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Time-Series Variation in Dividend Pricing

KENNETH M. EADES, PATRICK J. HESS, and E. HAN KIM*

ABSTRACT

Ex-dividend day returns vary over time. The ex-day returns of high-yield stocks are persistently positive for some time periods and negative for others; in contrast, ex-day returns of low-yield stocks are always positive and less variable. We are unable to explain the variation with changes in the tax code, but we do find a strong effect for the introduction of negotiated commissions. We find evidence that corporate dividend capturing is affecting ex-day returns and confirm the findings of Gordon and Bradford (1980) that the price of dividends is countercyclical.

THE RELATIVE PRICING OF dividends and capital gains has important implications for understanding the determinants of corporate dividend policy and how taxes affect asset prices. Numerous researchers have attempted to estimate the relative pricing of dividends and capital gains; however, these efforts have not resulted in a professional consensus.¹ One area of research that has received little attention is the time-series variation of the relative pricing. Although Litzenberger and Ramaswamy (1979, 1980) and Eades, Hess, and Kim (1984) present results that suggest variation over time, Gordon and Bradford (1980) provide the most detailed investigation of how the relative pricing of dividends and capital gains changes over time. In their article, Gordon and Bradford use monthly return data to estimate several equilibrium pricing models for five-year sample periods between 1926 and 1978 and find that the relative price of dividends is countercyclical: high during recessions and low during expansions. Although the results of Gordon

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¹See for example, Black and Scholes (1974), Litzenberger and Ramaswamy (1979, 1980), Hess (1982, 1983), and Miller and Scholes (1982). These studies test for tax parameters in equilibrium pricing models that allow for differential taxation. The other line of research reasons that the tax effect, if any, should be most pronounced on ex-dividend days. Studies that examine the security pricing behavior on ex-dividend days include Campbell and Beranek (1955), Elton and Gruber (1970), Black and Scholes (1973), Kalay (1982), Eades, Hess, and Kim (1984), Booth and Johnston (1984), Kaplanis (1986), Lakonishok and Vermaelen (1983, 1986), Grammatikos (1989), Koski (1990), Michaely (1991), Karpoff and Walkling (1988, 1990), Choe and Masulis (1991), Robin (1991), Stickel (1991), and Michaely and Vila (1991), Boyd and Jagannathan (1992).

and Bradford suggest that there are significant effects besides differential taxes that are determining the relative price of dividends, the finance literature has not followed up on these results.

The objective of this article is to reexamine the time-series behavior of the relative pricing on ex-dividend days and to investigate the extent that the observed variation is explained by tax differentials between dividends and capital gains, strategic short-term trading such as corporate dividend capturing, and the business cycle effects documented by Gordon and Bradford (1980).

The next section explains how we measure the relative pricing of dividends and capital gains and our sample design. Section II presents our empirical results and explores possible explanations for the time-series variation in ex-day returns. Section III contains some concluding remarks.

I. Methodology and Sample Design

A. Measuring Excess Returns

To illustrate the effect of differential taxation of dividends and capital gains, define the expected after-tax rate of return as:²

$$E(\tilde{R}^{\tau}) = \frac{E(\tilde{P}_0) - P_{-1}}{P_{-1}} \cdot (1 - \tau_g) + \frac{D}{P_{-1}} \cdot (1 - \tau_d) \quad (1)$$

where

$E_{-1}(\tilde{P}_0)$ = expectation on day -1 of the closing price on day 0 ,

P_{-1} = the closing price on day -1 ,

τ_g = present value of the marginal investor's capital gains tax rate,

D = taxable cash dividends,

τ_d = present value of the marginal investor's tax rate on dividend income.

²In a well-known paper Elton and Gruber (1970) argue that the higher taxation of dividends relative to capital gains results in the price drop on ex-dividend days being smaller than the amount of dividends paid. Although there are no conceptual problems in using the price drop-to-dividend ratio to infer relative tax rates, Eades, Hess, and Kim (1984) point out two problems associated with using the ratio in a test statistic. First, scaling price changes by dividends introduces a potential problem of heteroscedasticity. Imagine two stocks that have equal variances of price changes but pay dividends of \$1.00 and \$0.10. The variance of the ratio of the stock with a \$1.00 dividend is one percent of the variance of the ratio for the stock with a \$0.10 dividend. A simple average of these two ratios assigns far too much weight to the low-dividend stock. Second, price changes on the same ex day are dependent, and, therefore, it is difficult to calculate the appropriate degrees of freedom. See Eades, Hess, and Kim (1984), pp. 7-8.

By rearranging equation (1) the expected pretax rate of return can be written as:

$$E_{-1}(\tilde{R}) = \frac{E_{-1}(\tilde{R}^\tau)}{1 - \tau_g} + \frac{\tau_d - \tau_g}{1 - \tau_g} \frac{D}{P_{-1}} \quad (2)$$

where $E_{-1}(\tilde{R}) = \frac{E_{-1}(P_0) - P_{-1} + D}{P_{-1}}$. Because dividends are zero on all days except ex-dividend days, $\frac{E_{-1}(\tilde{R}^\tau)}{1 - \tau_g}$ is the pretax expected rate of return on non-ex days. It follows from equation (2) that the difference in observed pretax rates of return between ex-dividend days and the other days can be used to make inferences about the relation between τ_d and τ_g . If τ_d is greater (less) than τ_g , the difference in expected returns, $E_{-1}(\tilde{R}) - \frac{E_{-1}(\tilde{R}^\tau)}{1 - \tau_g} = \frac{\tau_d - \tau_g}{1 - \tau_g} \frac{D}{P_{-1}}$, is positive (negative).

Following Eades, Hess, and Kim (1984) we form an ex-dividend day portfolio on each calendar day. Every calendar day represents an observation of a portfolio of stocks going ex-dividend on that day. Because the composition of the portfolio changes every day, we standardize each daily portfolio's excess return as:

$$SER_t = \frac{RP_t - \hat{\mu}_t}{\hat{\sigma}_t} \quad (3)$$

where SER_t is the standardized excess return on the ex-day portfolio of day t , RP_t is the observed portfolio return on day t , $\hat{\mu}_t$ is the estimated average non-ex-day return for the ex-day portfolio of day t , and $\hat{\sigma}_t$ is the estimated standard deviation for the ex-day portfolio of day t . The relative pricing of dividends and capital gains is measured with the standardized excess returns (SER).

Because dividend announcements occur prior to the ex day, the reactions of stock prices to dividend announcements affect returns before the ex day and would bias our estimates of standard deviations and means during non-ex days.³ To avoid this bias, we estimate the means and standard deviations with 50 daily returns beginning five days after the ex day. Assuming that security returns are independently and identically distributed as multivariate normal during this 50-day period, under the null hypothesis the SERs will be distributed as univariate student t with 49 degrees of freedom, a mean of zero, and a standard deviation of one. We use this distribution in making inferences about the significance of the SERs.

