



American Finance Association

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Source: *The Journal of Finance*, Vol. 46, No. 3, Papers and Proceedings, Fiftieth Annual Meeting, American Finance Association, Washington, D. C., December 28-30, 1990 (Jul., 1991), pp. 845-859

Published by: Blackwell Publishing for the American Finance Association

Stable URL: <http://www.jstor.org/stable/2328545>

Accessed: 25/11/2009 12:10

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Ex-Dividend Day Stock Price Behavior: The Case of the 1986 Tax Reform Act*

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ABSTRACT

This paper analyzes the behavior of stock prices around ex-dividend days after the implementation of the 1986 Tax Reform Act that dramatically reduced the difference between the tax treatment of realized long-term capital gains and dividend income in 1987 and completely eliminated the differential in 1988. We show that this tax change had no effect on the ex-dividend stock price behavior, which is consistent with the hypothesis that long-term individual investors have no significant effect on ex-day stock prices during this time period. The results indicate that the activity of short-term traders and corporate traders dominates the price determination on the ex-day.

THE 1986 TAX REFORM Act (TRA) was the most dramatic change in the U.S. tax code during the past 40 years. It eliminated the preferential tax treatment of long-term capital gains which was adopted in 1921. Dividend income and realized capital gain income are now treated equally for tax purposes. Using the change in the tax system, this study offers new evidence about the effect of taxes on ex-dividend day price behavior. It shows that this tax change had no effect on the ex-dividend stock price behavior. Our study also shows that the adverse tax treatment of individual investors' dividend income had less effect on prices in the 1980s than it had in the 1960s, even before the change in the tax code.

In perfect capital markets, where investment policy is fixed, Miller and Modigliani (1961) showed that dividend policy does not affect the value of the firm. If dividends are taxed more heavily than capital gains, individual investors may require a higher pre-tax rate of return on dividend paying stocks. As Miller and Modigliani suggested, the uneven tax treatment of dividends and capital gains could lead to the formation of various 'clienteles' so that investors in high tax brackets hold low-yield stocks, while investors in low tax brackets will hold high-yield stocks. Elton and Gruber (1970) argued that taxing dividends more heavily than capital gains affects the behavior of

*This paper won the 1989 Trefftz Award of the Western Finance Association.

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prices on the ex-day. They further suggested that the marginal tax rate of the marginal investor in the different clientele groups could be estimated from the ex-dividend day price drop. Kalay (1982) showed that in a world of certainty, the short-term trading activity of arbitrageurs would eliminate any excess return on the ex-day. Relaxing the assumption of risk neutrality, Heath and Jarrow (1988) and Michaely and Vila (1991) demonstrated that the ex-day price is not controlled by any specific group of traders. The empirical research remains inconclusive as to the effect of differential taxes on the ex-day price.¹

The effect of the change in the U.S. tax law on the ex-dividend day stock price behavior is analyzed, and its potential effect on ex-day price behavior is derived. According to the long-term trading hypothesis, the ex-dividend day price drop should reflect the differential taxes between dividend income and capital gain income of the long-term traders. Hence, one would expect the price change to be a large proportion of the dividend amount in 1987 and in 1988, after the tax change, than in 1986. An examination of price behavior under the two shows that in 1986, 1987, and 1988, the dividend aversion of long-term individual traders did not affect the ex-day price significantly. In other words, we find no evidence of a negative tax effect either before or after the enactment of the 1986 TRA. To the contrary, our evidence is consistent with the hypothesis that the ex-day price is influenced primarily by short-term traders and corporate traders who favor dividend income over capital gain income.

The remainder of the paper is organized as follows. In Section I, the hypotheses are formulated, and the implications of the change in the tax code on the ex-dividend day price behavior are derived. Section II contains the data and methodology. The empirical results are reported in Section III, and Section IV concludes the study.

I. The Framework

A. The Hypotheses

In a risk-neutral world with preferential tax treatment of capital gains, the value of cash dividends is reduced by the tax differential. Ignoring overnight interest, the profit from selling at the end of the cum-day should equal the profit from selling at the beginning of the ex-day. More formally:

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

where

P_0 is the tax base,

P_{ex-1} is the stock price on the cum day,

P_{ex} is the expected stock price on the ex-day,

t_c is the capital gain tax rate, and

t_o is the ordinary tax rate.

