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The Ex-Dividend Day Behavior of Stock Prices: A Re-Examination of the Clientele Effect

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ABSTRACT

Past studies have documented an ex-dividend day price drop which is less than the dividend per share and positively correlated with the corresponding dividend yield. In contrast to prior work, we show that, without additional information, the marginal tax rates cannot be inferred from this phenomenon which is, therefore, not necessarily the result of a tax induced clientele effect. Despite adjustments for potential biases in earlier work, however, the correlation between the ex-dividend relative price drop and the dividend yield is still positive which is consistent with a tax effect and a tax induced clientele effect.

THE EFFECT OF DIVIDEND policy on stock prices is an issue of growing interest and controversy in the financial literature. As Miller and Modigliani [19] show, if capital markets are perfect the dividend policy of the firm, for a given investment policy, does not affect its market value. However, in a world in which dividends are taxed more heavily than capital gains, investors may demand higher before-tax returns to hold securities with high dividend yield.[1] Furthermore, in such a world, investors could form "clienteles" each preferring a particular dividend yield.[2] In particular, investors in high income tax brackets might find it advantageous to hold low dividend yield stocks, while those in lower income tax brackets concentrate their holdings in high dividend yield stocks.[3]

Although the notion of a tax-induced clientele effect has intuitive appeal, there are serious questions as to its existence. Long [18] pointed out that the portfolio dividend yield choice cannot be made independently of the risk expected return trade off, since the dividend yield of all mean variance efficient portfolios is a linear function of their nondiversifiable risk. If, for example, dividend yield is positively correlated with risk, and wealthy investors have high tolerance to risk, they may hold high dividend yield portfolios even though they pay a higher tax on dividend income than on capital gains. Furthermore, as Miller and Scholes

* Graduate School of Business Administration, New York University. This paper is a revised chapter of my Ph.D. dissertation at the University of Rochester, N.Y. I wish to thank my dissertation Committee—John Long (Chairman), Jerold Warner, and Ross Watts—for their support and encouragement. I would also like to thank the participants in the finance workshops of the University of Rochester, the University of Chicago, New York University, Northwestern University, and the University of Pittsburgh. Finally, I would like to thank Robert H. Litzenberger and Michael Brennan for their valuable comments. Unfortunately, the remaining errors are all mine.

[1] Brennan [6] was first to extend the single period Capital Asset Pricing Model to include the preferential treatment of capital gains. He shows that, for the same level of risk, the before-tax expected rate of return of a stock is an increasing function of its dividend yield.

[2] The "clientele effect" was originally suggested by Miller and Modigliani [19].

[3] Corporations, for example, pay a lower tax on dividend income than on capital gains.

[20] argue, if there is a costless way to avoid the tax payment on dividends by converting them to tax deferred capital gains, investors would not pay a premium for any dividend policy. Hence, the existence of a tax effect and of a tax-induced clientele effect are empirical issues.

To date, the empirical evidence on these issues is inconclusive. Direct studies of stock ownership [1, 13] uncover no significant tendency for high income groups to prefer low dividend yield. On the other hand, evidence consistent with a tax effect and a tax-induced clientele effect was found by an examination of the relationships between the behavior of stock prices and their respective dividend yield[4] (see Litzenberger and Ramaswamy [16, 17] and Elton and Gruber [10]).

Of particular importance is evidence obtained by the examination of the ex-dividend day behavior of stock prices (see [7, 9, 10, and 23]). A security purchased on the opening of trade on the ex-dividend day does not include a claim to the dividend announced earlier, while if purchased on the previous day, it does. Thus, the price of a security that goes ex-dividend is expected to drop, and the ex-dividend day offers a unique opportunity to compare capital gains (i.e., the price drop) to ordinary income (i.e., the dividends), without assuming a specific valuation model.[5]

Several authors [7, 9, 10, and 23] have argued that stockholders' marginal tax rates can be inferred by comparing the ex-dividend day price drop to the dividend per share (henceforth the ex-dividend day relative price drop) and have interpreted the empirical findings of a price drop smaller than the dividend per share, as evidence of a tax effect. In the most extensive of these studies, Elton and Gruber [10] (hereafter EG) found a positive correlation between the dividend yield of a security and the proportionate size of its ex-dividend price drop. This empirical regularity is frequently cited in the financial literature as evidence of a tax-induced clientele effect.[6] In this paper, we argue that stockholders' marginal tax rates cannot be inferred from the ex-dividend-day stock price behavior and offer an alternative explanation for it.

