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INTERPRETING EX-DIVIDEND EVIDENCE: THE CITIZENS UTILITIES CASE RECONSIDERED

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ABSTRACT

Numerous empirical studies have attempted to measure the effect of changes in dividend policy on corporate equity values. One of the most popular study methodologies has been an examination of share price changes around ex-dividend days. Comparing the movement in a stock's price with its nominal dividend payment leads to estimates of the stock market's relative valuation of dividends and capital gains. Ex-day price studies are often interpreted as showing that investors recognize their tax liabilities and therefore discount their dividend income. These studies predict that firms which reduce their payout ratio should rise in value, and buttress the view that an increase in dividend taxes would reduce the value of the stock market.

This study disputes these conclusions by presenting a "counterexample" which suggests that ex-dividend day studies provide limited insight into the effects of dividend taxes, or dividend policy, on corporate valuation. I analyze a firm with two different classes of common stock: one class pays taxable cash dividends, while the other pays untaxed stock dividends. On ex-dividend days, the taxable-dividend shares experience a price decline equal to about seventy-five percent of their dividend payment, while the untaxed stock distribution shares fall by the full value of their dividends. However, the prices of the two classes of equity do not reflect this apparent market preference for non-taxable distributions. The average price of taxable-dividend shares is approximately equal to that of the untaxed dividend shares, indicating that the market considers the two shares as equivalent.

These findings are important for several reasons. First, they cast doubt on earlier conclusions, based on ex-dividend day studies, about how a change in dividend taxes or payout policy would affect the market value of equity capital. Second, the results may provide new insights which help to explain why firms pay dividends. They deny the view that investors hold dividend paying stocks only because they are necessary for diversification, and may suggest that there is some attribute of cash dividends which investors genuinely value.

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The question of how dividend policy affects a firm's market valuation is central to financial economics. When investors are subject to taxes on both dividends and capital gains, tax preferences may be an important determinant of a firm's optimal payout policy. Numerous empirical investigations have attempted to measure the effect of changes in payout policy on share values. Many of these studies have also tried to predict the effects of changes in personal dividend taxes on stock market valuation. One of the strongest sources of evidence that investors consider the tax consequences of their investments and value dividends less than capital gains is the so-called "ex-dividend" literature. By comparing changes in stock prices on ex-dividend days with the value of dividend payments, these studies purport to measure the stock market's relative valuation of dividend and capital gains income.

The usual finding is that share prices decline by less than their dividend payout. If these studies are in fact calculating the marginal value of dividends, then they suggest that firms could raise their share values by reducing dividends. Alternatively, these investigations imply that high marginal dividend tax rates depress the stock market, since investors value the after-tax dividend stream associated with their investments.

Ex-dividend studies have recently been subject to criticism on several fronts. Miller and Scholes (1982) argue that one of the principal explanations for previous findings using monthly data, such as the CRSP tapes, involves the coincidence of ex-dividend dates and dividend announcement dates. Since a dividend announcement conveys information about a firm's liquidity and possibly about future profits, it should raise share prices. If a month contains both an announcement date and an ex-dividend date then there are two opposite-signed forces affecting share prices: the information or"announcement" effect raises the share price, while the dividend payment reduces it. The net effect is that we observe the share's one month price decline to be less than the value of its dividend. However, this finding could be perfectly consistent with the share price declining by the dividend's full value on the ex-day. Miller and Scholes demonstrate that after controling for these announcement effects, share prices seemed to decline by amounts much closer to their dividend payout.

The adjustment for announcement effects, although crucial in monthly data, cannot explain the findings of other ex-dividend studies employing daily data which also show price changes to be smaller than dividend payments. These findings pose an unresolved puzzle. Securities dealers, brokers, and untaxed institutions could all earn arbitrage profits if share prices in fact declined by less than the dividend. Miller and Scholes argue that the presence of this arbitrage should prevent the share price change from deviating from dividend value; the failure of this arbitrage is difficult to explain.

There are other technical criticisms of ex-day studies. Black and Scholes (1973) showed that much of the unusual return activity which has been discovered on ex-days disappears as trading periods of more than one day are considered. While the one-day return from holding a share on its ex-day seems abnormally high, the twenty-day return associated with buying the share ten days before the ex-date and selling ten days afterward may not be excessive. Litzenberger and Ramaswamy (1979,1982) have pointed out the importance of distinguishing between anticipated and unanticipated dividends in ex-day studies.

Although these criticisms of ex-dividend study methodology are important, they do not address the more central question of whether ex-day evidence is relevant to understanding the effects of dividend policy or dividend taxes. This paper presents an empirical "counterexample" to show that ex-dividend studies may not provide a reliable guide to the effect of dividend taxes on share values. The investigation focuses on the share prices and ex-dividend day price behavior of one firm, Citizens Utilities (CU), which maintains two different classes of common stock. Class A shares pay untaxed stock dividends twice each year, while Class B shares receive taxable cash dividends four times per year. The company charter requires the two classes of stock to distribute approximately equal amounts of dividends each year.

The paper begins with a test of the "tax effects" hypothesis, which predicts that a share's ex-day price decline equals the after-tax value of its dividend payment. If most investors are either indifferent between dividends and capital gains, or prefer capital gains, then the price of the taxable-distribution shares should fall by less than their dividend. The share price for Class A stock should decline by the full value of the stock dividend. The ex-dividend day evidence for Citizens Utilities is supportive of the tax effects hypothesis and consistent with earlier ex-day results.

The ex-day results predict that cash dividend shares should sell at a lower price than stock-dividend shares. This is where the theory's predictions unravel. As Long (1978) observed, when averaged over dividend cycles and adjusted for differences in dividend payout, Class A and Class B shares sell for almost the same price. While changes in share prices around ex-dates accord with the "tax effects" hypothesis, the levels of the two share prices do not.

The stock distribution shares appear to earn a higher return on non ex-days than the cash dividend shares. While this finding is difficult to reconcile with standard theories of asset pricing, it does suggest that ex-dividend studies may provide unreliable answers to basic questions about dividends and taxes. It also suggests that future dividend research should analyze the return on stocks with different payout rates during months when they do not pay dividends.

To investigate the Citizens Utilities case, I proceed in five stages. The paper's first section summarizes models of portfolio equilibrium in the presence of taxes which give rise to the tax-effects hypothesis. I try to relate these models to ex-day share price changes. The second section describes the two classes of Citizens Utilities equity, their tax treatment and their prices. Empirical evidence concerning the ex-dividend day behavior of CU shares is presented in the third section, as are several points of econometric methodology. The fourth section analyzes the trading volume around ex-dividend days to learn whether any unusual activity, indicative of arbitrage, takes place. In the fifth section I attempt to pinpoint the paradox of the Citizens Utilities case and explore several explanations for the divergence between price levels and ex-day price movements. There is a brief conclusion.

I. Modelling Ex-Dividend Day Price Changes

The after-tax capital asset pricing model[1] provides a useful starting point for the analysis of share price movements. An investor, say investor h, is

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[1] Brennan (1970) is the principle architect of this model. Gordon and Bradford (1980) and Auerbach (1981) have recently applied it to the study of ex-day share price movements.

defined by a vector of characteristics, $\{W^h, \theta^h, \gamma^h\}$, where W^h is total wealth, θ^h is the ratio of the investors' after-tax returns on one dollar of dividends and one dollar of capital gains, and γ^h is a measure of marginal risk aversion. If individual preferences may be characterized by a utility function of means and variances of asset returns, then

$$\text{(I.1)} \qquad \gamma^h = \frac{\partial u^h(\mu_h, \sigma_h^2)/\partial \mu_h}{\partial u^h(\mu_h, \sigma_h^2)/\partial \sigma_h^2}.$$

In more familiar notation

$$\text{(I.2)} \qquad \theta^h = \frac{(1-\tau_D^h)}{(1-\tau_C^h)}$$

where τ_D^h is the marginal dividend tax rate and τ_C^h the capital gains tax rate. If investors can borrow and lend freely and there are no short selling restrictions then the well-known after tax capital market line is defined by

$$\text{(I.3)} \qquad \bar{r}_{it} + \alpha \bar{d}_{it} - \bar{r}_{0t} = \frac{\mathrm{Cov}(r_i, r_m)}{\mathrm{Var}(r_m)} \cdot (\bar{r}_{mt} + \alpha \bar{d}_{mt} - \bar{r}_{0t}) + \tilde{\varepsilon}_{it}$$

where r_m is the capital gain on the market portfolio, d_m the dividends paid by the market portfolio, r_0 the risk-free interest rate, r_i and d_i the capital gain and dividend on the i^{th} security, and α is the market's valuation of dividends versus capital gains. Each individual's return on the i^{th} security is

$$\text{(I.4)} \qquad R_i^h = (1-\tau_c^h)\, r_i + (1-\tau_D^h) d_i.$$

The market's preference for dividends, however, is defined by

$$\alpha = \sum_h s^h\gamma^h / \sum_h s^h\gamma^h\theta^h. \tag{I.5}$$

Individual investor's tax preferences are weighted by s^h, their share of total wealth, and γ^h, their reciprocal risk preference, in computing the market dividend preference.

