Dividends and Taxes:  
A Re-Examination

Avner Kalay and Roni Michaely*  

This study re-examines the impact of the differential taxation of dividends and capital gains on assets' prices. Our analysis shows that the time horizon used to define and measure the dividend period is a key issue when interpreting the empirical results. Our results indicate that most of the return variation previously attributed to dividends is not because of a cross-sectional variation in returns, but due to the time-series variation in returns around the dividend payment. In light of the lack of cross-sectional return variation, interpreting the higher return around the dividend distribution as a tax effect is problematic.

The tax advantage of capital gains over dividend income is an important aspect of dividend policy that should affect both corporate considerations and investors' demand for dividends. Should individual investors require higher pretax risk-adjusted returns to hold stocks with higher dividend yield? Brennan's (1970) model of these tax effects indicates that risk-adjusted pretax returns should be positively correlated to dividend yields. However, empirical tests of the Brennan model are inconclusive. One of the leading textbooks, Corporate Finance (Ross, Westerfield, and Jaffe, 1999), best illustrates the current state of knowledge:

... financial theory indicates that the expected return on a security should be related to its dividend yield. Although this issue has been researched thoroughly, the empirical results are not generally consistent with each other. On the one hand, Brennan as well as Litterer and Ramaswamy find a positive association between expected pretax returns and dividend yield. In particular, Litzenberger and Ramaswamy find that a 1% increase in dividend-yield requires an extra 23% [should be 0.23%] in expected returns. On the other hand, both Black and Scholes and Miller and Scholes find no relationship between expected pretax returns and dividend yield. It is surprising that the results of such high quality research can be so contradictory. One can only hope that the ambiguities will be cleared in the future.

This paper provides a resolution to the seemingly conflicting results of the Black and Scholes (1974) and the Litzenberger and Ramaswamy (1979, 1980, and 1982) experiments. We show that the different results obtained in these studies are due to the use of different time horizons to define and measure the dividend period.

To understand the difference between Black and Scholes (1974) and Litzenberger and Ramaswamy (1979), we note that Litzenberger and Ramaswamy classify stocks as dividend-paying stocks only during the ex-dividend months. For example, a stock that pays quarterly dividends is classified in the zero dividend-yield group in two third of

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the months. Therefore, when Litzenberger and Ramaswamy document a significant positive dividend-yield coefficient in a Fama-Macbeth type test, it is not clear how to interpret these findings. Are their findings due to cross-sectional differences in dividend yield, which can then be interpreted as evidence consistent with the Brennan model? Or are their results evidence of time-series variations in return between dividend-paying and non-dividend paying months? In other words, can we conclude from their results that higher-dividend-yield stocks exhibit larger long-run (e.g., annual) risk-adjusted pretax returns (hereafter, cross-sectional return variations)? Or, do the Litzenberger and Ramaswamy results merely point out that stocks experience higher risk-adjusted pretax returns during their ex-month (hereafter, time-series return variations) and tell us little about the relation between long-run pretax risk-adjusted returns and yields?

The Black and Scholes test of Brennan's (1970) model classifies each stock as having the (same) estimated dividend-yield throughout the next year. Black and Scholes find no difference between the pretax monthly risk-adjusted returns of high- and low-dividend-yield stocks. Their evidence is inconsistent with the Brennan model. If Litzenberger and Ramaswamy (1979) results are evidence of time-series returns variation only, then they do not conflict with Black and Scholes's. This paper contains an investigation of this issue.

Our main results show that the time horizon used to define and measure the dividend period is a key issue when interpreting the empirical results. If the time horizon of the dividend period is a day, a week, or a month, we find a significant dividend-yield coefficient. However, the interpretation of this yield coefficient as a tax effect could be problematic, since it captures both time-series variations in returns (between ex- and non-ex-periods) and cross-sectional variations in returns (across stocks with different dividend yields). Only the latter is consistent with a tax effect. When we move to longer interval (a year), we do not find a significant relation between dividend yields and returns.

Why is the distinction between cross-sectional and time-series variations in returns so important here? We argue that the lack of cross-sectional risk-adjusted returns variations is evidence inconsistent with the Brennan (1970) model, given the tax structure in the US: to be eligible for lower tax rates on capital gains than on dividends, investors must hold a stock for a minimum period of one year.2

Consider an investor who wishes to own a stock without receiving its dividends. This investor buys the stock ex-dividend and sells it before the next ex-dividend. The dividends are paid to the investor's trading partners. If cash dividends are taxed more heavily than these capital gains, the risk-adjusted pretax return during the ex-dividend period will exceed the risk-adjusted pretax returns during other periods. In this case, time-series risk-adjusted return variations are evidence of a dividend tax effect.

However, most stocks pay dividends quarterly, so trying to avoid dividend income involves realizations of short-term capital gains. Under US tax laws, short-term capital gains are taxed as ordinary income. Thus, even though a long-term investor prefers long-term capital gains to dividend income, he or she does not require a larger pretax risk-adjusted return during only the ex-dividend period. Therefore, the implications of the Brennan model, combined with the US tax code, is that differences in tax rates between dividend income and long-term capital gains income should result in cross-sectional return variation.3

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1In his study of trading volume around ex-dividend days, Grundy (1985) makes a similar point.
2The minimum holding period have varied throughout the years. Over most of the post-WWII period, the minimum holding period was one year, but there have been holding periods of six months and 18 months.
3Corporations are willing to pay a tax-related premium to own the stock during an ex-dividend month.
Our empirical investigation centers on the issue of whether the dividend-related impact is due to cross-sectional or time-series variations in returns. The basic implementation of the test is as follows. We run a Litzenberger and Ramaswamy experiment with one difference: we classify stocks as having the same estimated dividend-yield throughout the year. We estimate the expected dividend-yield for any given month as the sum of the dividends paid during the previous calendar year, divided by the year-end price. In the absence of cross-sectional return variations, such an experiment would result in an insignificant dividend-yield coefficient. In fact, our results indicate that the estimated dividend-yield coefficient is insignificantly different from zero (t-value of 0.98). At the same time, a simple Litzenberger and Ramaswamy test (one in which stocks have positive dividend-yield only in ex-months) performed on the same sample results in a highly significant dividend-yield coefficient (0.24, t-value 8.51).

To further investigate for lack of cross-sectional return variations, we replace the dividend-yield with a dummy variable that takes the value of one in the ex-month and zero otherwise. The highly significant positive coefficient that we find (t-value of 8.92) is evidence of a time-series return variation.

Finally, we replicate the Litzenberger and Ramaswamy experiment, but we assign the estimated dividend-yield to a non-ex-month. If the data is dominated by a time-series return variation, this experiment should result in a negative dividend-yield coefficient. In fact, we do find a statistically significant negative dividend-yield coefficient. All of this evidence is consistent with the hypothesis that the data is dominated by time-series return variations.

Next, we determine if there are time-series returns variations within the ex-dividend month. We conduct tests using weekly return intervals data. The use of weekly returns helps us shed new light on the Miller-Scholes (1982) conjecture that Litzenberger and Ramaswamy (1979) document information effects rather than tax effects. Using weekly data we find a similar statistically significant dividend-yield coefficient (0.255, t-value 14.852). To examine the Miller-Scholes conjecture, we exclude weeks with both dividend announcements and ex-days, as well as dividend-omission weeks and find almost identical results. Hence, information-induced biases cannot explain Litzenberger and Ramaswamy's findings. The question is, what have we found? Time-series variations of weekly returns or cross-sectional?

