Expectations Data and the Predictive Value of Interim Reporting

A. RASHAD ABDEL-KHALIK* AND JOSE ESPEJO†

This paper provides an adaptive model depicting the interaction between the disclosure of interim earnings and the accuracy of earnings forecasts that are made public by security analysts. Our results indicate that accuracy of annual earnings forecasts is highly correlated with the announcement of interim earnings, suggesting that security analysts use the signals provided by the disclosure of interim reports. Though intuitively appealing, these results are inconsistent with some of the earlier research findings concerning the predictive power of quarterly earnings. They also provide a good explanation for the reasonably high rate of accuracy of analysts' annual earnings forecasts.

Historical Background

In the past decade, accountants have researched the predictive power of quarterly earnings and the accuracy of earnings forecasts as independent or unrelated phenomena. Green and Segall [1967a; 1967b], using mechanical rules derived from historical data to predict annual earnings per share, concluded that "first quarterly reports as presently prepared are of little help in forecasting earnings per share" [1967b, p. 36]. This negative conclusion prompted Holton to reply, "I can't believe it" [1967, p. 37]. The controversy was the focal issue in several subsequent studies. In each of these, the authors investigated

* Professor, University of Florida; † Assistant Professor, Duke University. We would like to thank Russ Barefield, Kal Cohen, Gene Comiskey, Nick Dopuch, W. S. Gray, Jack Hughes, and Jim McKeown for providing useful feedback on earlier drafts. However, we alone are responsible for any shortcomings that remain in this paper. [Accepted for publication July 1977.]

† For example, Barnea, Dyckman, and Magee [1972]; Brown and Niederhoffer [1968]; Coates [1972]; and Reilly, Morgenson, and West [1972].
the relative strength of predictive rules which are constructed from historical data of annual and quarterly earnings, compared to the predictive ability of other prediction rules which are constructed from annual historical data alone. The results have been mixed and contradictory, with the present state of the art in this area of research still fitting the summary provided by Barnea et al. [1972, p. 154]: “The accounting literature to date has not adequately dealt with the predictive usefulness of interim reports. Coates’ important study demonstrates that such reports may have predictive usefulness although his results appear to overstate this usefulness... On the other hand, other research may have under-estimated the predictive ability of interim reports.”

Moreover, all discussions of the predictive power of quarterly earnings assume that negative results are necessarily evidence of the absence of predictive usefulness of such reports. In fact, however, such results may merely reflect the use of imperfect mechanical rules for predicting annual earnings per share. Indeed, recent research results indicate that analysts’ forecasts are superior to the forecasts obtained by best available mechanical rule. Therefore, it may be more relevant to use analysts’ forecasts to assess the predictive usefulness of quarterly earnings.

The same basic shortcoming exists in the studies related to earnings forecasts. Except for some research showing the relevance of publicly available earnings forecasts to security prices and resource allocation, the research concerned with earnings forecasts has stressed evaluating the accuracy of earnings forecasts, whether made by corporate management or by security analysts. The results of these studies may be summarized as follows. (1) Earnings forecasts are reasonably accurate, but there are outliers with very high degrees of forecast error. (2) Analysts’ forecasts of annual earnings are not significantly less accurate than forecasts made by management. For this reason, there may be no need for management to disclose forecasts. (3) Accuracy of annual earnings forecasts does not appear to depend on the model used by a particular analyst because “differences among the forecasts of various analysts are not significant.”

As indicated, these two lines of research (the accuracy of publicly available earnings forecasts and the predictive value of quarterly earnings) have not intersected. Yet it would seem that analysts’
forecasts are dependent, in part, on interim earnings disclosures made by the management of the firm whose earnings are being forecasted. Moreover, if through disclosure of certain types of information, management can convey certain information which induces analysts to alter their forecasts and to channel them toward a higher degree of accuracy, then the question of the value of direct disclosure of earnings forecasts by management becomes unimportant.