Several important insights follow from the after-tax CAPM. First, provided there are no short selling restrictions, the ex-dividend day price coefficients on all firms should be the same.[1] That is

$$\frac{\partial \bar{r}_i}{\partial \bar{d}_i} = -\alpha \qquad \text{all } i. \tag{I.6}$$

As both Auerbach (1981) and Gordon-Bradford (1980) note, it is only the presence of short-selling restrictions or other constraints which produces "clienteles" across firms. Second, there is no presumption that $0 < \alpha < 1$, which is the assumption of most ex-dividend studies. For some institutional investors, $\theta^h = 1$, and for corporations, which are taxed less heavily on dividends than on capital gains, $\theta^h > 1$. Since corporations and institutions are both wealthy (large s^h) and not very risk averse (large γ^h), their weight in determining α is large and in equilibrium, a dollar of dividend income might be valued more than a dollar of capital gains. Finally, note that if everyone faces the same tax rates, then

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[1] Hess (1982) has tested and decisively rejected this hypothesis.

$$\text{(I.7)} \qquad \alpha = \frac{1}{\theta} = \frac{(1-\tau_D)}{(1-\tau_C)}.$$

In general, however, it is inappropriate to think of α as the ratio of any "marginal investor's" tax rates; such a marginal investor need not exist.

The theory which led to equation (I.3) is appropriate for analyzing a share which pays taxable dividends, such as CU Series B equity. However, if a firm pays stock dividends, then the appropriate capital-market line becomes

$$\text{(I.8)} \qquad r_{it} = r_{0t} - \frac{D_{it}}{P_{it-1}} + \frac{\mathrm{Cov}(r_i, r_m)}{\mathrm{Var}(r_m)} \cdot (r_{mt} + \alpha d_{mt} - r_{0t}) + \tilde{\varepsilon}_{it}$$

The stock distribution shares should experience ex-day declines equal to the value of their dividends.

Previous studies[1] of ex-day share price behavior have estimated equations of the form

$$\text{(I.9)} \qquad \frac{P_{it} - P_{it-1}}{P_{it-1}} = r_{it} = \bar{r}_{it} + \varepsilon_{it}$$

$$= r_{0t} - \alpha \frac{D_{it}}{P_{it-1}} + \beta_i \cdot (r_{mt} + \alpha d_{mt} - r_{0t}) + \tilde{\varepsilon}_{it}.$$

By regressing a share's price change on its' dividend yield and the market return, we obtain estimates of α, the market's dividend preference. Typical estimates of α have ranged between .7 and .8 although after correction for

[1] Examples of ex-day price studies include Campbell and Beranek (1955), Elton and Gruber (1970), Black and Scholes (1973), Gordon and Bradford (1980), Green (1980), Auerbach (1981), Hess (1982), Kalay (1982), Litzenberger and Ramaswamy (1982), Eades, Hess, and Kim (1982), and Miller and Scholes (1982).

announcement effects, Miller and Scholes (1982) found α to be approximately unity.

The finding that most ex-day coefficients are less than one leads to an "arbitrage puzzle" of sorts. While one view holds that differing α's across firms reflect differences in shareholder clienteles, another argues that such variations cannot persist, due to the activities of arbitrageurs. I shall consider each view in turn. Auerbach (1981) has shown that when some investors are constrained, the firm's ex-dividend coefficient, α^i, is defined by

$$(I.10) \qquad \alpha^i = \sum_h s_i^h \gamma^h / \sum_h s_i^h \gamma^h \theta^h$$

where $s_i^h = W^h / \sum_{h:h\varepsilon H(i)} W^h$ for H(i) the set of individuals who invest in the $i\underline{th}$ firm. The clientele debate essentially involves two questions. First, does the set of capital market constraints imposed on investors result in different clienteles for different firms? Second, are these clienteles in each firm stable over time, or does the firm's shareholder population change, perhaps around the ex-date?

The "arbitraguer" view holds that clienteles are unstable over time. Many institutions, and a small group of individuals,[1] face an effective marginal dividend tax rate of zero. They could earn tax arbitrage profits by trading shares around ex-dividend days. If there were no transactions costs, the untaxed investors could purchase the share on the day before the ex-dividend day, receive

[1] Nontaxable corporate and institutional investors are discussed by Green (1980) and Auerbach (1981). Miller and Scholes (1978) and Feenberg (1982) examine the possibility that tax provisions for interest deductability result in some personal shareholders facing a zero marginal tax rate on dividend income.

the dividend tax-free, and then re-sell the shares. Share prices would decline by at least the full value of their dividends in order to eliminate the untaxed investors' arbitrage profit. Of course, this argument neglects the fact that if share prices did decline by the full value of dividend payments, high marginal tax bracket individuals could earn substantial profits by shorting the stock prior to the ex-day and closing the short position afterwards.

To explain why this arbitrage does not occur, and why share prices fall by less than dividend payments, some resort to a transactions cost analysis. The profits from the round-trip ex-day transaction might not cover the cost of trading. Kalay (1978) estimated the effective commission rate for a large round-trip transaction in a stock costing $40 per share to be about 0.2% of the share price. The deviation between a share's ex-day price movement and its dividend payment is bounded by this transaction cost:[1]

$$(\text{I.11}) \qquad \frac{D_{t+1}}{P_t} + \frac{E_t(P_{t+1})-P_t}{P_t} - \phi < \beta_i(\bar{R}_{mt+1} - \bar{r}_{0t+1}) + \bar{r}_{0t+1}$$

where ϕ is the marginal transaction cost as a fraction of share's price. This may be rewritten to bound the price change-to-dividend ratio:

$$(\text{I.12}) \qquad \left| \frac{E_t(P_{t+1})-P_t}{D_{t+1}} - 1 \right| < (\phi + \delta)\left(\frac{D_{t+1}}{P_t}\right)$$

where δ is the opportunity cost term. The deviation between the ex-dividend day

[1] This bound is different from Kalay's, because it incorporates the risk adjusted opportunity cost of the transaction. This is the right hand side of expression (I.11). For plausible values, annual R_m = .20 and $\bar{r}_0$ = .10, β_i = .6, this "opportunity cost" is .06 percent per day.

price change and -1 cannot exceed the transactions cost plus the opportunity cost divided by the payout ratio. Citizens Utilities (Class B) quarterly dividends are equal to approximately two and one half percent of share value. When this information is combined with Kalay's transactions cost data, the lower bound on the ratio of the price change to the dividend payout is about 0.90.

If the foregoing analysis correctly described the transactions costs facing investors with low marginal dividend tax rates, then they should be able to earn arbitrage profits. One explanation for the absence of this arbitrage is that holding the shares exposes the arbitrageur to some extra risk for a brief period around the ex-date. Even if most of this risk is diversifiable, achieving a fully diversified position may entail still further transactions and brokerage costs. Therefore the risk adjusted opportunity cost in (I.11) may be an understatement, and total transactions costs to the arbitrager may greatly exceed Kalay's estimate. This might imply a much lower bound on the range of admissable security price changes. For a utility stock such as Citizens Utilities, however, it is difficult to believe that the excess risk is very large.[1]

The transactions costs bound may help to explain previous findings of "clientele" effects. Auerbach (1981), Litzenberger and Ramaswamy (1982) and

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[1] Kalay's arguments also assume an infinitely elastic security supply. To reduce transactions costs, however, investors must make large transactions. Transactions which pay a commission rate of only 0.2 percent of the share price would require a volume roughly equal to one and one third times CU's average daily trading volume. If the CAPM with homogeneous expectations is replaced by one with differing beliefs, then there may be a tradeoff between reducing transactions costs with large trading volumes and inducing price changes, especially in thin securities markets. This supply curve may explain why observed ex-dividend day share price movements lie outside the transactions cost bounds.

others have found that $\frac{P_{t+1}-P_t}{D_{t+1}}$ tends to decrease (toward -1.0 and often to values such as -1.3) as the dividend payout ratio rises.[1] This is sometimes interpreted as showing that high payout stocks attract investor clienteles with low marginal tax rates. An alternative explanation focuses only on the lower bound for price movements, since

$$\text{(I.13)} \qquad \frac{E_t(P_{t+1})-P_{t-1}}{D_{t+1}} < (\phi + \delta)\frac{P_t}{D_{t+1}}$$

an increase in the dividend payout ratio tightens the bound around -1.0. Arbitrage is more profitable on firms which pay higher dividends, and this may explain the observed "clientele".