¹Lakonishok and Vermaelen (1983, 1986), Eades, Hess, and Kim (1984), Poterba (1986), and Karpoff and Walking (1988) among others.

The left-hand side of the equation represents a sale before the ex-day on which all profits are taxed as capital gains. The right-hand side shows the profits of selling the stock on the ex-day, after the dividend is distributed. Rearranging terms,

$$\frac{P_{ex-1} - P_{ex}}{D} = \frac{1 - t_o}{1 - t_c} \quad (2)$$

Thus, in equilibrium the premium, $(P_{ex-1} - P_{ex})/D$ should be equal to the relative tax differential.

As Miller and Scholes (1982) and Kalay (1982) noted, there is no obvious reason why the equilibrium price should be determined by long-term investors if the market also includes short-term traders for whom the tax rate on dividends equals the tax rate on capital gains. For the short-term trader, equation (2) can be rewritten as $(P_{ex-1} - P_{ex})/D = 1$. Therefore, in the absence of transaction costs, the short-term traders' activity would drive the price differential to be equal to the dividend amount. Any deviation from this relation will trigger arbitrage activity, and in equilibrium the premium will be equal to one.

When thinking about tax-motivated trading (or holding) one should also take into account the existence of corporate traders. For them, dividends receive preferential tax treatment over capital gains. While the long-term trading hypothesis predicts that the premium should be less than one, because of the dividend aversion of individual investors, the preferential tax treatment of corporations' dividend income implies a premium above one.² For example, using the 1987 tax code and a corporation with a marginal tax of 34%, it can be shown that the corporation will benefit from the trade as long as the premium does not exceed 1.36 (ignoring transaction costs).

In sum, the long-term trading hypothesis predicts that the premium is on average less than one because of the dividend aversion of long-term traders. The alternative hypothesis is that the market pricing is dominated by short-term and corporate traders. Although the empirical evidence on the issue is inconclusive, most of it indicates that on average the premium is less than one, which supports the long term trading hypothesis.³ A change in the tax law can be used to test this hypothesis more directly. Lakonishok and Vermaelen (1983) studied the effect of the 1971 change in the Canadian tax code which made the tax treatment of dividends more favorable than capital gains. One would have expected the premium to be closer to one after the tax change took effect. The empirical findings were the opposite: the premium increased after the tax change. Poterba and Summers (1984) looked at the British market before and after tax changes and found evidence consistent with the existence of a tax effect. Barclay (1987) compared the ex-day price behavior prior to the introduction of federal taxes in 1913 with its behavior

²The premium is defined as the price change between the cum-day and the ex-day divided by the dividend amount.

³See, for example, Litzenberger and Ramaswamy (1979), Eades, Hess, and Kim (1984), Lakonishok and Vermaelen (1986), and Poterba (1986).

in the years 1962–1985. he finds that the average premium was not significantly different from one before the enactment of the federal taxes and significantly below one in 1962–1985. Barclay concludes that the higher taxes on dividends after 1913 caused investors to discount their value. A potential problem of this comparison is that in this time interval of 60 years, not only the tax code changed, but possibly many other variables affecting asset returns and individuals' behavior have changed.

In a similar spirit we examine this current change in the U.S. tax code. The long-term trading hypothesis predicts that the larger the discrepancy between the taxation of dividends and of long-term capital gains, the greater the dividend aversion. Comparing the premiums before and after the implementation of the 1986 TRA will provide further evidence on the existence of a negative tax effect.

B. The 1986 Tax Reform Act and the Long-Term Trading Hypothesis

The 1986 TRA drastically reduced the tax differential between capital gain and dividend income. Since January 1988, realized long-term capital gains and dividend have been treated equally for tax purposes.⁴ Preferential treatment of capital gains had begun with the revenue act of 1921. For the 1942–1978 period, 50% of capital gains were excluded from taxes, and 60% were excluded between 1979 and 1986.⁵ In 1987, the transition year between the old and the new tax code, the maximum tax rate on capital gains was set to 28%, whereas the maximum ordinary income tax rate was set to 38.5%. In 1988, the TRA eliminated all distinction between capital gains and ordinary income. The long-term trading hypothesis therefore predicts that the ex-day premium will be closer to one in 1987 than previously, and will be equal to one in 1988. Table I summarizes the expected impact of the TRA on the ex-dividend day premium as predicted by the long-term trading hypothesis.