In Section I previous models of the ex-dividend day stock price behavior (see [7, 9, 10, and 23]) are extended to incorporate transaction costs, arbitragers, and long term investors. Section II presents the empirical evidence. The results are discussed in Section III.

I. The Ex-Dividend Day Behavior of Stock Prices and Stockholder Tax Rates

Consider a simplified economy in which the marginal tax rates of investors can be inferred from the ex-dividend day behavior of stock prices. This simplified economy is described by the following set of assumptions:[7]

[4] For additional evidence, consistent with a tax effect, see Blume [5], Rosenberg and Marathe [24], Stone and Bartter [28].

[5] Notice that such a study is free of potential informational effects as the dividend announcement date is two to three weeks before the ex-dividend day. (See Miller and Scholes [21] for a discussion of the potential bias caused by the announcement effect).

[6] See, for example, [8, 27, 29, and 11]. A typical example is Haley [11]: "It is clear that firms differ with respect to several of the variables . . . , and the marginal tax rates of the shareholders."

[7] Most of these assumptions are explicit or implicit in past studies. They are relaxed in Subsections 2 and 3.

A.1. There are no transaction costs;
A.2. The tax on capital gains, τ_g, and the tax on ordinary income, τ_d, are known and the relationship between them is: $\tau_g = \min\{\tau_d/2, 25\%\}$;
A.3. The tax on short term capital gains is equal to the tax on long term capital gains;
A.4. There are unrestricted short sale possibilities;
A.5. Investors are risk neutral;
A.6. All investors are subject to the same tax rates $\tau_g \neq \tau_d$;
A.7. If purchased on the ex-dividend day, the stock will be sold, later on, at a higher price than the last cum-dividend price.

In this economy, the seller would be indifferent, ignoring discounting, to selling cum or ex-dividend, if

$$P_B - \tau_g(P_B - P_C) = \bar{P}_A - \tau_g(\bar{P}_A - P_C) + D(1 - \tau_d) \tag{1}$$

where

P_B = the stock price cum-dividend;
$\bar{P}_A$ = the expected price on the ex-dividend day;
P_C = the price at which the stock was purchased; and
D = the amount of dividend per share.

The left-hand side of (1) represents the after-tax receipts the seller would receive if he sold cum-dividend and had bought it for P_C. The right-hand side represents the expected net receipts from sale on the ex-dividend day.

Rearranging (1) leads to

$$\frac{P_B - \bar{P}_A}{D} = \frac{1 - \tau_d}{1 - \tau_g} \tag{2}$$

A buyer who purchased the stock cum-dividend would receive $D(1 - \tau_d)$ and pay P_B for the stock. If he were to buy on the ex-dividend day, he would pay the expected reduced price, $\bar{P}_A$, which would give rise (assuming A.7) to an increased tax liability of $\tau_g(P_B - \bar{P}_A)$. Hence, the buyer would be indifferent as to the timing of this purchase if

$$-P_B + D(1 - \tau_d) = -\bar{P}_A - (P_B - \bar{P}_A)\tau_g \tag{3}$$

Rearranging (3) leads to (2) again. Hence, the statistic $(P_B - \bar{P}_A)/D$ represents a particular ex-dividend day behavior of the stock price, which causes buyers and sellers, with tax rates τ_d and τ_g, to be indifferent as to the timing of their purchases or sales.[8, 9] Since short term traders (i.e., the arbitragers) are subject to the same taxes, Equation (2) is a necessary condition for equilibrium, and in this economy the tax rates can be inferred from $(P_B - \bar{P}_A)/D$.

In the remainder of this section, we relax some of the restrictive assumptions and show that the marginal taxes cannot be inferred from the ex-dividend day behavior of stock prices.

In the United States, short term capital gains (those realized in less than twelve months) are taxed as ordinary income. Hence, a large difference between the

[8] This analysis is implicit in most of past studies [7, 9, 23] and explicit in [10].