³Companies that announce a zero dividend are excluded from our sample; hence, the large negative returns associated with those announcements are also omitted from our sample. If we use pre-ex-day returns to estimate portfolio means, the omission of the large negative returns will upwardly bias the estimated means.

B. The Samples

Our most comprehensive sample is all taxable cash dividends by New York Stock Exchange (NYSE) common stocks between July 7, 1962 and October 11, 1989. This sample includes all distributions on the Center for Research in Security Prices (CRSP) 1990 NYSE monthly master tape that are coded as being fully taxable quarterly cash payments.⁴ In constructing this sample, we attempt to avoid confounding effects by excluding ex days that are within four days of another ex day or an announcement of a distribution.⁵ The result is 112,876 taxable distributions spread over 6,673 ex-day portfolios for an average of 16.9 distributions per portfolio. We refer to this sample as All-Taxables.

From the All-Taxable sample we construct a sample of stocks with high-yield cash dividends (High-Yield sample) and a sample of low yields (Low-Yield sample). The High-Yield sample consists of the highest dividend-yield quintile; the Low-Yield sample contains the three lowest dividend-yield quintiles. We exclude the second yield quintile to draw a clear distinction between the samples. Yields are calculated using the closing price on the day before the ex-dividend day. At the beginning of each year between 1962 and 1989 we rank stocks by their dividend yields and use these rankings to identify the samples. Our sample identification procedure results in a High-Yield sample of 22,381 distributions occurring on 5,625 days, and a Low-Yield sample of 67,911 distributions on 6,481 days.⁶

II. The Ex-Day Pricing of Dividends and Capital Gains

A. Variation in the Ex-Day Pricing

The time-series variation in ex-dividend day pricing is illustrated with Figures 1 and 2. Figure 1 shows the time series of the annual average ex-day SER for the All-Taxable sample. Figure 2 shows the same time series for the High-Yield and the Low-Yield samples.

The time-series variation in these figures is a significant attribute of the data. Moreover, Figure 2 reveals substantial differences in the time-series behavior of the High-Yield and Low-Yield samples. The High-Yield sample exhibits periods of persistently positive and negative ex-day excess returns, but the Low-Yield sample's ex-day excess returns are consistently positive and are less variable than their high-yield counterparts.

⁴The CRSP distribution codes are 1232 and 1238.

⁵The procedure used to estimate the SERs excludes the first four days of 1962 and the last 54 days of 1989. Because of these exclusions, our sample only includes ex days between July 7, 1962 and October 11, 1989.

⁶The number of high-yield distributions is less than 20 percent of the total taxable distributions by 194. This discrepancy is due to our sampling procedure of separating all fully taxable quarterly distributions on the CRSP tape by dividend yield before excluding distributions that have other ex days or announcements within four days of the ex day.

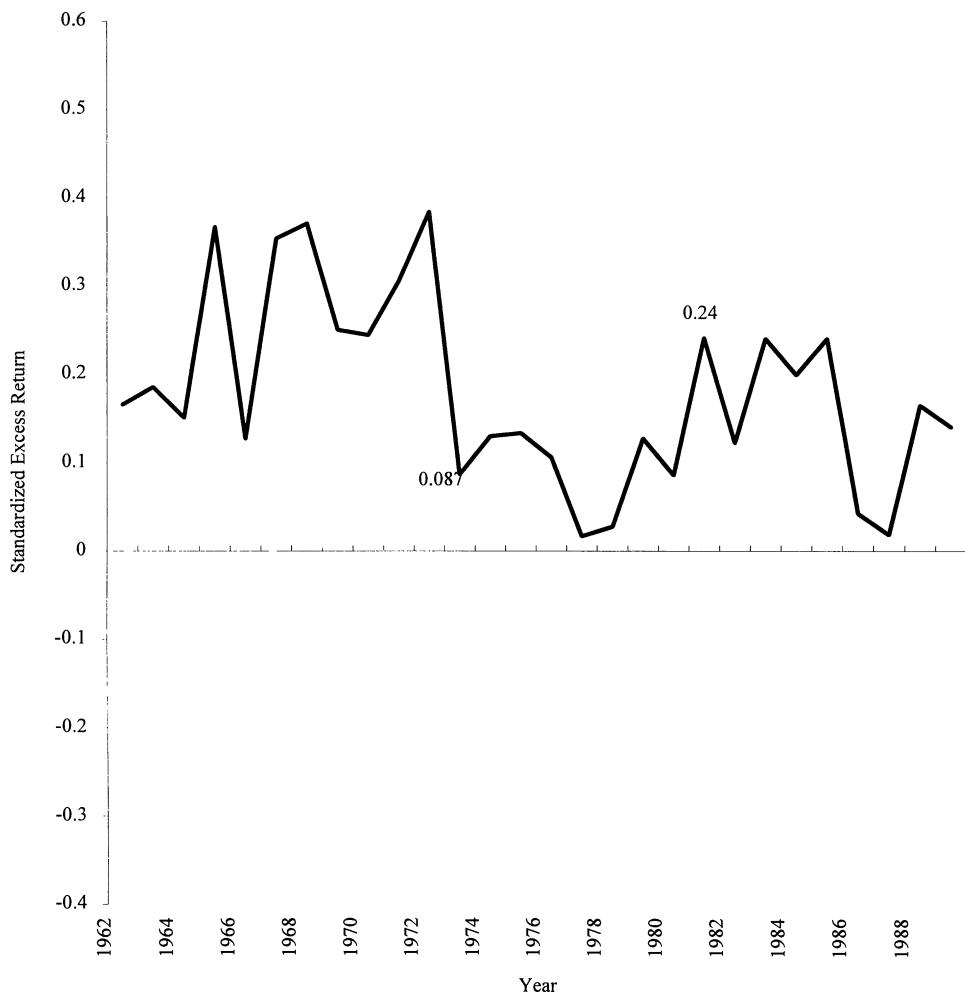


Figure 1. Average daily ex-dividend day pricing for all taxable cash distributions (1963 to 1989). The figure reports the average standardized excess return (SER) of ex-dividend day portfolios comprised of all taxable, regular cash dividends (CRSP codes 1232 and 1238). Portfolio SERs are calculated using a mean and variance estimated over the 50-day period beginning five days after the ex day. The sample includes 112,876 distributions occurring over 6,673 ex days with an average of 16.9 distributions per ex-day portfolio.