To address this issue, we perform a modified Litzenberger and Ramaswamy experiment in which we assign the estimated dividend-yield to each week (ex or non-ex). A positive dividend-yield coefficient resulting from such experiment is evidence of a cross-sectional return variations. However, like the results we obtain with monthly return interval, we find an insignificant dividend-yield coefficient.

A second modification is an experiment limited to ex-dividend weeks. A positive coefficient in this case is evidence of cross-sectional return variations. However, we find an insignificant dividend-yield coefficient. If anything, the point estimate of the dividend-yield coefficient is negative. The evidence is consistent with the hypothesis that the data exhibits only time-series return variations.

We find it interesting to compare the results obtained with weekly data to those obtained using monthly data. The ordinary-least-squares (OLS) point estimate of the dividend-yield coefficient is 0.2457 for the weekly experiment and 0.2261 for the monthly. The two estimates are remarkably similar. In other words, the difference between the ex-dividend-week risk-adjusted returns and the returns in other weeks is similar to the difference between ex-dividend-month returns and the returns during other months. Therefore, it seems that almost all of the excess returns occur within the ex-dividend week.

Finally, we replicate the Litzenberger and Ramaswamy experiment using quarterly
data. We already know that there are substantial time-series return variations within the quarter. However, Brennan (1970) predicts positive cross-sectional correlations between long-run (e.g., quarter) risk-adjusted returns and dividend yields. Finding a positive dividend-yield coefficient in this experiment is evidence of cross-sectional return variations. However, we find an insignificant dividend-yield coefficient. We fail to reject the hypothesis that stocks with higher dividend yields have the same long-run (quarterly) risk-adjusted returns as those with lower yields.

The paper is structured as follows. In Section I, we present a possible resolution of the seemingly conflicting evidence in Litzenberger and Ramaswamy (1979) and Black and Scholes (1979). We argue that the difference between the results of Litzenberger and Ramaswamy (1979) and Miller and Scholes (1982) is due to methodological issues and the distinction between time-series and cross-sectional returns variations. Section II presents the empirical evidence. Section III contains the interpretation of the empirical evidence and some extensions. Section IV concludes.

I. Tax Effects and Time-series Return Variation

Brennan’s (1970) pretax CAPM states that a security’s expected pretax excess return is positively and linearly related to its systematic risk and its expected dividend yield.

\[
E(R_{it} - R_n) = a_i + b_{it}(R_{mt} - R_n) + a_i(d_{it} - r) \tag{1}
\]

Finding a significantly positive \( a_i \) has been interpreted as evidence of a tax effect. The Litzenberger and Ramaswamy test of Brennan’s model involves three steps. First, the systematic risk of each stock is estimated for each of the test months. The estimation uses the market model regression.

\[
R_{it} - R_n = a_i + b_{it}(R_{mt} - R_n) + E_{it} \quad t = t - 60, ..., t - 1 \tag{2}
\]

where \( R_{mt} \) is the return on the market portfolio during Period \( t \), \( R_n \) is the rate of return on Stock \( i \) during Period \( t \), \( b_{it} \) is the estimated beta for Stock \( i \) for Period \( t \), \( R_n \) is the riskless rate of interest during Period \( t \), and \( e_{it} \) is a noise term.

The second stage uses the estimated beta for Stock \( i \) during Month \( t \), \( b_{it} \), and an estimate of Stock \( i \)'s expected dividend-yield for Month \( t \), \( d_{it} \), as independent variables in the following cross-sectional regression for Month \( t \):

\[
R_{it} - R_n = a_{n,t} + b_{it}(d_{it} - R_n) + e_{it} \quad i = 1, 2, ..., N \tag{3}
\]

The experiment requires an ex ante estimate of the test-month dividend yield. The estimate for Month \( t \) is obtained from past observations. For cases in which the dividends are announced at Month \( t-1 \), the estimate is \( d_t/R_{t-1} \). When the announcement and the ex-day occur in Month \( t \), Litzenberger and Ramaswamy estimate the market’s Time \( t \) expected dividend as of the end of Month \( t-1 \). The estimate they choose is the last dividend paid during the previous 12 months. If no dividends were paid during this period, the expected dividend is assumed to be zero. The second step is repeated for every month in the 1936-1977 period. \( b_{it} \) is estimated using the previous 60 months of data. An updated estimate of the expected dividend-yield for each stock is provided for each of the test months.
To understand and compare the potentially conflicting results of Black and Scholes (1974) and Litzenberger and Ramaswamy (1979), we note that Litzenberger and Ramaswamy classify stocks as non-dividend-paying stocks in any month that is not an ex-dividend month. For example, a stock that pays a quarterly dividend falls into the zero yield group in two third of the months, and its yield group is positive only during ex-dividend months.

This sequence of cross-sectional regressions results in time-series of $a_i$'s. The estimate of $a_i$ is the mean of this series. The standard error of the estimate is computed from the time-series of the $a$'s in a straightforward manner. Litzenberger and Ramaswamy (1979) find that $a_i$ is positive and significantly different from zero. Using maximum likelihood estimator (MLE) and generalized least squares (GLS) procedures, Litzenberger and Ramaswamy correct for the error-in-variables and heteroskedasticity problems in the data. However, the empirical regularity they document—a positive and statistically significant dividend-yield coefficient—is not sensitive to the method they use. The various methods yield similar estimated coefficients with minor differences in the significance level. Litzenberger and Ramaswamy interpret their finding to be consistent with Brennan’s pretax CAPM. That is, the positive dividend-yield coefficient is evidence of a dividend tax effect.

Black and Scholes (1974) do not distinguish between ex-months and non-ex-months. They construct portfolios of stocks examining the effect of dividend-yield on their risk-adjusted expected return. The estimate of dividend-yield they use is the preceding year’s dividends divided by the end-of-year stock price. A stock with a large estimated dividend-yield is classified as having that level of high yield throughout the next year. Black and Scholes find no difference between the pretax monthly risk-adjusted return of high- and low-yield stocks. They also find no difference in the after-tax risk-adjusted monthly returns of those stocks. Based on this evidence they advise investors to ignore dividends when forming their portfolios.

Black and Scholes (1974) fail to find differences in the long-run risk-adjusted pretax returns of high- and low-dividend-yield stocks. In other words, investors do not gain greater long-run (e.g., annual) risk-adjusted pretax returns on higher-yield stocks (i.e., no cross-sectional risk-adjusted pretax return variations).

Litzenberger and Ramaswamy (1979), in contrast, find that stocks provide higher pretax risk-adjusted returns during the ex-dividend months than they do in other months (i.e., they find time-series pretax risk-adjusted return variations). However, if Litzenberger and Ramaswamy’s empirical regularity is evidence of time-series return variations, then their results do not conflict with Black and Scholes’s.

II. Cross-Section or Time-Series Return Variations: Empirical Evidence

The first step in our empirical analysis is a replication of the Litzenberger and Ramaswamy (1979) experiment using the same data (the monthly CRSP tapes) and the same time period (1936-1977). The results are described in Table I. In Panel A, we present evidence using data from Litzenberger and Ramaswamy’s original period (1936-1977). This experiment uses the three estimation procedures, OLS, GLS, and MLE. We replicate sample means identical to those documented by Litzenberger
and Ramaswamy (up to the third decimal). Panel B reports the results of the experiment using data from 1940 to 1986, with virtually identical results.

The purpose of our experiments is to determine whether the Litzenberger and Ramaswamy result is evidence of time-series return variations only. We would also like to find out if there are time-series return variations within the month. Hence, we conduct a significant portion of our experiment using weekly return intervals. We use weekly rather than daily returns for two reasons: 1) the problem of missing observations, infrequent trading, and bid-ask effects are more pronounced in daily returns; and 2) as Lakonishok and Vermaelen (1986), Michaely and Vila (1996), and Koski and Scruggs (1998) show, the anomalous behavior of prices and volume around the ex-day is not limited to the day itself, but starts a few days before and ends a few days after. Thus, the period to be examined should encompass more than the ex-day itself. The results show the close association of a Litzenberger and Ramaswamy type test to the ex-dividend day studies.