[9] In fact, the relevant capital gain tax of the seller is marginally smaller than τ_g since his taxes would be paid in the future.

expected price drop and the dividend per share would offer profit opportunities for any investor. If, for example, the dividend per share is smaller than the expected price drop by more than transaction costs, investors could sell the stock short cum-dividend and buy it back ex-dividend, thereby gaining

$$(1 - \tau_0)[P_B - \bar{P}_A - D - \alpha\bar{P}] > 0 \tag{4}$$

where

τ_0 = the marginal tax rate on ordinary income the arbitrager is subject to;
$\bar{P} = (\bar{P}_A + P_B)/2$;
$\alpha\bar{P}$ = the expected transaction costs of "a round trip".

If, on the other hand, the dividend per share exceeded the ex-dividend expected price drop by more than the costs of buying and selling the stock, investors could buy the stock cum-dividend and sell it ex-dividend. If they could deduct the short term capital losses against ordinary income, they would gain

$$(1 - \tau_0)[D - (P_B - \bar{P}_A) - \alpha\bar{P}] > 0 \tag{5}$$

As detailed in the Appendix, dealers in securities (wheter they are brokerage firms, partnerships, or individuals) can deduct unlimited amounts of short term capital losses against ordinary income.[10] To the extent that these dealers, whose transaction costs are the smallest, are the price setters, the condition for no profit opportunities is obtained by combining (4) and (5):

$$| D - (P_B - \bar{P}_A)| \leq \alpha\bar{P} \tag{6}$$

Rearranging (6) we get

$$1 - \frac{\alpha\bar{P}}{D} \leq \frac{P_B - \bar{P}_A}{D} \leq 1 + \frac{\alpha\bar{P}}{D} \tag{7}$$

Thus, the allowable range of $(P_B - \bar{P}_A)/D$ which is consistent with the absence of profit opportunities is inversely proportional to the dividend yield, and the tax rates of the firms' stockholders cannot be inferred from the value of $(P_B - \bar{P}_A)/D$.[11]

Notice that if transaction costs were zero, $(P_B - \bar{P}_A)/D$ would be constrained to unity. However, transaction costs are unavoidable for the arbitrager's trade. Further, $(P_B - \bar{P}_A)/D$ can take any value within the bounds which are implied by the existence of an arbitrager, and if the members of NYSE are price setters, these bounds are symmetric around 1. Thus, although the existence of the arbitrager casts doubts on our ability to infer taxes from the observed $(P_B - \bar{P}_A)/D$, it cannot explain systematic departures from unity.[12]

The question naturally arises as to what can be said about the relationships

[10] Individuals can deduct no more than \$3,000 of short term capital loss against ordinary income every year. In addition, corporations cannot deduct any short term capital loss against their ordinary income (see Appendix).

[11] If, for example, the dividend yield is 2% and $\alpha = .2\%$, the absence of profit opportunities implies: $0.9 \leq (P_B - \bar{P}_A)/D \leq 1.1$. For a dividend yield of 1% (which is an "average" dividend yield) the bounds are $0.8 \leq (P_B - \bar{P}_A)/D \leq 1.2$.

[12] Notice that the limitation on the deductibility of short term capital losses against ordinary income restricts the gains of nonmembers (individuals and corporations) from long positions around

between $(P_B - \bar{P}_A)/D$ and investors' marginal tax rates within the bounds placed by the arbitrager. In this range the difference between the price drop and the dividend per share provides no profit for a short term trader. On the other hand, investors who have decided to buy (or sell) the stock near its ex-dividend day, for reasons unrelated to the dividends, can choose to trade cum-dividend or ex-dividend without affecting their transaction costs. In these cases, the marginal transaction costs are zero. If this "trading population" is large enough to affect prices, its activity in the economy could result in an ex-dividend day relative price drop as described by Equation (2), so long as this relative price drop is consistent with the no profit opportunities condition for the short term traders.[13]

In summary, marginal tax rates cannot be inferred from $(P_B - P_A)/D$ if it is outside the no profit opportunities bounds. Moreover, even if the sample mean of $(P_B - P_A)/D$ is within these bounds, the marginal tax rates of the trading population cannot be inferred from it, as it is affected by the short term profit elimination.[14] We turn now to re-examine the documented behavior of stock prices on the ex-dividend day.

