices are set by investors who have decided to sell (or buy) for reasons unrelated to the dividend. For these investors transaction costs are fixed costs and hence irrelevant for determining equilibrium prices. Putting it another way, investors are not deciding whether to transact or not, but only when: before or after the ex-dividend day. As there is no reason to assume that investors who trade around the ex-dividend day are any different from the (non-trading) "typical" shareholders, at least

in the basic EG model, ex-day price behaviour is very informative as it provides information on the tax related preference for dividends relative to capital gains of the average shareholder.

The long term trading hypothesis of Elton and Gruber was challenged by Kalay (1982).' Kalay noted that there is no obvious reason why the equilibrium price should be determined by long-term investors if the market also includes short-term traders, for whom the tax rate on dividends equals the tax rate on capital gains, implying an ex-dividend day price ratio of unity. He pointed out that if the ex-day price change to dividend ratio is significantly different from unity, an arbitrage opportunity exists which might be exploited by investors having low transaction costs. If this is the case, the equilibrium ex-day price ratio (and returns) should therefore reflect marginal investors transaction costs and any excess returns on the ex-day will be eliminated by the short-term trading activity of arbitrageurs.

In response, Elton, Gruber and Rentzler (1984), point out that Kalay's estimates of transaction costs were too low relative to what could conceivably be incurred by short-term traders around the ex-dividend days. They argue that Kalay, in estimating transaction costs, omitted several important components such as transfer taxes, registration fees, clearance costs and bid ask spreads, and that when all costs are considered, transaction costs prevented even the lowest cost traders (brokers and dealers) from affecting ex-day prices through short-term trades. Kalay (1984) conceded that the estimates in Kalay (1982) are too low but argued that revised estimates still allow short-term trading profits.

Karpoff and Walkling (1988) suggested that the tax penalty and the short-term trading explanations of ex-dividend day price behaviour are not competing but are complementary hypotheses. Investors trading for reasons unrelated to the dividend have incentives to time their trades so as to maximise after tax returns as implied by the tax penalty explanation. The resulting positive ex-day returns attract short-term traders who eliminate the positive returns up to their marginal transaction costs. This implies that for securities with active short-term trading, ex-day abnormal returns are positively related to transaction costs. Decreases in transaction costs make short-term trading profitable in a greater number of stocks. We will now move on to formally state the short-term trading hypothesis.

### 2.2. The Short-term Trading Hypothesis

The short-term trading hypothesis, introduced by Kalay (1982), is based on the proposition that some investors do trade around the ex-dividend

days for tax reasons. Consider the case of an investor facing equal tax rates on dividend income and capital gains (i.e. $t_o = t_c$, including zero rate institutions) implying indifference between dividend income and capital gains. If the price drop on the ex-dividend day is less than the amount of the dividend, such an investor may adopt a strategy of buying cum-dividend and selling ex-dividend. As long as the amount of the dividend and the tax saving from the capital loss exceed the roundtrip transaction costs such a strategy will be profitable. Algebraically, under the classical system of taxation, this can be expressed as:

$$(1 - t_0) [D - (P_c - P_{ex}) - \alpha\Pi] > 0 \qquad (6)$$

where $\Pi = \frac{P_{ex} + P_c}{2}$

and $\alpha$ = expected transaction costs for a roundtrip trading expressed as a percentage of average price $\Pi$.

$\alpha$ is the transaction cost of the lowest potential short-term trader and not the lower possible transaction cost. Some institutions that would like to trade may be prohibited from doing so for legal or professional reasons.

In case that the expected price drop was greater than the dividend our investor could sell short cum-dividend and buy back ex-dividend. An investor who borrows a security and sells it before the ex-date at a price of $P_c$ realises a short term gain of $P_c - P_{ex}$ if he buys back the security after the ex-day at $P_{ex}$. The dividend paid to the lender is deductible from ordinary income. So, the condition for profitable trading will now be:

$$(1 - t_0) [P_c - P_{ex} - D - \alpha\Pi] > 0 \qquad (7)$$

Profit can only be realised if arbitrageurs do not operate to wipe it out. In a rational market one would expect a no-profit condition to apply. The no-profit condition is given by $| D - (P_c - P_{ex}) | \leq \alpha\Pi$ which is equivalent to:

$$1 - \frac{\alpha\Pi}{D} \leq \frac{P_c - P_{ex}}{D} \leq 1 + \frac{\alpha\Pi}{D} \qquad (8)$$

This relationship implies that the higher the dividend yield ($D/\Pi$) of the stock the closer to the full amount of the divident the drop in the stock

price must be to prevent a profit opportunity arising for short-term traders. This is consistent with what Elton and Gruber found empirically, but which they interpreted as evidence of tax clienteles. Kalay (1982) argues that this clientele effect found by Elton and Gruber can be an artifact and actually created by short term trading.

Notice also that if the roundtrip transaction costs (a) are zero the above condition restricts ΔP/D to unity, whereas, if α is different from zero the ex-dividend day price ratio can fluctuate round one without causing arbitrage opportunities for short term traders, provided that the deviation remains within the defined boundaries. If transaction costs are prohibitively high short-term investors will not trade and the ex-dividend day price ratio will reflect the tax rate of the marginal long-term investor. The roundtrip transaction costs can be expressed in terms of the ex-dividend day price ratio by rearranging equation 8 to obtain:

$$\alpha_i = \overline{\left(\frac{D}{II}\right)_i} \Big/ 1 - \overline{\left(\frac{P_c - P_{ex}}{D}\right)_i} \Big/ \qquad (9)$$

where i refers to the dividend yield group and the bars denote averages.

Equation 9 will be useful when considering the tests carried out by Menyah (1993) for short-term trading.