A common application of the ex-dividend day experiment is estimating effects of tax law changes. For example, Grammatikos (1989) compares the mean ex-day returns before and after the Tax Reform Act of 1984 (July 1984). Using a sample period of 1975 to 1985, he finds a significant increase in ex-day excess returns for high-yield stocks following the tax law change. The results in Figure 2 raise a serious doubt about Grammatikos's conclusion. The average SERs increase in 1981 and 1982, start to decrease in 1983, and

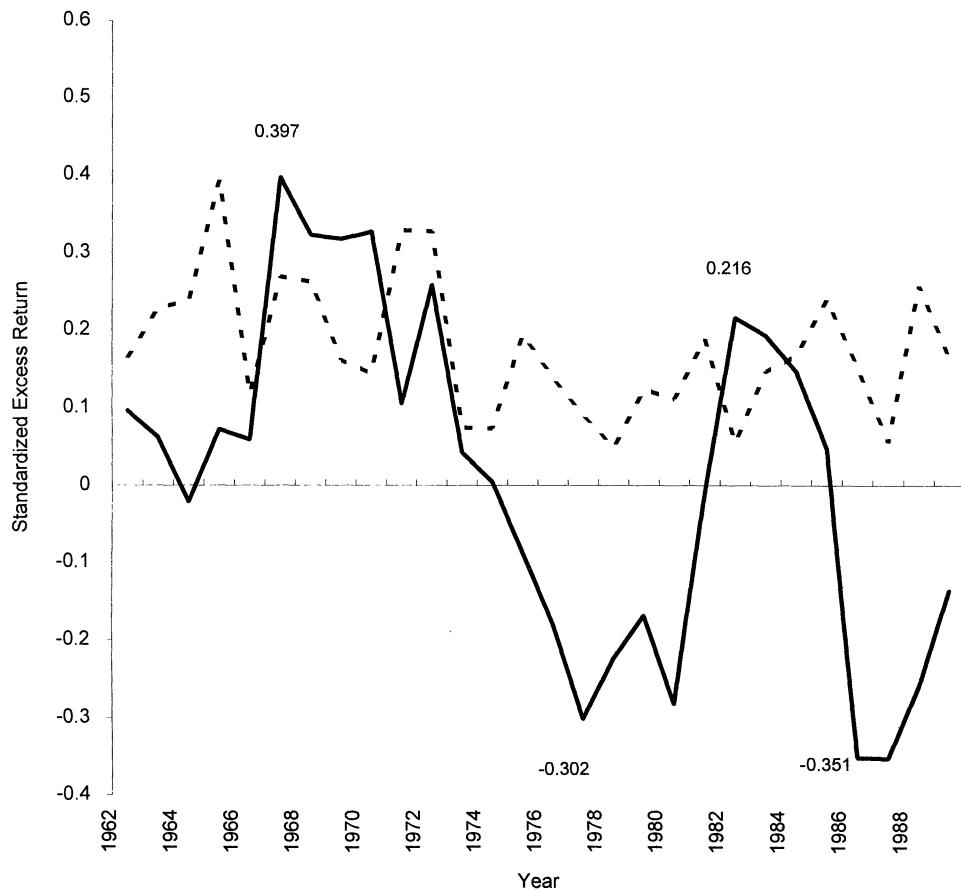


Figure 2. Average daily ex-dividend day pricing for High- and Low-Yield samples (1963 to 1989). The figure reports the average standardized excess return (SER) of High-Yield (solid line) and Low-Yield (broken line) ex-dividend day portfolios comprised of taxable, regular cash dividends (CRSP codes 1232 and 1238). Portfolio SERs are calculated using a mean and variance estimated over the 50-day period beginning 5 days after the ex day. The High-Yield sample consists of the highest dividend yield quintile for each year and the Low-Yield sample contains the three lowest dividend yield quintiles. The High-Yield sample includes 22,381 distributions over 5,625 ex days with an average of 4.0 distributions per ex-day portfolio; the Low-Yield sample includes 67,911 distributions over 6,481 ex days with an average of 10.5 distributions per ex-day portfolio.

become negative in 1986. Had Grammatikos selected his sample period so as to place the tax law change precisely in the middle, 1982 to 1986, his conclusion would have been reversed.

Figure 3 documents the persistence of the relative pricing of dividends. The figure plots the estimated autocorrelations of the monthly SERs for each sample and reports the Box-Pierce Q -statistic for the first 36 estimated autocorrelations. The High-Yield sample's autocorrelations are larger than

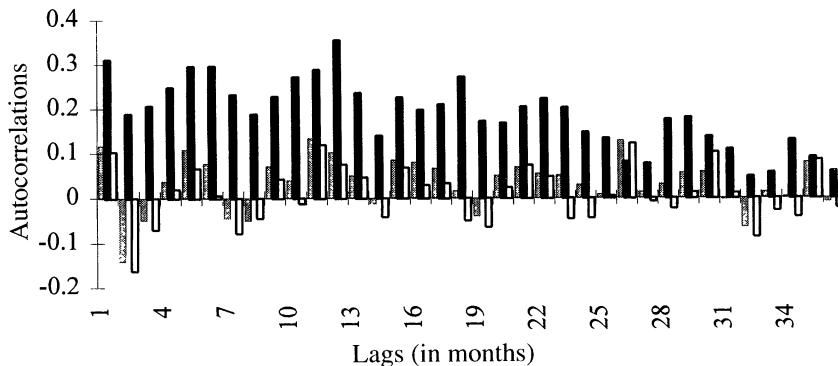


Figure 3. Autocorrelation of ex-dividend day returns. The figure depicts estimated autocorrelations of the monthly average ex-dividend day standardized excess returns for lags of one through 36 months. Estimates are reported for the All-Taxable (light shading), High-Yield (dark shading), and Low-Yield (not shaded) samples for the period 1963 to 1989. Box-Pierce Q -statistics for the first 36 autocorrelations are as follows:

All-Taxable Distributions: $Q(36) = 58.03$; p -value = 0.0011

High-Yield Distributions: $Q(36) = 523.64$; p -value < 0.0001

Low-Yield Distributions: $Q(36) = 52.73$; p -value = 0.0355.

the autocorrelations of the Low-Yield sample. The first 25 estimated autocorrelations of the High-Yield sample are positive and at least twice their asymptotic standard error of $0.055\left(\frac{1}{\sqrt{328}}\right)$. In contrast, only three of the Low-Yield sample's estimated autocorrelations are more than twice their asymptotic standard error.

Panel A of Table I reports summary statistics for average monthly SERs. According to equation (2), the higher tax rate applied to dividends predicts that the average ex-day returns should be the largest for the High-Yield sample; however, the average ex-day return of this sample is smallest and statistically not different from zero.