II. A Re-Examination of the Ex-Dividend Day Behavior of Stock Prices

The most extensive past study is the EG study. Like other authors [7, 9, and 23], they find $(P_B - \bar{P}_A)/D$ to be less than one; in addition, they report a positive correlation between the ex-dividend relative price drop and the dividend yield.[15] This evidence, however, is subject to potential biases from the use of closing prices of both the ex-dividend day and the day prior to it in calculating the tax rates implied from $(P_B - P_A)D$, on account of the normal daily price change in that price. To illustrate, let

P_B = closing price on the last cum-dividend day;

P_A = closing price on the ex-dividend day; and

P_X = the first ex-dividend price.

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the ex-dividend day. On the other hand, their gains from short positions are unaffected. A short position involves a short term capital gain, all of which is taxable as ordinary income, and the dividends paid to the owner of the stock are deductible against ordinary income. Hence, the limit on the deductibility of short term capital losses can create an asymmetry in the allowable range of no profit opportunities with a tendency towards a smaller price drop than the respective dividend per share. However, since the transaction costs of nonmembers are much higher than that of members, it is highly unlikely that these economic agents would affect the no profit opportunities bounds.

[13] This is, in fact, the equilibrium described in [10]. Since the cost "drives" the arbitragers out of the market, in this range, the "trading population" is the price setter.

[14] The relationship between the relative price drop and the marginal stockholder tax rate is further complicated since eliminating profits or choosing when to sell (or buy) the stock that goes ex-dividend involves risk. Thus, the expected price drop can be bigger than the dividend per share due to investors' risk aversion (when A.5 is relaxed). However, due to diversification ability and the short time horizon, this difference is probably very small. In addition, some investors who purchase the security can be uncertain about their actual holding period and, therefore, they are unsure about their actual tax rates.

[15] See [10], p. 71. Since $\tau_g = \min\{\tau_d/2, 25\%\}$, if Equation (2) is binding, τ_d can be inferred by observing $(P_B - P_A)/D$. Hence, if Equation (2) is binding, a positive correlation between $(P_B - P_A)/D$ and the dividend yield, D/P, implies a negative correlation between D/P and τ_d (i.e., it implies a tax-induced clientele effect).

To compare the price drop to the dividend per share, $(P_B - P_X)/D$ should be estimated. Thus, by using closing prices on both days, the ex-dividend price drop is biased downward. Formally

$$\frac{P_B - P_A}{D} = \frac{P_B - P_X - \bar{r}P_B}{D} \tag{8}$$

where $\bar{r}$ = the expected daily rate of return of the stock investigated.

The downward bias is $\bar{r}P_B/D$. For an average quarterly dividend yield of .01 and daily return of .0003,[16] the downward bias is .03. Recognizing this potential bias, EG estimated P_x by subtracting the average market movement from P_A. This correction can remove, or at least reduce, the bias in estimating the mean $(P_B - P_X)/D$. However, a bias can still exist in the estimation of the correlation between $(P_B - P_X)/D$ and D/P since the downward bias in estimating $(P_B - P_X)/D$ (i.e., $\bar{r}P_B/D$) using unadjusted closing prices is larger for stocks with higher expected rates of return and lower dividend yields. Therefore, if the expected daily rate of return is uncorrelated with the dividend yield, the correction employed by EG is sufficient. However, recent studies (e.g., [3]) document that the portfolio measure of risk, β, is negatively correlated with the dividend yield. Hence, the expected daily price appreciation is bigger for stocks with low dividend yield. Thus, the downward bias in estimating $(P_B - P_X)/D$ is stronger for stocks with small dividend yields both because D/P_B is smaller and $\bar{r}$ is larger than those associated with high dividend yields. Therefore, a more extensive correction for the "normal price movement" is required. Notice that it is possible to find the bias small and insignificant on the average, yet very significant in inducing the positive correlation.