The central fact which must be reckoned with is that on the ex-day, different shares experience price changes equal to different fractions of their dividend. Numerous difficulties arise in the econometric implementation of the ex-dividend models, and one approach is to attempt to explain the findings as spurious. There has already been much debate over the measurement of expected dividends the treatment of shares which trade infrequently, and the stability of α across firms and across time. This debate will doubtless continue. In the remaining sections of this paper, I hope to cast doubt on the value of this debate. Even if we correctly measure the ex-day price effects, we may not learn a great deal about how dividend policy affects firm valuation. First, however, I must review the circumstances surrounding my "test firm", Citizens Utilities.

[1] Poterba (1983) analyzes the ex-day price changes for these high-dividend payout stocks and concludes that corporation tax preferences for dividends, and other conventional explanations of ex-day coefficients less than -1, cannot explain this phenomena.

II. Class A and Class B: The Citizens Utilities Story[1]

Two classes of Citizens Utilities shares have been traded since 1956, when the firm received an I.R.S. ruling allowing it to issue Class A common stock. Class A shares receive regular stock dividends, which are not taxed upon receipt but are subject to capital gains taxation when sold. Class B shareholders receive quarterly cash dividends which are subject to the usual tax rules. When the Class A shares were issued in 1956, existing shareholders were allowed to choose which type of equity they wanted and to redeem their outstanding shares on a one-for-one basis for either Class A or Class B shares.[2]

Several important characteristics of the two classes of equity are described below:

(i) Shares of either class carry the same voting rights, and the same priority in bankruptcy. In the event of a share split, they are split simultaneously and in the same ratio.

(ii) The corporate charter requires that "whenever a given cash dividend per share is issued to Series B shares, a stock dividend per share of equal fair value must be paid during the same calendar year to Series A shares" (Long, 1978, p. 237).

(iii) Except during the period between the declaration date of Series B dividends and their ex-date, one share of Series A stock can be converted

[1] My discussion draws heavily on Long (1978). Readers who are interested in a more detailed discussion should to consult his paper.

[2] When the two types of equity were offered, approximately three fourths of the initial stock in the firm was returned for Class A (stock-dividend) shares. See "Citizens Utilities Company", Harvard Business School Case #9-204-059 (1959) for further discussion.

into one share of Series B stock. The option is not symmetric; Series B shares cannot be converted into Series A shares.[1]

(iv) Citizens Utilities' dividend policy calls for paying only cash dividends to Series B shares, and only stock dividends to Series A shares. All Series A share dividends take the form of additional shares of Series A stock.

Shortly after the letter ruling in the CU case, the IRS reversed its position on the tax rules governing regular stock distributions. In a July 1956 "proposed regulation", the IRS indicated that it would henceforth consider stock dividends of the type issued by CU to be taxable as cash dividends. The IRS denied all further requests from corporations attempting to establish two classes of equity, making the Citizens Utilities case somewhat unique. In 1958, the IRS indicated in a letter to Citizens Utilities that it would not rescind the company's special tax status and even suggested that in the event of a Congressional amendment to the 1954 Tax

[1] The prohibition on exchanging shares between the declaration and ex-dates lies at the heart of Citizens Utilities Class A tax-exempt status. The IRS in 1956 held that when the shareholder is permitted to elect to receive [a particular dividend in cash or stock ...[that dividend] is taxed to him exactly as a cash dividend would be - as ordinary income on the receipt of shares". ("Citizens Utility Company", pp. 4-5). The 1955 Citizens Utilities Annual Report explains: "Prohibitions of conversion from Series A to Series B shares during the period between dividend declaration and record dates proscribes shareholder election during that interval in which election is significant. Conversion to JSeries B during that period would enable the converting Series A shareholder to secure the right to receive the cash dividend declared on the Series B. Obviously, if shareholders convert Series A into Series B shares at times other than the interval between dividend declaration and record dates - as they are freely able to do, under the terms of our unique two-series common stock capitalization - they obtain no rights to any individual dividend, since none has been declared. The very absence in our charter of any absolute requirement that dividends on either Series be in cash or stock, plus the banning of conversion from Series A to Series B between dividend declaration and record dates, were decisive factors in the issuance of our historic, favorable tax ruling by the Internal Revenue Service in the first place."

Code, there would probably be a "grandfather clause" protecting the Citizens Utilities exemption. When Congress finally implemented the IRS proposed regulation as part of the Tax Reform Act of 1969, it specifically allowed stock distribution plans of the Citizens Utilities type to maintain their tax-exempt status until December 31, 1990. This eliminated the uncertainty about the date at which Series A shares would lose their tax-favored status.

Two further aspects of the Citizens Utilities case deserve mention. First, the dividends on the two classes of stock are paid at different times and different frequencies. Class B shares receive quarterly cash dividends, while Class A stock distributions are made only semi-annually. These asynchronous dividend patterns give rise to movements in the relative price of Citizens Utilities shares. The relative price of Class A shares is highest just before a stock distribution and lowest just before a Class B cash dividend payment.

A more important point for later analysis is that the firm has not distributed strictly equal dividends on Class A and Class B equity. Long (1978, p. 240) reports that "in interpreting the 'equal fair value' requirement in the charter amendment, the firm has very consistently declared the semi-annual Series A stock dividends in amounts such that the market value of any given per share stock dividend is about ten percent greater than the cash dividends per share on Series B stock in the corresponding half year".

Table I displays the annual average price and dividend payment for Class A and Class B shares for the last decade. The average dividend payment on Class A

TABLE I

CU Share Price Statistics

	Class A		Class B		
Year	Average Price	Dividends Paid	Average Price	Dividends Paid	Average Price (Class A/Class B)
1972	37.47	1.56	34.20	1.37	1.099
1973	36.81	1.71	35.18	1.60	1.046
1974	25.64	1.96	25.25	1.76	1.018
1975	28.31	2.10	26.86	1.88	1.055
1976	32.73	2.22	30.16	2.00	1.085
1977	36.49	2.35	32.75	2.14	1.115
1978	37.53	2.58	33.43	2.34	1.123
1979	37.87	2.93	33.18	2.56	1.144
1980	35.23	3.10	30.29	2.74	1.167
1981	32.85	3.35	29.80	2.92	1.104
1982	37.08	1.67*	33.74	1.54*	1.099

*For only the first half of 1982

Notes: Dividend value for stock distributions was computed using the procedure outlined by Long (1978). Data provided courtesy of Data Resources, Inc. The prices reported in the relative prices of Class A and Class B shares which take place during the year.

shares was 1.12 times that on Class B shares.[1] The average relative price of Class A shares, in terms of Class B shares, was 1.10. The stock market value of Class A shares is therefore slightly less than would be expected if the shares were priced in proportion to their dividend payments. There is substantial variation in the two share's relative prices over the investigation period. Class A share prices have averaged as much as sixteen percent greater than Class B during a one year period, and the two have at other times been separated by only a two percent differential. The relative price of Class A shares rose through the mid-1970's, peaking in 1980.[2]

Some explanation of the dividend payment differential can be found in early descriptions of the Citizens Utilities dual capitalization plan:

> The size of the stock dividend, Mr. Rosenthal said, will be calculated by taking the market price of CU common shares on the day the dividend is declared; this price would be reduced by the estimated amount the shares would drop in value if all shareholders receiving dividends in stock turned around and sold them on the market. The depressed price is then divided into the size of the cash dividend, and the resulting figure is the fractional share of stock to be paid in place of cash. [Wall Street Journal, 5 January 1956, p. 15].

The notorious difficulty in predicting the amount by which share prices will change in response to large trading volume makes challenging the company's interpretation of "equal fair value" a delicate matter.

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[1] The value of Class A dividends was computed following Long (1978) as $\frac{\delta}{1+\delta} P_{DEC}$, where δ = fractional share distribution per existing share and P_{DEC} is the share price on the declaration date. If an investor owning N shares were to sell $\frac{\delta}{1+\delta}$ N shares before the ex-date he would receive a stock dividend at rate δ on holdings of $(1-\frac{\delta}{1+\delta})N$ shares. His position after the ex-day is therefore $(1+\delta)(1-\frac{\delta}{1+\delta})N = N$, so he retains the same number of shares as before.

[2] I shall not speculate as to whether this reflects the gradual dissemination of the information in John Long's 1978 paper.