Panel B of Table I reports estimates of autoregressive integrated moving average (ARIMA) models for each of the samples. The ARIMA model explains more of the variation of the High-Yield sample than of the All-Taxable or Low-Yield samples. For the All-Taxable and Low-Yield samples, the first-order autoregressive parameter is not significant; in the case of the All-Taxable, including a first-order autoregressive is a clear case of overfitting, and subsequent empirical tests with the All-Taxable sample exclude the first-order autoregressive parameter.⁷ The large estimated first-order autoregressive parameter of the High-Yield sample reflects the tendency for this sample's ex-day returns to make extended departures from its mean of zero. In sum,

⁷Besides being insignificant, the AR(1) estimate reduces the impact of the MA(1) estimate, the adjusted R^2 and increases the Q -statistic.

Table I
Ex-Dividend Day Portfolio Standardized Excess Return (SER)
Summary Statistics

The ex-dividend day portfolios are comprised of all taxable, regular dividends (CRSP codes 1232 and 1238). The models are estimated over the period 1963 to 1989 for monthly average SERs. Portfolio SERs are calculated using a mean and variance estimated over the 50-day period beginning five days after the ex day. The High-Yield sample consists of the highest dividend yield quintile for each year and the Low-Yield sample contains the three lowest dividend yield quintiles. The All-Taxable sample includes 112,876 distributions occurring over 6,673 ex days with an average of 16.9 distributions per day. The High-Yield sample includes 22,381 distributions over 5,625 ex days with an average of 4.0 distributions per ex-day portfolio. The Low-Yield sample includes 67,911 distributions over 6,481 ex days with an average of 10.5 distributions per ex-day portfolio. Panel A contains descriptive statistics of the monthly averages of the daily SERs of the All-Taxable, High-Yield, and Low-Yield samples. Panel B reports estimated coefficients, R^2 , and Box-Pierce Q -statistics of ARIMA models for each of the samples.

Panel A: Descriptive Statistics				
Sample	Mean	Standard Deviation	Minimum	Maximum
All Taxables	0.177	0.339	-0.749	1.308
High Yields	0.016	0.389	-1.284	1.370
Low Yields	0.173	0.325	-0.789	1.215

Panel B: ARIMA Estimates					
Sample	Constant	AR(1)	MA(1)	R^2	Q -Statistic (36)
All Taxables	0.175 (8.359)	-0.255 (-1.101)	0.418 (1.761)	0.0181	48.04 <i>p</i> -value = 0.048
High Yields	-0.032 (-0.340)	0.961 (35.85)	-0.829 (-19.62)	0.16	50.90 <i>p</i> -value = 0.031
Low Yields	0.173 (8.736)	-0.363 (-1.461)	0.520 (2.279)	0.0193	45.30 <i>p</i> -value = 0.093

the relation between yield and the time-series variation of SERs makes it clear that the average effects are not the only, and perhaps not the most, important feature of the data.

B. Determinants of the Relative Pricing of Dividends

We consider three explanations for the observed variation of ex-day returns: differential taxation of dividends and capital gains, strategic trading by investors, and effects of the business cycle.

B.1. Differential Taxation

Because dividends are taxed more heavily than capital gains, it is often supposed that ex-day returns are larger than other days (see equation (2)). Such a pattern is apparent in the average returns of Table I for the All-Taxable and Low-Yield samples but not for the High-Yield sample. We estimate

the impact of differential taxes by identifying dates of tax law changes. During the period 1962 to 1989 there have been a number of changes in the taxation of capital gains, the allowed individual dividend deduction, and personal tax rates. Table II summarizes major changes in the personal taxation of dividends and capital gains.

At the risk of oversimplification, we focus on three changes in the personal tax code. The first is the 1977 increase in the minimum holding period for capital gains from six to nine months. This increase was followed with a second increase to one year and was not changed back to six months until 1984. The second change is the 1982 change in the maximum ordinary income tax rates. The third, and final, change is the 1986 Tax Reform Act enacted in 1987 that both reduced maximum tax rates and eliminated the capital gains exclusion.

We estimate the effect of these tax law changes on ex-day pricing by augmenting the ARIMA models with three dummy variables.⁸ In particular, we define the following dummy variables:

Dummy77 as one between January 1977 and June 1984 and zero otherwise,

Dummy82 as one between January 1982 and December 1986 and zero otherwise,

Dummy87 as one between January 1987 and October 1989 and zero otherwise.⁹

The results of estimating these models are shown in Panel A of Table III. By and large the estimates reveal no strong relations between ex-day returns and these changes in the tax code. The only variable of statistical significance is *Dummy77* (the 1977 increase in the minimum holding period for capital gains), and it is only marginally so. Increasing the minimum holding period makes more investors tax neutral between dividends and capital gains. According to the simple-tax hypothesis, equation (2), the increase should result in lower ex-day returns. The estimates provide weak evidence of this effect. The estimated effect of the 1977 dummy variable is negative in all three samples and statistically so in a one-tailed test for the All-Taxable and Low-Yield samples.

B.2. Strategic Trading

We define strategic traders to be either tax-neutral or tax-advantaged agents who trade against investors that have tax-motivated preferences for capital gains. Strategic traders include short-term traders and corporate investors. Miller and Scholes (1982) note that short-term traders are tax

⁸ For purposes of comparison we also estimate the effects of the dummy variables by regressing ex-day SERs on the dummy variables. These estimates are much the same as those reported in Table III.

⁹ Because the 1986 tax law change was phased in during 1987, the definition of the *Dummy87* is potentially troublesome. We experiment with different definitions of *Dummy87* with no substantive effect on our results.

Table II
Summary of Personal Tax Law Changes

	Date
Minimum holding period capital gains:	
Changed from 6 to 9 months	January 1977
Changed from 9 months to 1 year	January 1978
Changed from 1 year to 6 months	June 1984
Long-term capital gain exclusion	
60% from 50%	November 1978
Exclusion eliminated	January 1987
Maximum ordinary income tax rate	
74% from 87% at \$200,000	January 1964
70% at \$100,000 from 74% at \$200,000	January 1965
70% at \$102,200 from 70% at \$100,000	January 1977
50% at \$41,500 from 70% at \$102,200	January 1982
Top income tax bracket indexed to inflation	January 1983
Maximum bracket reduced to 33%	Between January 1987 and January 1988
Personal dividend exclusions	
Increased to \$100 from \$50	January 1964
Increased to \$200 from \$100	January 1981
Decreased to \$100 from \$200	January 1982
Eliminated	January 1987

neutral between dividends and capital gains and hence have an incentive to arbitrage any tax premiums embedded in the ex-day pricing of dividends.¹⁰ Corporations are allowed to exclude substantial fractions of dividend income from taxable income, and this exclusion results in a corporate tax preference for dividend income. Until 1986 the corporate dividend exclusion was 85 percent; in 1987 the exclusion was decreased to 80 percent; and in 1988, to 70 percent. The stated motivation for the corporate dividend exclusion is to reduce the double taxation of corporate profits resulting from intercorporate ownership of shares. Because corporations are allowed to deduct fully losses on short-term investments against taxable income, the corporate dividend exclusion creates the opportunity for tax arbitrage by buying cum-dividend and selling ex-dividend. Such strategic trading has become known as corporate dividend capturing and has been the subject of numerous empirical studies.¹¹