A. Weekly Returns and Information Biases

Using weekly returns also helps us shed new light on the Miller and Scholes (1982) conjecture that Litzenberger and Ramaswamy document information effects rather than taxes. Specifically, that the positive dividend-yield coefficient found by Litzenberger and Ramaswamy is evidence of dividend information effects, not taxes.

The Litzenberger and Ramaswamy experiment requires an ex ante estimate of the test-month dividend yield. However, their method ignores announcements of dividend omissions, since these are not reported on the CRSP tapes from which they obtain their data. A dividend omission following a positive expected dividend is an announcement of a drastic dividend reduction. By ignoring such omissions, Litzenberger and Ramaswamy's method relates the resulting negative excess return to a zero expected

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4We examined at length the potential effects of various definitions of the expected dividend yield on a Litzenberger and Ramaswamy experiment. Following the original Litzenberger and Ramaswamy study, in all of these cases a dividend-paying firm is assumed to have a positive dividend yield only during its ex-dividend month. The proxies we use include: 1) the dividend yield is set equal to the actual yield during the ex-month if announced earlier, and to zero in the following month; 2) the 12th month after any ex-dividend month is assumed to be an ex-dividend month. If month t+12 is indeed an ex-month and the dividend is announced before the ex-month, the expected yield is assumed to be equal to the actual yield during the ex-month. If the announcement and ex-dividend date occur during the same month, the expected dividend yield for this month is set equal to the actual yield of the corresponding month in the prior year, and to zero in other months. All of the refinements we investigate (as long as we define the expected dividend yield for a dividend-paying firm to be positive only during the ex-dividend month) result in a significantly positive dividend yield coefficient.

5The CRSP tapes classify dividends in ten categories. Four of these categories (2, 5 by the CRSP classification) are regular distributions: monthly, quarterly, semi-annually, and annually. The other types—year-end or final, extra or special, interim, and nonrecurring—can all be classified as nonrecurring. The first two categories (0 and 1 in CRSP) are unknown and unspecified, respectively. Of the 145,650 dividend announcements made during the period 1936-1977, 69.7% are quarterly dividends, 1.55% are other types of regular dividends. Another 5% are year-end or extra, and as many as 23.6% are unknown or unspecified. The classification can be important when the dividend yield has to be estimated; that is, when the ex-day and the announcement occur during the same return interval. The concern is the predictability of the timing and size of the payment. If the dividend is nonrecurring, is it totally unexpected, and is the expected dividend yield for its ex-month therefore zero? We replicate the Litzenberger and Ramaswamy study with alternative assumptions of dividend predictability, treating a nonrecurring dividend as totally unpredictable. In all of these tests we find a significantly positive dividend yield coefficient. We find the largest point estimate of the coefficient when we assume that the timing of unknown, unspecified, year-end, and extra dividends is predictable (and only dividends specified as nonrecurring are so treated). We make this assumption in all of the tests that follow.

6We also repeat the experiment using only quarterly dividends. The results are essentially the same as those reported in the body of the paper.
Table I. Replication of the Litzenberger and Ramaswamy (1979) Results on Monthly Returns Intervals

The table reports the results of a pooled time-series, cross-sectional regression of beta and dividend yield on security risk premia ($R_n - R_f$). For each month, we estimate the security’s beta in a time-series regression from t-60 to t-1. We estimate the dividend yield by the time t expected dividend divided by the price at the end of the previous month. Price changes are calculated on a monthly basis. We run a cross-sectional regression for each month in the sample:

$$R_n - R_f = \alpha_0 + \alpha_2 \hat{\beta} + \alpha_3 (d_t - R_n) + \epsilon_i$$

$i = 1, 2, \ldots, N$

The table contains the average of the estimated OLS, GLS, and MLE coefficients across the monthly cross-sectional regressions. t-values appear in parentheses.

<table>
<thead>
<tr>
<th>Method</th>
<th>$\alpha_1$</th>
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<th>$\alpha_3$</th>
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<tr>
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<tr>
<td>OLS</td>
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<td>(4.72)</td>
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<td>(6.30)</td>
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<td>0.232</td>
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<td>(3.70)</td>
<td>(1.80)</td>
<td>(8.13)</td>
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<tr>
<td>MLE</td>
<td>0.00388</td>
<td>0.00399</td>
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<td>(2.86)</td>
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<td>(8.50)</td>
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<tr>
<td><strong>Panel B. 1940-1986</strong></td>
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<td>(1.04)</td>
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<td>(1.68)</td>
<td>(9.09)</td>
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<td></td>
<td>(3.94)</td>
<td>(1.62)</td>
<td>(9.47)</td>
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dividend. This technical association can create a positive cross-sectional relation between Litzenberger and Ramaswamy’s estimate of expected dividend-yield and measured stock returns.

Litzenberger and Ramaswamy (1982) address this criticism, but at least some respected scholars are unconvinced. Perhaps the recent edition of Brealey and Myers (1999) contains the best description of the current state of knowledge (page 457) "...many respected scholars, including Merton Miller and Myron Scholes, were unconvinced. They stress the difficulty of measuring dividend-yield properly and proving the link between dividend-yield and expected return."

By using weekly data in a modified Litzenberger and Ramaswamy experiment, we avoid the problems that can be associated with the estimation of the expected dividend yield. Weekly data suffices for our purposes, since in most cases (96.6% of the sample), dividend announcements and the corresponding ex-dividend day occur during different weeks. In these cases, we know Week t dividend-yield with certainty by the end of Week t-1, hence no estimation is needed.

To avoid the potential biases associated with dividend omissions, we use the Michaely, Thaler, and Womack (1995) data on dividend-omissions announcements during the period 1964 to 1988. They identify dividend omissions by screening the CRSP tapes for firms that pay dividends during two periods and then omit a dividend for at least two periods. For firms that pay quarterly dividends, a period is a quarter; for firms paying dividends annually, it is a year. Overall, there are 887 announcements of
Table II. The Relation Between Risk Premium, Dividend Yield, and Beta Using Weekly Returns

The table reports the results of a pooled time-series, cross-sectional regression of beta and dividend yield on security risk premia (R_m - R_f). For each week, we estimate the security’s beta in a time-series regression from t-260 to t-1. We estimate the dividend yield by the expected dividend in week t divided by the price at the end of the previous week. Price changes are calculated on a weekly basis. Then we run a cross-sectional regression for each week in the sample:

\[ R_n - R_f = \alpha_1 + \alpha_2 \beta_n + \alpha_3 (\bar{a}_n - R_f) + \bar{e}_n \]

i = 1, 2, ..., N

The table contains the average of the estimated OLS, GLS, and MLE coefficients across the weekly cross-sectional regressions. t-values appear in parentheses. In the period covered (July 1967 to December 1986), there are 1,019 cross-sectional regressions.

<table>
<thead>
<tr>
<th>Method</th>
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<th>( \alpha_2 )</th>
<th>( \alpha_3 )</th>
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<td></td>
<td>(4.459)</td>
<td>(-0.417)</td>
<td>(11.447)</td>
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dividend omissions during the period 1964 to 1988. The modified experiment excludes these omissions from the sample.

B. Weekly Return—Empirical Results

We collect our data from the daily CRSP files. Weekly returns are calculated from Monday to Monday for the equally weighted market index and for each stock in the sample. We consider all the stocks listed on the New York Stock Exchange (NYSE). To be included in the sample, a stock must have data for at least 260 weeks (approximately five years).