A further consequence of Kalay's no profit condition is that the marginal tax rates cannot be inferred from the ex-day price ratio if the ratio is outside the no-profit opportunities bound. However, even if the sample mean of the ex-dividend day price ratios is within these bounds the marginal tax rates of the trading population can still not be inferred from it, as it is affected by the short-term profit elimination. This is so because the mean of ΔP/D is likely to consist of a combination of relative price drops which are within the bounds with those which are outside the bounds. As such it captures the effect of both the short-term profit elimination and the tax rates of the trading population.

As pointed out by Kalay (1982), the main implication of the short-term trading hypothesis is that the ex-dividend day ratio (ΔP/D) should not show significant departure from one if arbitrageurs move in to establish a no-profit pricing. Unfortunately for the hypothesis, the above is not supported by evidence in the US data for the taxable period and neither is it supported

by Canadian data, as Lakonishok and Vermaelen (1983) and Booth and Johnston (1986) using data from the Toronto Stock Exchange, showed that the ex-day price ratio is far below unity. In addition to this, Menyah (1993), using UK data, found significant departures from one implying that for the majority of UK equities arbitrageur trading around the ex-dividend day was minimal and did not produce the bounds defined by Kalay.

Menyah, however, also used a second approach to test for the existence of short-term trading in the UK. He inferred transaction costs as implied by the ex-dividend day price ratio ($\Delta\Pi/D$) and the dividend yield groups in equation 9. He then compared them against the transaction costs which might be incurred by investors engaged in such trading. If the transaction costs incurred by investors exceed those inferred using equation 9 the short-term trading hypothesis would be rejected (i.e. transaction costs are prohibitively high for short-term trading to be profitable), while if the actual transaction costs were less than, or equal to, those inferred, the hypothesis could not be rejected. Menyah found that the transaction costs inferred by equation 9 exceeded the official minimum transaction costs for the period under consideration, which supports the proposition that short-term trading could have been undertaken by exchange dealers who incur costs close to the minimum (or even lower that them).

Other researchers have also found evidence in support of the short-term trading hypothesis: Eades, Hess and Kim (1984), found that ex-dividend day stock returns decreased after negotiable commissions reduced transaction costs of trading common stocks in May 1975 (for the US), implying an increase in the arbitrage activity of short-term traders, Lakonishok and Vermaelen (1986), argued that if short-term trading is important, abnormal trading activity should be negatively related to transaction costs and positively related to the dividend yield. Their evidence supports both these hypotheses strengthening the argument in favour of the existence of short-term traders. (Lakonishok and Vermaelen tested for the effect of transaction costs by examining the impact of the introduction of negotiable commissions on trading volume).

Karpoff and Walkling (1988), argued that in stocks affected by short-term trading, ex-dividend day returns are positively correlated with transaction costs. Direct measures of transaction costs include: commission rates, the bid-ask spread and liquidity. Since these direct measures of transaction costs are difficult to obtain on a consistent basis, it is common practice to use

some form of transaction costs proxies in carrying out empirical tests. Karpoff and Walkling examined the following transaction cost proxies:

a. The inverse of the price of the stock measured at the end of the month prior to the ex-dividend month. A negative empirical correlation between a securities price and dealer bid-ask spreads, as well as brokerage commissions is well documented in the literature;

b. The market value of the firms common stock i.e., the number of outstanding shares times the firm's stock price at the end of the month prior to the ex-dividend month. Stoll and Whaley (1983) and Loeb (1983) documented that market value is negatively correlated with both the bid-ask spread and brokerage commission rates;

c. The number of outstanding shares, which is also correlated negatively with the bid-ask spread; and

d. The standard deviation of stock returns. The variance of returns correlates with the idiosyncratic rise of a large short-term position in the stock that might be costly to hedge. In addition to this, a large amount of empirical evidence (for example Karpoff, 1987), indicates that return volatility is positively correlated with liquidity.

On the basis of the results obtained from the above test, Karpoff and Walkling concluded that short-term trading significantly affects ex-dividend day returns and the valuation of dividends, but it does so primarily among high yield stocks and after the introduction of negotiated commissions. This is consistent with the predictions that the net benefits of short-term trading increases with the size of the dividend and decreases as the cost of trading rises.

Michaely (1991), analysed the behaviour of stock prices around ex-dividend days before and after the implementation of the 1986 Tax Reform Act (TRA), in the US, that completely eliminated the tax differential between dividend income and capital gains in 1988. He found that the tax change had no effect on the ex-dividend day price behaviour, which is consistent with the hypothesis that long-term individual investors had no significant effect on ex-day stock prices during this time period. His evidence suggests that the ex-day price is influenced primarily by short-term traders and corporate traders who favour dividend income over capital gains income. In addition to this, Robin (1991), who also examined the effects of the

1986 TRA, found results indicative of the presence of short-term trading, but in contrast to Michaely, found evidence of a preference for capital gains over dividend income, even after the introduction of the 1986 TRA. This conflict in empirical findings for data relating to the same period and which examine the effects of the same event (the 1986 TRA), indicates the difficulty in carrying out and interpreting empirical tests.

Lakonishok and Vermaelen (1986), point out to the following "real world" indications of the occurrence of short-term trading around ex-dividend days:

i) In 1970 the British government introduced specific legislation to levy penalties on investors who transact primarily for tax reasons.
   a) buying cum-dividend and selling ex-dividend was curtailed by sections 471-475 of the 1970 Anti-Avoidance Act which operates for dealers and tax exempt institutions when they buy a share cum-dividend and sell it within one month.
   b) selling short cum-dividend and buying back ex-dividend was curtailed by s. 477 of the 1970 Act.

ii) In the US the 1984 Tax Reform Act:
   a) abolished various short selling benefits.
   b) extended the holding period from 16 to 45 days for incorporate buyers to be eligible for the 85% dividend received tax deduction, and
   c) disallowed certain hedging strategies during the holding period.