In estimating the impact of strategic traders, some consideration needs to be given to the role of transaction costs. Although it is difficult to directly

¹⁰ Boyd and Jagannathan (1992) provide evidence that such tax-neutral investors trade strategically against taxable investors and, on average, cause the ex-day prices to be tax neutral for some securities.

¹¹ Lakonishok and Vermaelen (1986), Grammatikos (1989), Koski (1993), Michaely (1991), Karpoff and Walkling (1988, 1990), and Choe and Masulis (1991).

measure transaction costs, it is generally agreed that the introduction of negotiated commissions reflected a decrease in the level of transaction costs. We use the official introduction of negotiated commissions in May 1975 to define a dummy variable. In particular, the variable *Dummy75* is set equal to zero before May 1975 and is one thereafter.

The results of adding this dummy variable to the ARIMA models are reported in Panel B of Table III and reveal a strong effect for the negotiated commissions. The estimated effects are statistically significant in all three samples and most notable for the High-Yield sample. To the extent that the dummy variable is capturing reduced transaction costs, the expected sign of the coefficient is negative. The reduction in transaction costs should encourage strategic traders to trade against any tax premium present in ex-day returns. Some of the strategic traders may be tax neutral, some may be dividend-capturing corporations, and some may be taxable investors with low tax rates.

A comparison of the High-Yield sample results reported in Panel B of Table III with Panel A of Table I yields an interesting observation. Panel A of Table I shows that the High-Yield sample's average ex-day premium (0.016) is statistically indistinguishable from zero and less than 10 percent of the average premiums of the All-Taxable (0.177) or Low-Yield (0.173) samples. Yet, estimates of the negotiated commission dummy variable suggest that the reduction in transaction costs had the largest effect on the High-Yield ex-day returns.¹² Together these results suggest that high-yield securities are the primary targets for tax arbitrage and that strategic trading has eliminated the High-Yield ex-day premiums.

Panel C of Table III reports the results of estimating the independent effects of each of the dummy variables. When estimated jointly, the effect of negotiated commissions dominates the change in the minimum holding period for capital gains: the estimated coefficients for *Dummy77* are now insignificant for all three samples. As in Panel A, the estimated effects of the 1987 tax law change, *Dummy87*, are insignificant. The estimated effect of the 1982 tax law change, *Dummy82*, is only statistically significant for the High-Yield sample.

The 1982 tax law eliminated the distinction between personal service income and investment income resulting in a reduction in the maximum tax rate on investment income from 70 to 50 percent. The simple-tax hypothesis would predict that a reduction in personal tax rates would result in a reduction of the ex-day tax premium.¹³ The estimated coefficient of *Dummy82* in the High-Yield sample, however, suggests that ex-day returns increased with the 1982 tax law change. This positive estimate may be explained by noting that there was a substantial reduction in corporate taxes and a

¹²The inclusion of the negotiated commission dummy variable substantially alters the autoregressive and moving average parameters and increases the level of autocorrelation of the residuals.

¹³See equation (2).

Table III
Effects of Tax Law Changes and Negotiated Commissions on
Ex-Day Returns

The ex-dividend day portfolios are comprised of all taxable, regular dividends (CRSP codes 1232 and 1238). The models are estimated over the period 1963 to 1989 for monthly average standardized excess returns (SER). Estimated coefficients, R^2 , and Box-Pierce Q -statistics of an ARIMA model are reported for All-Taxable, High-Yield, and Low-Yield samples using monthly averages of the daily SER as the dependent variable. Panel A reports estimates of autoregressive and moving average variables augmented with dummy variables for tax law changes (*Dummy77*, *Dummy82*, and *Dummy87*). Panel B reports estimates of an ARIMA model augmented with a dummy variable for the introduction of negotiated commissions (*Dummy75*). The estimates of the ARIMA model with box tax law change and negotiated commission variables are reported in Panel C, and the estimates reported in Panel D include *Dummy75* (the negotiated commission variable), *Dummy82* (the 1982 tax law change variable), and *Dummy84* (the variable for the 1984 change that increased the holding period to qualify for dividend exclusion).

Panel A: Estimates of the Effects of Tax Law Changes						
Sample	Constant	AR(1)	MA(1)	<i>Dummy77</i>	<i>Dummy82</i>	<i>Dummy87</i>
All Taxables	0.212 (7.555)	na	0.142 (2.580)	-0.090 (-1.851)	-0.001 (-0.025)	-0.122 (-1.719)
High Yields	0.013 (0.108)	0.951 (24.51)	-0.821 (-16.12)	-0.140 (-1.130)	0.066 (0.498)	-0.051 (-0.257)
Low Yields	0.206 (7.933)	-0.411 (-1.632)	0.556 (2.417)	-0.091 (-1.985)	-0.009 (-0.180)	-0.058 (-0.882)

Panel B: Estimates of the Effect of Negotiated Commissions						
Sample	Constant	AR(1)	MA(1)	<i>Dummy75</i>	<i>R</i> ²	<i>Q</i> -Statistic (36)
All Taxables	0.242 (7.996)	na	0.129 (2.334)	-0.127 (-3.061)	0.041	41.85 <i>p</i> -value = 0.198
High Yields	0.166 (4.620)	0.235 (0.935)	-0.041 (-0.160)	-0.287 (-5.837)	0.166	77.25 <i>p</i> -value < 0.001
Low Yields	0.220 (7.745)	-0.422 (-1.687)	0.566 (2.481)	-0.088 (-2.250)	0.031	48.01 <i>p</i> -value = 0.056

