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The Ex-Dividend Day Behavior of Stock Returns: Further Evidence on Tax Effects

PATRICK J. HESS*

I. Introduction

THE EFFECTS OF firms' dividend policies on stock returns have been widely studied.[1] For the most part researchers have documented a statistically significant relation between dividend yields and stock returns; however, the explanation of this common empirical finding has been controversial. In two important papers, Litzenberger and Ramaswamy (1979, 1980) argue that this relation is best explained by differential taxation of dividends over capital gains. Litzenberger and Ramaswamy, like Elton and Gruber (1970) and Auerbach (1981), further argue that the dividend effect is complicated by clientele effects: the marginal-tax brackets implicit in security prices are negatively related to dividend yields.[2] The differential-tax explanation has been challenged by Blume (1980), Hess (1981), and Miller and Scholes (1981); these authors argue that the relation across securities is far too complicated to be entirely explained by tax effects. Hess conjectures that the empirical tests are clouded by the ability of dividend yields to proxy for changes in the riskiness of common stocks, and therefore, of their expected returns. Miller and Scholes outline the pitfalls of defining a dividend yield variable for a monthly trading interval; demonstrating that great care must be taken to insure that the definition of monthly dividend yields does not impound announcement effects. Both Hess and Miller and Scholes conclude that evidence provides no clear-cut support for tax effects.

This paper attempts to clarify the dividend controversy by addressing two of these issues: dividend related clientele effects and the information content of dividends. We find that dividend clienteles are not consistent with equilibrium prices; and not surprisingly, the empirical evidence does not support clientele effects in asset prices. At the same time, information effects do not completely explain the dividend effect. Finally, we do find evidence that dividends are proxying for changes in expected returns of common stocks.

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[1] A partial listing includes Auerbach (1981), Black and Scholes (1974), Black and Scholes (1973), Blume (1980), Brennan (1970), Elton and Gruber (1970), Friend and Pucket (1964), Gordon and Bradford (1980), Hess (1981), Litzenberger and Ramaswamy (1979, 1980), and Miller and Scholes (1978, 1981).

[2] The possibility of *ownership* clienteles forming on the basis of dividend yields was first suggested by Miller and Modigliani (1961). Unlike subsequent authors, Miller and Modigliani *did not* suggest that asset prices would reflect the various clienteles.

II. Dividend Yield Clienteles and Equilibrium Prices

Elton and Gruber, among others, have suggested that the potential tax impacts of dividends will lead to ownership clienteles forming on the basis of securities' dividend yields. The general idea is that investors in low marginal tax brackets purchase high yielding securities, and investors with high marginal tax brackets own low yielding securities. This pattern of ownership, considering dividends in isolation, minimizes the aggregate tax liability of all investors. These dividend-yield clienteles are also thought to be reflected in security prices. High yielding securities reflect a lower marginal tax bracket than low yielding securities.

It has been pointed out that clientele effects are inconsistent with unrestricted short-selling by investors. However, it is believed that short-selling restrictions may induce clientele effects in security prices. In a recent paper Litzenberger and Ramaswamy (1980) develop an after-tax-pricing equation incorporating dividend-yield clientele effects. Their model makes four important assumptions: (1) there are no short sales, (2) a single-period model with dividends known at the start of the period, (3) investors face a margin requirement, and (4) interest and dividend income are taxed as ordinary income and capital gains are untaxed. In this section we analyze the equilibrium properties of their model. It is shown that clientele effects are not consistent with equilibrium prices unless a very strong margin requirement is imposed—in particular investors are only allowed to borrow less than 50% of their invested capital.

The general form of the Litzenberger and Ramaswamy model is[3],

$$R_i^A = r_f(1 - \tau_g) + \tau_g d_i \quad \text{if} \quad \tau_g < \tau_m$$
$$R_i^A = r_f(1 - \tau_m) + \tau_g d_i \quad \text{if} \quad \tau_g \geq \tau_m$$

where R_i^A is the risk-adjusted return of security i, r_f is the taxable riskless rate of interest, τ_g is the tax bracket of the marginal investor in security i, d_i is the dividend yield of security i and τ_m is the tax bracket which equates the after-tax return on the taxable riskless asset with the tax-exempt rate: $r_f(1 - \tau_m) = r_m$.

