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October 1974

EFFECT OF STOCK REPURCHASE ON PRICE PERFORMANCE

Working Paper No. 94

by

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I. INTRODUCTION

One of the main concerns of those studying the increase in repurchasing activity is the effect such activity may have on the owners of those securities repurchased. Does the repurchase of stock by the issuing firm have positive or negative effects on the pricing of the outstanding shares? The literature indicates that, theoretically, repurchasing stock should have a positive effect on the price of that stock. Bierman and West [1] have shown quite rigorously that the differential tax rates on dividends and capital gains make repurchasing a preferred method of distributing excess funds to stockholders. Marshall and Young [6, 7] pointed out the advantages of repurchasing in terms of minimizing shareholder servicing costs. Nantell and Finnerty [4] have developed a model to show explicitly the advantages of repurchasing when management's judgment is that the stock is undervalued.

Although theory indicates a positive pricing effect from the repurchase of a firm's own shares, the empirical evidence is not completely consistent with the expectations based on this theory. For example, in an important recent study by Ellis and Young [2] the authors concluded that "... in the period subsequent to each type of repurchase, these securities both moved lower in price and fell relative to the market average." One potential explanation for these empirical results is to view repurchasing as a defensive mechanism aimed at covering up management's poor earnings performance. Poor performance prior to the repurchase might have produced a momentum in the pricing of these

securities that the repurchase itself could not reverse. Another explanation of the empirical results may be that there is information implicit in the repurchase announcement that ratifies a previously tentative market verdict that the repurchasing firm faces a reduction in its ability to generate high-yielding investment projects.

In this paper we hope to shed some light on the apparent contradiction between theory and evidence by utilizing the methodology of "residual analysis." This methodology, which has become a standard tool in efforts to identify price movements, is described in Section III. Section II presents a model which allows one to relate the technique of residual analysis to the specific question of the price effects of stock repurchases. Section IV presents the results, and our conclusions and summary are given in Section V.

II. MODELING THE PRICING OF A REPURCHASED SECURITY

In order to identify the effect of repurchasing upon the price of securities repurchased, a normative model must be developed relating price change to such variables as number of shares repurchased, repurchase price, etc. The procedure is to specify the per share post-repurchase price, P_{t+1}, as a function of the pre-repurchase price, P_t. In order to accomplish this, it is first necessary to relate the aggregate equity values of the firm before and after repurchase.

A starting point for the post-repurchase aggregate value, V_{t+1}, is the pre-repurchase value, V_t.[1] From this level we need to adjust for the cash outflow resulting from the repurchase operation

as well as for any new information accruing to the market as a result of the announcement:

$$V_{t+1} = V_t - R_t \sum_{i=1}^{m} s_{t,i} + I_t \qquad (1)$$

where R_t = average repurchase price paid,

$s_{t,i}$ = shares sold to the firm at t by the ith investor,

m = number of stockholders at t, and

I_t = value of new information accruing to the market as a result of the repurchase announcement.

As noted in the introduction, most of the theoretical discussions on stock repurchases imply that $I_t > 0$. However, available evidence suggests that the announcement of the repurchase could be viewed by the market as verification of a lack of high-yielding investments for the firm. In such a case, I_t could be negative or zero depending upon how "new" that information would be to the market.

In order to simplify equation (1) we represent R_t in terms of P_t, $s_{t,i}$ in terms of shares held prior to repurchase, and I_t in terms of pre-repurchase equity value, V_t:

$$R_t = P_t(1 + y) \qquad (2)$$

where y = premium paid above current price in the repurchase of the stock;

$$I_t = zV_t \qquad (3)$$

where z = new information multiplier;

and $s_{t,i} = x_i n_{t,i}$ (4)

where $n_{t,i}$ = number of shares held by the ith investor at time t.

From equation (4), it follows that[2]

$$\sum_{i=1}^{m} s_{t,i} = \sum_{i=1}^{m} x_i n_{t,i} = x \sum_{i=1}^{m} n_{t,i}. \quad (5)$$

Substitution from equations (2), (3), and (5) into equation (1) results in

$$V_{t+1} = \left[1 + z - (1 + y)x\right] V_t. \quad (6)$$

Interpreting equation (6) is best accomplished initially setting y, the repurchase premium, and z, the value of the new information multiplier, to zero. It follows that after the repurchase the value of the equity is reduced by the proportion x. In other words, as is expected, the value of the firm falls by an amount equal to the cash paid out during the repurchase operation. If, in repurchasing the shares, the firm pays a premium above P_t (i.e., if we now let $y > 0$) then the same conclusion holds, although the absolute value of the reduction is larger.