These attempts to regulate short-term trading through legislation in both the US and the UK can be taken to imply that the legislators thought that such trading is prevalent and considerable.

iii) The emergence of tax managed funds is another indication that short-term trading is important. Harris (1982), gives as an example Colonial Qualified Dividend Trust which states in its prospectus under investment objectives and policies: "The trust tends to engage in a dividend rollover program. Under this program the trust will purchase dividend paying stocks prior to their ex-dividend dates and sell them on or after their ex-dividend dates".

By now it should be quite clear that depending on who we assume to be the dominant trader around the ex-dividend day, we will obtain different predictions about ex-day price behaviour. It is an empirical matter to ascertain whether it is short-term traders or ordinary investors, trading for portfolio

reasons, which dominate security pricing on the ex-day. If the short-term traders dominate, ex-day abnormal returns will be related to transaction costs, whereas, if the ordinary investors dominate, ex-day abnormal returns will reflect the tax differential between dividend income and capital gains.

### 2.3. Criticisms of both the Long and Short-term Trading Hypotheses

In addition to the two competing hypotheses examined in the previous subsections, there exists some further research which suggests that both models offer an insufficient description of what in fact goes on on the ex-dividend day.

a) Lakonishok and Vermaelen (1986), are of the opinion that the abnormal price behaviour before and after the ex-dates suggests that pricing models which focus only on the ex-day itself are over-simplified. They argue that a more elaborate model would have to rely on the existence of buying pressure before as well as after the ex-day.

b) Eades, Hess and Kim (1984), Grinblatt, Masulis and Titman (1984) and Shaw (1991), questioned the whole tax explanation of the ex-dividend stock price behaviour. They show that stock returns are abnormally high not only on the ex-dividend days but also on the ex-dates of *non-taxable* distributions, like stock splits and stock dividends. They raise the possibility that ex-dividend day stock returns do not reflect marginal shareholder's tax rates but instead may be related to a larger ex-distribution day anomaly uncovered by their studies.

c) Grammaticos (1989), pointed out that short-term trading is not a risk free strategy. He devised a test for the importance of risk exposure by short-term traders by hypothesising that the 1984 Tax Reform Act (in the US), which increased the required holding period for dividend deduction by US corporations from 15 to 46 days, would inhibit short-term trading around ex-days, increasing thus ex-day abnormal returns. His evidences are consistent with this hypothesis.

In addition to this, Fedenia and Grammaticos (1993), indicated that both the long and short-term trading hypotheses have largely neglected the risk exposure of stock traders who deal around, or because of, the ex-dividend day. The two hypotheses have different predictions about the type of risk-investors will face:

i) since in the long-term trading hypothesis prices are set by the average investor who has decided to buy or sell for reasons unrelated to the dividend, he should worry only about systematic risk (i.e. risk which relates to the economy and the market as a whole and which, as such,cannot be diversified away).

ii) short-term traders, on the other hand, should worry about total risk defined to be the sum of systematic and unsystematic risk (where unsystematic risk is the risk which relates to a particular company and which, as such, can be diversified away). With sufficient diversification unsystematic risk should not be priced, i.e. a well diversified portfolio will have no unsystematic risk. However, to the extent that short-term traders are compelled to hold (partially) undiversified positions, by taking large positions in the stock of a specific company, one might expect a positive premium for unsystematic risk on the ex-day for those cases where short-term traders are the marginal investors.

The implication of the two above studies of Grammaticos and Fedenia and Grammaticos is that short-term traders are constrained not only by transaction costs, but also by the extra risk of not being diversified.

**2.4. The UK Evidence**

Most research examining the ex-dividend day price behaviour of securities focuses on the US Stock Market. Research relating to the UK Stock Market is fairly recent. Due to the different features of the tax systems in operation in the US and in the UK, the literature relating to the UK market is presented separately in this subsection (The current UK tax system will be further discussed in section three).

Brealy (1970) examined the distribution and independence of successive rates of return from the British equity market, over the period 1962-1968. He found evidence of tax effects in the pricing of 29 equities on the ex-dividend day.

Poterba and Summers (1984 and 1985), examined the effect of taxes on the valuation of dividends. They found, for 16 companies, that ex-day excess returns did not differ between the period before and after the 1970 Anti-Avoidance Act and interpreted this as evidence against the short-term trading hypothesis. However, they reported results consistent with the existence of tax effects.

It must be pointed out, however, that the main aim of the two studies above was neither the investigation for tax effects nor for short-term trading in the ex-day price behaviour of securities. Their inferences about the two hypotheses of tax effects and short-term trading are essentially by-products of studies focused on related but still different issues.

Kaplanis (1986), used data for UK traded options from 1979 to 1984 (a period falling entirely within the imputation tax regime), and found results consistent with the tax clientele hypothesis and inconsistent with the short-term trading hypothesis. He also found an actual average ex-day price ratio of less than one, which suggests a market preference for capital gains over dividend income. This is consistent with the tax rates applying at the time covered by his study, where the rate of tax on capital gains was much lower that the tax rate on dividend income.

Menyah (1993), studied two samples, one covering the period 1960-1977 for cross sectional analysis, and the second the period 1955-1984 for time series analysis. His results hardly show any support for tax clienteles, since he found low rank correlations (with some even having negative signs!) when examining the relationship between the ex-day price ratios and the dividend yield, indicating that dividend yields are not important in investors portfolio selection. However, Menyah did find that the ex-dividend day price ratio was different from unity (and in fact significantly below one), which in the absence of any specific activities coinciding with the ex-dividend days can reasonably lead to the conclusion that it implies the presence of tax effects. He also found some evidence of short-term trading although after the Anti-Avoidance legislation of 1970, its intensity has diminished. Furthermore, he shows that for the UK the unusual price behaviour caused by the stock going ex-dividend is essentially limited to the ex-dividend day, unlike the US where a pricing anomaly around ex-dividend days has been documented.