Moreover, the relative ex-dividend price drops cannot be assumed to be independent. In particular, those measured in the same calendar dates are likely to be dependent. This problem is very serious as the correlation is calculated between the mean dividend yield and the mean $(P_B - P_A)/D$ for 10 deciles. The dependence among the various relative price drops can reduce the degrees of freedom of this test to zero.[17]

To re-examine the ex-dividend day evidence a sample of 2,540 cash dividends paid between 1 April 1966 and 31 March 1967 was selected from the CRSP file.[18] To avoid the potential bias caused by the normal daily price movement, the data were adjusted in two ways.

First, the stochastic process generating returns was assumed to be stationary and of the form

$$\tilde{r}_{j,t} = \mu_j + \tilde{\epsilon}_{j,t} \tag{9}$$

where $E(\tilde{\epsilon}_{j,t}) = 0$ and $\text{cov}(\tilde{\epsilon}_{j,t}\, \tilde{\epsilon}_{j,t-1}) = 0$ for all j and all t. Based on this martingale model, an unbiased estimate of the security expected daily return, $\hat{\mu}_j$, was obtained from the time series of its realized returns. The time period used to obtain this

[16] This daily return corresponds to an annual return of 12%.

[17] I wish to thank R. Litzenberger for pointing it out to me.

[18] We follow EG who chose the same time period.

estimate was July 1962 to the end of 1965. The ex-dividend price of security j was then estimated as the discounted closing price on the ex-dividend day. Formally,

$$\hat{P}_{x,j} = P_A/(1 + \hat{\mu}_j) \tag{10}$$

The second method of correction is based on the "market model":

$$\tilde{r}_{j,t} = \alpha_j + \beta_j \tilde{r}_{m,t} + \tilde{\epsilon}_{j,t} \tag{11}$$

where

$\tilde{r}_{j,t}$ = the realized return of j at day t;
$\tilde{r}_{m,t}$ = the realized return on the market portfolio (approximated by the value weighted Index contained in CRSP) at day t; and
$\tilde{\epsilon}_{j,t}$ = disturbance term of security j at day t, and $E(\tilde{\epsilon}_{j,t}) = 0$.

The time series regression (11) was estimated for each firm in the sample for the period July 1962 to the end of 1965, and the ex-dividend price was estimated by

$$\hat{\hat{P}}_{x,j} = P_A/(1 + E(\tilde{r}_{j,t})) \tag{12}$$

where $E(\tilde{r}_{j,t})$ is the expected daily rate of return on security j at Day t, conditional on the market return for that day—$\hat{\alpha}_j + \hat{\beta}_j \tilde{r}_{m,t}$. In testing the null hypothesis that $(P_B - P_X)/D = 1$, three estimates for P_X were employed: the unadjusted closing price on the ex-dividend day, P_A; the closing price on the ex-dividend day discounted by the average daily return, $\hat{P}_X$; and the closing price on the ex-dividend day discounted at the conditional expected return obtained from the market model, $\hat{\hat{P}}_x$. The results are reported in Table I.

Adjustment for the daily price movement increases the relative price drop somewhat and under this adjustment the hypothesis that the price drop is equal to the dividend per share cannot be rejected.

Table I

Estimates of the Ex-Dividend Relative Price Drop and its Correlation with the Dividend Yield

Estimates of the ex-dividend price, P_x	Mean $(P_B - P_x)/D$	Standard Deviation of $(P_B - P_X)/D$	t statistics for H_0: $(P_B - P_X)/D = 1$	Spearman Rank correlation between $(P_B - P_X)/D$ and the dividend yield	Z Value	Number of observations
1. Closing price on the ex-dividend day	0.734	7.935	−1.689	0.0813	4.179	2,540
2. Closing price on the ex-dividend day adjusted for the average daily return	0.881	7.956	−0.75	0.0322	1.457	2,540
3. Closing price on the ex-dividend day adjusted for the market model returns	0.821	6.52	−1.376	0.0537	2.62	2,540