We use daily returns to compute weekly returns. We require a minimum of two daily returns in a given week to compute the weekly return. If fewer than two daily returns are available, we treat the weekly return as a missing observation. The CRSP daily files used in this section cover the period 1962 to 1986. The sample is limited to this period because of the 1986 tax reform.

The Litzenberger and Ramaswamy experiment is repeated in the following way. The first five years of data, July 1962 to June 1967 (260 weeks), are used to estimate the stock’s beta in the first week in July 1967. Using the market model, the beta estimation requires at least 75 weekly returns (out of the possible 260). If a stock has fewer than 75 observations, its beta is defined as missing for that week. The stock is then eliminated from the second-stage cross-sectional regression. Overall, 2,319 securities are included in the sample.

There are 1,279 weeks between July 2, 1962 and December 31, 1986. Eliminating the 260 weeks of data used for the beta estimation stage, 1,019 weeks remain for which we can estimate the cross-sectional regressions. Our estimate of dividend-yield is the dividend paid divided by the previous week’s closing price. The experiment results in 1,019 estimates of \( \alpha_1 \), \( \alpha_2 \), and \( \alpha_3 \). Table II summarizes the results.

The dividend coefficient is positive and significantly different from zero. In fact, the
Table III. The Relation Between Risk Premium, and Dividend Yield, and Beta Using Weekly Returns When Dividend Omission Weeks are Excluded

The table reports the results of a pooled time-series, cross-sectional regression of beta and dividend yield on security risk premia (R_{m} - R_{f}). For each week, we estimate the security's beta in a time-series regression from t-260 to t-1. The dividend yield is the expected dividend in Week t over the price at the end of the previous week. Price changes are calculated on a weekly basis. Then we run a cross-sectional regression for each week in the sample:

\[ R_{n} - R_{f} = \alpha_{1} + \alpha_{2} \hat{\beta}_{n} + \alpha_{3} (\bar{R}_{n} - R_{f}) + \hat{\epsilon}_{n} \quad i = 1,2,\ldots,N \]

We exclude dividend omission weeks and weeks containing both dividend announcement and ex-days. The table contains the average of the estimated OLS, GLS, and MLE coefficients across the weekly cross-sectional regressions. t-values appear in parentheses. In the period covered (July 1967 to December 1986), there are 1,019 cross-sectional regressions.

<table>
<thead>
<tr>
<th>Method</th>
<th>( \alpha_{1} )</th>
<th>( \alpha_{2} )</th>
<th>( \alpha_{3} )</th>
</tr>
</thead>
<tbody>
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<tr>
<td>GLS</td>
<td>0.00168</td>
<td>-0.00025</td>
<td>0.162</td>
</tr>
<tr>
<td></td>
<td>(4.63)</td>
<td>(-0.42)</td>
<td>(10.60)</td>
</tr>
<tr>
<td>MLE</td>
<td>0.0017</td>
<td>-0.00025</td>
<td>0.162</td>
</tr>
<tr>
<td></td>
<td>(4.63)</td>
<td>(-0.41)</td>
<td>(10.60)</td>
</tr>
</tbody>
</table>

t-value (14.851 for the OLS) is larger than that found in the original Litzenberger and Ramaswamy (1979) study. The mean dividend coefficient in Litzenberger and Ramaswamy is 0.236, compared with the 0.2556 reported here. The MLE and GLS methods result in a similar positive and significant point estimator of \( \alpha_{3} \) (0.173).

Clearly, weekly data can also contain informational biases. To control for these biases, we repeat the experiment on a subsample that excludes those weeks that have both announcement and ex-days and dividend-omission weeks. The results appear in Table III. Again, we find a positive and statistically significant dividend-yield coefficient. In fact, the results for this sample are approximately equal to those obtained for the full sample. The OLS point estimate of \( \alpha_{1} \) is 0.2457 (t-value of 14.101).

We note that this sample could still contain potential information-induced bias. What if dividends are announced on Monday, after the last trade of the day? Then, a positive announcement would lead to an excess return on Tuesday. Our method associates the excess return with that week. To control for this possibility, we replicate the experiment with the additional requirement that the dividend announcement day is at least four days before the ex-day. The results are almost identical to those reported in Table II.

To examine the robustness of the results, we perform an OLS version of the Litzenberger and Ramaswamy experiments for each of the calendar months. The first experiment uses all January weeks from July 1967 to December 1986. The other 11 tests use the other months during the same period. Table IV shows the results.

Column 2 of Table IV presents the dividend coefficients and respective t-values. Column 3 shows the number of cross-sectional regressions performed. Columns 4 and 5 detail the smallest and largest sample sizes in a given week. The smallest and largest number of non-zero dividends in a cross-sectional regression are given in the last two columns.

As described in the table, the null hypothesis of a zero-dividend coefficient is rejected in ten of these 12 tests. When we repeat the experiment using the GLS and MLE versions of the Litzenberger and Ramaswamy experiment, a similar picture emerges. The null
Table IV. The Relation Between Risk Premium, Dividend Yield, and Beta, Using Weekly Returns (Excluding Dividend Omission Weeks) for Each Calendar Month

The table reports the results of a pooled time-series, cross-sectional regression of beta and dividend yield on security risk premia ($R_n - R_f$). For each week, we estimate the security’s beta in a time-series regression from t-260 to t-1. We estimate the dividend yield by the expected dividend in Week t over the price at the end of the previous week. Price changes are calculated on a weekly basis. Then we run a cross-sectional regression for each week in the sample:

\[ R_n - R_f = \alpha_i + \alpha_{ii} \hat{P}_i + \alpha_{ik} (\hat{d}_n - R_f) + \epsilon_i \quad i = 1,2,\ldots,N \]

We exclude dividend omission weeks and weeks containing both dividend announcement and ex-days. The table contains the average of the estimated OLS coefficients for each of the 12 calendar months separately. t-values appear in parentheses. The period covered is July 1967 to December 1986.

<table>
<thead>
<tr>
<th>Month</th>
<th>( \alpha_i )</th>
<th>Sample</th>
<th>Min(s)*</th>
<th>Max(s)*</th>
<th>Min(d)*</th>
<th>Max(d)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>0.100 (1.480)</td>
<td>82</td>
<td>1188</td>
<td>1567</td>
<td>6</td>
<td>202</td>
</tr>
<tr>
<td>February</td>
<td>0.312 (6.564)</td>
<td>77</td>
<td>1193</td>
<td>1569</td>
<td>29</td>
<td>214</td>
</tr>
<tr>
<td>March</td>
<td>0.279 (5.145)</td>
<td>85</td>
<td>1200</td>
<td>1572</td>
<td>16</td>
<td>172</td>
</tr>
<tr>
<td>April</td>
<td>0.227 (3.334)</td>
<td>80</td>
<td>1199</td>
<td>1575</td>
<td>14</td>
<td>137</td>
</tr>
<tr>
<td>May</td>
<td>0.246 (5.426)</td>
<td>85</td>
<td>1196</td>
<td>1576</td>
<td>36</td>
<td>210</td>
</tr>
<tr>
<td>June</td>
<td>0.359 (6.023)</td>
<td>83</td>
<td>1203</td>
<td>1576</td>
<td>21</td>
<td>189</td>
</tr>
<tr>
<td>July</td>
<td>0.234 (3.443)</td>
<td>87</td>
<td>1201</td>
<td>1580</td>
<td>20</td>
<td>127</td>
</tr>
<tr>
<td>August</td>
<td>0.292 (5.307)</td>
<td>90</td>
<td>1199</td>
<td>1575</td>
<td>44</td>
<td>206</td>
</tr>
<tr>
<td>September</td>
<td>0.363 (5.892)</td>
<td>85</td>
<td>1196</td>
<td>1577</td>
<td>28</td>
<td>148</td>
</tr>
<tr>
<td>October</td>
<td>0.219 (3.091)</td>
<td>89</td>
<td>1189</td>
<td>1573</td>
<td>8</td>
<td>179</td>
</tr>
<tr>
<td>November</td>
<td>0.237 (5.233)</td>
<td>86</td>
<td>1189</td>
<td>1570</td>
<td>36</td>
<td>165</td>
</tr>
<tr>
<td>December</td>
<td>0.088 (1.346)</td>
<td>90</td>
<td>1198</td>
<td>1567</td>
<td>16</td>
<td>143</td>
</tr>
</tbody>
</table>

*The smallest number of securities in a cross-sectional regression.