We can interpret (1) by considering the tax induced behavior of investors. Investors with tax brackets less than τ_m prefer taxable to tax-exempt debt: $r_f(1 - \tau_g) > r_f(1 - \tau_m)$ if $\tau_g < \tau_m$. The model presumes that these low-tax-bracket investors also purchase stocks with after-tax-risk-adjusted returns equal to $r_f(1 - \tau_g)$. Thus they are indifferent between taxable debt and high yielding stock. Investors with tax brackets greater than or equal to τ_m purchase tax-exempt debt and stocks with after-tax-risk-adjusted returns equal to $r_f(1 - \tau_m)$. However, this

[3] The specific form of the Litzenberger and Ramaswamy model is,

$$E(\tilde{R}_i) - r_f = b_g\beta_{ig} + \tau_g(d_i - r_f)$$

where asset i belong to clientele g and $\tau_g < \tau_m$. If $\tau_g > \tau_m$ then

$$E(\tilde{R}_i) - r_f = b_g\beta_{ig} + \tau_g d_i + \tau_m r_f$$

where b_g is a risk premium for clientele g, β_{ig} is a risk measure and τ_m is the tax bracket implicit in the pricing of tax-exempt debt, Litzenberger and Ramaswamy (1980), p. 476. Auerbach (1981) develops a similar model.

equilibration of investors between bonds and stocks (1) is not sufficient to establish an equilibrium. It must also be true that all investors maximize their after-tax-risk-adjusted returns by holding these securities.

Consider a security i which is held by investors with tax brackets greater than τ_m. According to (1) the after-tax-risk-adjusted returns to these investors equal $r_f(1 - \tau_m)$. But now suppose that these investors combine security i with borrowing equal to,

$$d_i/r_f$$

and investment in a zero dividend yielding stock of,

$$d_i/r_f$$

per dollar invested in security i. The interest expense from this transaction would be equal to the dividend income of security i and thus all returns would accrue as untaxed capital gains. What will be the total capital gains, in a certainty equivalent sense, on the portfolio? The investment in the pure capital-gains security results in capital gains of,

$$\frac{d_i}{r_f} r_f(1 - \tau_m) = d_i(1 - \tau_m).$$

Security i, according to the model shown in (1), produces capital gains of,

$$r_f(1 - \tau_m) - (1 - \tau_g)d_i$$

(capital gains are adjusted for the after tax value of the dividend). Taken together, the portfolio produces untaxed risk-adjusted capital gains equal to,

$$r_f(1 - \tau_m) + (\tau_g - \tau_m)d_i \tag{2}$$

which exceeds $r_f(1 - \tau_m)$. Because of this, no investor would only hold pure capital-gains securities or tax-exempt debt. In equilibrium it must be the case that,

$$\tau_g = \tau_m$$

given the definition of τ_m (τ_m is defined as an equilibrium condition).

There are two questions which might be raised regarding this analysis: (1) What about risk? and (2) What about margin requirements investors might face? With respect to the first question it is sufficient to note that we have implicitly adjusted for risk by considering risk-adjusted returns. The margin requirement, however, depends upon the maximum dividend yield of securities held by high-tax-bracket investors. To determine this we imagine that a high-tax-bracket investor engages in the above described transaction with a security held by a low-tax-bracket clientele. If the owners of security i have a tax bracket less than τ_m, (1) says that:

$$R_i^A = r_f(1 - \tau_g) + \tau_g d_i.$$

By borrowing d_i/r_f and investing d_i/r_f in a zero dividend stock per dollar invested in security i, the high-tax investor receives risk-adjusted capital gains equal to:

$$d_i(1 - \tau_m),$$

from the pure capital-gains security. Security i produces untaxed capital gains equal to:

$$r_f(1 - \tau_g) - (1 - \tau_g)d_i.$$

Once again dividend income is equal to interest expense. Taken together, the after-tax-risk-adjusted return equals:

$$r_f(1 - \tau_g) + (\tau_g - \tau_m)d_i.$$

Note that if,

$$d_i < r_f,$$

then,

$$r_f(1 - \tau_g) + (\tau_g - \tau_m)d_i > r_f(1 - \tau_m).$$

As a result, high-tax investors only own securities with dividend yields less than or equal to r_f.