Table III—Continued

Panel C: Estimates of the Effects of Tax Law Changes and Negotiated Commissions								
Sample	Constant	AR(1)	MA(1)	Dummy75	Dummy77	Dummy82	Dummy87	R^2
All Taxables	0.242 (8.047)	na (2.159)	0.120 (-2.373)	-0.171 (0.328)	0.022 (1.277)	0.084 (0.203)	0.019 (0.203)	0.0370 <i>p</i> -value = 0.199
High Yields	0.144 (5.209)	-0.068 (-0.200)	0.200 (0.604)	-0.442 (-5.875)	0.104 (1.477)	0.271 (3.955)	0.024 (0.254)	0.205 <i>p</i> -value = 0.165
Low Yields	0.220 (7.737)	-0.431 (-1.714)	0.572 (2.496)	-0.080 (-1.169)	-0.038 (-0.596)	0.030 (0.486)	0.008 (0.090)	0.025 <i>p</i> -value = 0.042

Panel D: Estimates of Increased Holding Period for Dividend Exclusion, 1982 Tax Law Change and Negotiated Commissions								
Sample	Constant	AR(1)	MA(1)	Dummy75	Dummy82	Dummy84	R^2	Q -Statistic (36)
All Taxables	0.242 (8.053)	na (2.172)	0.120 (-3.091)	-0.152 (1.303)	0.079 (-0.081)	-0.005 (-0.081)	0.040 <i>p</i> -value = 0.163	43.10
High Yields	0.169 (5.365)	-0.068 (-0.201)	0.199 (0.595)	-0.343 (-6.689)	0.287 (4.566)	-0.126 (-2.027)	0.210 <i>p</i> -value = 0.145	42.74
Low Yields	0.220 (7.763)	-0.436 (-1.738)	0.576 (2.528)	-0.113 (-2.432)	0.0185 (0.324)	0.052 (0.922)	0.029 <i>p</i> -value = 0.039	49.83

notable increase in personal taxes coincident with the 1982 tax law change.¹⁴ Corporate dividend capturing is only profitable when corporations have taxable income, and a reduction in corporate taxes reduces the demand for dividend capturing. Because dividend capturing is likely to be targeted towards high-yield securities, a reduction in its level will be most visible in the High-Yield sample. Thus the estimated effect of negotiated commissions and the 1982 tax law change on the High-Yield sample supports the idea that corporate dividend capturing is reducing the ex-day returns of the High-Yield sample.

The corporate dividend exclusion requires that corporations own the dividend-paying stocks for a minimum holding period. Before July 1984, the minimum holding period was 15 days; after July 1984 the minimum holding period was increased to 45 days. We investigate the effect of increasing the minimum holding period by including an additional dummy variable (*Dummy84*) in our ARIMA estimates. Because there is little explanatory power associated with the 1977 and 1987 tax law changes, we only include the 1975, 1982, and 1984 dummy variables. The results of Panel D suggest that increasing the required holding period had a significant negative effect on ex-day excess returns. The negative effect of the 1984 dummy variable suggests that the increased holding period did not diminish dividend capturing but enhanced it. Below we argue that this surprising result is due to the correlation of ex-day returns and short-term interest rates.¹⁵

B.3. Effects of Treasury Bill and Dividend Yields

If dividend capturing is affecting ex-day returns, variables that affect the level of dividend capturing will affect ex-day returns. We conjecture that the level of dividend capturing will be affected by the dividend yields of stocks being captured and interest rates on cash-equivalent securities. The after-tax returns from dividend capturing depend upon the level of dividend yields. Transaction costs reduce the tax-arbitrage profits making it less profitable to dividend capture with low-yield stocks. In general, the higher the dividend yield, the higher is the return after transaction-cost from dividend capturing.¹⁶

¹⁴ Corporate tax payments fell from \$65.7 billion in 1981 to \$49 billion in 1982, while personal tax payments increased from \$6.9 to \$7.5 billion. Corporate tax payments increased after 1982 but did not exceed their 1980 level until 1984.

¹⁵ The results of Table IV suggest that the negative effect of the 1984 dummy variable reflects a decrease in short-term interest rates and not a change in the required holding period.

¹⁶ Consider two stocks both costing \$40 dollars but providing quarterly dividend yields of one and two percent. For the sake of discussion assume that the direct round-trip transaction costs are \$0.02 and that the round-trip bid-ask spread is 1/8 and that ex-day stock prices decrease by the amount of the dividend. The total transaction costs of the dividend capture is \$0.145 ($1/8 + 0.02$). If the corporate tax rate is 34 percent and the dividend exclusion is 70 percent, the stock with a one percent yield provides a tax loss of \$0.40 and taxable dividend income of \$0.12 ($(1-70\%) \cdot \0.40). The net taxable loss is \$0.28 and that has a value \$0.0952 ($\$0.28 \cdot 34\%$) less than transaction costs. The two percent yield stock has the same transaction costs, but provides a taxable loss of \$0.56 ($\$0.80 - (1 - 70\%) \cdot \0.80) with a value of \$0.1904 ($\$0.56 \cdot 34\%$) that exceeds the transaction costs.

As dividend yields change over time, we expect the level of dividend capturing to change over time.

We also expect interest rates on cash-equivalent securities to affect the level of dividend capturing. Corporations usually invest excess cash in short-term and low-risk securities. Corporate investment in financial securities is typically a temporary use of funds that have a more permanent home; e.g., payment of dividends or investment in real assets. Investors give corporate managers wide discretion in investing in real assets but generally do not expect them to aggressively manage a portfolio of financial assets and impose severe penalties when such portfolios suffer large losses.¹⁷ For these reasons, we assume that corporate investors find the common stock risk-return trade-off unattractive when investing corporate cash. The decision to dividend capture is driven by tax-arbitrage profits, and these profits are judged relative to the rate earned on cash-equivalent securities. In making these assertions we do not deny that expected returns of common stocks include a riskless rate; rather, we assume that corporations are reluctant to invest temporary excess cash in common stocks and will only do so when the tax-arbitrage profits are large relative to interest rates on cash-equivalent securities.

Historically, the relation between dividend yields and interest rates has not been one for one. Changes in T-bill yields are more variable than changes in dividend yields. Furthermore, changes in T-bill and dividend yields are not strongly correlated. During the sample period July 1962 to October 1989 the standard deviation of changes in one-month T-bill yields is about four times the standard deviation of changes in the dividend yield of the All-Taxable sample, and the estimated correlation between changes in these variables is only 0.09. Typically, a change in interest rates brings about little, if any, change in dividend yields. If expected returns are adjusting to changes in interest rate, increases (decreases) in interest rates imply that a smaller (larger) percentage of returns comes from dividends rather than capital gains. The tax-arbitrage gains earned from dividend capturing are directly related to the level of dividend yields; therefore, interest rate increases imply that the tax-arbitrage profit from dividend capturing decreases relative to the total returns earned on stocks.