The practice of marking-up the current spot price in declaring stock dividends is a common practice. It is designed to protect shareholders against sudden price movements, possibly caused by block trading.

Moreover, it is clearly in the company's interest to pay higher dividends on Class A shares. If the price of A shares were to remain substantially below the price of B shares for an extended period, there would be pressure to convert A shares to B shares for an arbitrage profit. However, the conversion away from Class A would deny CU its pool of retained earnings and subject it increased cash dividend demands. To avoid this conversion risk, the managers might attempt to pay higher dividends on Class shares.[1]

III. The Ex-Dividend Behavior of CU Share Prices

III. A. Standard Ex-Dividend Tests.

The ex-dividend day price behavior of CU shares was investigated using daily data on the closing prices of Series A and Series B shares for the period January 7, 1972 to October 5, 1982. There were a total of 2,697 observations on closing prices during this period.[2] Class A shares declared 21 dividends, while Class B

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[1] Most of the shares outstanding are Class A shares: 82.3%. This would give a policy which explicitly reduced the value of Class B shares support from a majority of the shareholders, but its illegality under the terms of the company charter would probably make any explicit policy impossible.

[2] Almost all ex-day studies are plagued by non-availability of data on transactions prices. By using closing prices, we run the risk of interpreting for example, movements from one side to another of the 'bid-ask spread" as an ex-day price change. However, as I show in the Appendix, these difficulties lead an errors-in-variable problem which may be treated by using instrumental variables estimators.

shares went ex-dividend 43 times. The larger number of ex-dates for the cash distribution shares is due to their quarterly payout policy.

To begin my investigation, I estimated simple equations of the type found in previous ex-day studies:

$$\text{(III.1)} \quad \frac{P_t - P_{t-1}}{P_{t-1}} = \beta_0 + \beta_1 \frac{D_t}{P_{t-1}} + \beta_2 R_t^{mkt} + \varepsilon_t$$

where R^{mkt} is the one-day market return, measured by the one day change in the value of the NYSE composite stock price index.[1] In this equation, β_2 will estimate $\frac{Cov(R_{CU}R_{MKT})}{Var\ (R_{MKT})}$ while β_1 estimates α^{CU}.

Ex-dividend equations were estimated for both classes of CU shares, and are reported in Table II-A. Payment of a one dollar dividend on the stock-distribution shares reduces their price by about ninety cents. By comparison, the cash distribution share price seems to decline by only about seventy six cents when a one dollar dividend is paid. This finding is consistent with the predictions of the "tax effects" hypothesis, since the price change is smaller for the taxable dividend payments than for the tax-free share distributions. However, the difference is not very large.

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[1] Since there may be a nontrading problem in share prices, as outlined by Scholes and Williams (1977), I have included both the current and the one-period lagged value of the market return. While the findings with respect to ex-dividend coefficients do not charge substantially when the lagged market return is included, the coeffient on this variable is significantly different from zero and I have therefore kept it in the specifications.

The market return is included in ex-dividend day price equations such as (III.1) in order to measure the change in a share's price which is attributable to systematic market forces. A more accurate indicator of the systematic forces affecting each class of Citizens Utilities shares is readily available, however: it is the return on the <u>other</u> class of CU stock. To explain changes in the price of Class A shares, therefore, I use a specification such as

$$\text{(III.2)} \quad \frac{P_t^A - P_{t-1}^A}{P_{t-1}^A} = \beta_0 + \beta_1 \frac{D_t^A}{P_{t-1}^A} + \beta_2 \cdot R_t^{mkt} + \beta_3 \cdot R_t^B + \epsilon_t$$

where superscripts A or B refer to the different share classes and R_t^B is the return on Class B shares, measured as the price change plus the dividend payout. Once again I include lagged values of R^{mkt} and R^B to treat non-trading effects. Results of estimating these specifications are reported in Table II-B, and are only slightly different from the findings with specification (III.1). The estimated ex-dividend coefficient for Class B shares rises to -.755, while that for Class A falls to -.947. The difference between these two coefficients is barely significant at the 95% confidence level.

There is a puzzle in these findings, however. The coefficient on the "other return" variables, β_3 of (III.2), is substantially less than one for both shares. One explanation for this finding may be that share prices are measured with error, inducing a classical errors-in-variables bias which forces the coefficients closer to zero. I expected the returns on the two shares to be very close to equal; after imposing this restriction, I obtained the following estimates:

TABLE II-A

Ex-Dividend Day Share Price Regressions

Equation	Dividend Type	Constant ($x 10^{-4}$)	$(\frac{D_t}{P_{t-1}})$	R_t^{Mkt}	R_{t-1}^{Mkt}	R^2	SSR	SEE
1.	Cash	3.20 (2.39)	-.780 (.106)	--	--	.020	.408	.012
2.	Cash	2.70 (2.32)	-.761 (.103)	.248 (.027)	.180 (.026)	.077	.383	.011
3.	Stock	.46 (1.77)	-.755 (.078)	.065 (.021)	.040 (.020)	.459	.224	.099
4.	Stock	.52 (1.78)	-.760 (.079)	--	--	.456	.226	.009

Notes: The dependent variable is the share price change on the ex-dividend day, as a fraction of the preceeding day's price, $(P_t - P_{t-1})/P_{t-1}$. The equations are estimated using daily data for the period 1972:007 to 1982:301, for a total of 2697 observations. The estimates were computed using two-stage least squres; for further discussion, see the appendix. Standard errors are shown in parenthesis. For further data description, see the text.

TABLE II-B

Ex-Dividend Day Share Price Regressions

Equation	Dividend Type	Constant (x 10^{-4})	$(\frac{D_t}{P_{t-1}})$	R_t^{Mkt}	R_{t-1}^{Mkt}	$R_t^{other\ CU}$	$R_{t-1}^{other\ CU}$	R^2	SSR	SEE
1.	Cash	.46 (1.77)	-.753 (.079)	.065 (.021)	.035 (.020)	.627 (.014)	.012 (.014)	.460	.224	.099
2.	Cash	.52 (1.78)	-.756 (.079)	--	-- (.014)	.641 (.014)	.017	.457	.226	.009
3.	Stock	1.20 (1.84)	-.946 (.058)	.131 (.021)	.096 (.021)	.652 (.015)	.035 (.015)	.485	.236	.009
4.	Stock	1.35 (1.83)	-.957 (.058)	--	--	.681 (.015)	.046 (.015)	.471	.242	.009

Notes: The dependent variable is the share price change on the ex-dividend day, as a fraction of the preceding day's price, $(P_t-P_{t-1})/P_{t-1}$. The equations are estimated used daily data for the period 1972:007 to 1982:301, for a total of 2697 observations. The estimates were computed using two-stage least squares; for further discussion, see the appendix. Standard errors are shown in parenthesis. For further data description, see the text.

$$\text{(III.3)} \quad \frac{P_t^A - P_{t-1}^A}{P_{t-1}^A} - R_t^B = \underset{(1.99)}{-.23} - \underset{(.063)}{.984} \frac{D_t^A}{P_{t-1}^A} \qquad R^2 = .0826 \quad SSR = .2821$$

and

$$\text{(III.4)} \quad \frac{P_t^B - P_{t-1}^B}{P_{t-1}^B} - R_t^A = \underset{(1.98)}{-.97} - \underset{(.087)}{.748} \frac{D_t^B}{P_{t-1}^B} \qquad R^2 = .0261 \quad SSR = .2812$$

These findings suggest that Citizens Utilities shares behave in a fashion which is consistent with the tax-effects hypothesis. Shareholders appear to value taxable cash distributions less than they value tax-free stock distributions.[1]

These findings provide evidence against Black and Scholes' (1973) claim that one reason the market values dividends is because some types of return streams could only be obtained by purchasing shares which pay dividends. Because of their attractive diversification properties, investors might hold dividend shares in spite of their payout policy. This cannot explain the demand for Citizens Utilities Series B shares. Any individual who faced a higher tax rate on dividend income than on capital gains could obtain the return stream corresponding to Citizens Utilities without bearing the dividend tax liability. The non-zero implicit marginal tax rate on cash dividends, however, may suggest

[1] In their analysis of ex-day share price movements, Black and Scholes (1973) found that while there were excess returns to shares on their ex-dividend day, these returns disappeared if the holding period was extended to include several days before and after the ex-date. When my equations were re-estimated for holding periods of 20 and 40 days the ex-day coefficients were unstable and sometimes reversed the pattern found on the ex-day.

that some investors choose to hold the tax dis-favored shares to obtain the benefit of steady dividend income.

