We test the cash flow signalling and free cash flow/overinvestment explanations of the impact of dividend announcements on stock prices. We use Tobin’s Q ratios less than unity to designate overinvestors. The average return associated with announcements of large dividend changes is significantly larger for firms with Q’s less than unity than for other firms. This evidence, the results of further tests involving a finer partition of the data, and an analysis of changes in analysts’ earning forecasts surrounding dividend announcements support the overinvestment hypothesis over the cash flow signalling hypothesis.

1. Introduction

The positive association between announcements of dividend changes and stock-price movements has been documented in several empirical studies. Fama, Fisher, Jensen, and Roll (1969) find that firms announcing stock splits accompanied by increases in cash dividends have a statistically significant, positive mean, risk-adjusted stock return during the announcement months, and those accompanied by dividend decreases have a significant negative return. Studies by Pettit (1972) and others find that the mean risk-adjusted return for firms announcing dividend increases is significantly positive over the two days surrounding the announcement, and for those announcing dividend decreases the two-day return is significantly negative. More recently, Aharony and Swary (1980) report similar results after controlling for contemporaneous

*The authors acknowledge helpful comments from Yakov Amihud, Michael Barclay, K.C. Chan, Michael Jensen, John David Mayers, Richardson Pettit, Andrei Shleifer, Clifford Smith (the editor), Rene Stulz, and participants of a seminar at the 1988 American Finance Association meeting in New York. The data collection, calculation of Tobin’s Q, and computer programming assistance of Anne Cheng are gratefully acknowledged. The research assistance of CT. Chen, Jose Puyol, Lin Shaw, and David Sun are also acknowledged. The remaining errors are the sole responsibility of the authors. The original title of this paper was 'What information is contained in dividend announcements?'.

quarterly earnings reports. These studies indicate that announcements of dividend changes do convey information to the market. However, the question ‘What information is contained in dividend announcements?’ has not been fully resolved.

Lintner (1958) and Fama and Babiak (1968) find a times-series relation between annual dividends and earnings that is consistent with the view that dividend-paying firms increase their dividends only when management is relatively confident that the higher payments can be maintained. If managers have information about future and/or current cash flows that investors do not have, investors will interpret a dividend increase as a signal that management anticipates permanently higher cash flows, and a dividend decrease as a signal that management expects permanently lower cash flows. The dividend signalling models developed by Battacharya (1979), John and Williams (1985), and Miller and Rock (1985) predict that dividend announcements convey information about future and/or current cash flows. However, this prediction is not supported by the empirical studies of Watts (1973) and Gonedes (1978), who are unable to find an economically significant relationship between dividends and subsequent earnings. Further, they find that current and past dividends forecast future earnings no more accurately than do current and past earnings. A more recent study by Ofer and Siegel (1987), in contrast, finds that knowledge of dividend announcements does improve the accuracy of the average analyst’s preannouncement forecasts of future earnings.

In a recent article extending the work of Berle and Means (1932) on the separation of ownership from control, Jensen (1986) argues that a firm with substantial free cash flows will have a tendency to overinvest by accepting marginal investment projects with negative net present values. If managers are overinvesting, an increase in the dividend will, all else being equal, reduce the extent of overinvestment and increase the market value of the firm, and a decrease in the dividend will have the opposite result. Jensen views the empirical evidence of a positive association between dividend-change announcements and stock-price movements as supporting the free cash flow hypothesis.

In an attempt to distinguish between the predictions of the cash flow signalling hypothesis and the free cash flow hypothesis, the present study uses empirical estimates of Tobin’s Q ratio to determine a group of overinvesting firms. If it is assumed that a firm’s investments are scale-expanding and exhibit decreasing marginal efficiency of capital, an average Q less than unity implies overinvestment. If a firm is undertaking the value-maximizing level of investment, its average Q will exceed unity. The overinvestment hypothesis predicts that the average return in response to announcements of sizable dividend changes is larger for overinvesting firms than for value maximizers.

We find that the average return associated with announcements of sizable dividend changes is significantly higher for firms with average Q’s less than unity than for those with average Q’s greater than unity.
Although this empirical evidence is consistent with the overinvestment hypothesis, it is also consistent with the cash flow signalling hypothesis if investors anticipate large dividend increases for firms with average $Q$'s greater than unity. Further tests involving a finer partition of the data and the relation between announcement of dividend changes and subsequent changes in analysts' earnings forecasts support the overinvestment hypothesis over the cash flow signalling hypothesis.