This implies that the previously defined tax arbitrage at most requires borrowing equal to half of the total investment. Thus, if effective margin requirements are at least 50%, there can only be one tax effect for securities with dividend yields less than or equal to r_f. It follows then that:

$$R_i^A \leq r_f(1 - \tau_m) + \tau_m d_i \quad \text{if} \quad d_i < r_f. \tag{1'}$$

We now turn our attention to securities with dividend yields greater than r_f. Consider two securities i and k where it is assumed that,

$$d_i > d_k.$$

Because the dividend yield of i exceeds k, clientele effects imply that τ_i is less than τ_k. However, if this is so, the owners of security i are able to earn higher after-tax-risk-adjusted return by purchasing k instead of i. In particular, their risk-adjusted-after-tax return would equal,

$$r_f(1 - \tau_k) + \tau_k d_k - \tau_i d_i = r_f(1 - \tau_k) + d_k(\tau_k - \tau_i) > r_f(1 - \tau_i)$$

since $d_k > r_f$. Unless securities i and k have identical implicit tax brackets no investor would hold the security with the lower implicit tax bracket. Both securities will be held only if the tax bracket is equal to the higher tax bracket. Otherwise the more heavily taxed investors would purchase taxable debt.

Thus far we have established that there are at most two possible clientele effects: one for securities with dividend yields less than r_f and one for securities with dividend yields greater than r_f. By considering investors with tax brackets equal to τ_m, a single tax effect can be demonstrated. These investors compare stocks to taxable or tax-exempt debt, and it must be true that:

$$r_f(1 - \tau^*) + \tau^* d_i - \tau_m d_i \leq r_f(1 - \tau_m),\ r_f(\tau_m - \tau^*) \leq d_i(\tau_m - \tau^*).$$

Since $d_i > r_f$ this restriction can only hold as a strict equality which implies that τ^* equals τ_m. From our previous analysis it follows that high yielding securities must also be priced as if dividends were taxed at the rate τ_m. Assuming that dividend and interest are taxed equivalently, there can only be a single dividend effect in equilibrium: the tax rate implicit in the pricing of tax-exempt securities.

III. Empirical Tests

The Statistical Model

If we define,

$$E(\tilde{R}_{it}) = R_{it}^{A} + \alpha_{0i}^{*} \qquad i = 1, 2, \cdots, N \qquad (2)$$
$$t = 1, 2, \cdots, T$$

where $\tilde{R}_{it}$ is the return of security i in period t and α_{0i}^{*} is a risk adjustment unique to asset i (e.g. the beta of asset i times the after-tax-premium of the market), then after-tax-pricing equations of the previous section may be stated in terms of expected returns. The clientele-effect model is,

$$E(\tilde{R}_{it}) = \alpha_{0i}^{*} + (1 - \alpha_{1i})r_{ft} + \alpha_{1i}d_{it}, \qquad (3)$$
$$\alpha_{1i} = \alpha_{1j} = \tau_k,$$

if asset i and j are held by investors in clientele k. The simple tax-effect models are identical to (3), but restrict,

$$\alpha_{1i} = \alpha_{1j} = \tau_m,$$

for all i and j. Of course, if there are no tax defects all α_1's equal zero.