As a final test of the ex-dividend day behavior of CU shares, I attempted to learn whether on the ex-days of Class A shares, the price of Class B shares exhibited any unusual behavior. I examined this proposition by including the dividend payments of both shares in the regressions explaining each share's price movements. The results are reported in Table III. Except in one case, there appears to be no systematic effect of one share's dividends on the other's price movements. A large and statistically significant effect occurs when the price behavior of Class A shares is being explained by the total return on Class B shares. The estimated coefficient on $\left(\frac{D_t^B}{P_{t-1}^B}\right)$ is significantly negative, -.183. However, this is not a finding that ex-dividend days for Class B shares affect Class A share prices. Rather it reflects the earlier finding that in computing the return on Class B shares, the market assigns a lower value to cash dividend distributions than to capital gains. Thus, the finding just says that in constructing a measure of Series B returns, the appropriate specification is

$R_t^B = \frac{P_t^B - P_{t-1}^B}{P_{t-1}^B} + .8 \frac{D_t^B}{P_{t-1}^B}$. Thus, the α for Class B shares is about .80.

TABLE III

Cross-Share Ex-Day Price Effects

Equation	Dividend Type	Constant ($\times 10^{-4}$)	$(\frac{D_t}{P_{t-1}})$	$(\frac{D_t}{P_{t-1}})$ other CU	R_t^{Mkt}	R_{t-1}^{Mkt}	$R_t^{other\ CU}$	R^2	SSR	SEE
1.	Cash	2.96 (2.39)	-.779 (.106)	.089 (.075)	--	--	--	.021	.407	.012
2.	Cash	2.42 (2.32)	-.759 (.103)	.103 (.074)	.248 (.026)	.180 (.027)	--	.078	.386	.012
3.	Cash	.39 (1.74)	-.755 (.079)	.028 (.056)	.065 (.021)	.041 (.021)	.627 (.014)	.459	.224	.009
4.	Cash	.45 (1.78)	-.759 (.078)	.022 (.056)	--	--	.643 (.013)	.456	.226	.009
5.	Stock	3.88 (2.42)	-.898 (.079)	-.031 (.109)	--	--	--	.047	.436	.013
6.	Stock	3.24 (2.38)	-.882 (.075)	-.007 (.105)	.292 (.027)	.223 (.027)	--	.121	.401	.012
7.	Stock	1.65 (1.82)	-.949 (.058)	-.165 (.081)	.128 (.021)	.105 (.021)	.658 (.015)	.485	.235	.009
8.	Stock	1.85 (1.85)	-.959 (.056)	-.183 (.082)	--	--	.689 (.015)	.471	.242	.009

Notes: Dividend value for stock distributions was computed using the procedure outlined Long (1978). Equations were estimated using the instrumental variables procedure outlined in the appendix. Data provided courtesty of Data Resources, Inc.

In a similar spirit, I regressed the difference in the two shares' returns on their dividend payouts. Such a specification could be derived from the after-tax CAPM by using one share's return to substitute out the market risk variables. Since both series of CU shares possess identical risk theoretically profiles, their risk-adjusted after tax returns should be the same. My estimates are shown below.

$$R_t^A - R_t^B = \underset{(.0000)}{.0001} - \underset{(.088)}{.252}\frac{D_t^B}{P_{t-1}^B} + \underset{(.063)}{.014}\frac{D_t^A}{P_{t-1}^A}.$$

While there is clear evidence that dividends paid on Class B shares must be "devalued", so that α for Class B is less than one, the hypothesis that dividends and capital gains on Class A shares receive equal weight cannot be rejected. These findings confirm the large body of pre-existing ex-day literature, and lead inexorably to the usual conclusion that CU could raise its market value by cutting its dividend on Class B shares.

III. B. Some Econometric Issues.

All of the preceding equations have been estimated under the standard assumptions of the general linear model. However, the stochastic process generating share price movements may not satisfy these assumptions. The particular issues which I shall focus or involve changes over time in the variance of returns. If prices are more volatile around event days than on non-event days, the coefficient standard errors reported by least squares will be inappropriate for making inferences about the ex-day model. Because these standard errors are computed using the average residual variance over the entire data sample, they will not reflect the greater uncertainty which attaches to price movements around ex-dates. If all of the events whose effects we wish to measure occur during these periods of abnormal volatility, our confidence in the results must be smaller than it would be if the events occurred in other, lower return variance periods.

This problem is a form of heteroscedasticity since the residual variance is related to one of the independent variables, the dividend payout. To explore its importance, I regressed the squares of residuals from the equatioss in Table II-B on a dummy variable corresponding to the ex-dividend day:

$$\text{Class A shares:} \quad e_t^2 = \underset{(.047)}{.822} + \underset{(.535)}{.890}\ \text{EXDAYA}$$

$$\text{Class B shares:} \quad e_t^2 = \underset{(.053)}{.827} + \underset{(4.29)}{.440}\ \text{EXDAYB}$$

The return variance on ex-days is larger for both shares; for Class A shares, it is more than twice as great as the residual variance on non-ex-days. Class B returns display a somewhat less pronounced increase, about fifty percent. A general test against heteroscedasticity, proposed by White (1980), was also computed for each return equation by regressing the squared residuals on the set of independent variables. The tests resoundingly rejected the null hypothesis of homoscedastic errors.[1]

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[1] The calculated statistics are TR^2 from the regression of e_t^2 on the explanatory variables in the returns model for the Class A and Class B equations, respectively. These statistics are distributed as χ_6^2 under the null of homoscedasticity; the 99% confidence value is 16.81. The actual test values were between 30 and 90.

.The finding of substantial heteroscedasticity led me to re-estimate the standard errors for the returns equations using White's (1980) heteroscedasticity-consistent procedure. The resulting equations, with both OLS and White-consistent statndard errors, are shown below:

$$\left(\frac{\Delta P_t}{P_t}\right)^A = 1.11 - .946 \left(\frac{D}{P}\right)_t^A + .652\ R_t^B + .035\ R_{t-1}^B + .131\ R_t^M + .095\ R_{t-1}^M$$

	Constant	$(D/P)_t^A$	R_t^B	R_{t-1}^B	R_t^M	R_{t-1}^M
	(1.81)	(.058)	(.015)	(.015)	(.021)	(.021)
White Standard Errors	(1.80)	(.083)	(.036)	(.028)	(.027)	(.025)

$$\left(\frac{\Delta P_t}{P_t}\right)^B = .463 - .753 \left(\frac{D}{P}\right)_t^B + .627\ R_t^A + .012\ R_{t-1}^A + .065\ R_t^M \quad .036\ R_{t-1}^M$$

	Constant	$(D/P)_t^B$	R_t^A	R_{t-1}^A	R_t^M	R_{t-1}^M
	(1.78)	(.078)	(.015)	(.014)	(.020)	(.021)
White Standard Errors	(1.80)	(.088)	(.030)	(.020)	(.026)	(.024)

While all but one of the estimated standard errors increase, the effect on the dividend payout's precision is particularly pronounced. The standard error in the Class A equation increases by nearly fifty percent; that in the model for Class B returns rises by a smaller amount. After making these corrections the difference between the ex-dividend coefficients on Class A and Class B shares remains statistically significant at a 10%, but not a 5%, confidence level. However, the implications of excess volatility around event days extend far beyond the present study. If this proves to be a general tendency in security returns data, then many conclusions and inferences based on previous studies may require re-examination.

A second pattern which I discovered in the residuals from my return model was persistence of excess volatility. Days on which returns were unusually noisy were, on average, followed by days with highly variable price movements. This can be seen from the following residual-square regressions:

$$\text{Class A: } e_t^2 = \underset{(.051)}{.472} + \underset{(.512)}{.726}\ \text{EXDAYA} + \underset{(.019)}{1.94}\ e_{t-1}^2 + \underset{(.020)}{.072}\ e_{t-2}^2 + \underset{(.020)}{.080}\ e_{t-3}^2 + \underset{(.020)}{.073}\ e_{t-4}^2 + \underset{(.019)}{.034}\ e_{t-5}^2$$

$$\text{Class B: } e_t^2 = \underset{(.583)}{.497} + \underset{(.423)}{.488}\ \text{EXDAYB} + \underset{(.019)}{.108}\ e_{t-1}^2 + \underset{(.019)}{.077}\ e_{t-1}^2 + \underset{(.119)}{.089}\ e_{t-3}^2$$

Only lagged values which were statistically significant were retained in these equations. Serial correlation in the residual variances can make ordinary least squares estimation highly inefficient.[1] Perhaps more importantly, however, persistence in security return variances may require modifications in standard option pricing and other security valuation rules.