Table II

The Implied Minimum Transaction Costs of a 'Round Trip' for Twenty Groups

Group	Mean (D/P)	Mean $(P_B - \bar{P}_A)/D$	α
1	.002	0.219	0.157%
2	.0036	1.689	0.245%
3	.0046	1.058	0.027%
4	.0054	0.402	0.323%
5	.0062	0.645	0.220%
6	.0069	0.460	0.374%
7	.0076	0.587	0.315%
8	.0083	0.825	0.144%
9	.0089	0.933	0.059%
10	.0094	0.878	0.115%
11	.0100	1.038	0.038%
12	.0105	0.824	0.184%
13	.0110	0.784	0.236%
14	.0115	0.876	0.142%
15	.0119	0.849	0.179%
16	.0125	0.928	0.090%
17	.0132	1.101	0.133%
18	.0138	1.079	0.109%
19	.0148	1.087	0.129%
20	.0209	1.290	0.609%

However, even after adjustment, the sample ex-dividend day price drop is less than the dividend per share. It seems then that although the marginal tax rates of each trader cannot be inferred from $(P_B - P_X)/D$, the evidence suggests that, on average, the investors comprising the trading population on the ex-dividend day pay higher taxes on dividend income than on capital gains.

Based on 2540 successive closing price observations, we have calculated the Sperman Rank Correlations between the dividend yield, D/P, and their respective price drops as a fraction of the dividend amount, $(P_B - P_A)/D$. The results are described in Table I. The use of unadjusted dividends gives a Spearman Rank Correlation between the 2540 pairs of $(P_B - P_A)/D$ and D/P of 0.0813 which, for 2539 degrees of freedom, is significant at the 1% level.

To adjust for the potential bias inducing a positive correlation, we used the discounted closing prices on ex, $\hat{P}_x$, to calculate $(P_B - \hat{P}_x)/D$. In this case, the Spearman Rank Correlation is 0.0322 and insignificantly different from zero. When the market model is employed to obtain the discounted closing prices, $\hat{P}'_x S$, we find a Spearman Rank correlation of 0.0537 which is *significantly* different from zero at the 5% level. Thus, the bias is found to be in the direction suggested: however, the sample correlation is still positive and in the second case it is significantly different from zero.

To shed some light on the question whether the correlation is a result of a tax-induced clientele effect in the trading population or that of profit elimination by short term traders, the sample was divided into 20 groups of 127 observations each. Group One consists of the lowest dividend yields and Group Twenty the

Table III

The Transaction Costs of a 'Round Trip' for a Member of the NYSE as a Percentage of the Stock Price

Price per Share	Number of Shares 100	500	1,000	2,000	4,000
2	1.2%	1.2%	1.1%	1%	0.95%
8	0.48%	0.46%	0.44%	0.38%	0.35%
14	0.38%	0.36%	0.35%	0.29%	0.26%
18	0.34%	0.33%	0.32%	0.26%	0.23%
25	0.28%	0.27%	0.26%	0.22%	0.2%
30	0.24%	0.24%	0.23%	0.2%	0.19%
35	0.2%	0.2%	0.19%	0.18%	0.17%
40	0.2%	0.19%	0.18%	0.17%	0.16%
50	0.16%	0.16%	0.15%	0.14%	0.14%
60	0.14%	0.14%	0.13%	0.13%	0.12%

highest. For each group, the mean[19] value of $(P_B - P_X)/D$ was computed. From this it is possible to infer the minimum level of the transaction costs for a "round trip" necessary to avoid profit opportunities. From Equation (7) this minimum level of transaction costs is

$$\alpha_i = (\overline{D/P})_i \mid 1 - (\overline{(P_B - P_A)/D})_i \mid \tag{13}$$

where $(\overline{D/P})_i$ is the mean dividend yield for Group i and $(\overline{(P_B - P_A)/D})_i$ is the mean relative price drop of Group i. Table II presents the results.

These minimum levels of transaction costs are far lower than those paid by the investor community at large, so that it is safe to conclude that the ex-dividend day behavior of stock prices provides no short term profit potential for a typical nonmember investor. On the other hand, the transaction costs of a member in the NYSE are of similar magnitude as shown in Table III.[20]

III. Conclusions and Implications

This study re-examines the theory and the documented empirical evidence of the ex-dividend day behavior of stock prices. Upon re-examination, past studies, in which the ex-dividend day price drop is found to be significantly less than the dividend per share and positively correlated to its respective dividend yield, are shown to contain two potential biases. First, the documented positive correlation can be the result of an incomplete adjustment for the "normal" daily price movement and the use of closing prices on the ex-dividend day. Second, the statistical significance of the measured correlation is questionable as some of the

[19] In this section, we report only the results of the first method of adjustment. The second method resulted in similar numbers.