Lasfer (1995) examined the behaviour of share prices around the ex-dividend dates, before and after the implementation of the 1988 Income and Corporation Taxes Act (ICTA), that substantially reduced the tax differential between dividends and capital gains in the UK. He found that in the pre-1988 period, when the differential taxation of dividends and capital gains was high, ex-day returns were positive and significant, which is equivalent to an ex-day ratio significantly below one. In contrast, in the post-1988 period, ex-day returns are, in most cases, insignificantly different from zero, which is equivalent to an ex-day price ratio of unity.

In arriving at the above findings, Lasfer made an adjustment for settlement date effects. The need for such an adjustment is also suggested by Theobald and Price (1984), who point out that since in the UK shares go ex-dividend on the first Monday of the two week Stock Exchange account, it might be possible that a settlement effect distorts ex-dividend day price behaviour. The settlement effect arises from the assumption that the purchase of shares will be delayed from the last day of the Stock Exchange account (a Friday), to the following Monday (the start of a new account), giving the purchaser an extra 11 days (or 18 days for a three week account) interest free credit before settlement, resulting in higher returns on the first Monday of the account to compensate the seller.

However, Menyah (1993), argues that the above argument does not take into account Stock Exchange rule 96(2)i which allows "new time" dealing during the last two days of an account. Such new time dealings are settled at the same time as other transactions which take place during the new account which follows it. This results in the preceding Thursday, before the beginning of a new account, in being the most appropriate time for new time dealings to gain thus four extra days interest over the first Monday of the account. Hence, Thursdays before the beginning of new accounts should have higher returns to reflect the implicit interest rates to sellers, while no settlement effect should affect the first Mondays. Based on the above argument, Menyah concludes that interest adjustments for settlement effects in ex-day price ratios (and returns) are inappropriate and thus should not be made. The reported differences in returns between first and non first Mondays of the Stock Exchange account may be due to factors which are still unknown.

Before adjusting for settlement effects, Lasfer found that both the pre- and post- 1998 ex-day price ratios were significantly below one, although the 1988 ICTA has resulted in a significant rise in the drop-off ratio. He interpreted this as being consistent with the hypothesis that taxation affects ex-day pricing, but inconsistent with the hypothesis that the ex-day price ratio reflects the long-term investors tax differential between dividends and capital gains. He argues that if ex-day pricing was driven solely by taxes, the ex-day drop-off ratio should have been greater than one after the introduction of the 1998 ICTA to reflect the tax credit associated with the cash dividend received. This point is discussed further in section three, where we show that under certain circumstances an ex-day price ratio of less than one, even after the 1988 ICTA, might still be consistent with the long-term trading hypothesis.

In addition to the above, Lasfer found evidence which is inconsistent with both the short-term trading hypothesis and the tax induced dividend clientele hypothesis. He also showed that ex-day returns are not affected by the commonly used measures of transaction costs, such as the bid-ask spread and trading volume, or by the day of the week, month of the year, type of divident distribution, interest rates or the number of days to the actual receipt of the cash dividend.

A summary of the results from the above studies is provided in table I. From the table we can clearly see that in the UK the presence of tax effects is well documented. However, when it comes to the tax induced clientele hypothesis and the short-term trading hypothesis, the evidence is conflicting.

TABLE I

The UK evidence on Ex-Day price behaviour: A summary

| Study | Time Period Examined | Tax Effect | Tax Induced Clientele | Short-Term Trading |
|---|---|---|---|---|
| Brealy (1970) | 1962 - 1968 | √ | – | – |
| Poterba & Summers (1984 & 1985) | 1956 - 1981 | √ | – | X |
| Kaplanis (1986) | 1979 - 1984 | √ | √ | X |
| Menyah (1993) | 1960 - 1977 & 1955 - 1984 | √ | X | √ |
| Lasfer (1995) | 1985 - 1994 | √ | X | X |
| OVERALL | | √ | ? | ? |

Notes
√: Supportive of hypothesis
X: Against hypothesis
–: Study did not examine this hypothesis
?: Inconclusive

## 3. The Current UK Tax Regime and its Implications on Ex-dividend Day Price Behaviour

Menyah (1993) showed that, for the UK, it is reasonable to conclude that ex-day price behaviour differs between the different tax regimes generally to reflect how investors preferences for dividends and capital gains alter to capture the peculiarities of each regime. In this section we will consider the effect of the current UK tax regime on the ex-dividend day price behaviour of securities by identifying specific investor groups and examining the way in which taxation might influence their decisions. The analysis that follows draws heavily from Butterworths UK Tax Guide 1993-94.

### 3.1. Income Tax

Income tax is charged on the taxable income of the year of assessment. There is no definition of income, beyond the statement that income is taxable if it falls within one or other of the Schedules of the Taxes Act 1988. For the purposes of this paper Schedule F bears the greatest importance.

**Schedule F (Taxes Act 1988,** S. **20)**

Schedule F taxes distributions by companies resident in the UK. The tax is due on the dividends of the year of assessment and is in effect deducted at source.

The tax treatment of dividends from shares is closely bound up with the way in which companies are taxed. For this reason, further discussion on dividend taxation is deferred until corporation tax is considered.

### 3.2. Capital Gains Tax (CGT)

CGT was introduced in 1965. It is charged on chargeable gains accruing to, that is realised by, a person, other than a company, during a year of assessment. Chargeable gains accrue only on chargeable disposals of chargeable assets.