We are now in a position to return to our original concern, that of specifying P_{t+1} in terms of pre-repurchase values. Since, by definition,

$$V_t = P_t \sum_{i=1}^{m} n_{t,i}$$

and

$$V_{t+1} = P_{t+1} \sum_{i=1}^{m} n_{t+1,i}$$

equation (6) can be written so as to highlight P_{t+1} in the manner desired:

$$P_{t+1} \sum_{i=1}^{m} n_{t+1,i} = \left[1 + z - (1 + y)x\right] P_t \sum_{i=1}^{m} n_{t,i} \tag{7}$$

$$P_{t+1} = P_t \left[1 + z - (1 + y)x\right] \frac{\sum_{i=1}^{m} n_{t,i}}{\sum_{i=1}^{m} n_{t+1,i}}$$

where $n_{t+1,i}$ = number of shares held by the ith investor at t+1.

Since $n_{t+1,i} = n_{t,i} - s_{t,i}$ and since $s_{t,i}$ can be expressed as in (4), it is possible to express the ratio of the summation of shares held in equation (7) as $\frac{1}{1 - x}$. Therefore, equation (7) can be rewritten as

$$P_{t+1} = P_t \left[\frac{1 + z - (1 + y)x}{1 - x}\right]. \tag{8}$$

Again, it is easiest to interpret this representation of P_{t+1} by initially setting $y = z = 0$. While equation (6) indicates that in this case the aggregate value of the equity is reduced by the repurchase

amount, equation (8) indicates that the per share price is unaffected by the repurchase.

The objective of this paper is to identify the value of z, the new information multiplier, in terms of this model. If prices react as theory indicates, then z should be positive. In the following section, a methodology for empirically identifying (ex-post) the value of z is developed. However, if we are to identify the market's reaction to the economics implied in the stock repurchase announcement, equation (8) makes it clear that it is first necessary to remove the effect of any premium paid above P_t in the repurchase of the shares. A failure to make this adjustment when $y \neq 0$ would result in a downward bias in any measurement of returns for the period following repurchase. To see this most clearly, rewrite equation (8) as

$$P_{t+1} = P_t \left[1 + \frac{z - yx}{1 - x}\right]. \tag{8a}$$

The post-repurchase price, P_{t+1}, will reflect the entire value of the new information multiplier, z, only if $y = 0$. If a premium is paid, i.e., if $y > 0$, identifying the value of the new information, z, by comparing P_{t+1} to P_t requires an adjustment for this premium. The specific manner in which the necessary adjustment can be made is presented after development of the general methodology employed to identify stock price reaction to stock repurchase announcements.

III. METHODOLOGY

In any attempt to isolate the effects of a stock repurchase on stock price movements it is desirable to remove the effect of general market movements. Using Sharpe's market model [5], Fama and others [3] developed a methodology for isolating the effects of economic events on stock prices by identifying the residuals of the market model at the time of the announcement of the event. The market model is a straightforward specification of the return generating process for a specific security, relating its return to that of the market:

$$r_{jt} = a_j + b_j r_{mt} + e_{jt}. \tag{9}$$

Equation (9) indicates that the return to security j in any time period t, r_{jt}, is a function of the disturbance or residual, e_{jt}, which is specific to the individual security, as well as the market-wide return, r_{mt}. The residual in equation (9) can serve as a measure of abnormal performance of a security, since the effects of the market and the market's effect on the return to security j are explained by way of a_j, b_j, and r_{mt}. In this paper we are interested in identifying the abnormal performance associated with the announcement of a firm's stock repurchase plans.