There is indirect evidence that analysts do revise their forecasts periodically in reaction to various signals given by the management and in reaction to other firm-related news. For example, the weekly issues of Standard & Poor's Earnings Forecaster and the quarterly issues of Value Line indicate that analysts revise their forecasts of annual earnings per share immediately following the announcement of actual quarterly earnings per share. Apparently, these quarterly reports have some predictive content. However, the issue remains whether the revised forecasts increase the accuracy of the predicted portion of annual earnings per share. Somewhat related is the question of the relative importance of each quarter in improving the accuracy of the forecasted numbers.

Our research study is aimed at an evaluation of the relative use of the signals provided by quarterly reports in improving the predictive ability of security analysts in forecasting annual earnings. Since every quarterly announcement contains signals of the realizability of prior expectations, analysts are expected to use these signals in revising the predicted portion of annual earnings. As a result, annual earnings forecasts would tend to become more accurate throughout the fiscal year.

The Model

In order to develop the model, we identify five points in time: (a) the beginning of the fiscal period (time-period 0), (b) the dates of announcing quarterly earnings (time-periods 1, 2, 3 for the first three quarters), and (c) the end of the fiscal period or when annual earnings are known (time-period 4). The model stipulates a specific form of interaction between quarterly earnings announcements and revisions of analysts' forecasts. At time 0, analysts make a forecast of earnings for the fiscal period. At the end of the first quarter, a number is announced for actual earnings during the quarter. Analysts then evaluate the announced number and revise their forecasts of annual earnings accordingly. We hypothesize that if the announced quarterly earnings are different from expectations, analysts entertain several revision possibilities (RPi), which may be summarized as follows.

(RPi) A revision of the predicted portion of annual earnings (defined as forecasted annual earnings minus realized quarterly earnings) would be unnecessary if the deviations between actual and expected earnings
for the quarter are judged to be temporary and would not affect the forecasts of the remaining quarters. However, the forecast of annual earnings number will be revised to incorporate the deviations between actual and predicted earnings of the current quarter.

(RP2) A revision of the predicted portion of annual earnings (of remaining quarters) will take the same direction as the deviation between actual and predicted earnings of the present quarter, if the pattern set by such deviation is expected to continue. In this case, annual earnings forecast would be revised to incorporate all these changes in expectations, in addition to the deviations of the present quarter.

(RP3) The predicted portion of annual earnings (forecasted earnings of the remaining quarters) is revised in the opposite direction of the deviation between actual and expected earnings of the present quarter, if such deviation is expected to be compensated for in other quarters. In this case, the forecast of annual earnings may not be changed.

In any of the three cases, the information provided by quarterly reports is measured by the unexpected deviation of actual quarterly earnings from those forecasted. If analysts in fact use these quarterly deviations to revise the predicted portion of the annual number of earnings, it would be difficult indeed to argue that such reports have no predictive power. Such an argument would be even less valid for the first quarter since the deviation of actual from expected earnings of the first quarter would provide analysts with feedback on the accuracy and directions of their expectations. The feedback-revision cycles are shown in figure 1.