In addition, there may be an indirect tax advantage to the corporate ownership of taxable debt. Miller (1977) argues that in equilibrium the

¹⁷Asymmetric reward structures will cause corporate investors to act as if they are risk averse. Such reward structures seem to apply for short-term investment decisions by corporations. Anecdotal evidence of this conclusion is that immediately following the October 1987 crash, several corporate treasurers were dismissed when their dividend-capturing programs experienced large capital losses. For example, *The Wall Street Journal* reported on November 3, 1987 that "One of the hardest hit was Hawaiian Electric Industries Inc. Late last week, it announced that it had lost \$11.3 million in the stock market, almost all in a dividend capture program. The treasurer of the unit responsible for the loss 'retired' last week."

marginal investor's effective tax rate on income from stocks is less than that on corporate debt and that investors will earn higher before-tax returns on debt than equity. When corporations make short-term investments in other firms' stocks, their nominal tax rates on debt and equity are the same except for the dividend exclusion that gives rise to dividend capturing. When firms choose dividend capturing over cash-equivalent securities, they give up the tax premium of debt in exchange for tax-arbitrage profits. The lost tax premium of debt, or higher before-tax rate of return, is an opportunity cost of dividend capturing that is increasing in the level of interest rates.

In addition to the above arguments, there are empirical regularities that support the notion that dividend capturing is negatively related to the level of interest rates. Fama and Schwert (1977) find that stocks returns are negatively related to one-month T-bill rates and Glosten, Jagannathan, and Runkle (1993) find that one-month T-bill rates are a good instrument for predicting the standard deviation of stocks. Taken together, these results imply that increasing interest rates predict both higher risk and lower risk premiums for common stocks. Corporate treasurers that are reluctant to invest in common stock when they expect the normal risk-return tradeoff, will be further dissuaded during periods of high interest rates.¹⁸

Finally, there is considerable evidence that interest rates are countercyclical.¹⁹ The negative correlation between interest rates and business conditions may imply that firms are squeezed for cash during periods of high interest rates and have little cash to invest in financial securities, particularly if the investment is risky.

For these reasons we expect the level of dividend capturing to be related positively to dividend yields and negatively to short-term interest rates. We test these predictions by estimating the ARIMA models but include a measure of each sample's dividend yield and the interest rate on cash-equivalent securities. The dividend yield is measured with the average quarterly yields of the securities included in the month's ex-day portfolios, the cash-equivalent yields with one-month T-bill rates at the beginning of the month. Estimates of the ARIMA models that include dividend yields and T-bill rates are shown in Panel A of Table IV.

The results reported in Panel A are consistent with the prediction of a negative relation between ex-day returns and dividend yields and a positive relation between ex-day returns and T-bill rates. As expected, these results are strongest for the High-Yield sample and weakest for the Low-Yield sample. The High-Yield results suggest that corporations primarily engage in

¹⁸Our high-yield sample include 1,967 different stocks. Of this total, 270 had options traded on a domestic options exchange sometime during the period July 1962 to December 1989. We estimate the effect of the ability to hedge with options by eliminating these 270 stocks from the high-yield sample. The conclusions are unaffected.

¹⁹The countercyclical nature of interest rates are implied by the results of Fama and Schwert (1977) and have been documented by Litterman and Weiss (1985) and Lee (1992).

dividend capturing with high-yield stocks and that the level of dividend capturing is negatively correlated with interest rates.²⁰

An alternative explanation for the negative relation between dividend yields and ex-day returns is the countercyclical effects documented by Gordon and Bradford (1980). These authors find that the relative price of dividends is inversely related to the business cycle. If the relative price of dividends is countercyclical, ex-day returns will be procyclical. Firms are slow to adjust dividend payments, causing dividend yields to be countercyclical. The observed negative relation between ex-day returns and dividend yields may simply reflect the countercyclical behavior of yields and valuations.

Unlike the negative correlation of dividend yields, the positive correlation of T-bill rates with ex-day returns cannot be explained with business cyclical effects: the results are limited to the High-Yield sample, and interest rates are countercyclical and not procyclical, as implied by the positive correlation.

As described in Section I.A, our calculation of standardized excess returns subtracts the average return estimated with 50 daily returns beginning five days after the ex day. This forward-looking definition avoids an *ex post* selection bias of dividend announcement effects but introduces another. Fama and French (1988) and Fama and Schwert (1977) document that both dividend yields and T-bill rates forecast future returns of common stock. It is possible that the observed correlations of ex-day SERs with dividend yields and T-bill rates reflect the ability of these variables to forecast future returns of common stocks. We conduct a diagnostic test by including the contemporaneous and the two leading monthly returns of the Standard and Poor's (S & P) 500 in the ARIMA models. Although the SERs are strongly positively correlated with the contemporaneous return of the S & P 500 and strongly negatively correlated with the leading returns, the estimated effects of dividend yields and T-bill rates are unaffected qualitatively.

B.4. Measuring the Business Cycle Effects

Gordon and Bradford (1980) find that their estimates of the relative prices of dividends are countercyclical. They take their countercyclical finding as evidence that Tobin's *q* is procyclical and that firms are penalized for paying

²⁰The average portfolio dividend yield is meant to measure the extent that the securities included in the portfolio are subject to dividend capturing. It is, of course, an imperfect measure. Because transaction costs are not directly related to price, it is more reasonable to define a dividend-capturing sample with the level of cash dividends and not dividend yields. Such a sample would not directly help us explain the difference between the time-series behavior of high- and low-yield securities documented in Figures 1 through 3. Nevertheless, we did construct a sample from the highest quintile of cash dividends in any year. The average cash dividend of this sample was \$0.5265 and the average minimum was \$0.382. For our high-yield sample the average cash dividend is \$0.382. As might be expected, the estimated effects of dividend yield and the T-bill rate are stronger for the sample constructed from the highest quintile of cash dividends. As reported in Panel A of Table IV, the dividend-yield *t*-statistic is -2.082 and the T-bill rate *t*-statistic is 3.704. The corresponding values for the top quintile of cash dividends are -3.918 and 4.678. These estimates are further evidence that dividend capturing is affecting ex-day dividend pricing.

Table IV
ARIMA Model Estimates with Macroeconomic Variables

The ex-dividend day portfolios are comprised of all taxable, regular dividends (CRSP codes 1232 and 1238). The models are estimated over the period 1963 to 1989 for monthly average standardized excess returns (SER). Estimated coefficients, R^2 , and Box-Pierce Q -statistics of the ARIMA model are reported for the All-Taxable, High-Yield, and Low-Yield samples with monthly averages of the daily SER as the dependent variable. Estimates of the ARIMA model augmented with dividend yield and Treasury bill yield are reported in Panel A. Panel B reports estimates of the ARIMA model augmented with leading and lagging rates of change in industrial production. The results reported in Panel C are for the ARIMA model augmented with leading and S & P 500 returns ($S & P500_{t+2}$, $S & P500_{t+1}$, and $S & P500_t$) and lagged Low-Yield ex-day returns (Low_{t-1}). In Panel C the model is estimated for the Low-Yield sample only.