Two provisions of the 1986 TRA directly affect the corporate trader's marginal rate of substitution between dividend income and capital gain income. First, the maximum corporate tax rate was reduced from 46% to 40% in 1987 and 34% in 1988. Second, corporations can deduct only 70% of their dividend income and not 85% as before. The effective tax rate on dividends, however, has changed very little. For example, a corporation in the highest tax bracket (taxable income of more than \$100,000) had an effective dividend tax rate of 6.9% (0.46×0.15) before 1987 and a tax rate of 10.2% (0.34×0.3) in 1988.⁶

⁴It is still possible to defer taxes by not realizing a capital gain. Also, capital losses are deductible in full against capital gains, although only \$3000 of capital losses can be offset against ordinary income. For a detailed description of the tax law changes, see Pechman (1987).

⁵In addition, the capital gain tax rate could not exceed 25%.

⁶Nevertheless, the corporation incentive to engage in transaction in order to capture the dividend is reduced since the marginal rate of substitution $(1 - T_o)/(1 - T_g)$ between dividend income and capital gain income has narrowed. For example, in 1986 MRS equals $0.931/0.54$ ($= 1.72$) for a corporation in the 46% tax bracket. For the same company, the 1988 MRS equals $0.898/0.66$ ($= 1.36$).

Table I
**Comparison of the Relative Tax Rates for Dividend Income and
 Long-Term Capital Gain Income and the Predicted Premium
 According to the Long-Term Trading Hypothesis in 1986,
 1987, and 1988**

Period	Relative tax rate ^a	The behavior of the premiums according to the long-term trading hypothesis
1986	$T_g = 0.4 * T_o$	premium(1986) < 1
1987	$T_g = T_o$ if $T_o < 28\%$ $T_g = 28\%$ if $T_o > 28\%$	$1 > \text{premium}(1987) > \text{premium}(1986)$
1988	$T_g = T_o$	premium = 1

^a The comparison is between tax rates on *realized* gains. T_g is the tax rate on long-term capital gains. T_o is the tax rate on dividend income.

II. Data and Methodology

A. Data

Closing prices for the 50 days surrounding the ex-day (-25 to $+25$) were collected for all firms listed on the NYSE which paid dividends during the 1986–1989 period.⁷ Companies were excluded from the sample if they did not trade on the cum-day, the *ex*-day, or at least 4 of the 11 days surrounding the ex-day; or if they had more than eight missing observations in the estimation and event period combined.

The sample contains 4,306 events in 1985, 4,499 events in 1987, 4,785 events in 1988, and 4,799 events in 1989. To isolate the extremely volatile period following the October 1987 crash, the sample was divided into three periods; the pre-crash period (January through September); the post-crash period (October through December); and the entire sample (January through December). The precision of the results for the post-crash period and for the entire sample is limited, and their interpretation questionable because of the high price changes and high volatility. Therefore, the analysis is based on the first 9 months of 1987.⁸ For purposes of comparability, we also use the first 9 months of 1986. The final sample contains 3,206 events in 1986 and 3,316 events in 1987.

B. Methodology

In an analysis based on the ex-dividend day closing price, the price drop due to the dividend is underestimated by the daily expected return. Therefore, we adjust the ex-day closing price by the expected daily return. The

⁷The data were obtained from IDC and IDD Data Corporation. Firms which paid dividends in foreign currency were excluded from the sample.

⁸The results for the entire year are available from the author.

adjusted closing price P_{ex}^* is:

$$P_{ex,i}^* = \frac{P_{ex,i}}{(1 + E(R_i))} \quad (3)$$

where $E(R_i)$ is the expected daily return, estimated by the mean model, the market model, or the OLS market model as in Brown and Warner (1985). The parameters for the mean and the OLS models are estimated in days -25 to -2 and $+2$ to $+25$ where day zero is the event day.