The stochastic version of equation (3) is,

$$\tilde{R}_{it} = E(\tilde{R}_{it}) + \tilde{\mu}_{it}$$
$$\tilde{R}_{it} = \alpha_{0i}^{*} + (1 - \alpha_{1i})r_{ft} + \alpha_{1i}d_{it} + \tilde{\mu}_{it} \qquad (4)$$

where $\tilde{\mu}_{it}$ is a disturbance which is assumed to be independently and identically distributed as $N(0, \Sigma)$. (Σ is not assumed to be diagonal). As stated, (3) requires observation of the taxable-riskless rate of interest, and this series is not available on a daily basis. Because of this we propose the alternative model,

$$\tilde{R}_{it} = \alpha_{0i} + \alpha_{1i}d_{it} + \tilde{\nu}_{it} \qquad (4a)$$

where α_{0i} includes the average effect of r_f and $\tilde{\nu}_{it}$ includes deviations of r_f from its average. Assuming that daily dividend yields are orthogonal to changes in the taxable riskless rate, (4*a*) will be an adequate approximation of (4).[4]

Sample of Securities and Data

Tests for clientele effects require that we identify securities which belong to the same clientele. For purposes of our empirical tests we define ten clienteles on the basis of average dividend yield.[5] Each of these clienteles consists of fifteen securities having approximately the same dividend yield. The time period July 2, 1962 to December 31, 1979 is divided into ten subperiods each with approximately 439 daily return observations (approximately 287 degrees of freedom per subperiod). During the subperiods the securities included in the respective clienteles remain the same. However, the clienteles are not defined to be the same for all sub-periods.

[4] The model shown in (4a) is in the form of Zellner's seemingly unrelated regression. The seemingly unrelated regression exploits the cross-sectional relation between the disturbances. See Zellner (1962).

[5] Elton and Gruber (1970) define ten clienteles on the basis of average dividend yield, and Litzenberger and Ramaswamy (1980) define five.

Using daily stock returns to estimate and test the alternative models has two significant advantages. First, tests for clientele effects require estimation of large systems which in turn require large samples. It is unreasonable to assume that the distribution of security returns is constant for ten to fifteen year periods. Daily returns allow us to achieve large samples over short periods of calendar time, and therefore, require less restrictive assumptions about changes in the distribution of returns. A second, and perhaps more important, advantage is the ability to define a dividend yield variable which does not impound announcement effects. Miller and Scholes find that approximately 30 to 40% of the dividends paid in a month are also announced in the same month. When payment and announcement occur in the same month, the definition of anticipated dividend yields is a troublesome problem.[6] Because all dividends are announced before being paid, the market always knows the actual dividend before the ex-dividend day, and therefore, actual dividends paid are always equal to anticipated dividends at the close of the day before the ex-day.

All data used in our calculations are taken from the daily return and monthly master files of the Center for Research in Security Prices. These files were combined into a daily master file for New York Stock Exchange common stocks.

Empirical Results

Tests of the simple-tax-effect models are reported in table 1. The null hypothesis for these tests is,

$$\alpha_{1i} = \alpha_{1j}$$

for all i and j. The table lists the number of observations per equation, the F-statistics conditional on the estimated covariance matrix of the disturbances, the approximate probability of observing the sample given the null hypothesis, and the restricted estimates and their asymptotic standard errors.[7] The null hypothesis is easily rejected in all periods (In all cases the reported probabilities equal the minimum value calculated by the subroutines). The reader is reminded that the dividend yields used in these tests are free from information effects, and therefore, the failure of the simple-tax-effect model cannot be explained by the contamination of the dividend yield variable with dividend announcement effects. While the failure of the null hypothesis implies that the restricted estimates reported in table 1 are not meaningful, it is interesting to note that the restricted coefficients are not consistently positive or negative (Miller and Scholes report similar results for an "information free" definition of monthly dividend yields).

Our tests for clientele effects in some ways employ a less restrictive null hypothesis. Instead of requiring that the dividend effect is the same for all securities, the null hypothesis is,

$$\alpha_{1i} = \alpha_{1j}$$

if i and j belong to the same clientele. Tests of this hypothesis are reported in

[6] Miller and Scholes (1981) document that the cross-sectional regression techniques of previous authors are highly sensitive to the definition of dividend yield.

[7] All formal test results are large sample approximations.