This model of the interaction between quarterly earnings and security analysts' forecasts leads to the following differences between this and previous research. (1) It provides an explicit recognition of the dependency of the information flows from both sources. (2) It does not use quarterly numbers per se. Instead, the relevance of quarterly reports is assumed to be in providing feedback on the accuracy of quarterly expectations, and the model uses the deviations of quarterly from expected as a measure of the feedback. (3) It does not rely on mechanical, unverified rules of predictions; it uses publicly available forecasts made by security analysts. (4) It uses the information signals of all of the first three quarters, instead of being restricted to the first quarter. (5) Finally, adaptive forecasting, in the sense described here, is consistent with the findings reported by Foster [1977]. He found that "each quarterly series appears to have both (a) a seasonal component, and (b) an adjacent quarter to quarter component. . . (and) . . . a forecasting model which took into account both the (a) and (b) components yielded more accurate one-step ahead forecasts than models which incorporated only one of the above components" [1977, p. 24]. The consistency between Foster's results of time-series analysis and our model stems from the fact that the deviation between actual and forecasted quarterly
<table>
<thead>
<tr>
<th>Analysts' Actions [Forecasting Annual Earnings]</th>
<th>TIME PERIOD</th>
<th>Managements' Actions [Announcing Interim Earnings]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual EPS Forecast at the Start</td>
<td>FEPS&lt;sub&gt;0,y&lt;/sub&gt;</td>
<td>0 [Start of y]</td>
</tr>
<tr>
<td>First Revision of Annual EPS Forecast</td>
<td>FEPS&lt;sub&gt;1,y&lt;/sub&gt;</td>
<td>1</td>
</tr>
<tr>
<td>Second Revision of Annual EPS Forecast</td>
<td>FEPS&lt;sub&gt;2,y&lt;/sub&gt;</td>
<td>2</td>
</tr>
<tr>
<td>Third Revision of Annual EPS Forecast</td>
<td>FEPS&lt;sub&gt;3,y&lt;/sub&gt;</td>
<td>3</td>
</tr>
<tr>
<td>AEPS&lt;sub&gt;y&lt;/sub&gt; = FEPS&lt;sub&gt;3,y&lt;/sub&gt; + u&lt;sub&gt;4,y&lt;/sub&gt;</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Fig. 1. – Stipulated interactions between analysts' and managements' actions (adaptive forecasting).
earnings is expected to incorporate information on the changes in both components of the series. To this extent, the information content of the interim measures can be used to adjust annual earnings forecasts after each interim signal is received. As a result, the model provides a more realistic picture of the dynamics of the interaction between information flows from management and analysts.

To express this model symbolically, let us assume that after three revisions of forecasted annual earnings per share, the forecasts made in the fourth quarter are quite accurate and any forecast error would be random. Accordingly, for any firm \( j \), let:

\[
AEPS_y = FEPS_{3,y} + u_{3,y}
\]  

(1)

where:

- \( AEPS_y \) = actual earnings per share of year \( y \);
- \( FEPS_{3,y} \) = forecasted annual earnings per share which are made for year \( y \) after the announcement of third quarter earnings;
- \( u \) = a random error with expectations equal to zero and \( \text{Cov}(u, FEPS_y) = 0 \);
- \( y \) = fiscal year for which forecasts are made.

From figure 1, \( AEPS_y \) may be considered a terminal value, while \( FEPS_{3,y} \) is the final step in a chain of revisions prior to the terminal value, because \( FEPS_{3,y} \) is the product of three revisions of earlier forecasts. As the above discussion suggests, these revisions are functions of the quarterly feedback signals which are measured by the quarterly forecasting error. These revisions may be stated (for any firm \( j \)) as follows:

\[
FEPS_{q,y} = FEPS_{q,y} + \lambda_q(D_{y,q}) + u_{q,y}
\]  

(2)

where:

- \( q \) = quarter in which forecasts of annual EPS are made, \( q = 1, 2, 3, 4 \);
- \( y \) = fiscal year for which forecasts are made;
- \( \lambda \) = an adaptation coefficient designating the strength and direction of revisions of forecast;
- \( FEPS_{q,y} \) = forecasted annual earnings per share made in the \( q \)th quarter for fiscal period \( y \);
- \( D_{y,q} \) = the deviation of actual from expected earnings per share of quarter \( q \) during fiscal period \( y \) — this is a measure of quarterly forecast error;
- \( u \) = a random error, as before.

Because the forecast error of the fourth quarter would not be used to revise forecasted annual earnings per share, then only the forecast errors associated with the results of the first three quarters can be considered to provide negative feedback on the predictability of forecasted annual earnings.
casts, and there are three equations of the form (2) above, one for each feedback quarter. These three equations can be traced on the left-hand side of figure 1 by starting with the terminal value and going up. By substituting the three equations of form (2) recursively, we obtain:

$$FEPS_{3,v} = FEPS_{0,v} + \lambda_1(Dy') + \lambda_2(Dy^2) + \lambda_3(Dy^3) + u'_v$$  \hspace{1cm} (3)

where all notations are as defined above, except:

$$u'_v = \sum_{q=1}^{3} u_{q,v}.$$  

By further substitution of (3) into (1), we obtain:

$$AEPS_v = FEPS_{0,v} + \lambda_1(Dy') + \lambda_2(Dy^2) + \lambda_3(Dy^3) + e_v$$  \hspace{1cm} (4)

where $e_v = u'_v + u_{3,v}$.