The procedure used to identify this abnormal performance, if it exists, may be as follows:

1) for each security for which a stock repurchase is announced during month t = 0, the a_j and b_j parameters

of the market model are computed by way of a least-squares fit of equation (9) for a time period ending at month t = -12;

2) to estimate the effect of the stock repurchase, the residuals from equation (9) for each repurchased security are computed for months t = -6 to t = +6 using the model parameters as computed in the first step;

3) for the month of the repurchase announcement t = 0, in computing the residual, it is necessary to adjust the security's return by computing an adjusted beginning-of-month price by way of equation (8), assuming z = 0;

4) an average residual for month t, U_t, is then computed for the entire stock repurchase sample (size = N) as $U_t = \sum_{i=1}^{N} e_{jt} / N$; and, finally,

5) a cumulative average residual for the sample is computed as $CU_t = \sum_{k=-12}^{t} U_k$.

The sample of firms was generated by searching annual reports from 1960 to 1972 and 10-K reports for 1968 to 1972 of each firm on a list comprised of all those COMPUSTAT firms whose total shares outstanding decreased in any one year from 1960 to 1972. In order to include a firm from this list in our sample, the search of the annual report or 10-K report or other sources had to yield the following data:

1) specific date or time period during which the repurchase occurred,
2) number of shares repurchased and the number outstanding at the end of the previous year,
3) average price paid by the firm for the repurchased shares,
4) closing price of the stock on the day preceeding the initiation of the repurchase,
5) whether the repurchase was accomplished by the way of a tender offer or by way of a purchase in the open market, and
6) that the firm was traded on the NYSE.

The result of this screening process was a sample of 34 repurchases by way of tender offer and 91 by way of open-market purchase.

Monthly price relatives for each of the securities in the sample for the entire 1960-1972 period were taken from the CRSP tapes.[3] Fisher's Investment Performance Index for these months was used as the market return. As indicated above in the first step for computing the residuals, the a_j and b_j parameters for each jth security were computed using these monthly price relatives from January 1960 until t = -12. The parameters for one of the securities was based on 24 months of data,[4] while at the other extreme, another security's parameters were computed with 109 months of data. Using these parameters along with actual individual stock and market returns for the months t = -6 to t = +6, the residuals for each security were computed for those months.[5]

The month of most interest is t = 0 and that is also the only month in which the individual security price relatives must be adjusted.[6] As shown in the previous section, as long as a premium is paid ($y > 0$), the post-repurchase price could fall below the pre-repurchase price even if there was a positive information content to the announcement itself (even if $z > 0$). Since it is this positive information content for which we are testing, we need to abstract from the repurchase price paid.[7] This is accomplished by multiplying the beginning of month price for month t = 0 by $(1 - (1 + y)x)/(1 - x)$ as indicated by equation (8). Our approach adjusts only for the repurchase premium (i.e., to set $z = 0$) and lets the residuals for month t = 0 indicate the sign of z. If the average residual, U_o, for month t = 0 is positive, the implication is that $z > 0$ which is consistent with the hypothesis that there is a positive informational content to the repurchase announcement (e.g., ratification of the tax advantage). If $U_o < 0$, the implication is that $z < 0$ which is consistent with the hypothesis that there is a negative informational content to the repurchase announcement (e.g., ratification of a lack of high-yielding projects).

IV. RESULTS

The values of the average residuals, U_t, and cumulative average residuals, CU_t, are given in Table 1 for the open-market sample and in Table 2 for the sample of tendered securities. They are graphed in Figures 1 through 4.

TABLE 1

ANALYSIS OF RESIDUALS FOR OPEN-MARKET REPURCHASES

Month t	Average Residual U_t	Cumulative Average Residual CU_t	t-Statistic for U_t
-6	-.0022	-.0022	-0.323
-5	-.0125	-.0147	-1.964*
-4	-.0055	-.0202	-0.660
-3	.0111	-.0091	1.255
-2	-.0042	-.0133	-0.538
-1	-.0007	-.0140	-0.736
0	.0095	-.0045	0.450
1	.0050	.0005	0.742
2	.0051	.0056	0.626
3	-.0062	-.0006	-0.839
4	.0098	.0092	1.057
5	.0209	.0301	1.906*
6	-.0026	.0275	-0.331

*Significant at the 10% level.