Table 1

Test of Common Dividend Yield Effect: All Securities

$$\tilde{R}_{it} = \alpha_{0t} + \alpha_{1t} d_{it} + \tilde{\nu}_{it}$$

Time Period	Observations Per Equation	"F-Statistic"[a]	P-Value[b]	Restricted Estimate[c]
7/03/62–3/31/64	438	2.133	.0001	−.0361 (.035)
4/01/64–12/27/65	439	2.056	.0001	.0221 (.035)
12/28/65–9/21/67	439	2.102	.0001	.1695 (.040)
9/22/67–8/01/69	439	1.777	.0001	.3550 (.046)
8/04/69–4/27/71	439	2.035	.0001	.2201 (.045)
4/28/71–1/22/73	439	2.548	.0001	.1333 (.035)
1/23/73–10/17/74	439	2.001	.0001	−.0290 (.034)
10/18/74–7/14/76	439	2.666	.0001	.0198 (.030)
7/15/76–4/11/78	439	2.396	.0001	−.0616 (.025)
4/12/78–12/31/79	436	2.572	.0001	−.0082 (.025)

[a] Degrees of freedom equals 149 and the number of observations less 2 times 150.

[b] Lowest P-value is .0001.

[c] Asymptotic standard errors are reported in parenthesis below the restricted estimates.

table 2 for each of the ten periods. In general the clientele effects hypothesis fares no better than the simple-tax-effect models: the hypothesis is rejected at the .0001 level in every period. As a check of the sensitivity of our results across all clienteles, tests for each individual clientele are also reported.

The results of the individual clientele tests are consistent with the results for all clienteles. The null hypothesis of a common effect is almost always rejected at high significance levels. While it is difficult to summarize the restricted estimates for the individual clienteles, the high-yielding clienteles (clienteles 9 and 10) generally result in lower estimates than low-yielding clienteles (clienteles 1 and 2), and there is some tendency for the restricted estimates to decline with dividend yield (although the decline is by no means uniform).

Comparing the Ex and Non-Ex-Day Dividend Yield Effect

The results of tables 1 and 2 are inconsistent with both the clientele-effect model and the simple-tax-effect model, but document an important statistical association between dividend yields and stock returns. This association can not be explained by the announcement effect of dividends. We have not investigated the hypothesis that dividend yields are proxying for changes in the riskiness of