It is also necessary to adjust heteroskedasticity in the premium's variance, which exacerbates the ex-day price change of small dividends relative to large dividends. There are two sources of heteroskedasticity. First, each security has its own conditional variance; that is, the diagonal elements of the disturbance covariance matrix are not equal. We estimate these variances from the time series regression and adjust the premium accordingly. The estimation of the variances is repeated under the three models (mean, market, and OLS). The second source of heteroskedasticity is the dividend yield itself. As shown in the Appendix, the estimated premium for security i , under the null hypothesis of no tax effect, can be written as:

$$\frac{P_{i,ex-1} - \tilde{P}_{i,ex}}{D_i} = 1 - (\varepsilon_{i,ex}) \frac{P_{i,ex-1}}{D_i} \quad (4)$$

where

$P_{i,ex-1}$ is the cum-day price,

$\tilde{P}_{i,ex}$ is the ex-day price, and

D_i is the dividend amount for stock i .

Equations (4) and (A.8 in the Appendix) show that the heteroskedasticity is proportional to the ratio of the dividend yield to the disturbance variance. The weighted mean premium, which is also the GLS estimator of the mean premium, is:

$$\bar{P}_{ex}^* = \frac{\sum_{i=1}^N d_i^2 / \sigma_i^2 P_{i,ex}^*}{\sum_{i=1}^N d_i^2 / \sigma_i^2} \quad (5)$$

That is, the premiums are weighted inversely to their disturbance variance and in proportion to their dividend yield. If $\sigma_i^2 = \sigma^2 \forall i$, and $d_i^2 = d^2 \forall i$, then $\bar{P}_{ex}^*$ is the simple mean premium.

III. Results

In this experiment the long-term trading hypothesis yields two major predictions. First, the 1986 premiums are expected to be less than one; second, we expect to observe higher premiums after the tax change than before the tax change. But as Table II shows, the mean ex-day premiums for 1986, 1987, 1988, and 1989, adjusted for heteroskedasticity, are 1.054, 1.028, 0.998, and 1.009, respectively, and they are not significantly different from

Table II
Comparison of the Ex-Dividends Premiums in
the Two Tax Regimes. The Premiums Are
Adjusted for Heteroskedasticity

	Mean ^a	S.D.	Z-value ^b
1986	1.054	1.318	2.320
1987	1.028	1.229	1.330
1988	0.998	0.821	0.168
1989	1.009	1.131	0.527

^a Using the OLS market model.

^b Test of the null hypothesis that the mean premium equals one.

each other. Even the 1986 mean premium is above one. The level of the premiums is not affected by the change in the tax law which makes dividends more favorable to long-term individual investors. Thus, these results do not support the hypothesis that long-term individual investors significantly influence price formation around the ex-dividend day.

To gain further insight we compare our results of the 1986–1989 ex-day premiums to the Elton and Gruber (1970) and Kalay (1982) findings. The regulations regarding dividend income and long-term capital gain income were almost the same in 1966–67, the time of the Elton and Gruber and the Kalay studies, as in 1986, the last year under the old tax law.⁹ Thus, according to the long term trading hypothesis, one would expect to observe similar stock price behavior in the two time periods. In 1987, on the other hand, the gap between the long-term capital gain tax rate and dividend income tax rate has narrowed substantially for all tax brackets and has been eliminated for all but the highest two brackets. Hence, the long-term trading hypothesis predicts that the premium would increase between 1986 and 1987.

Table III presents the ex-day premiums for each of the three time periods. For both 1986 and 1987, the premiums are never significantly lower than one at the 1% level for all adjustment models. The average premiums of 1986–87 are significantly higher than the premiums of 1966. For example, using the OLS market model, the average premiums are 0.838 in 1966 and 1.054 in 1986, and they are significantly different with a *t* statistic of 7.69. Under all adjustment methods we detect differences between the 1966 and the 1986–87 average premiums. The average premiums in 1966 are significantly lower than one, while insignificantly different from one in 1986 and 1987. Contrary to the long-term trading hypothesis prediction, the 1986 mean premiums are not significantly lower than those of 1987, and the mean premiums are

⁹There are two minor differences. First, the amount of dividend exclusion for the individuals was \$200 in the earlier period and only \$100 in 1986–1987. Second, the tax exclusion of long-term capital gains rose from 50% to 60% in 1986.

Table III

Ex-Dividends Premiums for the Three Time Periods

The first period, 1966–67, as in Elton and Gruber (1970) and Kalay (1982); the second and the third periods, 1986 and 1987, the periods before and after the implementation of the 1986 TRA.