IV. Transactions Volume around the Ex-Date

Tax arbitrage around ex-dividend days may change the firm's clientele, thereby reducing the effective tax rate on the firm's dividends. If this arbitrage were taking place, then it should be detectable from a study of the trading volume in CU shares. Green (1980) studied shares in the Dow Jones index and found some evidence of unusual trading activity around ex-dates, particularly "acceleration" of trades. Volume seemed unusually high on the few days preceeding the ex-date. Volume tests should play a major role in future ex-day investigations, since they provide one of the few mechanisms for understanding whether firms actually face stable shareholder clienteles.

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[1] Engle (1982) discusses these problems, which he refers to as "Autoregressive Conditional Heteroscedasticity," and demonstrates in some cases OLS becomes infintely inefficient relative to maximum likelihood. While procedures for estimating models with ARCH exist, I have not yet explored their application.

To examine CU volume fluctuations, I estimated two regression models. The first, based on Green's approach, focussed only on trading activity within one week of the ex-date:

$$\text{(IV.1)} \quad VOLUME_t = \delta_0 + \delta_1\ EXDIVA_{-2} + \delta_2\ EXDIVA_{-1} + \dots + \delta_5\ EXDIVA_{+2} + \pi_1\ EXDIVB_{-2} + \pi_2\ EXDIVB_{-1} + \dots + \pi_5\ EXDIVB_{+2} + \psi_1\ NYSEVOL_t + \varepsilon_t$$

VOLUME is the transactions volume in either Class A or Class B shares, EXDIVA and EXDIVB are indicator variables for ex-dividend dates, and NYSEVOL is the trading volume on the New York Stock Exchange.[1] The δ_i and π_i coefficients measure the deviation of volume from its average level, where $EXDIVA_{-2}$ for example is an indicator variable for days which are two trading days before the ex-day.

The results of estimating this model for the period 1972-1982 are shown in Table IV. Although each type of share is unusually active on its ex-date, the volume differences above normal are not statistically significant. The stock distribution (Class A) shares experience volume eighteen percent above average on their own ex-dates, and Class B shares' volume is up by about 22% on their ex-date. These effects are substantial, even if statistically insignificant. I

[1] NYSE volume is at best an imperfect proxy for the actual volume on the OTC exchange.

Table IV: Volume Around Ex-Dates

Equation	Type of Share	Constant	Number of Days Until Ex-Date: Series A Shares (-2)	(-1)	0	(+1)	(+2)	Number of Days Until Ex-Date: Series B Shares (-2)	(-1)	0	(+1)	(+2)	NYSE Vol	R^2	SEE
1	Cash distribution	11.66	-	-	-	-	-	-	-	2.54	-	-	-.121	.0006	1308
		(.25)								(2.03)			(.597)		
2	Cash distribution	11.66	-	-	1.72	-	-	-	-	2.56			-.121	.0007	1308
		(.25)			(2.86)					(2.03)			(.598)		
3	Cash distribution	11.63	-.63	-1.06	1.74	-1.16	-1.01	-.05	1.17	2.57	-.40	2.00	-.118	.0014	1511
		(.27)	(2.8)	(2.8)	(2.8)	(2.8)	(2.8)	(2.04)	(2.04)	(2.04)	(2.04)	(2.04)	(.605)		
4	Stock distribution	33.59	-	-	6.06	-	-	-	-	-	-	-	-.374	.0005	2512
		(.48)			(5.50)								(1.147)		
5	Stock distribution	33.65	-	-	5.99	-	-	-	-	-4.00	-	-	-.376	.0009	2512
		(.48)			(5.50)					(3.91)			(1.147)		
6	Stock distribution	33.57	-.43	8.08	6.07	1.56	1.12	6.32	-1.44	-3.92	-3.17	-3.03	-.662	.0032	2513
		(.51)	(5.50)	(5.50)	(5.50)	(5.50)	(5.50)	(3.95)	(3.91)	(3.91)	(3.17)	(3.17)	(1.161)		

<u>Notes:</u> All coefficients are x 100. The dependent variable is the daily trading volume in explanatory variables are indicator variables for ex-dividend dates, and the volume on the

$$\text{CU shares volume} = \delta_o + \psi_1 \cdot \text{NYSE volume} + \sum_{i=-2}^{2} \delta_i \cdot \text{EXDIVA}(i) + \sum_{i=-2}^{2} \pi_i \cdot \text{EXDIVB}(i) + u$$

where, for examaple, EXDIVA(+i) is a dummy variable indicating that the current date is i days from the ex-date for Series A shares.

also explored the "cross-effects" of one share's ex-date on the other share's volume. While ex dates for Class A shares seems to raise Class B share volume, the reverse appears to be true on Class B distribution days: Class A volume declines. There is no pronounced volume pattern before and after the ex-dates.

There are two difficulties with this simple volume model. First, our attention should not be confined only to the few days around the ex-date. There are sound reasons for activity to increase far in advance of the ex-date. For example, corporate dividend receipts are eligible for the 35% tax exemption only if the corporation has held the shares for a period of more than 15 days before the ex-date. This might lead to excess trading 16 days before the ex-day. The second problem is that when trading volume rises for a period of several days, it may be impossible to identify an increase on any particular day around the ex-date but easy to find a sizable "week before" effect. These concerns led to an alternative specification designed to capture trading movements further from the ex-date:

$$(IV.2) \quad VOLUME = \delta_0 + \delta_1\ EXDIVA_{(-1\ to\ -10)} + \delta_2\ EXDIVA_{(-11\ to\ -20)} + \delta_3\ EXDIVA_{(+1\ to\ +10)} + \delta_4\ EXDIVA_{(+11\ to\ +20)} + \pi_1 EXDIVB_{(-1\ to\ -10)} + \cdots + \pi_4\ EXDIVB_{(+11\ to\ +20)} + \phi_1 NYSEVOL + \varepsilon .$$

The indicator variables on the right hand side now correspond to ten day <u>intervals</u> around the ex-date.

The results of estimating (IV.2) are reported in Table V. There is some evidence of unusual trading activity in Series A shares. Trading appears to be about nine percent above usual in the twenty days before the ex-date for Class A

TABLE V

Additional Volume Specifications

Variable	Equation 1 (Cash Distribution)	Equation 2 (Stock Distribution)
Constant	11.82 (.42)	32.86 (.59)
EXDIVA (-20 to -11)	-.23 (.95)	2.69 (1.82)
EXDIVA (-10 to -1)	-.16 (.95)	2.71 (1.82)
EXDIVA (0)	1.71 (2.88)	6.79 (5.49)
EXDIVA (1 to 10)	.95 (.95)	-.79 (1.82)
EXDIVA (11 to 20)	-.11 (.95)	2.93 (1.82)
EXDIVB (-20 to -11)	-.85 (.77)	-3.01 (1.47)
EXDIVB (-10 to -1)	.76 (.77)	-2.14 (1.47)
EXDIVB (0)	2.51 (2.09)	-4.05 (3.98)
EXDIVB (1 to 10)	-.03 (-.76)	2.04 (1.46)
EXDIVB (11 to 20)	.84 (.77)	1.59 (1.46)
NYSE Volume	-1.27 (.600)	-.476 (1.14)
R^2	.004	.005

Notes: Both equations are estimated for the period 1972:007 - 1982:270 using daily data on the volume of each share's trading. The explanatory variables are dummy variables for periods around the ex-date. For example, EXDIVA (-20 to -11) is 1 on days which are between 20 and 11 trading days before the ex-date of Class A shares.

stock. This effect is statistically significant at the 95% level. Similarly, activity is almost ten percent below normal in the twenty days preceeding an ex-date for Series B shares. Trading in Class A shares rises after the Series B ex-date.

Class B shares exhibit much less unusual trading activity around ex-dates. Almost all of the indicator variables' coefficients are substantially less than their standard errors. In addition, the coefficients are small; even if they were precisely estimated, they would not suggest particularly substantial volume movements. The absence of Class B trading undermines the "tax arbitrage" theory of ex-day behavior. While there should be trading around the ex-date for shares with taxable distributions, there is no evidence that this trading actually occurs for Citizens Utilities. The excess trading volume for Class A shares is puzzling, since there are few tax advantages to be gained by trading around the ex-date.

One explanation for the absence of trading activity is CU's size. While Citizens Utilities is monitored by Value Line and several investment firms, and there is some interest in CU for its unique capitalization, it does not appear to attract active trading interest in many firms.[1] This may reflect a thin market for the firm's shares, and may suggest that any attempts to take advantage of arbitrage profits would result in substantial share price changes and thereby become unprofitable.