Finally, by rearranging, we can rewrite (4) as:

$$PE_v = \lambda_1(Dy') + \lambda_2(Dy^2) + \lambda_3(Dy^3) + e_v$$  \hspace{1cm} (5)

where:

$PE_v = \text{the annual prediction error without any signals from management and is measured by } (AEPS_v - FEPS_{0,v})$, and all other notations remain as before.

Let us now consider what the signs of $\lambda^q$ should be in view of the three revision possibilities (RP) mentioned earlier. If RP1 prevails, $\lambda_v^1$ will be the only nonzero coefficient, because the deviations of first quarter $AEPS$ from $FEPS$ will not affect earnings in subsequent quarters. And since the forecast error $PE$ will take the same direction and magnitude of the first quarterly deviation $D$, $\lambda_v^1$ should be positive. If RP2 prevails and the pattern of deviation set in any quarter is expected to continue for remaining quarters, then the prediction error will be affected by the direction of such a pattern. Since $PE$ will take the same direction as $D_v^q$, then all $\lambda^q$ should be positive. Finally, if the third revision possibility, RP3, takes place, then a positive deviation $D_v^q$ will lead to a negative deviation in a forthcoming quarter ($D_v^{q+1}$). Hence, the deviation in a given quarter is expected to be cancelled out by deviations in other quarters before the end of the year with no effect on the total prediction error, $PE$. The cancellation will take place only if all $\lambda^q$ are positive. Note then that in any of the three revision possibilities hypothesized for the adaptive behavior of security analysts, the adaptation coefficient $\lambda^q$ should be positive. We now proceed to estimate equation (5).

**Data and Estimation**

In selecting our sample, we had to find a publicly available source where security analysts reveal their forecasts of quarterly earnings and
also revise such forecasts after the announcement of actual earnings in each of the first three quarters. A single source would also ensure the homogeneity of the models and assumptions underlying the forecasts. Because we wanted to increase the chances that the revisions of earnings forecast are due to the feedback provided by quarterly earnings announcements, the time elapsed between the announcement and the revision of the forecast was restricted to a period of about one month. After stumbling around, we learned that the Value Line Investment Survey (VL) is the only available source for this type of information. VL is published quarterly and consists of thirteen editions in each quarter.

In order to satisfy the timing criterion, we had to eliminate the firms included in the first four editions of VL. In addition, utilities and financial institutions were excluded because of their institutional peculiarities. Using the data of 1976, we selected a sample of 100 firms from the firms in the remaining industries. The sample selection was basically random, except when a randomly selected firm had a fiscal year different from the calendar year. In this case, such a firm was replaced by the firm adjacent to it because it would be very difficult to trace the timing of quarterly announcement and revisions of forecasts for firms whose fiscal period is not consistent with calendar year if we are to continue using VL. Finally, some data inconsistencies between quarters caused us to discard three firms, which left ninety-seven firms in the final sample. The ninety-seven firms and their industries are shown in Appendix A.

We then observed the revisions of quarterly forecasts for these firms in each of the quarterly editions, compared revised forecasts against actual, and measured the prediction errors and deviations which are used in estimating the model. The model was estimated twice: first with the annual prediction error, PE, and each of the quarterly deviations, $D_q$, standardized by actual annual earnings and by the actual earnings of the related quarter, and second using the actual values of $PE$ and $D_q$ (with their signs preserved). The results of the two model estimations are shown in table 1. As these results show, there appears to be little difference between the estimated models in the directions of the coefficients, their level of significance, the overall level of explanation, and in the significance of the function. Similarly, the interdependence of explanatory variables was generally low for both types of data, as shown in table 2.