The largest number of securities in a cross-sectional regression.

*The smallest number of dividends in a cross-sectional regression.

The hypothesis of a zero-dividend yield coefficient is rejected in nine of the 12 tests. Again, January and December result in insignificant coefficients.

We find insignificant dividend coefficients only in tests that use data from December and January. The insignificant yield coefficient in January could be related to the small firm-January effect documented by Keim (1983) and others. Keim shows that the abnormal
Table V. Estimating the Extent to Which the Data Exhibits Cross Sectional or Time Series Return Variations Using Weekly Returns

The table presents refinements of the Litzenberger and Ramaswamy (1979) experiment, separating time-series from the cross-sectional variation in weekly returns. The experiment uses pooled time-series, cross-sectional regression of beta and dividend yield on security risk premia ($R_n - R_f$). For each week, we estimate the security’s beta in a time-series regression from t-260 to t-1. Then we run a cross-sectional regression for each week in the sample:

$$R_n - R_f = \alpha_n + \alpha_2 \beta_n + \alpha_3 (\delta_n - R_f) + \epsilon_n$$

$i = 1, 2, \ldots, N$

The table contains the average of the estimated OLS coefficients across the weekly cross-sectional regressions (with t-values in parentheses) for the period 1967-1986. In the first row, we limit the sample to stocks with an ex-week only (i.e., in each cross-sectional regression, we include only stocks that paid a dividend in that week). In each of the 995 weeks investigated, there are at least 20 observations. In Row 2, we define the dividend yield of each stock as the cumulative dividends paid during the prior year divided by the prior year-end prices.

<table>
<thead>
<tr>
<th>Method</th>
<th>$\alpha_1$</th>
<th>$\alpha_2$</th>
<th>$\alpha_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0.000353</td>
<td>0.004290</td>
<td>-0.0115</td>
</tr>
<tr>
<td></td>
<td>(-0.45)</td>
<td>(5.86)</td>
<td>(-0.32)</td>
</tr>
<tr>
<td>2</td>
<td>0.00114</td>
<td>-0.00023</td>
<td>0.00186</td>
</tr>
<tr>
<td></td>
<td>(3.75)</td>
<td>(-0.3958)</td>
<td>(0.578)</td>
</tr>
</tbody>
</table>

Performance in January can be attributed to small stocks, and that these are also stocks that are less likely to pay dividends (Keim, 1985). Indeed, Keim (1985) shows a nonlinear relation between dividend-yields and returns in January. Small, non-dividend-paying stocks experience the highest returns in that month. However, it is important to note that Keim’s dividend-yield coefficient is long-term (dividend-yield over the previous 12 months), but the dividend-yields we use here vary each week, depending on whether the stock has paid dividend in that week.

Our evidence indicates that the empirical regularity is not limited to a particular period or to a particular time during the year. Therefore, the question remains: what have we measured, time-series or cross-sectional return variations?

To address this question, we replicate the Litzenberger and Ramaswamy experiment, using weekly data and a long-run definition of yield. The experiment assigns the estimated dividend-yield to each week, whether it is an ex-week or not. The experiment should result in an insignificant dividend-yield coefficient if the data show only a time-series return variation. As Table V shows, the dividend-yield coefficient is insignificantly different from zero. We fail to reject the null hypothesis of no relation between dividend-yield and risk-adjusted returns. Using weekly data, the original Litzenberger and Ramaswamy experiment results in a significant yield coefficient (Tables II and III), but with a long-run definition of yield we find an insignificant coefficient—evidence of time-series return variation.

We find that ex-dividend weeks offer higher risk-adjusted returns than do other weeks. We wonder what happens during the ex-dividend week. Is the risk-adjusted return greater for high-yield stocks than for low-yield stocks? The second weekly experiment addresses this question. The sample is limited to stocks going ex during the week investigated, which substantially reduce the sample size. We conduct the experiment for a given week only if the sample consists of at least 20 observations, which gives us 995 weeks. Table V shows our results. The dividend-yield coefficient is insignificantly different from zero. We fail to reject the null hypothesis that high- and low-dividend-yield stocks offer the same risk-adjusted return during the ex-dividend week.
Table VI. Estimating the Extent to Which the Data Exhibits Cross-Sectional or Time-Series Return Variations Using Monthly Returns

The table reports refinements of the Litzenberger and Ramaswamy (1979) experiment, separating time-series from cross-sectional variation in monthly returns. The experiment uses a pooled time-series, cross-sectional regression of beta and dividend yield on security risk premia \((R_i - R_p)\). For each month, we estimate the security’s beta in a time-series regression from t-60 to t-1. Then, we run a cross-sectional regression for each month in the sample:

\[
R_{it} - R_p = \alpha_1 + \alpha_2 \hat{\beta}_i + \alpha_3 (d_{it} - R_p) + \varepsilon_{it} \quad i = 1, 2, \ldots, N
\]

The table contains the average of the estimated OLS coefficients across the monthly cross-sectional regressions (t-values in parentheses) for the period 1940 to 1986 (Panel A) and for the period 1967 to 1986 (Panel B). The first row of each panel reports the results with the Litzenberger and Ramaswamy definition of dividend yield. In the second row, the dividend yield of each month is defined as the cumulative dividend paid during the prior year divided by the prior year-end price. The last row of Panel B reports the regression results where the dividend yield is assigned to the month that follows the ex-month.

| Method | Panel A. 1940 to 1986 | | | Panel B. 1967 to 1986 | | |
|--------|-----------------------|---------|-----------------------|---------|
| 1\(^a\) | \(0.00808\) \(0.00144\) | \(0.24\) \(8.51\) | \(0.0467\) \(0.00315\) | \(0.011\) \(0.98\) |
| \(2\) | \(6.6\) \(1.0\) | | \(3.21\) \(1.64\) | | |
| 2\(^b\) | \(0.00508\) \(0.012\) | \(0.2261\) \(6.5\) | \(0.00342\) \(0.00151\) | \(0.0194\) \(1.02\) |
| \(3\) | \(2.13\) \(0.37\) | | \(1.4\) \(0.46\) | | |
| 3\(^c\) | \(0.008\) \(0.0085\) | \(-0.0549\) \(-1.83\) | \(6.5\) \(0.614\) | | |
| \(6.5\) \(0.614\) | | | | |

\(^a\)A replication of the LR experiment.
\(^b\)A replication of the LR experiment in which the dividend yield of each month is defined as the cumulative dividend paid during the prior year divided by the prior year-end price.
\(^c\)A replication of the LR experiment in which the dividend yield is assigned to the month that follows the ex-month.