	Mean premium	S.D.	Z value ^a	% above one	Fisher Test
April 1966–March 1967					
Mean model	0.865	1.51	–5.77	47.5	–3.21
Market model	0.876	1.52	–5.25	46.9	–3.92
OLS model	0.838	1.44	–7.23	46.1	–4.94
January–September 1986					
Mean model	1.057	1.40	2.31	49.5	–0.56
Market model	1.041	1.37	1.70	49.5	–0.56
OLS model	1.054	1.32	2.32	49.9	–0.03
January–September 1987					
Mean model	1.007	1.268	0.32	50.3	0.38
Market model	1.060	1.311	2.64	51.5	1.68
OLS model	1.028	1.229	1.33	50.7	0.83

^a Test of the null hypothesis that the mean premium equals one.

insignificantly different from one for both years. The Fisher sign test indicates further that in 1986–1987, the number of premiums below one is not statistically different from the number of premiums above one under all adjustment methods. In 1966, the number of premiums below one is significantly higher than the number of premiums above one under all adjustment methods. Also, the Spearman rank correlation coefficient between the dividend yield and the relative price drop is insignificant in 1986 and 1987.

This comparison enables us to distinguish changes in market behavior that are due to tax changes from those due to other factors such as the reduction in transaction costs for the large traders or the emergence of new hedging instruments. Such institutional changes may cause a shift in the relative weight of various trading groups. Facing lower transaction costs in the equity, options, and future markets, short-term and corporate investors are likely to trade more around the ex-day in the latter period and hence will have greater effect on price formation. The possibility that some structural changes other than taxes have increased the influence of corporate and short-term traders is also supported by the studies of Eades, Hess, and Kim (1984) and Lakonishok and Vermaelen (1986). These studies find that the reduction in the transaction costs in May 1975 resulted in higher premiums.

A comparison of the results with and without the correction for heteroskedasticity shows that the correction for heteroskedasticity reduces the variance of the premium estimates but does not change their mean significantly. Using the OLS market model, the drop in the variance is from 43.9 and 57.6, when no adjustment is made, to 1.74 and 1.29 under the adjust-

ment, for 1986 and 1987, respectively.¹⁰ Since both the GLS and the OLS estimates are consistent estimators, we would not expect to observe significant change in the mean premium.

Next, the sample is divided into deciles according to dividend yield. For the sake of brevity, Table IV presents only the results of the 1986–1987 premiums estimated with the OLS market model, corrected for heteroskedasticity. The results for the other models and the least squares mean premium are described in the text. Columns 2 through 5 show, respectively, the dividend

Table IV
Ex-Dividends Premiums by Yield Deciles

The 1986 premiums are shown in Panel A and the 1987 premiums in Panel B. The premiums are adjusted according to the OLS market model, and corrected for heteroskedasticity.

Decile	yield ^a (%)	Mean	S.D.	Z-Value ^b	% above One	Z-Value
Panel A (1986)						
1	0.17	1.850	8.87	1.71	54.4	1.56
2	0.33	1.100	5.67	0.33	49.7	-0.11
3	0.45	0.684	4.32	-1.30	48.4	-0.55
4	0.56	0.801	3.27	-1.10	45.9	-1.45
5	0.68	0.645	2.33	-2.77	44.7	-1.90
6	0.78	0.713	1.94	-2.65	43.1	-2.46
7	0.92	0.821	1.86	-1.72	42.2	-2.79
8	1.2	1.017	1.33	0.23	48.4	-0.55
9	1.65	1.224	0.87	4.61	64.1	5.03
10	2.45	1.069	0.62	1.97	59.1	3.24
Panel B (1987)						
1	0.15	0.846	9.74	-0.28	49.2	-0.27
2	0.31	1.310	5.13	1.10	56.0	2.14
3	0.41	0.836	4.10	-0.73	49.2	-0.27
4	0.50	1.017	3.34	0.09	52.3	1.04
5	0.61	0.520	3.05	-2.86	43.5	-2.36
6	0.71	0.810	2.00	-1.73	47.4	-0.93
7	0.85	0.858	1.73	-1.49	45.9	-1.48
8	1.16	0.952	1.39	-0.63	46.8	-1.15
9	1.67	1.185	0.79	4.26	59.5	3.46
10	2.71	1.070	0.58	2.18	57.4	2.69

^a The dividend yield is defined as the dividend amount over the cum-day price.

^b Test of the null hypothesis that the mean premium equals one.