[20] These are the relevant transaction costs for the period studied. They are obtained from the "New York Stock Exchange Constitution and Rules," Section 1702, p. 1105. Currently, the rate are negotiable.

observations are likely to be dependent. This study adjusts for these potential biases, yet the remeasured correlation is still positive and the sample mean relative price drop is still less than one (though statistically insignificant).

As shown in the paper, the marginal tax rates of stockholders cannot be inferred, in general, from the relative price drop. Therefore, the documented ex-dividend day behavior of stock prices is not necessarily evidence of a tax effect or a clientele effect. However, this evidence is consistent with the hypothesis that, on average, the investors comprising the trading population pay higher taxes on dividend income than on capital gains.

Note, however, that the tax rates of the trading population cannot be inferred from the estimate of the mean relative price drop even if it is within the no profit opportunities bounds. This estimate 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 effects of both the short term profit elimination and the tax rates of the trading population.

REFERENCES

1. T. R. Atkinson. *The Pattern of Financial Asset Ownership.* Princeton University Press, 1956.
2. C. A. Barker. "Price Changes of Stock Dividend at Ex-Dividend Dates." *Journal of Finance* 14 (September 1959), 373–78.
3. W. Beaver, P. Kettler, and M. Scholes. "The Association Between Market Determined and Accounting Determined Risks Measures." *Accounting Review* 45 (October 1970), 654–82.
4. F. Black and M. Scholes. "The Effects of Dividend Yield and Dividend Policy on Common Stock Prices and Returns." *Journal of Financial Economics* 1 (May 1974), 1–22.
5. M. E. Blume. "Stock Returns and Dividends Yields: Some More Evidence." Working Paper No. 1-79, Rodney L. White Center for Financial Research, University of Pennsylvania, Wharton School, Philadelphia, Pa.
6. M. J. Brennan. "Taxes, Market Valuation and Financial Policy." *National Tax Journal* 22 (December 1970), 417–27.
7. J. A. Campbell and W. Beranek. "Stock Price Behavior on Ex-Dividend Dates." *Journal of Finance* 10 (December 1955), 425–29.
8. C. B. Cohen. "Taxing Stock Dividends and Economic Theory." *Wisconsin Law Review* (August 1974), 142–75.
9. D. Durand and A. M. May. "The Ex-Dividend Behavior of American Telephone and Telegraph Stocks." *Journal of Finance* 15 (March 1960), 19–31.
10. E. J. Elton and M. J. Gruber. "Marginal Stockholders Tax Rates and the Clientele Effect." *Review of Economics and Statistics* 52 (February 1970), 68–74.
11. C. W. Haley. "Taxes, The Cost of Capital, and the Firm's Investment Decision." *Journal of Finance* 26 (September 1971), 901–18.
12. P. Hess. "The Empirical Relationship between Dividend Yield and Stock Returns: Tax effect or Non Stationarity in Expected Returns." Unpublished Ph.D. Dissertation, University of Chicago.
13. W. G. Lewellen, K. L. Stanley, R. C. Lease, and G. Schlarbaum. "Some Direct Evidence on The Dividend Clientele Phenomenon." *Journal of Finance* 33 (December 1978), 1385–99.
14. J. Lintner. "Distribution of Income of Corporation Among Dividends, Retained Earnings and Taxes." *American Economic Review* 45 (May 1956), 97–113.
15. ———. "The Valuation of Risk Assets and the Selection of Risk Investments in Stock Portfolios and Capital Budgets." *Review of Economics and Statistics* 47 (February 1965), 13–37.
16. R. H. Litzenberger and K. Ramaswamy. "The Effect of Personal Taxes and Dividends On Capital Asset Prices: Theory and Empirical Evidence." *Journal of Financial Economics* 7 (June 1979), 163–95.
17. ——— and K. Ramaswamy. "Dividends, Short Selling Restrictions, Tax Induced Investor Clienteles and Market Equilibrium." *Journal of Finance* 35 (May 1980), 469–82.