C. Monthly Return—Empirical Results

To test for cross-sectional monthly return variations, we use a long-run definition of yield. We estimate the expected dividend-yield in each month by the sum of the dividends paid during the previous year divided by the stock price at the end of the prior year. Each firm is identified as having the estimated dividend-yield in each month (ex or non-ex) during the quarter. This experiment differs substantially from the original one performed by Litzenberger and Ramaswamy since the variation in yield is cross-sectional and not a time-series. It would result in an insignificant dividend-yield coefficient in an economy that shows only time-series return variations. The results are presented in the second row of Panel A, Table VI. The estimated dividend-yield coefficient is insignificantly different from zero (t-value of 0.98). We fail to reject the null hypothesis that stocks with high dividend yields offer the same expected risk-

\(^d\)Measuring the denominator at the beginning of Month 1 does not have any impact on our results.
Table VII. The Relation Between Dividend Yield and Risk-Adjusted Returns Using Quarterly Data

The table reports the results of a pooled time-series, cross-sectional regression of beta and dividend yield on security risk premia ($R_i - R_f$). For each quarter, we estimate the security's beta in a time-series regression from $t-48$ to $t-1$. We estimate the dividend yield by the expected dividend in quarter $t$ divided by the price at the end of the previous year. Price changes are calculated on a quarterly basis. Then we run a cross-sectional regression is run for each week in the sample:

$$R_i - R_f = \alpha_i + \alpha_{\beta_i} \beta_{it} + \alpha_{\delta_i} (\delta_{it} - R_f) + \varepsilon_i \quad \quad \quad \quad i = 1, 2, \ldots, N$$

The table contains the average of the estimated OLS, GLS, and MLE coefficients across the quarterly cross-sectional regressions. t-values appear in parentheses. The period covered is 1943-1990. Overall, 192 cross-sectional regressions are estimated.

<table>
<thead>
<tr>
<th>Method</th>
<th>$\alpha_1$</th>
<th>$\alpha_2$</th>
<th>$\alpha_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLS</td>
<td>0.027</td>
<td>0.0046</td>
<td>-0.0049</td>
</tr>
<tr>
<td></td>
<td>(5.62)</td>
<td>(1.12)</td>
<td>(-0.0024)</td>
</tr>
<tr>
<td>GLS</td>
<td>0.0189</td>
<td>0.0083</td>
<td>0.1197</td>
</tr>
<tr>
<td></td>
<td>(4.398)</td>
<td>(1.636)</td>
<td>(0.775)</td>
</tr>
<tr>
<td>MLE</td>
<td>0.0018</td>
<td>0.009</td>
<td>0.1313</td>
</tr>
<tr>
<td></td>
<td>(4.106)</td>
<td>(1.634)</td>
<td>(0.854)</td>
</tr>
</tbody>
</table>

adjusted returns as do those with low yields. In contrast, a Litzenberger and Ramaswamy experiment in which stocks have positive dividend-yield only in ex-months, results in a significantly positive dividend-yield coefficient (0.24 with a t-value of 8.51, see first row of Table VI, Panel A). These results indicate that the monthly data show time-series return variations that are related to dividend yield.

Panel B of Table VI contains the results of the same experiment performed on a shorter period (1967 to 1986). The first row shows the results of an OLS version of a Litzenberger and Ramaswamy experiment. The dividend-yield coefficient is significantly positive (0.226 with a t-value of 6.5). The second experiment, which uses a long-run definition of yield, leads to an insignificant dividend-yield coefficient (t-value of 1.02). For both periods, we fail to reject the null hypothesis that high- and low-yield stocks offer the same monthly risk-adjusted pretax returns. The evidence is consistent with the hypothesis that the Litzenberger and Ramaswamy positive dividend-yield coefficient is the result of time-series return variations.

An alternative approach is to eliminate the cross-sectional variation altogether by replacing the dividend-yield with a dummy variable that is equal to one if it is an ex-dividend month, and zero otherwise. In this experiment, a significant dividend-yield coefficient is evidence of time-series return variations.

The regression results in a highly significant dividend-yield coefficient ($t = 8.92$). This finding is consistent with Miller and Scholes (1982), who document a positive and significant coefficient for a variable that is equal to the price reciprocal in ex-months, and zero otherwise. It is also consistent with the Fama and French (1993) claim that the yield coefficient might capture factors other than taxes, and that those other factors might affect assets' returns.

Suppose we assign the estimated dividend-yield to a non-ex month and assume a zero yield during the other months. In this experiment, the larger ex-dividend-month risk-adjusted returns are associated with zero expected dividends and the lower returns with positive expected dividends. If the data exhibits time-series
Table VIII. The Effect of the 1986 Tax Reform Act and the October 1987 Stock-Market Crash

We estimate the Litzenburger and Ramaswamy (1979) regression on monthly return intervals using a pooled time-series, cross-sectional regression of beta and dividend yield on security risk premia \( R_{n} - R_{f} \). For each month, we estimate the security’s beta in a time-series regression from t-60 to t-1. The dividend yield is the expected dividend in month t over the price at the end of the previous month. Price changes are calculated on the monthly basis. Then, we run a cross-sectional regression for each month in the sample:

\[
R_{n} - R_{f} = \alpha_{1} + \alpha_{2} \beta_{n} + \alpha_{3} (d_{n} - R_{f}) + \epsilon_{n} \quad i = 1, 2, \ldots, N
\]

The table contains the average of the estimated MLE coefficients across the monthly cross-sectional regressions. We exclude the 14 weeks around the October 1987 crash and weeks containing both dividend announcement and ex-dividend days.

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of Observations</th>
<th>Mean ( (\alpha_{3}) )</th>
<th>t ( (\alpha_{3}) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967 to 1986</td>
<td>1,019</td>
<td>0.162</td>
<td>10.58</td>
</tr>
<tr>
<td>1967 to 1976</td>
<td>498</td>
<td>0.178</td>
<td>8.14</td>
</tr>
<tr>
<td>1977 to 1986</td>
<td>521</td>
<td>0.146</td>
<td>6.816</td>
</tr>
<tr>
<td>1987 to 1990</td>
<td>194</td>
<td>-0.008</td>
<td>-0.301</td>
</tr>
</tbody>
</table>

return variations, we expect a significantly negative dividend-yield coefficient.

To test for this possibility, we repeat the Litzenburger and Ramaswamy experiment, assigning the estimated expected dividend-yield to the month following the ex-dividend month. To illustrate, suppose January is an ex-month with an expected dividend-yield of 1%. In this experiment, the yield is artificially assigned to February.

Table VI, Panel B (third row) shows that the experiment results in a significant and negative dividend-yield coefficient. Consistent with our earlier results, the evidence suggests that the risk-adjusted monthly return is higher during the ex-dividend month. These results show that the variation in returns that are related to the dividend-yield are time-series rather than cross-sectional.

Now, we can compare the results of a Litzenburger and Ramaswamy experiment obtained with weekly data with those estimated using monthly data. The weekly dividend-yield coefficient (0.255, Table II) is approximately equal to the monthly coefficient (0.229, Table I, Panel A). Thus, the difference between the ex-dividend-week return and the return in other weeks is similar to the difference between the ex-dividend-month return and the return in other months. Hence, almost all of the documented excess returns appear to occur within the ex-dividend week.

D. Quarterly Return Variations

We document above higher risk-adjusted returns during the ex-dividend week (or month). Therefore, we know that there are substantial time-series return variations within the quarter. Now we would like to know if there are time-series or cross-sectional quarterly return variations.

Table VII presents the results of this experiment. The coefficients are estimated by OLS (first row), GLS (second row), and MLE (third row), and the period 1943 to 1990. We estimate the betas using the market model during the prior 48 quarters. Expected quarterly dividend-yield is assumed equal to the mean quarterly dividend-yield of the previous calendar year. We estimate a total of 192 cross-sectional regressions.