While trading volume data show no clear signs of changes in the firm's clienteles around ex-dividend days, it is still of some interest to examine the

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[1] The 1982 Directory of Security Research lists only one analyst as a contact for Citizens Utilities, and she informed me in a telephone interview that she does not actively follow the company's shares. I also learned that the company is rarely traded by institutional investors, and that its primary market consists of "retail investors".

shareholder composition of Class A and Class B shares. Unpublished data, provided by Citizens Utilities, disaggregating shareholders into several categories is shown in Table VI. Interpretation of shareholder information such as this must proceed cautiously, since many of the "brokers" holdings are probably beneficial holdings which should ultimately be assigned to individuals or institutions. There is some evidence that individuals hold a larger fraction of the outstanding Class A than Class B shares. Nominees and Institutions hold a smaller amount of the A shares. In addition, the individuals holdings of A shares are in substantially larger blocks than the B shareholdings. The investment value of the typical individual A-shareholders' position is roughly two and one half times the size of the average Class B shareholding.

Some further insights into the role of the tax clienteles in the stock market derives from the shareholder survey conducted by CU's Chairman, Richard Rosenthal, in 1955. Shareholders were asked which type of dividend policy they preferred: all stock, all cash, or a mix of the two. Sixty eight percent of the shareholders participated in the survey; of the respondents, 55% voted for all-stock dividends, 38% for the half stock-half cash plan, and 7% desired all cash dividends.[1] However, Business Week reported

> The all-cash minority is a powerful one because its shares are concentrated in large blocks in the hands of a few investment trusts and other institutional investors. Its preference is one reason why

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[1] Shareholding-weighted percentages calculated by Business Week, 14 January 1956, p. 107.

James Poterba
Working Paper #1131

Table Six: Clienteles in Citizens Utilities Shares

	Class A Shares (Stock Dividend)	Class B Shares (Cash Dividend)
Number of Outstanding Shares (million)	14.574	3.125
Fraction of Shares Held By:		
Individuals	.646	.541
Fiduciaries	.065	.070
Brokers and Nominees	.289	.389
Average Hodling Size: (Number of Shares)		
Individuals	963.60	392.50
Fiduciaries	587.00	389.10
Brokers and Nominees	13,366.00	5,547.10

NOTES: Data were kindly provided by the Illinois Stock Transfer Company, after Mr. Richard Rosenthal, Chairman of the Board of Citizens Utilities, granted me access to these statistics.

James Poterba
Working Paper #1131

Table II-A

Ex-Dividend Day Share Prices Regressions

Equation	Type	Constant (x 10^{-4})	$(\frac{D_t}{P_{t-1}})$	R_t^{Mkt}	R_{t-1}^{Mkt}	R^2	SSR	SEE
1.	Cash	3.20 (2.39)	-.780 (.106)	--	--	.020	.408	.012
2.	Cash	2.70 (2.32)	-.761 (.103)	.248 (.027)	.180 (.026)	.077	.383	.011
3.	Stock	3.80 (2.46)	-.900 (.078)	--	--	.046	.436	.013
4.	Stock	3.22 (2.37)	-.882 (.074)	.292 (.027)	.223 (.027)	.121	.402	.012

Notes: The dependent variable is the share price change on the ex-dividend day, as a fraction of the preceeding day's price, $(P_t - P_{t-1})/P_{t-1}$. The equations are estimated using daily data for the period 1972:007 to 1982:301, for a total of 2697 observations. The estimates were computed using two-stage least squares; for further discussion, see the appendix. Standard errors are shown in parenthesis. For further data description, see the text.

> stockholders are getting the choice of a cash-paying as well as a stock-paying category. [Business Week, January 14, 1956, p. 107].

These bits of anecdotal evidence suggest that stock market clienteles may exist. However, the fact that many CU shareholders in 1955 wished to receive both cash and stock dividends is difficult to reconcile with rational behavior taking account of taxes.[1]

V. Pinpointing the Paradox

Ex-day price changes for Citizens Utilities shares suggest that investors value taxable cash dividends less than they value non-taxable distributions. However, the relative prices of the two classes of equity do violence to these predictions. While the ex-day evidence suggests that after adjustment for different levels of dividends the taxable dividend shares should sell for about twenty percent less than the nontaxable shares, their average price during the last 10 years has been two percent greater than the price of Class A shares. The paradox is that the ex-day behavior of the two shares is inconsistent with their relative prices. On days between dividend payments, the return on Class B shares must be lower than the return on Class A shares. This is a significant result, suggesting that the rate of return which investors demand on different shares may depend upon their dividend policy, even on days when no dividends are paid. Findings such as this are difficult to reconcile with standard theories of asset pricing.

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[1] Some institutions such as pension funds might face identical (zero) tax rates on both sources of income. However, their CU shareholdings are substantially below the fraction of investors who voted for a half-and-half policy in 1955. The annual reports often reveal letters from investors who hold both classes of CU shares ("one for dividends, one for capital appreciation.") This is also difficult to square with strict tax-clientele theories.

Before drawing conclusions from the CU case, it is important to explore any features of the two shares which could explain their paradoxical prices. First, the eventual expiration of Series A shares' dividend tax exemption could affect the shares' relative prices. While the difference between Class A and Class B ex-day price movements should reflect the difference between marginal dividend and capital gains tax rates, the difference between the share prices should reflect the discounted value of the tax savings. For example, if the two shares were identically taxed on all dividend payments except one, then prices would be almost the same but they might experience widely different changes, as a fraction of their dividend, on that dividend ex-day.

Assuming that the Class A shares' tax exemption will be eliminated in 1990,[1] we can calculate the value of each share.

$$(V.1) \qquad P_t^A = \int_t^{1990} D_s^A \, e^{-r(s-t)} ds + \int_{1990}^{\infty} \alpha \, D_s^A \, e^{-r(s-t)} ds \text{ and}$$

$$(V.2) \qquad P_t^B = \int_t^{\infty} \alpha \, D_s^B \, e^{-r(s-t)} ds$$

where α is the market's relative value of dividends and capital gains. If $D_s^A = \kappa D_s^B$, for $\kappa = 1.10$ in the Citizens Utilities case, then

$$(V.3) \qquad \frac{P_t^A}{P_t^B} = \kappa + \frac{\int_t^{1990} (1-\alpha) \, D_s^A \, e^{-r(s-t)} ds}{P_t^B} = \kappa\left[1 + \frac{(1-\alpha) D_t^B}{P_t^B} \int_t^{1990} e^{(g-r)(s-t)} ds\right]$$

where g is the growth rate of Class A dividends. The relative price of the two shares should approach κ as the date of expiration nears.[2] We would predict that

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[1] There is some chance that Congress will choose to extend the grandfather clause, allowing CU a tax exemption after 1990.

[2] If on expiration the two shares become identical so that there could be no differences in dividends, then the price ratio would approach unity.

the prices of Class A and Class B shares would have become closer in the last 10 years, However, as Table I shows, the prices have in fact diverged during the last few years. This is prima facie evidence against the prospect of tax-exempt-expiration driving the price movements.

Further evidence comes from evaluating the relative price in expression (V.3). Assuming that Class A dividends will rise at 8 percent per year until 1990, treating $\alpha = .75$, the payout rate on Class B shares as 10 percent, and assuming an after-tax nominal discount rate r of .10, the 1982 relative price of Class A and Class B shares would be 1.32. The observed 1982 price ratio is 1.10, which is substantially less than the calculations predict. The importance of this calculation is that the two shares' similar prices cannot be attributed solely to the expected expiration of Series A's tax exemption.

An alternative explanation of the share's equal valuation is that investors fail to perceive the tax system's important role. This seems unlikely since the annual report for each year contains a discussion of the advantages of "unique Two-Series Capitalization". The 1981 Report, for example, explains that:

> Series B shares meet the needs or desires those investors to whom conventional cash dividends are attractive, because their circumstances are such that they pay modest to no taxes on them. Our Series A shares have particular attraction to those investors whose purpose is to compound their investment at no additional cash cost and without taxation during the compounding period. [Citizens Utilities (1981), p. 46].

Investors who study the corporate documents should be aware of the tax issues surrounding choice of share type, and ignorance should not explain the price behavior.

The clienteles, as discussed in the last section, might provide a partial explanation. The puzzle for any clientele theory is why observed ex-day price changes appear to suggest that Class B dividends are worth only seventy five percent of their nominal value. Some investors are paying a substantial tax price for the priviledge of receiving cash distributions. Clienteles should form readily in CU shares since the problem of finding equivalent-risk high and low payout stocks does not arise. Both classes of shares should be equally risky, so investors should be able to choose the income stream which they prefer for tax or other reasons, without concern for risk differentials.