Section 2 describes the theoretical basis of the subsequent tests. Section 3 describes the data and provides evidence that is consistent with both overinvestment and cash flow signalling hypotheses. Section 4 presents a test that attempts to distinguish between the two hypotheses, and section 5 summarizes the implications of the study for interpreting the information in dividend announcements.

2. Tobin's Q ratio as an indicator of overinvestment

We use the Modigliani and Miller (1966) limited growth model to describe the overinvestment hypothesis and the rationale for using Tobin’s $Q$ ratio as an indicator of overinvestment. Using this model the value of firm $V$ is

$$V = \left[ \frac{X}{K} \right] + \left[ I \left( \frac{P - K}{K} \right) T \right],$$

where $X$ is expected earnings from existing assets, $K$ is the cost of capital, $P$ is the average rate of return on investment, $I$ is the anticipated level of current investment, and $T$ is the firm’s finite growth horizon. The first term in square brackets is the contribution of the firm’s existing assets to its market value and the second is the net present value of future investment opportunities. The term $(P - K)/K$ is the average net present value profitability index (net present value per dollar of investment) for the firm’s investments when they are made. The cash flow signalling hypothesis predicts that announcements of dividend increases will signal higher cash flows or earnings $X$ from current assets, and vice versa, i.e., $dV/dD = (dX/dD)/K > 0$, but the net present value of future investments is assumed to be unaffected.

As suggested by Easterbrook (1984, p. 655), capital markets serve a monitoring function when management raises capital through security offerings. Investment bankers and other financial intermediaries evaluate proposed projects and put their reputations on the line by implicitly certifying that the new securities are backed by the represented earnings potential. As pointed out by Jensen (1986, p. 324), value-maximizing firms with their $P > K$ are able to withstand capital markets’ monitoring, whose investment is carried to the point where the marginal $Q$ (present value of marginal investment) is unity, whether marginal investment is financed internally or externally. Announce-
ments of dividend changes by value-maximizing firms, therefore, will have no impact on investors’ expectations about investment policies, and should on average have no effect on the firms’ stock prices.

Jensen (1986) argues that firms with substantial free cash flow have a tendency to overinvest by accepting marginal investment projects that have negative net present values. Those firms will be reluctant to subject negative-net-present-value projects to the monitoring associated with external financing. Furthermore, the fixed interest obligation associated with debt issues provides an additional disincentive to finance negative-net-present-value projects with debt. Announcements of dividend changes by overinvesting firms will change investors’ expectations about the size of the firms’ future investment in negative-net-present-value projects. An increase in the dividend will, all else being equal, lessen the overinvestment and increase the market value of the firm, and vice versa for dividend decrease. We call this extended form of the free cash flow hypothesis the overinvestment hypothesis.

Under the overinvestment hypothesis, the impact of a dividend change announcement on the firm’s market value is found by differentiating $V$ in (1) w.r.t. $D$:

$$\frac{dV}{dD} = \frac{dI}{dD} \left[ \left( P - K + I \frac{dP}{dI} \right) / K \right] T,$$

(2)

where $dP/dI < 0$ because of decreasing marginal efficiency of capital and the term in square bracket is the marginal net present value profitability index (marginal $Q$ less unity). For value-maximizing firms, marginal $Q$ is unity and the level of investment is independent of the dividend, thus $dI/dD = 0$ which implies that $dV/dD = 0$. For overinvesting firms the marginal $Q$ is less than unity and the level of investment is inversely related to the dividend, i.e., $dI/dD = -1$ which implies that $dV/dD > 0$.

To obtain the average Tobin’s $Q$ ratio, both sides of (1) are divided by the firm’s current capital stock, $C$:

$$Q = \frac{R}{K} + \frac{I/C}{K} (P - K) T,$$

(3)

where $R = X/C$ is the average return on the current capital stock. Under scale-expanding investment and diminishing marginal efficiency of capital, if the average return on investment, $P$, is greater than $K$, then the average return on the existing capital stock, $R$, must also be greater than $K$ and Tobin’s $Q$ will be greater than unity. Conversely, if the average return on the existing capital stock, $R$, is less than $K$, then the average return on investment, $P$, must also be less than $K$ and Tobin’s $Q$ will be less than unity.
Proposition 1. An average Q ratio greater than unity is a necessary condition for a firm to be at the value-maximizing level of investment.