TABLE 2

ANALYSIS OF RESIDUALS FOR TENDERED REPURCHASES

Month t	Average Residual U_t	Cumulative Average Residual CU_t	t-Statistic for U_t
-6	.0105	.0105	0.718
-5	.0137	.0242	0.976
-4	.0120	.0362	1.121
-3	-.0016	.0346	-0.138
-2	-.0055	.0291	-0.437
-1	.0113	.0404	1.059
0	.0649	.1053	3.051**
1	-.0129	.0924	-0.774
2	.0170	.1094	1.105
3	.0165	.1159	1.758
4	.0073	.1232	0.589
5	.0095	.1327	0.746
6	-.0048	.1279	-0.344

**Significant at the 1% level.

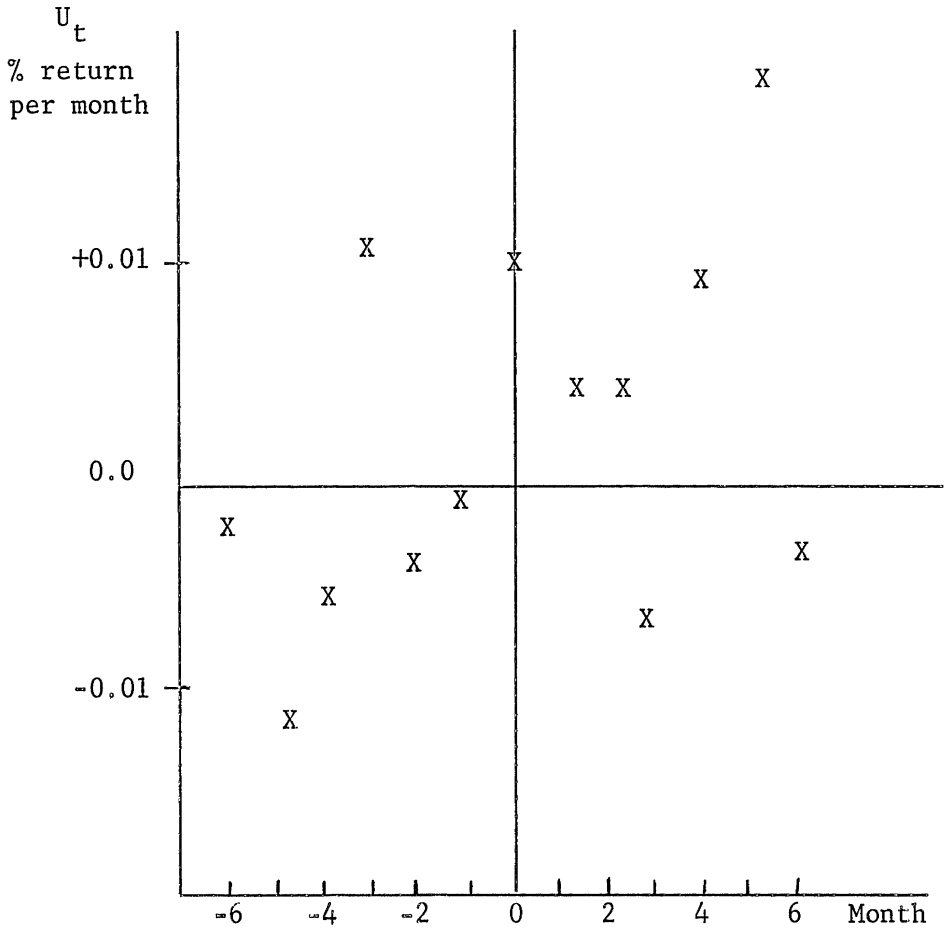

Figure 1