¹⁰In this special case we are able to compare the variance of the coefficient with and without the correction for heteroskedasticity. Usually, the comparison should be made between $(X'X)^{-1}(X'\Sigma X)(X'X)^{-1}$, the correct covariance matrix of the least squares estimator, and the GLS estimator of the variance. White (1980) estimation of the variance is reduced to the OLS estimation of the variance since the only independent variable is the constant term. The use of the White estimate of the variance results in asymptotically correct inferences based on the OLS results. However, the coefficient itself is estimated more efficiently under the explicit correction for the problem of heteroskedasticity as presented in Table II.

yield the 'GLS' mean premium, the standard deviation, and the *Z*-statistics of the test of the null hypothesis that the mean premium equals one.¹¹ The mean premium pattern has a 'U' shape with its lowest point is the 5th decile mean premium, both in 1986 and 1987. The mean premiums in the first four deciles are indistinguishable from one. The fifth decile's mean premium is 0.645 in 1986 and 0.52 in 1987, statistically different from one in both years. The last two deciles' mean premiums are above one and significant. In both years the first decile exhibits a relatively higher variance, about twice as high as in the second decile. A casual look at the standard deviations reveal that they are inversely related to the yield; the highest yield group has the lowest standard deviations, around 0.6, and the first decile has the highest, around 9.

The sign test reported in the last two columns of Table IV reinforces the pattern that is seen in the mean premium. In 1986 only deciles 5, 6, and 7 have significantly more observations below one than above one, and only the highest two deciles have significantly fewer observations below one. For 1987, only in the fifth decile is the number of premiums below one statistically significant. The findings of premiums that are greater than one for deciles 9 and 10 is consistent with the preferential corporate tax treatment of dividends relative to capital gains.¹² Since the effective marginal tax rate on dividends paid by corporations is practically the same in both years, a change would not be expected.

An analysis of excess returns enables us to examine price behavior around the ex-day and verify our prior results. The excess return EXR_{it} , for stock i at time t , is defined as:

$$EXR_{it} = R_{it} - E(R_i) \quad (6)$$

where $E(R_i)$ is the expected return on stock i using the OLS market model mentioned above.

Using the calendar time method, the stocks are grouped according to the actual calendar time of the event. Each security in a portfolio is given an equal weight, and the average daily return for the portfolio is calculated. Then, the standardized excess return is calculated for each portfolio and the t -statistic is computed as the sum of the standardized excess returns multiplied by the square root of the number of events.¹³

The unusual price movements are not limited to the ex-day itself. Table V presents the excess returns for days -5 to $+5$ (where day 0 is the ex-day) for

¹¹The analysis presented in Table IV was repeated using a different estimation period that excluded the 11 days around the event. The results remain essentially the same.

¹²Significant at the 10% level for all adjusted premiums.

¹³The excess return is also measured under three different assumptions: (1) all events are cross-sectionally independent; (2) the events are cross-sectionally dependent; (3) all events that did not occur on the same calendar date are independent. Three return-generating models are employed under each assumption: the mean model, the market model, and OLS market model. The findings indicate that the choice of the return-generating process has no effect on the outcome.

Table V
The Excess Return for the Highest Yield Groups (Deciles 9 and 10) and Their Significance for the 10 Days Surrounding the Ex-Dividend Day

The excess return (E-R) is the return above that predicted by the OLS market model. The stocks are grouped according to the ex-day.

Day	1986 (640 OBS)		1987 (662 OBS)	
	E-R (%)	T-Stat	E-R (%)	T-Stat
- 5	0.125	2.88490	0.107	1.28947
- 4	0.232	3.06268	0.104	0.22580
- 3	0.088	1.34619	0.155	2.56287
- 2	0.087	2.00292	- 0.037	- 0.70745
- 1	0.146	3.37599	- 0.011	- 0.21085
0	- 0.283	- 3.99572	- 0.329	- 5.29059
1	- 0.167	- 3.22074	- 0.134	- 3.45058
2	- 0.138	- 1.79225	- 0.123	- 1.44761
3	- 0.065	- 0.95397	- 0.108	- 0.70165
4	- 0.082	- 1.05291	- 0.102	- 1.46224
5	- 0.041	- 0.63209	- 0.161	- 2.16402

the highest two yield groups. As one would expect if corporate trading activity is a significant influence, most days before the ex-day exhibit positive excess returns which are significant in 4 out of the 5 days in 1986 and in only one day in 1987. A significant price drop is documented on both the ex-day and the day after the ex-day. In fact, the first 9 days following the ex-day exhibit negative excess returns. At least for the high yield stocks, it seems, the effect of ex-dividend trading activity is not limited to the ex-day itself. The significant price changes observed the surrounding changes are consistent with buying before the ex-day and selling after. Excess return for the whole sample reinforces our prior results; the mean excess return is indistinguishable from zero, both before and after the implementation of the TRA, which is equivalent to a premium not different than one (as reported in Table II).