From 1988-89 (i.e. the implementation of the 1988 ICTA) the tax rates of income tax and capital gains tax were unified. This means that chargeable gains are now taxed at income tax rates, reducing thus the · importance of the distinction between capital gains and income. More accurately, an individual's net chargeable gains for the year of assessment are treated as the top slice of income in computing CGT liability. There is, however, an

annul exempt amount for capital gains accruing to individuals. This annual exempt amount is index linked, unless parliament decides otherwise (TCGA 1992 s.3(3)). For 1994-1995 onwards the indexation adjustment is by reference to the increase in the retail price index for the year to 30th September in the preceding tax year. Despite the unification of rates, the tax charged for capital gains remains CGT and not income tax. Normally CGT is due on the first December following the end of the year of assessment The taxation of capital gains on the disposal of assets was codified by the Taxation of Chargeable Gains Act (TCGA) 1992 which came into force on 6 May 1992.

Capital losses may be set off against capital gains of the same year. An excess of capital losses cannot be set off against income liable to income tax. However, unrelieved losses may be carried forward to later years but not back to previous years. For this reason it is generally preferable to realise losses sooner rather than later.

Shareholders are liable to CGT on the disposal of their shares, assuming that they are not corporations. A body subject to corporation tax has its gains charged to that tax and not to CGT.

### 3.3. Corporations and Dividend Distributions

Corporation resident in the UK are subject to corporation tax (CT) on their profits, the term profits covering both income and capital gains. There is a single rate of CT, although for corporations with profits less than £1m there is a special regime. This single rate is charged whether the company distributes or retains its profits.

The imputation system, introduced in 1973, allows the shareholders to use a part of the CT paid by companies to offset their own liability to schedule F income tax. The mechanism imputes a part of the company's tax liability to its shareholders, which is regarded as a prepayment of their income tax liability on the dividend. In order to ensure that the amount imputed represents tax actually paid by the corporation, the corporation must, when paying dividend pay Advanced Corporation Tax (ACT). ACT must be paid when the dividend is paid whether or not the company is liable to pay CT (e.g. through lack of profits). The ACT is set against the company's liability to CT. The remaining corporation tax payments to the Revenue are described as mainstream corporation tax. They constitute the effective corporation tax burden since the amounts which are described as ACT would be paid as income tax even if CT were completely abolished.

The rate of ACT is tied to the lower rate of income tax (S) and can be expressed algebraically as:

$$\text{Rate of ACT} = \frac{S}{1-S} \tag{10}$$

where S is between zero and one.

The shareholder's income for tax purposes is given by the value of the qualifying distribution plus ACT. The tax credit available is at the same amount as the ACT. (A detailed example of the operation of ACT can be found in Butterworths UK Tax Guide 1993-94 pp. 652-653).

We now move on to establish the algebraic form of the relationships necessary to allow us to make predictions about the ex-day price behaviour of securities, under the current UK tax laws.

Let us assume that a shareholder, who is an individual liable to an income tax rate of (to), receives a divident amounting to £ D (before income tax).

The ACT, which is at the same amount as the tax credit available on this dividend, is equal to:

$$D.\frac{S}{1-S} \tag{11}$$

Then, the shareholders income for tax purposes is given by:

$$D + \frac{D.S}{1-S} = \frac{D}{1-S} \tag{12}$$

(i.e. value of the qualifying distribution plus ACT)

The shareholder will thus receive an after tax cash flow from the dividend of:

$$\frac{D(1-t_o)}{1-S} \tag{13}$$

If no dividends were paid by the corporation in question, retained earnings would cause the share price to rise. This will result in a realised capital gain when the shareholder finally disposes of the security. So, on selling the security, the shareholder will receive, after allowing for the capital gains tax, an amount of:

D (1 - $t_c$), where $t_c$ is the effective rate on capital gains.

Dividends are optimal for the individual shareholder, when the after tax cash flow from the dividend exceeds the after tax cash flow from realised capital gains (of the same pre-tax amount) i.e.:

$$\frac{D(1-t_o)}{1-S} > D(1-t_c) \qquad (14)$$

This is equivalent to:

$$t_0 < t_c + S\ (1-t_c) \qquad (15)$$

Since in the UK, the nominal $t_o$ is equal to the nominal $t_c$ and S is greater than zero, the above relationship will always be true, implying that shareholders who are individuals should prever dividend income over capital gains.

Notice, however, that the rate of capital gains tax that should be used is the effective rate and not the nominal rate. When the two rates are not equal a different outcome to the one suggested above may result depending on the relative size of $t_o$ and effective $t_c$.

Davidson and Mallin (1989), suggest that effective capital gains tax rate is likely to be lower than the income tax rate because:

a) Capital gains taxes are charged on realization and not on accrual. By postponing realisation one may lower the effective capital gains tax rate (i.e. reduce the present value of the tax to be paid). The full indexation of capital gains in 1985 has, however, reduced the value of the benefit of deferral substantially.

   The option to realise capital gains at a future date also allows the investor to realise them when the tax rate is more favourable and/or when it is convenient to offset it against other losses.

b) Substantia] relieves and offsets are available for capital gains taxes. For example, the annual exemption from capital gains accruing to individuals was £5,800, in 1993-1994.

Using the above arguments, Davidson and Mallin ignored capital gains taxes in establishing their expectations about the ex-day price ratio (for individual investors).

The Elton and Gruber formulae established in section two need to be adjusted to incorporate the effects of the imputation tax system. The equilibrium condition becomes:

$$P_c - t_c (P_c - P_0) = P_{ex} - t_c (P_{ex} - P_0) + D \frac{1-t_o}{1-S} \quad (16)$$

By rearranging equation 16 we can see that the ex-day price ratio will now be:

$$\frac{(P_c - P_{ex})}{D} = \frac{1-t_o}{(1-t_o)(1-S)} \quad (17)$$

The predictions made on the basis of this formula depend mainly on the relative magnitude of the CGT rate ($t_c$) and the income tax rate ($t_o$). These predictions are summarised in table 2.

Until now we have considered the case where a corporation pays a dividend to a shareholder who is an individual. The question arises as to what is the tax treatment in the case where the shareholder is another corporation.