Proof. For a value-maximizing firm, investment is carried to the point where the marginal-net-present-value profitability index is zero (the marginal Q ratio is unity). From decreasing marginal efficiency of capital, \( I(d P/dl) < 0 \), and \( P - K \) must be greater than zero at the level of investment where \( dV/dl = 0 \). Under decreasing marginal efficiency of capital, \( P - K > 0 \) implies that \( R > K \); thus \( Q \) is also greater than 1 by (3). Q.E.D.

Proposition 2. An average Q ratio less than unity is the sufficient condition for a firm to be overinvesting.

Proof. For an overinvesting firm, investment is carried to the point where the marginal-net-present-value profitability index is negative (the marginal Q is less than unity). Under decreasing marginal efficiency of capital, \( I(d P/dl) < 0 \); therefore, the average rate of return on investment, \( P \), is greater than the marginal return on investment \( [P + I(d P/dl)] \). It follows from (3) that \( Q < 1 \) implies that \( P < K \) [because \( Q < 1 \) implies either \( (R < K, P < K) \) or \( (R > K, P < K) \)]. Therefore, \( [P + I(d P/dl)] < K \), which indicates overinvestment. Q.E.D.

Using estimates of average Q’s rather than true marginal Q’s to separate firms into value maximizers and overinvestors causes some potential problems. First, the preceding discussion is based on scale-expanding investment. For firms with different types of investment projects, an average Q less than unity is not a sufficient condition for overinvestment. Second, average Q’s are measured on reported replacement costs, which are unaudited and may differ from true economic replacement costs. Finally, an average Q equal to unity is chosen as the cut-off point in dividing firms into value-maximizing and overinvesting categories, some overinvesting firms (with marginal Q’s less than unity) may be incorporated into the group with average Q’s greater than unity along with value-maximizing firms. In spite of these caveats, if investor’s perceptions of marginal Q’s are directly related to average Q’s, then the overinvestment hypothesis predicts that the average returns associated with dividend announcements will be larger for firms with average Q’s less than unity than for those with average Q’s greater than unity.

3. Empirical test of the overinvestment hypothesis

Tobin’s Q is the ratio of the market value of the firm’s equity and debt to the replacement cost of its assets. The calculations of the individual items and the data sources are summarized below. We obtain common stock prices and
numbers of shares outstanding from the Center for Research in Security Prices (CRSP) monthly return file. The book value of preferred stock is used as a surrogate for its market value because preferred stock is a very small portion of the sample firms’ capital structures. The prices of long-term bonds are obtained from Moody’s Bond Record. If the price of a nonconvertible bond is not reported, the yield to maturity of another bond with a similar maturity and coupon rate issued by the same firm is used to calculate the first bond’s price. Bonds with less than a year remaining to maturity, floating-rate bonds, convertible debt for which price data are not reported, and debt with an unknown coupon and/or maturity date are valued at book value. Replacement costs of net plant and equipment and inventories for 1979 to 1984 are obtained from the Financial Accounting Standard Board (FASB) regulation 33 tape edited by Columbia University.

Our sample includes dividend-change announcements that meet two criteria: (1) the absolute dividend changes by more than 10% and (2) we are able to calculate the average Q’s for the firm announcing the change. The daily returns and the date of dividend announcements are retrieved from the CRSP daily return file and master file, respectively. Stocks that have split in the quarter before the dividend announcements are excluded, as are financial organizations and public utilities. The final sample consists of 429 dividend-change announcements from 1979 to 1984.

Daily risk adjusted returns are measured as unadjusted returns minus the product of a Scholes-Williams beta and the equally weighted CRSP index returns. To test the hypothesized difference in average returns for firms with average Q’s greater than and less than unity, returns associated with announcements of dividend increases greater than 10 percent are averaged with the negative of returns of firms with dividend decreases greater than 10 percent in absolute value. As shown in table 1, the average returns for firms with average Q’s less than unity is more than three times as large as that for firms with average Q’s greater than unity. The difference is significant at the 1% level.

Daily returns are influenced by information other than dividend announcement. To reduce the impact of other information, we examine intraday returns. Because of the data availability, the sample of intraday returns consists of 76 dividend-change announcements over the period 1982-1984. The exact minute of dividend announcement is obtained from the Dow Jones News Service. To avoid mixing intraday and overnight returns, in our intraday analysis we use only announcements that occur within the trading day. The intraday stock price data are obtained from the Fitch tapes.