Table 2

Test of Common Dividend Yield Effect: Ten Dividend Yield Clienteles

$$\tilde{R}_{it} = \alpha_{0t} + \alpha_{1t} d_{it} + \tilde{\nu}_{it}$$

	Time Periods				
	7/03/62–3/31/64	4/01/64–12/27/65	12/28/65–9/21/67	9/22/67–8/01/69	8/04/69–4/27/71
All Clienteles[a]					
F-statistic	2.180	1.869	1.993	1.819	1.955
P-value	.0001	.0001	.0001	.0001	.0001
Clientele #1[b]					
F-statistic	2.093	2.321	1.930	3.029	1.934
P-value	.0095	.0034	.0192	.0001	.0189
Restricted Estimate	.2545	.6126	1.2410	−1.472	.9110
	(.326)	(.442)	(.673)	(.847)	(.931)
Clientele #2					
F-statistic	2.762	.7730	2.368	1.576	1.679
P-value	.0004	.7000	.0027	.0774	.0525
Restricted Estimate	.0295	.3657	1.0490	.3454	.3801
	(.220)	(.225)	(.316)	(.403)	(.344)
Clientele #3					
F-statistic	2.048	1.668	1.469	2.113	1.573
P-value	.0116	.0547	.1133	.0087	.0781
Restricted Estimate	−.2658	.4343	.2076	.6836	.2476
	(.156)	(.156)	(.216)	(.315)	(.266)
Clientele #4					
F-statistic	1.389	3.891	.9072	1.747	1.775
P-value	.1489	.0001	.5502	.0404	.0361
Restricted Estimate	.2909	.6063	.4716	.4975	1.2169
	(.136)	(.135)	(.201)	(.203)	(.216)
Clientele #5					
F-statistic	1.532	.6950	2.662	1.046	1.207
P-value	.0908	.7817	.0007	.4033	.2617
Restricted Estimate	.1230	.0225	.6408	.6286	.4403
	(.114)	(.116)	(.172)	(.197)	(.181)
Clientele #6					
F-statistic	3.669	2.428	2.376	2.037	1.552
P-value	.0001	.0021	.0026	.0122	.0843
Restricted Estimate	−.0899	−.0707	.0519	.2117	.2123
	(.099)	(.116)	(.128)	(.153)	(.135)
Clientele #7					
F-statistic	.9658	.6504	1.688	1.909	2.692
P-value	.4859	.8242	.0507	.0209	.0006
Restricted Estimate	−.1549	−.0679	.0329	.3990	.1203
	(.110)	(.090)	(.114)	(.135)	(.143)
Clientele #8					
F-statistic	3.221	.5656	3.448	.5899	2.120
P-value	.0001	.8935	.0001	.8754	.0085
Restricted Estimate	−.0138	.1788	.2807	.2657	.1608
	(.086)	(.102)	(.106)	(.113)	(.121)
Clientele #9					
F-statistic	1.728	1.979	1.867	2.380	3.219
P-value	.0435	.0156	.0249	.0026	.0001
Restricted Estimate	−.0793	−.0410	.3035	.3876	.2760
	(.079)	(.082)	(.093)	(.045)	(.100)
Clientele #10					
F-statistic	2.120	3.657	1.225	1.791	1.697
P-value	.0085	.0001	.2481	.0339	.0490
Restricted Estimate	−.0667	−.2047	−.0255	.3188	.0380
	(.076)	(.071)	(.068)	(.092)	(.083)

Table 2 (*continued*)

	Time Periods				
	4/28/71–1/22/73	1/23/73–10/17/74	10/18/74–7/14/76	7/15/76–4/11/78	4/12/78–12/31/79
All Clienteles					
F-statistic	2.455	2.017	2.531	2.335	2.305
P-value	.0001	.0001	.0001	.0001	.0001
Clientele #1					
F-statistic	3.764	2.445	1.939	1.442	3.401
P-value	.0001	.0019	.0185	.1245	.0001
Restricted Estimate	1.577	.2980	−1.178	−.8929	1.925
	(.446)	(.813)	(.744)	(.592)	(.563)
Clientele #2					
F-statistic	2.511	2.991	3.145	2.645	1.687
P-value	.0014	.0001	.0001	.0007	.0510
Restricted Estimate	.0003	.1760	.2930	.5986	.3731
	(.425)	(.406)	(.253)	(.224)	(.251)
Clientele #3					
F-statistic	1.548	1.450	1.995	3.051	.553
P-value	.0855	.1209	.0145	.0001	.9021
Restricted Estimate	.8822	.3500	.2098	−.0103	.0723
	(.270)	(.280)	(.168)	(.158)	(.170)
Clientele #4					
F-statistic	1.847	1.431	1.915	2.295	1.364
P-value	.0270	.1291	.0204	.0038	.1613
Restricted Estimate	.2724	−.1430	.1809	−.0073	.4794
	(.203)	(.174)	(.131)	(.120)	(.132)
Clientele #5					
F-statistic	2.325	1.370	1.928	1.759	1.352
P-value	.0034	.1581	.0193	.0385	.1677
Restricted Estimate	.0751	.1380	−.1117	−.0055	.2458
	(.167)	(.160)	(.121)	(.104)	(.108)
Clientele #6					
F-statistic	4.885	1.732	2.423	2.812	2.037
P-value	.0001	.0428	.0021	.0003	.0121
Restricted Estimate	.4447	.1330	.6185	.0563	−.088
	(.154)	(.111)	(.136)	(.094)	(.110)
Clientele #7					
F-statistic	2.100	1.214	1.073	1.660	3.625
P-value	.0004	.2565	.3771	.0564	.0001
Restricted Estimate	.1695	.0260	.2371	.0568	.1767
	(.127)	(.115)	(.100)	(.094)	(.088)
Clientele #8					
F-statistic	2.471	2.096	2.182	1.950	4.138
P-value	.0017	.0094	.0064	.0176	.0001
Restricted Estimate	.4722	.1150	.0507	.1576	.1936
	(.096)	(.081)	(.084)	(.075)	(.070)
Clientele #9					
F-statistic	1.467	3.074	6.808	1.069	2.066
P-value	.1140	.0001	.0001	.3804	.0107
Restricted Estimate	−.0012	−.0390	.0025	−.1490	−.1257
	(.083)	(.070)	(.060)	(.053)	(.057)
Clientele #10					
F-statistic	1.395	2.369	1.867	4.091	2.515
P-value	.1456	.0027	.0249	.0001	.0014
Restricted Estimate	.0107	−.1930	−.1518	−.1444	−.1236
	(.052)	(.060)	(.053)	(.038)	(.037)