Figure 1 depicts the cumulative excess return from days - 5 to + 5 for 1986 and 1987. The solid lines are the excess return for the entire sample, and the dashed line is the excess return for deciles 9 and 10 combined. While the cumulative excess return (CER) for the entire sample is practically identical in 1986 and 1987, the CER of the high-yield deciles is higher in 1986 than in 1987. In fact, the 1987 CER reaches zero on the ex-day and is - 0.6% on the fifth day after the ex-day.

IV. Summary and Conclusions

This paper tests the effect of the change in the U.S. tax law on stock price behavior around the ex-dividend day. The 1986 TRA greatly reduced the

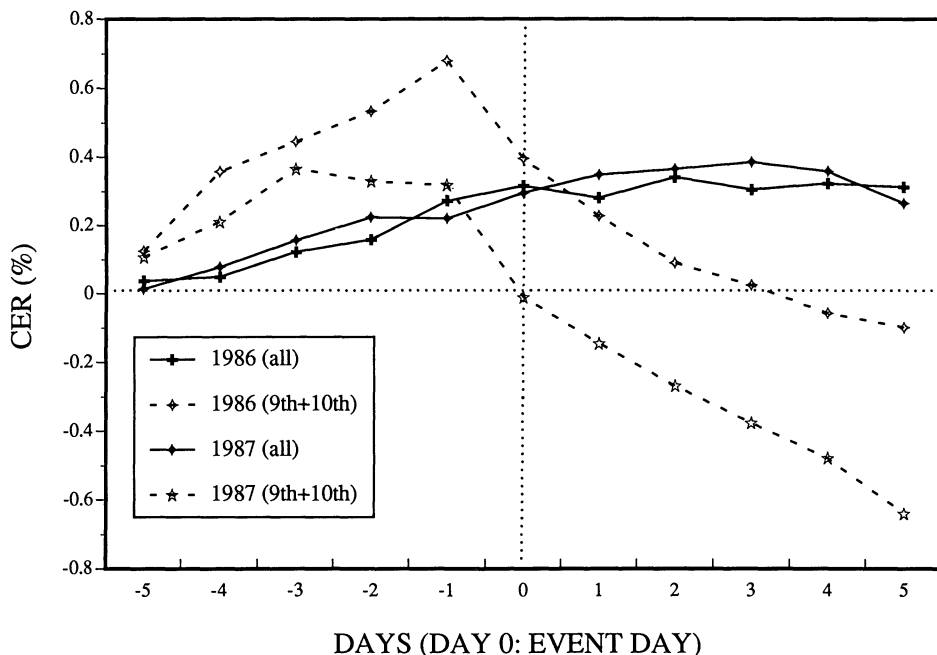


Figure 1. Cumulative excess returns (days -5 to $+5$). Entire sample (solid lines); highest yield group (dashed lines).

differential taxes between dividend income and capital gain income for long-term individual investors. The TRA did not change the incentives of short-term traders and had a very small impact on corporate traders incentives to trade around the ex-day. According to the long-term trading hypothesis, this tax change should have resulted in higher premiums.

Our results show that the average premiums are similar before and after the tax change and indistinguishable from one. A comparison of the average premiums within yield deciles also shows a similar pattern in 1986 and in 1987. This evidence suggests that the change in the relative tax rates between dividend and capital gain income, for long-term individual investors, had no effect on the ex-dividend stock price behavior. The premiums for the high dividend-yield securities are consistently above one, consistent with a significant role for corporate traders.