Average Residuals - Open Market Sample

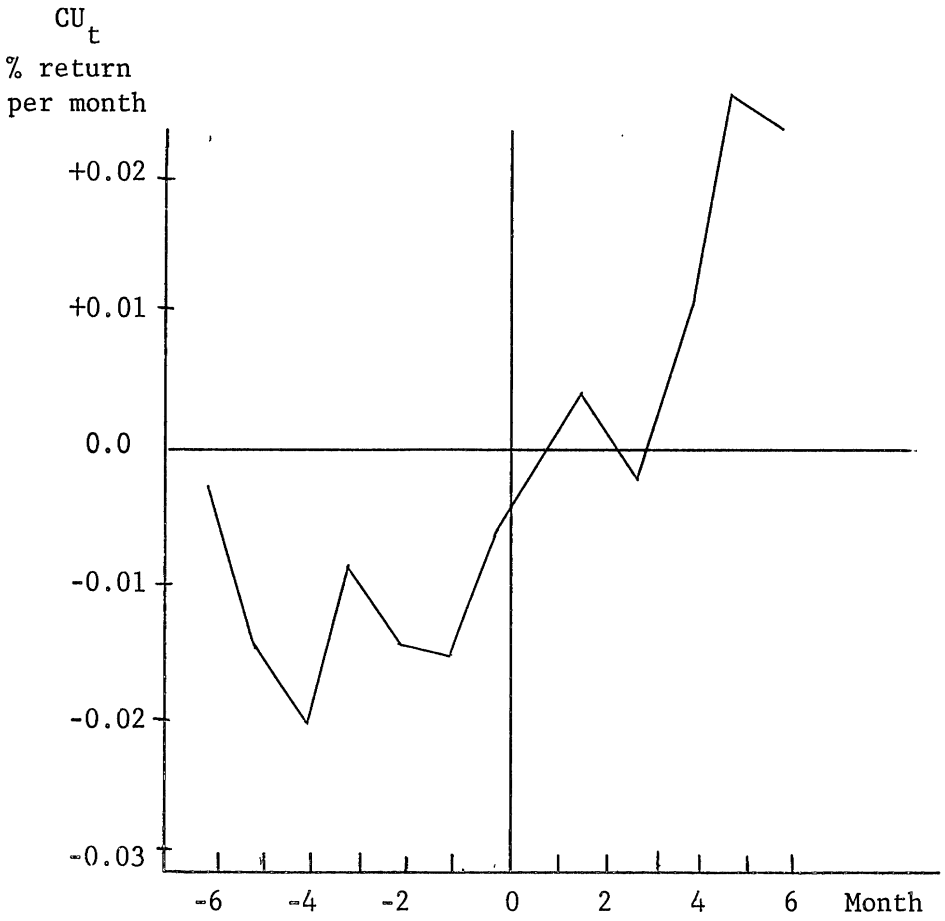

Figure 2

Cumulative Residuals - Open Market Sample

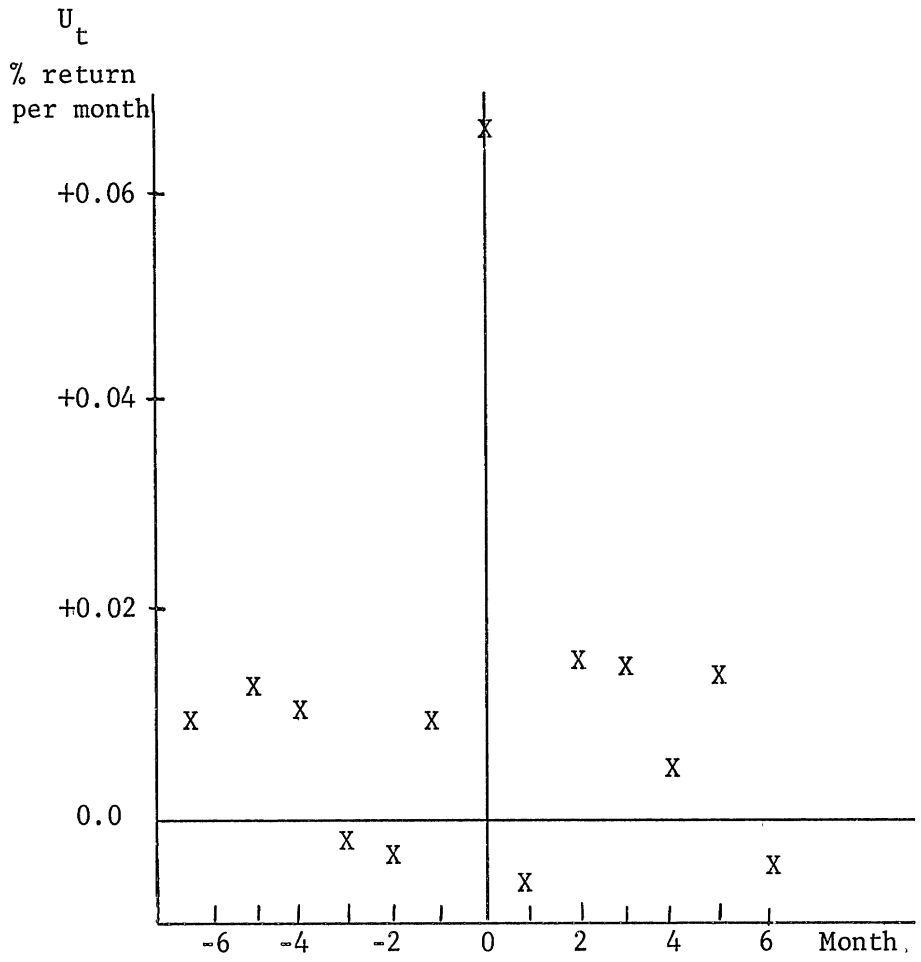

Figure 3

Average Residuals - Tendered Sample

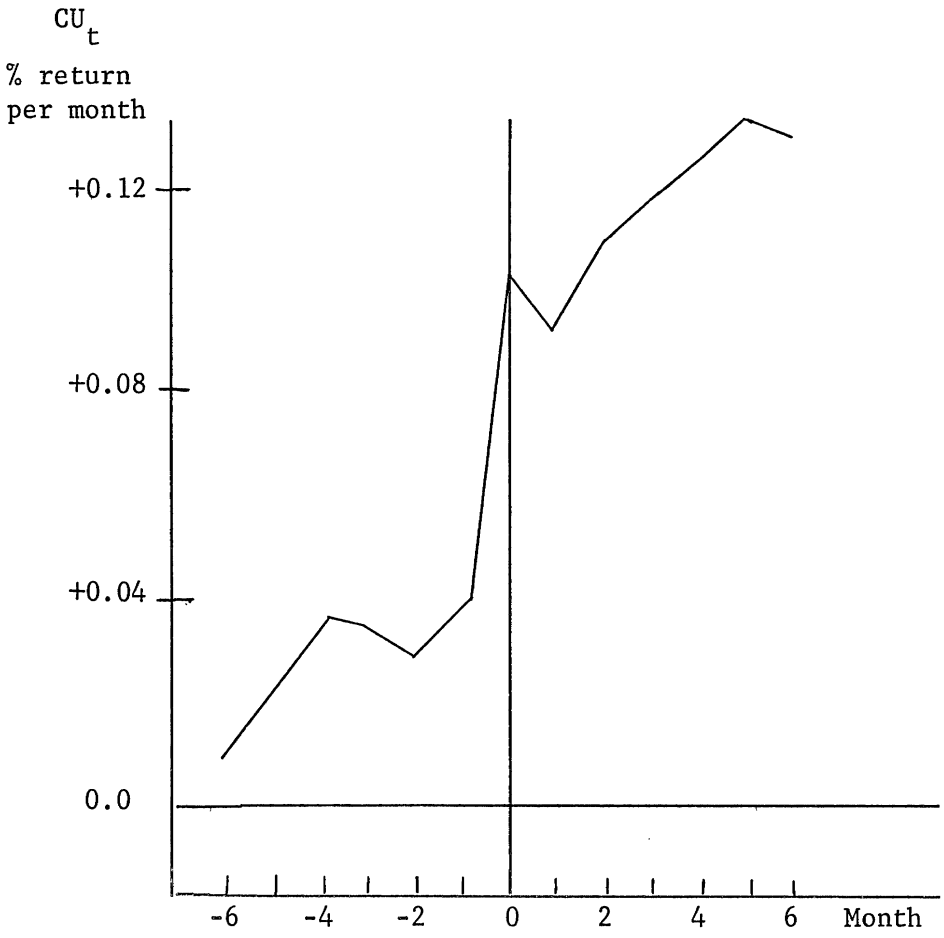

Figure 4

Cumulative Residuals - Tendered Sample

For the open-market repurchase sample, the residuals indicate that the repurchase activity had no significant effect on the pricing of the repurchased shares either during the months preceding the announcement, during the month of the announcement, or during the months following the announcement. None of the residuals were significantly different from zero at the 5% level, although for months t = -5 and t = +5, they were significant at the 10% level. Before any conclusions could be drawn from these results for our alternative hypotheses as to price movements around the repurchase date, we analyzed the residuals for the sample repurchased by way of a tender offer.