[a] Degrees of freedom equal 140 and the number of observations less two times 150.
[b] Degrees of freedom equal 14 and the number of observations less two times 150.

individual stocks, and to this end we propose the statistical model,

$$\tilde{R}_{it} = \alpha_{0i} + \alpha_{1i}d_{it} + \alpha_{2i}d_{it}^{*}xk + \tilde{\nu}_{it} \tag{5}$$

where d_{it}^{*} is the last dividend paid divided by the closing price at $t - 1$ and k equals zero on an ex-day and one otherwise.

The model shown in (5) allows us to separately estimate the ex and non-ex-day dividend effects. The non-ex-day effect represents a general effect which, assuming that the tax effects of dividends are limited to ex-days, represents the proxying effect of dividend yields. The ex-day effect incorporates both the proxying effect and the tax effect, and it is hoped that we can isolate each effect by comparing the two coefficients. If there is no tax effect on the ex-day, we would expect that,

$$\alpha_{1i} = \alpha_{2i}$$

for all i. If both a tax effect and proxying effect are present, we should observe that,

$$\alpha_{1i} - \alpha_{2i} = \alpha_{1j} - \alpha_{2j} = \tau$$

for all i and j.

Table 3

Ex-Day and Non-Ex-Day Dividend Yield Effects

	$\tilde{R}_{it} = \alpha_{0i} + \alpha_{1i}d_{it} + \alpha_{2i}d_{it}^{*} \times K_{it} + \tilde{\nu}_{it}$			
	$\alpha_{1i} = \alpha_{1j}$	$\alpha_{2i} = 0$	$\alpha_{2i} = \alpha_{1i}$	$\alpha_{1i} - \alpha_{2i} = \alpha_{1j} - \alpha_{2i}$
July 3, 1962– October 17, 1966				
F-statistic	1.875	1.038	1.767	1.795
P-value	.0030	.4093	.0060	.0055
Degrees of Freedom	29; 32, 400	30; 32, 400	30; 32; 400	29; 32, 400
Restricted Estimate	.133			.048
Standard Error	.059			
October 18, 1966– March 16, 1971				
F-statistic	2.044	1.805	3.083	1.741
P-Value	.0008	.0045	.0001	.0081
Degrees of Freedom	29; 32, 400	30; 32, 400	30; 32, 400	29; 32, 400
Restricted Estimate	.491			.314
Standard Error	.060			
March 17, 1971– June 30, 1975				
F-statistic	1.867	2.057	1.790	1.650
P-value	.0032	.0006	.0050	.0154
Degrees of Freedom	29; 32, 400	30; 32, 400	30; 32, 400	29; 32, 400
Restricted Estimate	.264			.115
Standard Error	.055			
July 1, 1975– October 12, 1979				
F-statistic	2.063	1.977	2.228	2.077
P-value	.0007	.0011	.0001	.0006
Degrees of Freedom	29; 32, 430	30; 32, 430	30; 32, 430	29; 32, 430
Restricted Estimate	.025			.0725
Standard Error	.039			

While these tests are potentially interesting, two important qualifications should be noted. First, the relation between dividend yields and changes in the riskiness of securities is likely to be quite complicated. We have no a priori reasons to believe the relation will be linear or constant over time. Unfortunately, there is no obvious functional form that is likely to hold. Because of this, it may not be possible to separate these two effects in the manner presumed by these tests. Secondly, it has been suggested that transaction costs may result in tax effects occurring period by period and not just on the ex-day. If tax effects are spread across all days, the ex and non-ex-day coefficients would be equal and we would be unable to distinguish a general dividend yield effect from a tax effect. All we can reasonably hope for is that these tests will establish that one or both of the effects seems to be present.