By comparing average premiums in three time periods—20 years before the 1986 TRA, the last year before the TRA, and the year immediately afterward—one can separate the effect of the tax change from other effects, such as the change in transaction costs or changes in investors' knowledge or attitudes toward risk. The average premiums in the 1960's are always significantly lower than the premiums in 1986 and 1987 and significantly below one. These findings may reflect a structural change in the U.S. financial markets between 1966–1967 and 1986–1987. The reduction in

transaction costs and the emergence of liquid futures and options markets, may have shifted the relative weights of the various trading groups in the equity markets so that institutional and corporate traders now play a more significant role than before, while individual traders are less influential. As a consequence, a change in the individual investor's tax rates has no significant effect on the ex-dividend day prices.

Appendix A

THE GLS ESTIMATOR OF THE PREMIUM

Under the null hypothesis of no tax effect, the expected price drop relative to the dividend amount is equal to one.

$$\frac{P_{i,t-1} - E(P_{i,t})}{D_i} = 1. \quad (\text{A.1})$$

Assume returns are generated by the following process:

$$\tilde{R}_{it} = E(R_i) + \varepsilon_{i,t} \quad \text{and} \quad (\text{A.2})$$

$$\varepsilon_{i,t} \sim N(0, \sigma_i^2). \quad (\text{A.3})$$

Expressing equation (A.2) in terms of prices, we get:

$$\frac{\tilde{P}_{i,t} - P_{i,t-1}}{P_{i,t-1}} = \frac{E(P_{i,t}) - P_{i,t-1}}{P_{i,t-1}} + \varepsilon_{i,t}. \quad (\text{A.4})$$

Dividing numerator and denominator of equation (A.1) by $P_{i,t-1}$ and writing it in terms of the random variable,

$$\frac{-\{(\tilde{P}_{i,t} - P_{i,t-1})/P_{i,t-1} - \varepsilon_{i,t}\}}{D_i/P_{i,t-1}} = 1 \quad \text{and} \quad (\text{A.5})$$

$$\frac{P_{i,t-1} - \tilde{P}_{i,t}}{D_i} = 1 - (\varepsilon_{i,t}) \frac{P_{i,t-1}}{D_i}. \quad (\text{A.6})$$

The residual variance in equation (A.6) is not constant. Under assumption (A.2) the specific form of the variance covariance matrix of the disturbances is:

$$\text{VAR}(\varepsilon_i) = \Omega \quad i = 1, \dots, N \quad (\text{A.7})$$

where

$$\Omega_{ij} = \begin{cases} \sigma_i^2 / d_i^2 & \text{if } i = j, \\ 0 & \text{otherwise} \end{cases} \quad (\text{A.8})$$

d_i is the dividend yield on stock i .

It is clear from equation (A.6) that calculating the mean premium can be viewed as a regression with only a constant term in the regression. As such,

the correction for heteroskedasticity is straightforward.¹⁴ Equation (A.9) expresses the estimated coefficient under the correction for heteroskedasticity due to the variation in σ_i^2 . Equation (A.10) also accounts for the variation in the yield.

$\hat{\beta}_1$, the GLS estimate of the mean when accounting for only variation in the disturbance variance, equals

$$\hat{\beta}_1 = (X' \Omega_*^{-1} X)^{-1} (X' \Omega_*^{-1} Y) = \frac{\sum 1/\sigma_i^2 P_{i,ex}^*}{\sum 1/\sigma_i^2} \quad (\text{A.9})$$

where Ω_* is $N \times N$ covariance matrix with diagonal elements equal to the disturbance variance of stock i , $i = 1, \dots, N$.

$P_{i,ex}^*$ is the premium as calculated in equation (4).

The estimator of the mean premium, $\hat{\beta}_2$, when the variations in the dividend yield are also accounted for (i.e., Ω is used instead of Ω_*), is:

$$\hat{\beta}_2 = (X' \Omega^{-1} X)^{-1} (X' \Omega^{-1} Y) = \frac{\sum_{i=1}^N d_i^2 / \sigma_i^2 P_{i,ex}^*}{\sum_{i=1}^N d_i^2 / \sigma_i^2}. \quad (\text{A.10})$$

¹⁴The OLS estimates, even under heteroskedasticity, are unbiased. Moreover, if the weights, the dividend yield in this case, are uncorrelated with the independent variables and the sample is large, then the difference between the weighted average and the simple average variance is not large, and the inference procedure based on OLS is not as misleading. For a formal derivation of this result, see Greene (1988), p. 402-403.

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