Panel A: Effect of Dividend Yields and Treasury Bill Yields on Ex-Day Returns

Sample	Constant	AR(1)	MA(1)	Dummy75	Dummy82	Dividend Yield	T-Bill Rate	R^2	Q -Statistic (36)
All Taxables	0.507 (4.956)	na	0.081 (1.456)	-0.121 (-2.346)	0.005 (0.087)	-34.505 (-3.056)	13.910 (1.270)	0.063	48.28 <i>p</i> -value = 0.067
High Yields	0.264 (2.172)	-0.102 (-0.274)	0.204 (0.554)	-0.368 (-5.566)	0.180 (2.758)	-17.945 (-2.082)	44.875 (3.704)	0.228	45.98 <i>p</i> -value = 0.082
Low Yields	0.376 (3.850)	-0.458 (-1.852)	0.592 (2.634)	-0.063 (-1.276)	0.008 (0.127)	-17.615 (-1.232)	-10.301 (1.004)	0.032	50.48 <i>p</i> -value = 0.034

Table IV—Continued
Panel B: The Effects of Leading and Lagging Rates of Change in Industrial Production

Panel B: The Effects of Leading and Lagging Rates of Change in Industrial Production							
Sample	Constant	AR(1)	MA(1)	Dummy75	Dummy82	$\frac{IP_{t+6} - IP_t}{IP_t}$	$\frac{IP_t - IP_{t-6}}{IP_{t-6}}$
All Taxables	0.216 (7.057)	na	0.117 (2.102)	-0.130 (-3.133)	0.056 (1.210)	0.732 (1.258)	-0.332 (-0.544)
High Yields	0.154 (4.905)	-0.034 (-0.103)	0.160 (0.485)	-0.324 (-7.585)	0.221 (4.000)	-0.146 (-0.235)	-0.397 (-0.635)
Low Yields	0.186 (6.709)	-0.770 (-9.152)	0.876 (-13.509)	-0.084 (-2.235)	0.018 (0.366)	1.214 (2.194)	-0.268 (-0.480)

Panel C: Rates of Change in Industrial Production, Contemporaneous and Leading S & P 500 Returns, and Low-Yield Ex-Day Returns							
Low_t	$0.355 Low_{t-1} -$	$0.087 Dummy75 +$	$0.036 Dummy82 +$	$0.925 \frac{IP_{t+6} - IP_t}{IP_t}$	$- 0.301 \frac{IP_t - IP_{t-6}}{IP_{t-6}}$		
(8.394)	(-0.741)	(-2.858)	(0.902)	(2.029)			
	$- 1.727 S \& P500_{t+2} -$	$1.697 S \& P500_{t+1} +$	$3.16 S \& P500_t +$	$(1 - 0.448 B) \tilde{\varepsilon}_t$			
	(-5.763)	(-5.63)	(10.506)	(0.979)			

dividends during expansions and retaining earnings during recessions.²¹ We investigate the presence of a countercyclical valuation of dividends by estimating the ARIMA models with the 1975 and 1982 dummy variables and a leading and lagging measure of industrial production. Specifically, we include the rates of change in industrial production for the six months prior and the six months following the ex day. The results of this estimation are shown in Panel B of Table IV. Neither the All-Taxables nor the High-Yield samples support the claim that the valuation of dividends is countercyclical, but the Low-Yield results do. To the extent that the High-Yield sample's ex-day returns are being driven by dividend capturing, the lack of a procyclical relation for this sample is anticipated.

The positive correlation between the Low-Yield sample's ex-day returns and future rates of change in industrial production is consistent with Gordon and Bradford's finding that the valuation of dividends is countercyclical. Countercyclical valuation of dividends implies procyclical ex-day returns.

Because the stock market predicts future economic activity and the ex-day portfolios' returns are positively correlated with market returns, the positive correlation of the Low-Yield SERs and future rates of change in industrial production may be an artifact of our calculation. To check for such an effect we estimate the ARIMA model for the Low-Yield sample but include the contemporaneous and two leading monthly returns of the S & P 500. These estimates are reported in Panel C of Table IV and show that the inclusion of the returns of the S & P 500 reduce the estimated effect of the leading rate of growth of industrial production but not its statistical significance.

III. Conclusions

We document substantial time-series variation in the ex-day pricing and find that the variability of pricing depends upon dividend yield. The ex-day returns of our High-Yield sample are more variable than the Low-Yield or All-Taxable samples and tend to wander away from their sample mean of zero. The average ex-day excess returns of the All-Taxable and Low-Yield samples are positive and significant, but the average for the High-Yield sample is indistinguishable from zero even though it is sometimes positive and sometimes negative for extended periods of time. In contrast to the High-Yields, the ex-day excess returns of the Low-Yield and All-Taxable samples are consistently positive.

We attempt to explain the variation in ex-day pricing with tax law changes, strategic trading, and the countercyclical pricing documented by Gordon and

²¹Gordon and Bradford (1980), p. 131, state that "The cyclical pattern of the results is consistent with marginal Tobin's q interpretation of α , where α represents the value in the market of an additional dollar of real investment in the firm. We find this value to be sharply procyclical as would be expected. Of particular interest in this connection is the very low value of α during the depression, when corporate investment at the margin was apparently almost valueless."

Bradford (1980). We measure changes in the taxation of dividends with four dummy variables that represent the tax law changes in 1977, 1982, 1984, and 1987. Only the 1982 dummy variable has explanatory power and only for the High-Yield sample. We explain this result by noting that the 1982 tax law change reduced corporate tax payments. The reduction in corporate taxes may have reduced the demand for dividend capturing, resulting in higher ex-day returns.

In addition to dummy variables that reflect changes in tax rates, we also include a dummy variable for the introduction of negotiated commissions in May 1975. This transaction-cost dummy variable has a strong negative effect on the ex day, particularly for the High-Yield sample. The introduction of negotiated commissions coincided with a substantial reduction in transaction costs. We believe that the lower transaction costs resulted in strategic traders arbitraging away the ex-day premiums. This conclusion is supported by the observation that the effect of negotiated commission is strongest for the High-Yield sample.

We find that High-Yield ex-day returns are positively related to one-month T-bill rates and negatively related to dividend yields. We interpret these correlations as further evidence that corporate dividend capturing is affecting ex-day returns. Finally, we confirm Gordon and Bradford's (1980) finding that the pricing of dividends is countercyclical.

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