18. J. B. Long, Jr. "Efficient Portfolio Choice with Differential Taxation of Dividends and Capital Gains." *Journal of Financial Economics* 5 (August 1977), 25–53.
19. M. H. Miller and F. Modigliani. "Dividend Policy, Growth, and the Valuation of Shares." *The Journal of Business* 34 (October 1961), 411–33.
20. ——— and M. Scholes. "Dividend and Taxes." *Journal of Financial Economics* 6 (December 1978), 333–64.
21. ———. "Dividend and Taxes: Empirical Evidence." Unpublished Manuscript, the University of Chicago, 1980.
22. "*New York Stock Exchange Constitution and Rules.*" Commerce Clearing House, Inc., January 1975.
23. P. B. Readett, Jr. "The Price Behavior of Stocks on Their Ex-Dividend Dates." S.M. Thesis, MIT, 1956.
24. B. Rosenberg and V. Marathe. "Test of Capital Asset Pricing Hypothesis." *Journal of Financial Research*, forthcoming.
25. M. Scholes and J. Williams. "Estimating Betas From Non-Synchronous Data." *Journal of Financial Economics* 5 (December 1977), 309–28.
26. W. F. Sharpe. "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk." *Journal of Finance* 19 (September 1964), 425–42.
27. R. C. Stapleton. "Taxes, the Cost of Capital and the Theory of Investment." *Economic Journal* 82 (December 1972), 1273–92.
28. B. K. Stone and B. S. Bartter. "The Effect of Dividend Yield on Stock Returns: Empirical Evidence on the Relevance of Dividends." Working Paper No. E-26-8, Georgia Institute of Technology, Atlanta, Georgia.
29. J. Van Horne and J. G. McDonald. "Dividend Policy and New Equity Financing." *Journal of Finance* 26 (May 1971), 507–19.

APPENDIX

This appendix contains the institutional details as to the tax on short and long term capital gains (losses) which are payable (deductible) by the various economic agents trading in financial instruments. These economic agents can be classified into three groups.

1. *Individuals:* Any capital gain (loss) which is realized by an individual within twelve months (six months in the period of our study) is considered a short term capital gain (loss) and taxed (deducted) as ordinary income. Individuals, however, can deduct no more than $3,000 a year against ordinary income. Further, any noncorporate taxpayer is entitled to carry over unused capital loss for an unlimited number of years until it is used up (but cannot carry a capital loss back to an earlier year). A capital loss which is carried over to a later year retains its long term or short term character in the year to which it is carried (see IRS regulation 1.1211-1).

2. *Corporations:* A corporation cannot deduct short term capital loss against ordinary income. It can, however, carry back a capital loss sustained in taxable years beginning after 1969 to each of the three years preceding the loss year. Any access can be carried forward for five years following the loss year. The capital gains (losses) retain their short term or long term character in the year to which they are carried (see IRS regulation 1.1211-1).

3. *Security Dealers:* A dealer in securities is engaged in selling to customers in the ordinary course of trade or business and, therefore, is not entitled to capital gain benefit whether he is an individual or represents a corporation or a partnership. Thus, any loss (or gain) by a dealer from the sale exchange of securities will

be treated as ordinary loss (or gain), unlimited amounts of which can be deducted against ordinary income (see IRS regulation 1.1236-1).

There is, however, one exception. A dealer can *choose* to classify a security as one purchased for investment purposes. In this case the gain (loss) will be considered as capital gains and the appropriate limitations on the deductibility of short term capital loss against ordinary income applies. Regulation 1.1231-1(d) specifies the actions which the dealer has to take the qualify for such a classification. "A security is clearly identified in the dealer's records as a security held for investment when there is an accounting separation of the security from other securities, as by making appropriate entries in dealer's books of account to distinguish the security from inventories and to designate it as an investment and by (a) indicating with such entries, to the extent feasible, the individual serial number of, or other characteristic symbol imprinted upon, the individual security; or (b) adopting any other method of identification satisfactory to the Commissioner." On the other hand, the dealer can *always choose* to classify his purchases as inventory in which case he can deduct unlimited amount of loss against his ordinary income.