The similarity between the two types of data did not extend to the tests for heteroscedasticity. Because the data used in the study were drawn from a cross-section of large and small firms, it is expected that the residual term increases with the increase in the size of earnings, a condition that would violate the assumption of a constant variance. We

---

*Published by Arnold Bernhard & Co., Inc. We would like to thank Gene Comiskey for directing our attention to this source.
TABLE 1

<table>
<thead>
<tr>
<th>Model for:</th>
<th>Statistics</th>
<th>Constant*</th>
<th>D</th>
<th>D²</th>
<th>D³</th>
<th>S.E.</th>
<th>F**</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonstandardized Errors</td>
<td>Coefficient</td>
<td>(t)</td>
<td>0.0077</td>
<td>1.84</td>
<td>1.439</td>
<td>1.626</td>
<td>0.83</td>
<td>49.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.109)</td>
<td>(7.88)</td>
<td>(3.85)</td>
<td>(5.29)</td>
<td>(3, 93)</td>
<td></td>
</tr>
<tr>
<td>Standardized Errors</td>
<td>Coefficient</td>
<td>(t)</td>
<td>0.0076</td>
<td>1.84</td>
<td>1.48</td>
<td>1.70</td>
<td>0.204</td>
<td>54.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.34)</td>
<td>(9.13)</td>
<td>(4.27)</td>
<td>6.32</td>
<td>(3, 93)</td>
<td></td>
</tr>
</tbody>
</table>

* Constant is not significant at any reasonable level.
** F_{(n, dn)} and all the coefficients of D are statistically significant at alpha level below 0.001.

TABLE 2

<table>
<thead>
<tr>
<th>Model for:</th>
<th>Variables</th>
<th>D¹</th>
<th>D²</th>
<th>D³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonstandardized Errors</td>
<td>D¹</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D²</td>
<td>0.057</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D³</td>
<td>0.268</td>
<td>0.184</td>
<td>1.0</td>
</tr>
<tr>
<td>Standardized Errors</td>
<td>D¹</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D²</td>
<td>-0.198</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D³</td>
<td>0.062</td>
<td>0.303</td>
<td>1.0</td>
</tr>
</tbody>
</table>

tested for the existence of heteroscedasticity, using the test suggested by Goldfield and Quandt. The sample data were rank ordered by the size of earnings per share and after the middle thirty-three observations were discarded, each of the two samples at the upper and lower ends, consisting of thirty-five observations each, formed a subsample to estimate separate functions using the same variables of equation (5). The sum of the squares of the residuals were compared for the two samples of each year, and the R-statistics (approximating the F-statistic) were computed to test for the existence of heteroscedasticity in the data. The results shown in table 3 suggest that the hypothesis of a constant variance for the residual term could not be rejected for the nonstandardized data, but could be rejected for the standardized data at the 0.01 significance. Accordingly, the estimates of the model using the measured deviations and errors should be less biased than the estimates of the model using standardized data.

Another interesting finding is the persistence of the estimated relationship over the two subsets of the sample. This clearly suggests that the results are not due to the inclusion or exclusion of certain firms in the sample.