The estimated dividend-yield coefficients are insignificantly different from zero in all
Table IX. Cross-Sectional Relation Between Risk Premium, Dividend Yield, and Beta Using Weekly Returns

The table reports the results of a pooled time-series, cross-sectional regression of beta and dividend yield on security risk premia (\(R_{i} - R_{f}\)). For each week, we estimate the security’s beta in a time-series regression from t-260 to t-1, and the dividend yield is estimated by the expected dividend (as in Litzenberger and Ramaswamy, 1979) in week t over the price at the end of the previous week. We assign the expected dividend yield to each of the 14 weeks preceding (and including) the ex-dividend week. Price changes are calculated on the weekly basis. Then, we run a cross-sectional regression for each week in the sample

\[ R_{i} - R_{f} = \alpha_{i} + \alpha_{d} \hat{\beta}_{i} + \alpha_{n} (\hat{D}_{i} - R_{f}) + \epsilon_{i}, \quad i = 1, 2, \ldots, N \]

We exclude dividend omission weeks and weeks containing both dividend announcement and ex-days. The table contains the average of the estimated MLE coefficients across the weekly cross-sectional regressions. We also exclude the 14 weeks around the October 1987 crash and weeks containing both dividend announcement and ex-dividend days.

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of Observations</th>
<th>Mean ((\alpha_{d}))</th>
<th>t ((\alpha_{d}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967 to 1986</td>
<td>1,019</td>
<td>-0.000017</td>
<td>-0.766</td>
</tr>
<tr>
<td>1967 to 1976</td>
<td>498</td>
<td>-0.000023</td>
<td>-0.719</td>
</tr>
<tr>
<td>1977 to 1986</td>
<td>521</td>
<td>-0.00001</td>
<td>-0.352</td>
</tr>
<tr>
<td>1987 to 1990</td>
<td>180</td>
<td>0.00005</td>
<td>0.984</td>
</tr>
</tbody>
</table>

three estimation methods. We fail to reject the hypothesis that stocks with higher dividend yields have the same quarterly returns as those with lower yields.

The evidence indicates that stocks experience significantly larger returns during the ex-dividend period, but that the excess return is not related to the dividend-yield during the ex-dividend period and during the entire year.

E. The Effect of the 1986 Tax Reform Act

The 1986 Tax Reform Act eliminated the preferential tax treatment for realized capital gains. We wish to see whether this tax reform changed the relation between dividend yield and measured returns. Data from the post-tax-reform period (1987 to 1990) make possible a new Litzenberger and Ramaswamy experiment.

We perform a week-by-week version of the Litzenberger and Ramaswamy experiment, excluding 14 weeks surrounding the October 1987 crash and weeks containing both dividend announcements and ex-days. Table VIII describes our results. We find that for the 1967 to 1986 period the dividend coefficient is positive and highly significant. However, for the 1987 to 1990 period, the MLE version of the experiment results in an insignificant negative \(\alpha_{d}\). This is surprising. During the post-tax-reform period, ex-dividend week returns are not abnormally high.

To examine whether stocks show cross-sectional return variations, we repeat the experiment, assigning the Litzenberger and Ramaswamy expected quarterly dividend-yield estimate to each of the 14 weeks preceding (and including) the ex-dividend week. In each quarter, the yield estimate uses only historical data. The sample is reduced to 194 weeks because we exclude the last quarter of 1990 (as well as the 14 weeks surrounding the October crash).

The results are detailed in Table IX. We find an insignificant dividend coefficient for the 1967 to 1986 period, and for all of the subperiods that we investigate. For example, for the 1987 to 1990 subperiod, the MLE estimate of \(\alpha_{d}\) is positive (0.00005) but
Figure I. Plot of Risk-Adjusted Monthly Returns as a Function of Their Respective Dividend Yield

We assume an economy in which returns are higher during ex-dividend month, but unrelated to the dividend yield. Regressions lines I to V are the outcome of a Litzenberger and Ramaswamy (1980) tax-induced clientele test performed in this economy. The higher-yield group (V) is associated with a smaller yield coefficient.

statistically insignificant (t-value of 0.984).

Consistent with the results for the earlier period, during the post-tax reform period stocks show no cross-sectional return variation. Stock returns also fail to show time-series variations during this period.

This evidence is consistent with Michaely (1991), who finds no excess returns around the ex-dividend day during the post-tax-reform (1986) period. Michaely shows that the elimination of the time-series return variations around the ex-dividend day occurred even before the tax reform. He concludes that the change in the preferential treatment of capital gains did not cause the change in stock-price behavior around the dividend payments.

III. Discussion

As noted earlier, Brennan's (1970) capital asset-pricing model states that a security's pretax return is linearly and positively related to its systematic risk and its expected dividend yield. The model predicts cross-sectional return variations; that is, stocks with higher dividend yields should offer larger risk-adjusted pretax returns throughout the year. The empirical evidence, however, indicates that stocks experience only time-series return variations. What can we learn from such evidence? Is this likely to be an outcome of taxes?

The answer is not simple. It seems clear that long-term investors would require a tax premium during ex-dividend periods only if they could avoid the dividend tax penalty during other periods. Can it be done? Consider an investor attempting to own stock XYZ without receiving its dividends. Suppose the stock pays quarterly dividends, with
Table X. Variation in Beta Between Ex-Dividend Periods and Non-Ex-Dividend Periods

The table reports the results of a regression of dividend yield and beta on security risk premium ($R_{m} - R_{f}$). However, we allow beta to vary between ex-months and non-ex-months. The first-stage regression (the time-series regression by which beta is estimated) takes the following form:

$$R_{n} - R_{f} = \alpha_{n1} + K\beta_{n1}(R_{m} - R_{f}) + (1-K)\beta_{n1}(R_{m} - R_{f}) + \epsilon_{n}$$  \quad t = 1,2,...,T - 1

We estimate the dividend yield by the expected dividend in month $t$ over the price at the end of the previous month, as in Litzenberger and Ramaswamy (1979). Price changes are calculated on a monthly basis. Then, we run a cross-sectional regression for each month in the sample:

$$R_{n} - R_{f} = \alpha_{n} + \alpha_{n2}\hat{\beta}_{n} + \alpha_{n3}(d_{n} - R_{f}) + \epsilon_{n}$$  \quad i = 1,2, ..., N

$\hat{\beta}_{n}$ is $\beta_{n}$ if Security $i$ paid a dividend in Month $t$ and is $\beta_{n}$ if Security $i$ did not pay a dividend in that month. The table contains the average of the estimated MLE coefficients across the monthly cross-sectional regressions. $t$-values appear in parentheses. Since we use ten years of data to estimate betas, the sample covers the period 1946 to 1986.

<table>
<thead>
<tr>
<th>Method</th>
<th>$\alpha_{n}$</th>
<th>$\alpha_{n2}$</th>
<th>$\alpha_{n3}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1$^a$</td>
<td>0.00626</td>
<td>0.001450</td>
<td>0.171</td>
</tr>
<tr>
<td></td>
<td>(4.54)</td>
<td>(0.71)</td>
<td>(7.126)</td>
</tr>
<tr>
<td>2$^b$</td>
<td>0.006223</td>
<td>0.002635</td>
<td>0.182</td>
</tr>
<tr>
<td></td>
<td>(4.28)</td>
<td>(1.27)</td>
<td>(7.42)</td>
</tr>
<tr>
<td>3$^c$</td>
<td>0.006800</td>
<td>0.001970</td>
<td>0.194</td>
</tr>
<tr>
<td></td>
<td>(4.76)</td>
<td>(0.971)</td>
<td>(7.68)</td>
</tr>
<tr>
<td>4$^d$</td>
<td>0.001390</td>
<td>0.00017</td>
<td>0.120</td>
</tr>
<tr>
<td></td>
<td>(3.68)</td>
<td>(0.300)</td>
<td>(7.69)</td>
</tr>
</tbody>
</table>

$^a$ A replication of the LR experiment for the period 1946 to 1986.