Intraday returns are measured over the period one hour before to two hours after dividend announcements, beginning with the first trade price of the one-hour preannouncement period and ending with the last trade of the
Table 1

<table>
<thead>
<tr>
<th>$Q &gt; 1$</th>
<th>$Q &lt; 1$</th>
<th>$(Q &lt; 1) - (Q &gt; 1)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average return</td>
<td>0.003</td>
<td>0.011</td>
</tr>
<tr>
<td>p-value*</td>
<td>(0.021)</td>
<td>(0.000)</td>
</tr>
</tbody>
</table>

*The p-values based on a conventional t-test and those based on a bootstrap procedure [see Barclay and Litzenberger (1988)] are identical to three decimal places.

Table 2

<table>
<thead>
<tr>
<th>$Q &gt; 1$</th>
<th>$Q &lt; 1$</th>
<th>$(Q &lt; 1) - (Q &gt; 1)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average return</td>
<td>0.0001</td>
<td>0.0178</td>
</tr>
<tr>
<td>Bootstrap p-value*</td>
<td>(0.595)</td>
<td>(0.007)</td>
</tr>
</tbody>
</table>

*t-test p-values are lower: (0.483), (0.005), and (0.008), respectively.

two-hour postannouncement period. Intraday returns are not adjusted for market movements because of the problem of nonsynchronous trades. To accommodate the missing-observation problem inherent in intraday returns, we use the bootstrap algorithm developed by Barclay and Litzenberger (1988) to determine significance level that takes account of a random sample size. Table 2 shows that the average return is significantly larger for firms with average $Q$'s less than unity than for those with average $Q$'s greater than unity. Announcements of sizable dividend changes have a significant impact on the stock price of the firm with average $Q$'s less than unity, but no impact for Arms with average $Q$'s greater than unity.
4. An alternative interpretation of the cash flow signalling hypotheses

While the previous evidence is consistent with the overinvestment hypothesis, it is also consistent with a conditional cash flow signalling hypothesis. If investors anticipate large dividend increases for firms with average $Q$'s greater than unity, the impact of such changes on average return will be small. However, if large dividend decreases by these firms are not anticipated, the price impact will be substantial. In the previous tests we average the returns associated with large dividend increases and the negative of returns associated with large dividend decreases. The sample of firms with average $Q$'s greater than unity includes many more increases (103) than decreases (8); therefore, the average effect will be small. However, if dividend increases are not anticipated for firms with average $Q$ ratios less than unity, the price impact will be substantial. In our sample only 55 of 318 firms with $Q$'s less than unity announce sizable dividend cuts, it is reasonable to argue that investors are not anticipating large dividend decreases. Since neither increases nor decreases are anticipated, the average effect will be substantial.

Under the conditional cash flow signalling hypothesis, for firms with average $Q$'s greater than unity the predicted impacts on returns of announcements of dividend changes is larger in absolute value for dividend decreases than for increases. However, the overinvestment hypothesis predicts a symmetrical impact. For firms with average $Q$'s less than unity, the two hypotheses predict a significant impact on return in both dividend increase and decrease cases.

Table 3 shows that the average return in response to dividend announcements for firms with average $Q$'s greater than unity is significant for dividend increases and insignificant for dividend decreases. However, the absolute value of the average returns associated with dividend-increase and dividend-decrease announcements are similar in magnitude, and are not significantly different from each other. This evidence is inconsistent with the conditional cash flow signalling hypothesis.

The average returns for Arms with average $Q$’s less than unity are significant for both dividend increases and decreases. In either dividend increase or decrease case, the absolute value of the average return is significantly larger at the 5% level for firms with average $Q$’s less than unity than those with average $Q$’s greater than unity. In the dividend decrease case, this larger price impact is inconsistent with the predictions of the conditional cash flow signalling hypothesis. Thus, these tests reject the conditional cash flow signalling hypothesis.

The conditional cash flow signalling hypothesis predicts that announcements of dividend changes by firms with average $Q$’s less than unity will cause investors to revise their cash flow expectations in the same direction, whereas the overinvestment hypothesis predicts no impact on current cash flow expectations. For firms with average $Q$’s greater than unity, both hypotheses predict
Table 3

Our sample of daily returns consists of 429 dividend change announcements that meet two criteria: (1) the absolute value of the percentage dividend change is greater than 10% and (2) we are able to calculate the average Q ratio for the firm. We divide the sample into four groups: (1) Tobin’s Q > 1 with dividend increase, (2) Tobin’s Q > 1 with dividend decrease, (3) Tobin’s Q < 1 with dividend increase, and (4) Tobin’s Q < 1 with dividend decrease.