By Tax Act 1988, s. 208 qualifying distributions received by a company resident in the UK are not subject to corporation tax. This means that as long as money stays within the UK resident corporate sector only one charge to ACT will be made. The qualifying distribution received by the corporation together with the amount of the tax credit is called Franked Investment Income (FII). The company may use the FII to frank its own qualifying distribution, known as franked payments, so that it does not have to pay ACT on it; i.e. a company may distribute its FII without additional tax cost.

From the foregoing analysis we can conclude that corporations will prefer dividend income over capital gains, as divident income is not subject to corporation tax, whereas capital gains are treated as profits subject to corporation tax.

### 3.4. Unit Trusts, Investment Trusts and Pension Funds

These institutions face a zero rate of tax on both their income and capital gains (i.e. $t_o = t_c = 0$). At first this might lead to the misleading conclusion that they should thus be indifferent between capital gains and dividend income. However, once we consider how the imputation system treats dividends it becomes clear that these tax exempt institutions should in fact prefer dividend income over capital gains. This can be easily seen if we refer back to the previous discussion on distributions to ordinary investors. The tax exempt investor will receive a dividend of D from the corporation and subsequently it will recover £D $\frac{S}{1-S}$ tax credit from the Revenue obtaining thus a total cash flow of £ $\frac{D}{1-S}$ which is in fact the amount of the gross dividend. In the case where profits were retained by the corporation the tax exempt shareholder would realise a capital gain of £ D on which no tax would be charged. It is clear from this illustration that dividends are preferred over capital gains as $\frac{D}{1-S} > D$ (where $S > 0$).

### 3.5. Life Insurance Companies

A special tax treatment applies to life insurance companies. They pay corporation tax on their interest income, but income tax at the basic rate on dividend income. A special rate of tax of 30% on their capital gains applies. By combining the above tax treatment with the provisions of the imputation system it is clear that life assurance companies should prefer dividend income over capital gains, as with a dividend distribution they receive the full amount of the dividend (say D) by offsetting their tax liability against their tax credit (both being equal to the basic rate of tax), whereas if they realised capital gains they would receive a net cash flow of D (I - $t_c$) = 0.7 <D (Note that for a basic rate tax payer the tax credit is given at the basic rate of 25% rather than at the lower rate of 20% of income tax for reasons of administrative convenience. These figures apply to 1995).

In conclusion, under the UK tax regime it appears that most investor groups should prefer dividend income over capital gains. This implies an ex-dividend day price ratio greater than one for the UK stock market. However, two possible exceptions exist to the above result. These are:

a. an individual with capital gains less than the annual exempt amount (i.e. $t_c$=0) and personal tax rate (to) greater than the lower rate of income tax (S), or

b. individual investors who are facing an effective capital gains tax rate which is negligible for the reasons outlined by Davidson and Mallin (1989), and $t_0 > S$.

In these two cases the ex-day price ratio is expected to be less than one, even after the implementation of the 1988 ICTA, which unified the tax rates of income and capital gains.

The effects of the UK tax regime on the predictions of the long-term trading hypothesis are summarised in table 2.

**TABLE 2**

Expected ex-dividend price ratios according to the tax explanation for different marginal investors (Under the provisions of the 1988 Tax Act)

| | TRADER TYPE | (Pc-Pex)/D |
|---|---|---|
| 1. | Individual with<br>a. Capital gains < annual exempt amount or, under assumptions of Davidson & Mallin (1989) ($t_c = 0$)<br>b. Capital gains > annual exempt ammount (Nominal $t_o$ = Nominal $t_c$) | $\frac{1-t_o}{1-S} < 1$ for $t_o > S$<br>$> 1$ for $t_o < S$<br>$\frac{1}{1-S} > 1$ |
| 2. | Corporations ($t_o = 0$, $t_c = t_{cor}$) | $\frac{1}{1-t_{cor}} > 1$ |
| 3. | Tax exempt investors ($t_o = t_c = 0$) | $\frac{1}{1-S} > 1$ |
| 4. | Life assurance cos ($t_o$ = Basic rate, $t_c$ = 30%) | $\frac{1}{1-t_c} > 1$ |

Notes

$t_0$ = Tax rate on ordinary income, $t_c$ = Capital gains tax rate, S = Lower rate of income tax, $t_{cor}$ = Corporation tax rate.

### 3.6. Restatement of the Short-Term Trading Hypothesis to Incorporate UK Tax Laws

Kalay's (1982) derivation of the no-profit boundaries for short-term trading was based on an assumed short-term trader having equal tax rates on dividend income and capital gains. Since 1988, the nominal tax rates of income tax and capital gains tax, in the UK, were unified, but the effect of the imputation tax system still causes the effective tax rates to differ, and as seen above, this difference might create a bias in favour of dividend income. Due to the particularity of the UK tax regime a restatement of Kalay's equations is necessary.

The derivation of the adjusted boundaries is presented in the appendix and the results are summarised in table 3. As we can see, the effect of the UK tax laws on the no-profit condition for short-term trading is to increase the lower bound above that suggested by Kalay. It should be pointed out that now, it may even be possible for the lower bound to be above one, depending on the size of the transaction costs (a) and of the dividend yield (D/Π). This is obviously quite different from Kalay's requirement for the ex-day ratio to lie around unity in order for the data to indicate arbitrage trading by short term investors.

Notice that the optimal strategy for UK short-term traders, as suggested by the predictions of the tax explanation (i.e. $\Delta P/D>1$ in table 2), is to sell short and cover their position by buying ex. Buying cum and selling ex will not be profitable as the ex-dividend day price ratio implied by the tax explanation suggests that such a strategy will result in a loss. The actual strategy adopted by short-term traders, however, will depend on the actual ex-day price ratio. Since the ex-day price ratio may differ between securities, a different short-term trading strategy might be optimal for different securities, which suggests that one cannot infer this strategy by simply looking at the average ex-day price ratio.