Analysis of these residuals in Table 2 shows quite clearly that the market reacted to the announcement of the stock repurchase in a manner that is consistent with our positive information hypothesis. The only month in which the residuals showed any significant deviation from zero was during the month of the announcement and this was at the 1% level. The implication drawn from these results is that the market reacts favorably to the announcement of stock repurchases, just as the existing theory in the literature indicates. The specific economic variables affected could be taxes, stockholder service costs, or inside information. The evidence is not consistent with the alternative hypothesis that the effect on pricing would be negative. The rationale for that hypothesis was that since the announcement could be seen as an admission by management of its inability to generate high-yielding investments, the market would react negatively. Given the evidence

presented here, either the announcement of repurchase is not seen as such by the market, or if it is, that piece of information has been discounted by the market before the actual announcement.

The rejection of the alternative hypothesis is possible for both samples of repurchased securities. At first it seemed that the evidence was consistent with the positive pricing effects hypothesis for only the tendered sample. Since the residuals for the open-market repurchases were not significantly different from zero, the positive pricing effects hypothesis would have to be rejected for that sample. However, it seems strange that the results should differ for the two samples. With this in mind, we suggest another interpretation of the results for the open-market sample.

One of the contributions of the model given in Section II was to show that if the firm pays a premium in the repurchase of its securities (if $y > 0$), any attempt to determine the information content of the announcement (i.e., any attempt to determine the sign of z) would lead to understating the value of z unless an adjustment is made for the repurchase premium. In the tendered sample, for which the positive pricing effects hypothesis cannot be rejected, such an adjustment was made. However, for the open-market sample it was decided that, by definition, no premium is paid in the repurchase of the shares. However, if the firm itself exerts price pressure on the stock in its repurchase efforts, then in essence it has paid a premium. We have no evidence that such price pressure does exist, but if it did, the beginning of

the announcement month prices for these securities would need to be adjusted downwards just as we did for the tendered sample. Such an adjustment may lead to residuals in month t = 0 that are significantly different from zero. We do not mean to make any definitive statements on this matter, but only to suggest an explanation for the seemingly inconsistent results. Further research is necessary before any stronger statement can be made.

V. SUMMARY

In this paper we have attempted to identify empirically the market's reaction, in terms of price effects, to the announcement of repurchase. One hypothesis is that, as the literature suggests, news of positive economic benefits is transmitted to the market by the announcement of repurchase and the market reacts accordingly by bidding up the price of the stock. This hypothesis could not be rejected for a sample consisting of shares repurchased by way of a tender offer. The methodology employed is the analysis of the residuals of the market model for the months surrounding the repurchase announcement. A model was developed which showed that in order to isolate the effect on the price of any information implicit in the announcement, an adjustment must be made to the pre-repurchase price to account for any premium the firm paid in its repurchase efforts.

For a sample of securities repurchased on the open market, analysis of the residuals indicates a neutral effect on prices, leading

us to reject the positive pricing effects hypothesis. However, a possible methodological problem with this sample is mentioned which, if handled successfully, might shift the results in the direction of accepting the hypothesis. However, more research is necessary before any definite conclusions can be drawn for this sample.

Footnotes

1. The interval between t and t + 1 is most conveniently thought of as a single day, time t being the day before the repurchase and time t + 1 being the day of the repurchase.

2. The variable x is an average of the individual x_i's weighted by the number of shares initially held by the ith investor. In other words,

$$x = \sum_{i=1}^{m} x_i \left(\frac{n_{t,i}}{\sum_{i=1}^{m} n_{t,i}} \right).$$

3. It is because we relied on this data source for price relatives that one of our data requirements was that the firm be listed on the NYSE. The authors wish to thank the Graduate School of Business at the University of Wisconsin for making the CRSP files available to us while one of us was a Visiting Professor of Finance there.

4. In other words, this security was repurchased in January of 1963.

5. Since we are interested in residuals around the repurchase month, we need to know not only the year, but also the month in which the repurchase was initiated. Hence, the need for data requirement number 1.

6. This actually is true only for the repurchases by way of tender offers, since, by definition, in open-market repurchases no premium above market price is paid.

7. In [4], Nantell and Finnerty show that an investor's wealth position is unaffected by the repurchase premium as long as he sells to the firm a pro rata share of his stock, i.e., as long as $x_i = x$.

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