<table>
<thead>
<tr>
<th>Q &gt; 1.0</th>
<th>Dividend increase (0.016)</th>
<th>Dividend decrease (0.371)</th>
<th>Difference in absolute values for increases and decreases (0.000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q &lt; 1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-test p-value (0.000)</td>
<td>(0.027)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Q &lt; 1) - (Q &gt; 1) (0.005)</td>
<td>-0.024</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-test p-value (0.008)</td>
<td>(0.027)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

that announcements of large dividend increases will have little or no impact on investors’ current cash flow expectations. For such firms announcing dividend decreases, however, the conditional cash flow signalling hypothesis predicts downward revisions in cash flow expectations, whereas the overinvestment hypothesis predicts no impact on current cash flow expectations.

Analyzing the impact of dividend announcements on current cash flow expectations requires data on expectations. We obtain analysts’ forecasts data from the Investment Brokers Estimate System (IBES) data base developed by Lynch, Jones, and Ryan Company. This data base contains summary statistics for analysts’ forecasts of annual earnings per share for the current fiscal year. The individual forecasts are collected monthly from all major brokerage firms. We don’t know when in the month these forecasts are surveyed, so we use the earnings forecasts reported at the end of the month before the dividend-announcement month for the preannouncement forecasts and the forecasts reported at the end of the month following the dividend announcement month for the postannouncement forecasts.

The impact of announcements of sizable dividend changes on analysts’ forecasts is measured using the median of the elasticity of the average of analysts’ earnings forecasts with respect to large dividend changes (percentage change in earnings per share forecasts divided by percentage dividend change). The use of a median instead of a mean avoids the distortions resulting when the average of analysts’ preannouncement earnings forecasts is close to zero. A few very large positive or negative percentage revisions resulting from a denominator close to zero would have no material impact on a median calculated over a large number of firms.
Medians of elasticity of the average of analysts' earnings forecasts with respect to dividend-change announcements over the period 1979-1984.

Our sample of analysts' forecasts consists of 429 current year's earnings per share (EPS) forecasts that meet two criteria: (1) the absolute value of the percentage dividend change is greater than 10% and (2) we are able to calculate the average Q ratio for the firm announcing the dividend change. We divide the sample into four groups: (1) Tobin's Q > 1 with dividend increase, (2) Tobin's Q > 1 with dividend decrease, (3) Tobin's Q < 1 with dividend increase, and (4) Tobin's Q < 1 with dividend decrease.

<table>
<thead>
<tr>
<th></th>
<th>Dividend increase Current-year EPS</th>
<th>Dividend decrease Current-year EPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q &gt; 1.0</td>
<td>0.0053</td>
<td>-0.0483</td>
</tr>
<tr>
<td>Bootstrap p-value</td>
<td>(0.544)</td>
<td>(0.406)</td>
</tr>
<tr>
<td>Q &lt; 1.0</td>
<td>0.0993</td>
<td>-0.3685</td>
</tr>
<tr>
<td>Bootstrap p-value</td>
<td>(0.375)</td>
<td>(0.298)</td>
</tr>
<tr>
<td>Bootstrap p-value of (Q &lt; 1) - (Q &gt; 1)</td>
<td>(0.370)</td>
<td>(0.329)</td>
</tr>
</tbody>
</table>

To test whether the median of the elasticity of the average of analysts' earnings forecasts is different from zero, the bootstrap technique is used [see Efron (1982) for details]. Table 4 reports the median earnings forecasts for four groups, and shows that the effect of dividend announcements on earnings expectations is not statistically between the median percentage changes and the lack of statistical significance indicate that postannouncement revisions in analysts' earnings forecasts are not consistent with the predictions of the conditional cash flow signalling hypothesis. Thus, the tests based on revisions in analysts' earning forecast reject the conditional cash flow signalling hypothesis and support the overinvestment hypothesis.

5. Conclusion

This paper investigates the informational content of dividends in the framework of the principal-agent conflict model developed by Berle and Means and extended by Jensen. If managers are overinvesting, an increase in the dividend will reduce the overinvestment and increase the market value of the firm. Similarly, a dividend decrease signals that more negative-net-present-value projects will be undertaken. For value-maximizing firms the level of investment is theorized to be independent of dividends. The present study divides firms into overinvestors and a mixed group of value maximizers and marginal overinvestors on the basis of Tobin's Q. The average return for firms with average Q's less than unity is significantly larger than for firms with average


Efron, B., 1982, The jackknife, the bootstrap and other resampling techniques (Society for Industrial and Applied Mathematics, Philadelphia, PA).