TABLE 3

Short-term trading no-profit boundaries under UK tax laws

| | TRADER TYPE | BOUNDARIES |
|---|---|---|
| 1. | Individuals (With capital gains > annual exempt ammount) | $\frac{1}{1-S}-\frac{\alpha\Pi}{D}\leq\frac{P_c-P_{ex}}{D}\leq\frac{1}{1-S}+\frac{\alpha\Pi}{D}$ |
| 2. | Corporations | $\frac{1}{1-t_{cor}}-\frac{\alpha\Pi}{D}\leq\frac{P_c-P_{ex}}{D}\leq\frac{1}{1-S}+\frac{\alpha\Pi}{D}$ |
| 3. | Tax exempt investors | $\frac{1}{1-S}-\frac{\alpha\Pi}{D}\leq\frac{P_c-P_{ex}}{D}\leq\frac{1}{1-S}+\frac{\alpha\Pi}{D}$ |
| 4. | Life insurance cos | $\frac{1}{1-t_c}-\frac{\alpha\Pi}{D}\leq\frac{P_c-P_{ex}}{D}\leq\frac{1}{1-S}+\frac{\alpha\Pi}{D}$ |

Notes
$t_0$ =Tax rate on ordinary income
$t_c$ = Capital gains tax rate
S = Lower rate of income tax
$t_{cor}$ = Corporation tax rate

$\alpha$ = Round trip transaction costs as a percentage of average price
D=Amount of dividend
$\Pi$ = Average price defined as (Pc+Pex)/2

## 4. The Big Bang: Structure of the UK Stock Market

In addition to the change in the tax regime, there was another major disturbance during the last decade which literally shook up the structure of the UK stock market. This was the **Big Bang** of the 27th of October 1986.

In this section two changes brought about by the Big Bang, which are of direct importance to this paper, and their impact on the hypotheses identified in section 2, will be considered.

### a) Abolition of Minimum Commissions

After the Big Bang minimum commission was abolished and negotiable commissions were introduced. This is expected to cause a reduction in transaction costs, as commissions will now be lower, resulting in an increase in the activity of short-term traders.

### b) Outside Ownership

International share dealers were allowed in the London Stock Exchange. This causes an additional difficulty in interpreting the ex-day price behaviour of securities because it raises the possibility that such behaviour is also influenced by the tax laws of the countries of the foreign investors and not only by the UK tax laws.

This argument is supported by the findings of Lakonishok and Vermaelen (1983), who have shown, using Canadian data, that the ex-day price ratio was not affected by changes in the taxation of ordinary income and capital gains in the direction predicted by the Elton and Gruber equation. They suggested the possibility that the ex-day behaviour of Canadian stocks may reflect the US tax legislation and not Canadian legislation, as Canadian stocks are also owned by US residents.

## 5. Conclusions

This paper critically reviewed the literature on the ex-dividend day price behaviour of securities.

We first outlined the process by which dividends are distributed and explained why the share price is expected to fall on the ex-dividend day. Then we stated and evaluated the major hypotheses that attempt to explain the ex-day price behaviour of securities, as these were proposed by their initiators, Elton and Gruber (1970), for the long-term trading hypothesis, and Kalay (1982) for the short-term trading hypothesis. These hypotheses were subsequently adjusted to take into account the particularities of the current UK tax system.

Under the provisions of the imputation tax system and the 1988 ICTA, which eliminated the differential tax treatment between dividend income and realised capital gains, it was predicted that most investor groups should prefer dividend income over capital gains. This suggested an ex-dividend day price ratio greater than one. An exception was, however, identified to this result. This is an investor who is an individual, with a negligible effective rate of tax on capital gains (either because his capital gains are less than the annual exempt amount, or for the reason suggested by Davidson and Mallin, 1989) and personal tax rate greater than the lower rate of tax. In this case the investor will prefer capital gains over dividend income, suggesting an ex-day price ratio of less than one. The empirical findings of Lasfer

(1995), before adjusting for settlement effects, that both the pre- and post-1988 ex-day price ratios are significantly below one, are consistent with this latter argument.

The short-term trading hypothesis was also restated to incorporate the UK tax laws. The effect was to increase the lower bound above that suggested by Kalay (1982), so that now it might even be possible for the lower bound to be above one, depending on the magnitude of transaction costs and of the dividend yield.

Our review suggests one major conclusion. That is that the ex-dividend day price ratio values observed result from a complex interaction of investor preferences between dividend income and capital gains, arbitrage constraints, tax laws applying in the countries of foreign investors trading in UK securities, risk and possibly by other variables which have not yet been identified and tested. The results of Eades, Hess and Kim (1984), Grinblatt, Masulis and Titman (1984) and Shaw (1991), which establish that stock returns are abnormally high on the ex-dates of *non-taxable* distributions, support the claim that ex-dividend day stock price behaviour is related to a larger ex-dividend day anomaly which has not yet been uncovered. The puzzle unearthed by Campbell and Beranek (1955) remains thus unsolved and poses a challenge for future researchers.

# APPENDIX

## Derivation of the no-profit boundaries for short-term traders under the UK tax laws

Due to the technical nature of some of the aspects of this analysis, it was judged appropriate that the derivation of the no-profit boundaries for short-term traders be shown separately in this appendix.

Kalay's (1982) equations for short-term trading strategies state that:

i) buying cum and selling ex is not profitable if
$(1-t_o)\ [D - (P_c - P_{cx}) - \alpha\Pi \leq 0$ and

ii) selling short cum-dividend and buying ex to cover your position is not profitable if:
$(1-t_o)\ [P_c - P_{cx}) - D - \alpha\Pi] \leq 0$

The above two equations need to be adjusted to take into account the provisions of the imputation tax regime used in the UK, as well as some other particularities of the current UK tax laws and Stock Exchange practise.