Tests of the ex and non-ex-day effect are conducted with the Dow Jones 30 over four periods. The first test we consider attempts to verify that the ex-day effect is not the same across this sample of securities (the first column in table 3). For each period we can reject the hypothesis that the α_1's are equal across securities at reasonably high significance levels. The second column presents tests of the hypothesis that the non-ex-day effect is equal to zero. With the exception of the first period, this hypothesis is also rejected at high significance levels. Taking together these tests suggest that one or both dividend yield effects may be at work. However, the two remaining tests do not further clarify the issue. Tests for equality of the ex and non-ex-day effects and a common difference in these effects are not in accord with the data. In summary, these tests have failed to decompose the two effects.

IV. Summary and Conclusion

This paper has attempted to shed some light on the empirical relation between dividend yields and stock returns. Three possible explanations were considered: clientele effects, information effects and the ability of dividend yields to proxy for changes in the riskiness of securities. In two respects we meet with success. We are able to reject both the clientele effect model and announcement effects as explanations of the across security dividend yield effect. While we have established the plausibility of the proxying effect, we were unable to disentangle the ex and non-ex-day impact of dividend yields. Hopefully, future research can focus more carefully on this issue.

REFERENCES

Auerbach, A., "Stockholder Tax Rates and Firm Attributes," unpublished manuscript, June, 1981.

Black, F. and M. Scholes, "The Behavior of Security Returns Around Ex-Dividend Days," unpublished manuscript, July, 1973.

Black, F. and M. Scholes, "The Effects of Dividend Yields and Dividend Policy on Common Stock Prices and Returns," *Journal of Financial Economics*, May, 1974, pp. 1-21.

Blume, M., "Stock Returns and Dividend Yields: Some More Evidence," *Review of Economics and Statistics*, November, 1980, pp. 567-577.

Brennan, M. J., "Taxes, Market Valuation and Corporate Financial Policy," *National Tax Journal*, December, 1970, pp. 417-427.

Elton, E. and M. Gruber, "Marginal Stockholder Tax Rates and the Clientele Effect," *Review of Economics and Statistics*, February, 1970, pp. 68-74.

Friend, I. and M. Puckett, "Dividends and Stock Prices," *American Economic Review*, September, 1964, pp. 656–682.

Gordon, R. and D. Bradford, "Taxation and the Stock Market Valuation of Dividends and Capital Gains: Theory and Empirical Results," *Journal of Public Economics*, October, 1980, pp. 109–136.

Hess, P., "Dividend Yields and Stock Returns: A Test for Tax Effects," unpublished manuscript, September, 1981.

Litzenberger, R. and K. Ramaswamy, "The Effects of Personal Taxes and Dividends on Capital Asset Prices: Theory and Empirical Evidence," *Journal of Financial Economics*, June, 1979, pp. 163–195.

Litzenberger, R. and K. Ramaswamy, "Dividends, Short Selling Restrictions, Tax-Induced Investor Clienteles and Market Equilibrium," *Journal of Finance*, May, 1980, pp. 469–482.

Miller, M. and F. Modigliani, "Dividend Policy, Growth and the Valuation of Shares," *Journal of Business*, October, pp. 411–433.

Miller, M. and M. Scholes, "Dividends and Taxes," *Journal of Financial Economics*, December, 1978, pp. 333–364.

Miller, M. and M. Scholes, "Dividends and Taxes: Some Empirical Evidence," unpublished manuscript, May, 1981.

Zellner, A., "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bids," *Journal of the American Statistical Association*, June, 1962, pp. 348–368.