The central result of comparing these shares is that even if clienteles have formed for the two shares, they have not completely eliminated the tax arbitrage opportunities. One explanation of this phenomenon which should not be ignored is that Citizens Utilities is too small to make tax arbitrage a highly profitable activity. Investors who specialize in exploiting these tax differentials may focus on stocks which admit large positions with relatively small changes in price. This may not be possible for Citizens Utilities.

Conclusions

A burgeoning literature has focussed on the accurate measurement of ex-day price effects, but there have been few attempts to assess the value of these investigations. The Citizens Utilities paradox raises substantial doubts concerning the usefulness of ex-dividend day share price studies. While the stock market's valuation of the dividends paid by the two classes of shares is quite different, its valuation of the two shares is almost identical. This suggests that using ex-day studies to draw inferences about the effect of alternative dividend policies, or dividend tax regimes, on share values can be misleading. The results also call into question the extent to which tax arbitrage affects ex-day price changes. For one class of Citizens Utilities shares, ex-day price movements are substantially less than the value of dividends.

The findings suggest some leads for the explanation of corporate dividend policy. "Signalling" theories cannot explain the premium on Class B shares, since the payment of cash dividends on Class B shares can be observed by both Class A and Class B shareholders. Owners of the taxable dividend shares acquire no more information than owners of stock-dividend shares. The most plausible explanation of the relative price behavior of CU shares rests on a fundamental preference, by some classes of investors, for cash dividends. For some small investors, this preference may be due to current consumption needs and the high transactions costs associated with small portfolio liquidations. Other investors, trusts and some institutions, may value current income more than capital appreciation. Studies of how important these investors are should constitute a substantial part of the future research program on dividend payout.

APPENDIX

Stochastic Specification in Share Price Models

Share transactions take place in units of eighths of a dollar. At any moment, a security's recorded price is not its market clearing price. The market clearing prices and recorded prices are linked by a "measurement error" attributable to round-price trading:

$$(1)\quad P_t = P^*_t + \varepsilon_t$$

where P_t is the recorded price, P^*_t is the market clearing price, and ε_t is an error term which is not greater than 12.5 cents in absolute value. There may also be errors in share prices which are closing prices and not actual transaction prices.

To analyze the econometric significance of these measurement errors, consider the simple ex-dividend day model of Section III. The "true" model was specified as

$$(2)\quad \frac{P^*_t - P^*_{t-1}}{P^*_{t-1}} = \alpha_0 + \alpha_1 \frac{D_t}{P^*_{t-1}} + \zeta_t$$

or for notational simplicity $y_t = \alpha_0 + \alpha_1 x_t + \zeta_t$. The model must be estimated as

$$(3)\quad \frac{P_t - P_{t-1}}{P_{t-1}} = \alpha_0 + \alpha_1 \frac{D_t}{P_{t-1}} + u_t$$

or $\tilde{y}_t = \alpha_0 + \alpha_1 \tilde{x}_t + u_t$. To demonstrate the inconsistency of (α_0, α_1) for (α_0, α_1), I shall linearize eqation (3) in $(\varepsilon_t, \varepsilon_{t-1})$. This yields, for the dependent variable,

$$(4)\quad \frac{P_t - P_{t-1}}{P_{t-1}} \doteq \frac{P^*_t - P^*_{t-1}}{P^*_{t-1}} + \frac{1}{P^*_{t-1}}\varepsilon_t - \left[\frac{1}{P^*_{t-1}} + \frac{P^*_t - P^*_{t-1}}{(P^*_{t-1})^2}\right]\varepsilon_{t-1} \equiv y_t + v_t\varepsilon_t - w_t\varepsilon_{t-1}$$

where $v_t = 1/P^*_{t-1}$ and $w_t = v_t + v_t y_t$. Similarly, linearizing the independent variable yields

(5) $$\frac{D_t}{P_{t-1}} \doteq \frac{D_t}{P^*_{t-1}} - \frac{D_t}{(P^*_{t-1})^2}\varepsilon_{t-1} = x_t - z_t\varepsilon_{t-1}.$$

where $z_t = \frac{D_t}{(P^*_{t-1})^2}$. The true model specifies that $y_t = \alpha_0 + \alpha_1 x_t + \zeta_t$, while we estimate (α_0, α_1) by least squares on the augmented equation

(6) $$\tilde{y}_t = \alpha_0 + \alpha_1(x_t - z_t\varepsilon_{t-1}) + \zeta_t + v_t\varepsilon_t - w_t\varepsilon_{t-1} + \alpha_1 z_t\varepsilon_{t-1}.$$

It is clear that the explanatory variables are correlated with the error; this will lead to inconsistent estimates.

I shall focus on the inconsistency of α_1. This estimator is

(7) $$\text{plim}\,\alpha_1 = \text{plim}\left[\frac{1}{T}\sum_{t=1}^{T}(x_t - z_t\varepsilon_{t-1})^2\right]^{-1}\left[\frac{1}{T}\sum_{t=1}^{T}(x_t - z_t\varepsilon_{t-1})(\tilde{y}_t)\right]$$

$$= \alpha_1 + \left[Q_{xx} + \sigma^2 Q_{zz}\right]^{-1}\left[\text{plim}\,\frac{1}{T}\sum_{t=1}^{T}(x_t - z_t\varepsilon_{t-1})(\zeta_t + v_t\varepsilon_t - (w_t - \alpha_1 z_t)\varepsilon_{t-1})\right]$$

$$= \alpha_1 + \left[Q_{xx} + \sigma^2 Q_{zz}\right]^{-1}\left[-\alpha_1 Q_{zz}\sigma^2 + Q_{zw}\sigma^2\right]$$

where $Q_{xx} = \text{plim}\,\frac{1}{T}\sum_{t=1}^{T}\left(\frac{D_t^2}{P^*_{t-1}}\right)$, $Q_{zz} = \text{plim}\,\frac{1}{T}\sum_{t=1}^{T}\left(\frac{D_t^2}{P^{*\,4}_{t-1}}\right)$, and

$$Q_{zw} = \text{plim}\,\frac{1}{T}\left(\sum_{t=1}^{T}\left[\left(\frac{D_t}{P^{*\,3}_{t-1}}\right) + \frac{D_t(P^*_t - P^*_{t-1})}{(P^*_{t-1})^4}\right]\right) = \text{plim}\,\frac{1}{T}\sum_{t=1}^{T}\left(\frac{D_t P^*_t}{(P^*_{t-1})^4}\right).$$ Thus,

(8) $$\text{plim}\,\alpha_1 = \alpha_1 - \alpha_1\left[\frac{\sigma^2 Q_{zz}}{Q_{xx} + \sigma^2 Q_{zz}}\right]\left[1 - \frac{Q_{zw}}{\alpha_1 Q_{zz}}\right].$$

The first bracketed term is the $\frac{\text{noise}}{\text{noise + signal}}$ ratio for the independent variable, the dividend-payout ratio. It is reminiscent of the usual result for regression models in the presence of measurement error: the coefficients are biased toward zero, and the probability limits of the estimators are the true coefficient values times one minus the noise to signal ratio. The second bracketed term modifies the usual errors-in-variable expression, because there is a spurious correlation between the measured dependent and independent variables. An altenative expression shows this more clearly:

$$(9) \quad \text{plim}\ \alpha_1 = \alpha_1\left[\frac{Q_{xx}}{Q_{xx} + \sigma^2 Q_{zz}}\right] + \left[1 - \frac{Q_{xx}}{Q_{xx} + \sigma^2 Q_{zz}}\right] \frac{Q_{zw}}{Q_{zz}} .$$

The second term depends upon $\beta_{wz} = Q_{zw}/Q_{zz}$, the regression coefficient of w_t on z_t. These variables, w_t and z_t, are coefficients in the Taylor expansions for the independent and dependent variables in terms of the measurement errors. The estimated α_1 therefore will be biased by increasingly large amounts as these linear terms become more highly correlated. Provided the dividend-price ratio exhibits some variation, this second term is unlikely to vanish and resulting coefficients may be contaminated.

A consistent estimation procedure can be developed by employing instrumental variables. Since lagged values of prices contain measurement errors which are uncorrelated with current prices, but systematic components which are highly correlated,[1] they provide particularly good instruments. The results which are reported in the text correspond to IV estimators using $\frac{D_t}{P_{t-2}}$, $\frac{D_t}{P_{t-3}}$, etc. as instruments.

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[1] The efficient markets hypothesis predicts that market-clearing prices evolve according to a random walk, or something close to it. This means the correlation between past market-clearing prices and current prices is particularly high.

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