In summary, these results show: (1) That each of the quarterly earnings announcement appears to contribute to the revision of the forecasted portion of earnings per share in a significant way. This is evidenced by the high explanatory power provided by the feedback cycles discussed earlier and shown in figure 1. (2) The models appear to
<table>
<thead>
<tr>
<th>Type of Data</th>
<th>Obs. in Subset</th>
<th>Statistics</th>
<th>Constant</th>
<th>$D^1$</th>
<th>$D^2$</th>
<th>$D^3$</th>
<th>S.E.</th>
<th>$F^a$</th>
<th>$R^2$</th>
<th>$SS^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonstandardized</td>
<td>1-35</td>
<td>Coefficient ($t$)</td>
<td>-.0135</td>
<td>2.3</td>
<td>1.18</td>
<td>1.53</td>
<td>.66</td>
<td>13.5</td>
<td>.57</td>
<td>13.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.11)</td>
<td>(4.7)</td>
<td>(1.35)</td>
<td>(2.07)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>63-97</td>
<td>Coefficient ($t$)</td>
<td>-.188</td>
<td>2.01</td>
<td>2.13</td>
<td>2.38</td>
<td>.70</td>
<td>18.3</td>
<td>.64</td>
<td>15.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.23)</td>
<td>(5.5)</td>
<td>(3.2)</td>
<td>(4.72)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardized</td>
<td>1-35</td>
<td>Coefficient ($t$)</td>
<td>.012</td>
<td>1.91</td>
<td>1.58</td>
<td>2.02</td>
<td>.295</td>
<td>16.5</td>
<td>.61</td>
<td>2.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.21)</td>
<td>(5.6)</td>
<td>(2.4)</td>
<td>(3.84)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>63-97</td>
<td>Coefficient ($t$)</td>
<td>-.05</td>
<td>2.75</td>
<td>1.74</td>
<td>2.16</td>
<td>.106</td>
<td>27.4</td>
<td>.73</td>
<td>.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.95)</td>
<td>(6.9)</td>
<td>(3.4)</td>
<td>(5.6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* All $F$'s have (35, 35) degrees of freedom and are significant at $<0.01$.
* Using sum of squares, $R = F = 15.1 + 13.3 = 1.13$ for nonstandardized data, which is not significant at the 0.05 level, and $R = F = 2.69 + 0.35 = 7.7$, which is significant below the 0.05 level.
provide a reasonable explanation for the apparent high degree of accuracy of analysts' forecasts of annual earnings forecasts that is reported in earlier studies. That is, the accuracy of earnings forecasts seems to depend on the feedback provided by quarterly earnings' announcements regarding the realizability of the predicted earnings. This permits analysts to revise their quarterly and annual forecasts and to approach a higher degree of predictive accuracy.

Conclusions

Accuracy of earnings forecasts and the information content of quarterly earnings have previously been researched independently, thus ignoring the potential impact of signals reflected by interim reports on the accuracy of earnings forecasts. In this paper, we provided an adaptive model which assumes that quarterly earnings announcements convey signals about the level of realizable earnings for the year. By estimating the model using data obtained from Value Line for the 1976 forecasts and actual earnings we obtained strong evidence of the significance of the predictive power contained in each of the first three interim reports. The estimation was not altered when the model was estimated for subsets of the sample.

These results are in contrast with the conclusions of Green and Segall [1967a; 1967b] and others which raised doubts about the predictive value of quarterly earnings reports, but which were based on mechanical forecasting rules rather than on actual forecasting models of analysts.

APPENDIX A

Firms in the Sample

Alcoa  Cincinnati Milaeron
Amax   City Investing
American Brands Cleveland-Cliffs
American Cyanamid Combustion Engineering
AMP    Control Data
A. O. Smith Cooper Industries
Arvin Ind. Corning Glass
ATO    Crompton & Knowles
Avon Products Cummins Engine
Babcock and Wilcox Diamond Shamrock
Belden Diebold
Betz Labs Dorr Oliver
Bristol Myers Dover
Brown Group Du Pont
Burndy Easco
Burroughs Eli Lilly
Carborundum Ethyl
Cheesebrough Ponds Faberge
Federal Signal  
GAF  
General Electric  
General Signal  
Gillette  
Halliburton  
Hanna Mining  
Hazeltine  
Hercules  
Hobart Corp.  
Honeywell  
Hughes Tool  
Hunt (Philip) Chemical  
Inland Steel  
IU International  
Kaiser Aluminum  
Kaiser Industries  
Libbey Owens  
LTV  
Marathon Mfg.  
McNeil  
Melville Shoe  
Merck  
Midland-Ross  
Miles Lab  
Monsanto  
Nalco Chemical  
National Steel  
Newmont Mining  
North American Philips  
Northwest Industries

Norton  
Olin  
Pfizer  
Philip Morris  
Raytheon  
Reading and Bates  
Reichold  
Revol  
Reynolds Ind.  
Reynolds Metal  
Robins (A. H.)  
Rohm and Haas  
Roper  
Schlumberger  
Signode  
Singer  
Skil  
Smithkline  
Square D  
Stanley Works  
Studebaker Worthington  
Sybron  
Texas Instruments  
Textron  
Upjohn  
U.S. Tobacco  
Warner and Swasey  
Warner Lambert  
Western Co.  
Xerox

REFERENCES