As we have seen in sub-section 3.3 of this paper an individual receiving a dividend of £D by a corporation, will actually receive a net cash flow of $£\ \frac{D(1-t_o)}{1-S}$

where: $t_o$ = Individual's tax rate on ordinary income
S = Lower rate of income tax, which is also the imputation tax rate

The above observation raises the question, as to what amount is a short-seller liable to pay to his cum-dividend buyer (i.e. £D or $£\ \frac{D}{1-S}$), and whether there are any implications for the Revenue

In case of a short sale a cum-dividend seller would be obliged to manufacture a dividend and pay it to the buyer. The seller would, under UK tax law, be liable to account for the tax direct to the IR. In the case of Stock Exchanges settlement of UK dividends, the receiving buying Stock Exchange member firm wili assume that the tax has been, or will be,

accounted for to the IR, and will, therefore, when paying the dividend to its cum-dividend buying client, issue a tax credit voucher. The client will use this voucher to prove his tax position and subject to status, reclaim tax credit.

The above suggest that a short-seller will have a cash outflow of not only the amount of the net divident (D), which he will pay to his cum-buyer, but also an additional amount equal to $\frac{D.S}{1-S}$ which he will pay to the Revenue. This results in a total cash outflow of £ $\frac{D}{1-S}$ which is in fact the gross amount of the dividend.

Let us now move on to actually re-state Kalay's equations, so as to take into account the above effects. This will be done for each class of possible short-term traders individually.

a) **Individual Traders**

Under the 1988 tax reforms we now have nominal $t_0$=nominal $t_c$=t (assume that capital gains exceed the annual exempt amount so that $t_c$=0).

Buying cum and selling ex will not be profitable as long as:

$$(1-t)[\frac{D}{1-S}-(P_c-P_{ex})-\alpha\Pi\leq 0$$

or equivalently, $\frac{1}{1-S}-\frac{\alpha\Pi}{D}\leq\frac{P_c-P_{ex}}{D}$

Selling short will not be profitable if:

$$(1-t)[P_c-P_{ex}-\frac{D}{1-S}-\alpha\Pi]\leq 0$$

which is equivalent to $\frac{P_c-P_{ex}}{D}\leq\frac{1}{1-S}+\frac{\alpha\Pi}{D}$

Thus, the no-profit condition for an individual engaging in short term trading is given by:

$$\frac{1}{1-S}-\frac{\alpha\Pi}{D}\leq\frac{P_c-P_{ex}}{D}\leq\frac{1}{1-S}+\frac{\alpha\Pi}{D}$$

**b) Corporations**

For corporations we have $t_0 = 0$ and $t_c = t_{cor}$ (i.e. corporation tax rate). cum-ex trading is unprofitable if:

$$D - (1 - t_{cor})\ [(P_c-P_{ex}) + \alpha\Pi] \leq 0$$

$$<=> \quad \frac{1}{1-t_{cor}}-\frac{\alpha\Pi}{D}\leq\frac{P_c-P_{ex}}{D}$$

In case of corporations selling short the no-profit condition is given by:

$$(1 - t_{cor})\ [P_c - P_{ex} - \frac{D}{1-S} - \alpha\Pi] \leq 0$$

$$<=> \quad \frac{P_c-P_{ex}}{D}\leq\frac{1}{1-S}+\frac{\alpha\Pi}{D}$$

So, the no-profit condition for corporations involved in short-term trading is given by:

$$\frac{1}{1-t_{cor}}-\frac{\alpha\Pi}{D}\leq\frac{P_c-P_{ex}}{D}\leq\frac{1}{1-S}+\frac{\alpha\Pi}{D}$$

c) **Tax Exempt Institutions**

In this case cum-ex trading is unprofitable as long as:

$$\frac{D}{1-S}-(P_c-P_{ex})-\alpha\Pi\leq0$$

$$<=> \quad \frac{1}{1-S}-\frac{\alpha\Pi}{D}\leq\frac{P_c-P_{ex}}{D}$$

short selling will be unprofitable as long as:

$$P_c - P_{ex} - \frac{D}{1-S} - \alpha\Pi \leq 0$$

$$<=> \quad \frac{P_c - P_{ex}}{D} \leq \frac{1}{1-S} + \frac{\alpha\Pi}{D}$$

Hence, the no-profit condition for tax exempt investors is given by:

$$\frac{1}{1-S} - \frac{\alpha\Pi}{D} \leq \frac{P_c - P_{ex}}{D} \leq \frac{1}{1-S} + \frac{\alpha\Pi}{D}$$

**d) Life Insurance Companies**

Insurance companies pay a tax on their ordinary income equal to the basic rate of tax and a tax of 30% on their capital gains (hence $t_c$ 0).

Cum — ex trading will not be profitable if:

$$D - (1-t_o)[P_c - P_{ex} + \alpha\Pi] \leq 0$$

$$<=> \quad \frac{1}{1-t_c} - \frac{\alpha\Pi}{D} \leq \frac{P_c - P_{ex}}{D}$$

Short selling will not be profitable if:

$$(1-t_c)[P_c - P_{ex} - \frac{D}{1-S} - \alpha\Pi] \leq 0$$

$$<=> \quad \frac{P_c - P_{ex}}{D} \leq \frac{1}{1-S} + \frac{\alpha\Pi}{D}$$

So, the no-profit condition for life insurance is given by:

$$\frac{1}{1-t_c} - \frac{\alpha\Pi}{D} \leq \frac{P_c - P_{ex}}{D} \leq \frac{1}{1-S} + \frac{\alpha\Pi}{D}$$

The boundaries derived in the above analysis are summarised in table 3 of the main paper.

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