$^b$ A replication of the LR experiment in which the first-stage estimation of beta uses ten years of data.

$^c$ An LR experiment that allows the beta in the ex-months to be different from the beta in the non-ex-months.

$^d$ A replication of the LR experiment using weekly return interval with different betas in ex and non-ex weeks. The estimation of the first-stage betas is done as in $^c$.

the ex-dividend days being the last business day of March, June, September, and December. A possible strategy involves buying the stock, for example, on January 1 and selling it cum-dividend after the next dividend announcement, thereby realizing only capital gains. On April 1, our investor can buy the stock ex-dividend, keep it until the end of June, and so on. The dividends are paid to the investor’s trading partners. The trading strategy results in two classes of investors—those receiving only short-term capital gains and those receiving mostly cash dividends. If dividends are taxed more heavily than these capital gains, the pretax return during the ex-dividend period will exceed the pretax returns during other periods. In this case, time-series risk-adjusted return variations are evidence of a dividend tax effect.

However, investors who try to own the stock only during non-ex-periods must realize short-term capital gains. Under US tax laws, short-term capital gains are taxed as ordinary income. In other words, because the attempt to avoid dividend income involves the realization of short-term capital gains, the investor pays the same taxes he or she would pay on dividend income and therefore requires an identical tax premium. Thus, even
though a long-term investor prefers capital gains to dividend income, he or she does not require a larger pretax return during only the ex-dividend period.

The economic incentives of the long-term investor should not lead to excess returns during any one of the ex-dividend weeks within their holding periods. Nevertheless, if many long-term investors prefer to sell the stock before the last ex-dividend day, the cum-dividend stock price could be depressed, creating larger returns during the ex-period. But if these investors time their trades to economize on the taxes they could pay on the last dividend, they will surely require compensation for the dividends distributed during their holding periods. Therefore, if we observe tax-based price pressure that results in excess returns during the ex-period, we should observe a “tax premium” for stocks with higher dividend yields. Thus, it is difficult to provide a tax-based explanation to time-series return variations in an economy that shows no cross-sectional return variations.

The Litzenberger and Ramaswamy (1980) study includes another interesting, statistically significant, empirical regularity. In their 1980 study, Litzenberger and Ramaswamy document evidence that seems consistent with a tax-induced clientele effect. A clientele effect exists in the economy when investors in higher (lower) tax brackets buy stocks with low (high) dividend yields. Litzenberger and Ramaswamy assume that a higher dividend yield coefficient implies higher investors’ marginal tax rates.

In their experiment, Litzenberger and Ramaswamy divide the stocks into five subsamples, based on their expected dividend yield. Group 1 contains the lowest-yield stocks, and Group 5 contains the highest. They then calculated the dividend yield coefficient for each of the yield groups. Litzenberger and Ramaswamy find negative correlation between the dividend yield coefficient and the dividend yield, and interpret it as evidence consistent with a tax-induced clientele effect. This result is puzzling since direct tests uncover no relation between investors’ marginal tax rates and their portfolio dividend yields.

Figure 1 provides a possible explanation for this empirical regularity. Consistent with the empirical evidence presented in this paper, the figure describes an economy in which all stocks have higher ex-dividend period expected returns. The excess return is not related to the dividend yield. In the cross-sectional regression the same return differential (between the ex- and non-ex-period) is related to the larger dividend yield, resulting in a smaller regression slope for the higher-yield groups. Thus, this association might not be evidence of a tax-induced clientele effect.

If taxes do not explain the time-series return variations, what does? Perhaps this period is characterized by higher systematic risk and should therefore have higher return. To explore this issue, we measure securities’ betas for ex-months and for non-ex-months separately in the time-series regression:

\[
R_{it} - R_{it} = a_n + Kb_{nt}(R_{mt} - R_{it}) + (1-K)b_{nt2}(R_{mt} - R_{it}) + e_{nt}
\]  

(4)

where \( K \) is a dummy variable equal to one in ex-periods and zero in non-ex-periods.

The second stage of the experiment uses \( b_n \) if Month \( t \) is an ex-month and \( b_{nt} \) if it is a non-ex-month. We use ten years of data to estimate the two betas for each stock and report our results in Table X.

Row 1, Table X shows the results using monthly data from the period 1946-1986. Row 2 shows the results of a similar test in which the return interval is a week (and the sample

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8The empirical evidence is inconsistent with this conjecture. Eades, Hess, and Kim (1984), Lakonishok and Vermaelen (1986), and Michaely and Vila (1996) find a positive excess return prior to the ex-day.

9See Peterson, Peterson, and Ang (1985) and Lewellen, Stanley, Lease, and Schlarbaum (1978).
period is from 1967 to 1986). These tests all result in a positive and significant dividend-yield coefficient.

We also repeat the experiment, this time assuming that different months have different betas. The ex-month, the preceding month, the following month, and all the other months as a group have different betas. Again, we use ten years of data to estimate these four betas. When we replicate the Litzenberger and Ramaswamy experiment with these betas, we still find a dividend yield coefficient that is very close in magnitude to what has been reported in Litzenberger and Ramaswamy (1979). Using weekly return intervals and measuring a different beta during the ex-dividend week does not affect the estimate of the yield coefficients. The results are similar to those reported in Table IX. Thus, the risk changes investigated here do not explain the time-series variations in monthly or weekly returns.

Perhaps the problem is with the underlying asset-pricing model that we use. The underlying assumption of the null hypothesis is that the asset-pricing model is a one-factor model (such as the CAPM). Recent research has raised serious doubts on the empirical validity of such models. For example, Fama and French (1992) find that firm size and book-to-market-value of equity are better predictors of future returns than is beta alone.

Another possibility is that the true underlying model is a multi-factor model and the dividend-yield is a proxy for an omitted factor. Fama and French (1993) offer an interesting insight that is relevant to this issue. They show that when using the three-factor model, there is no trace of different intercepts among portfolios with different dividend yields. Chen, Grundy, and Stambaugh (1990) also examine the relations between dividend-yield and returns in a multi-factor model. Their evidence corroborates our finding of no cross-sectional return variations.

**IV. Conclusions**

We show that the empirical evidence documented by Black and Scholes (1974) is consistent with the evidence presented by Litzenberger and Ramaswamy (1979). The significant dividend-yield coefficient documented in Litzenberger and Ramaswamy (1979) is a result of time-series return variations, i.e., higher risk-adjusted returns during ex-dividend periods. In fact, the excess returns are concentrated in the ex-dividend week.

Our empirical evidence indicates that both studies do not find cross-sectional return variations, that is, the long run risk-adjusted returns are not correlated with dividend yield. Our evidence is inconsistent with Brennan’s (1970) model. Moreover, given the structure of the US tax code, current theories do not link time-series return variations to taxes.

Although our evidence is inconsistent with the Brennan (1970) model it is not necessarily inconsistent with the “tax hypothesis.” Brennan makes certain assumptions about the tax structure. Among other things, his model has no tax clienteles, short-term capital gains, foreign investors, transaction costs, or tax arbitrage. Our empirical evidence—time-series return variations and no cross-sectional return variations—is not explained by the known tax models. It could very well be that these empirical findings are somehow related to a more complex theory of tax effects, yet to be developed. ■
References


