In this study, accuracy of security analysts' median consensus forecasts of earnings per share is investigated using a sample from Turkey. Regression results demonstrate that analysts' forecasts of earnings in Turkey deviate from the theoretical relationship between forecasts and actual earnings represented by a 45-degree line passing through the origin. Forecasts are shown to be inefficient in the pooled sample covering the time period 1991-95. The observation that the forecasts are inefficient can be interpreted as a lack of accuracy in predicting a volatile target. These results are especially important to equity investors in light of the continuing uncertainty in the emerging markets.

1. Introduction

Investors seeking high return prospects and diversification benefits in emerging markets also face high volatility and informational barriers in these markets. Further development of emerging country equity markets and their integration with the world capital market is dependent on the availability of timely and accurate information on company prospects. Security analysts play an important role in this process by providing investors with information on company fundamentals. Forecasts of earnings per share are an important piece in the information set supplied by security analysts. The importance of analysts' earnings forecasts as a representative of the market's earnings expectations is well documented in developed equity markets such as the United States, United Kingdom, and Japan (Brown [1978], Rendleman, Jones, and Latane [1982], Conroy, Harris, and Park [1994], Jacques and Rie [1994]). However, the earnings forecasting literature covering the emerging markets has not addressed such issues as the accuracy and market association of earnings forecasts, the operating environment of security analysts and its impact on their forecasting process, and the accuracy of analyst generated forecasts compared to those generated by statistical time series models.

This study focuses on Turkey, which is identified as a big emerging market by the U.S. Department of Treasury with its good potential for trade growth in the next century (see Business America, 1994). Apart from its high growth potential, Turkey has a relatively large population, has been introducing economic reform packages to liberalize its financial markets, and possesses political importance in its region. These characteristics contribute to its potential to lead economic growth in the Middle East, Asia, and Eastern Europe.

The main null hypothesis is that analysts' forecasts in Turkey are unbiased and efficient. This null hypothesis is tested against alternative hypotheses of bias and inefficiency. Regression results demonstrate that analysts' forecasts in Turkey deviate from the theoretical relationship between forecasts and actual earnings represented by a 45-degree line passing through the origin. Forecasts are inefficient, although the null hypothesis that they are biased cannot be rejected in the pooled sample between 1991-95.

2. Sample Selection

Data for our analysis is gathered using the Institutional Brokers Estimate System (I/B/E/S) International history data tapes. This data base provides information on security analysts' consensus earnings forecasts from over forty countries. This study focuses on the accuracy of analysts' earnings forecasts for a sample of
Turkish companies. A sample of median consensus forecasts of annual primary earnings per share of Turkish companies reported to I/B/E/S for a given fiscal year-end is constructed. Median consensus forecasts were chosen over mean forecasts because of O'Brien's [1988] finding in a sample of U.S. firms that median earnings forecasts exhibit the smallest bias of competing consensus forecast measures. Earnings per share figures are taken from the Background Data File of the I/B/E/S history tape. Forecasts and actual earnings per share for each firm year are divided by beginning-of-year share price in order to scale for cross-sectional differences in the level of earnings and share price. The final sample includes 645 observations for the period 1991-95.

3. Methodology and Results

Forecast error is calculated as actual earnings per share minus the forecast of earnings per share. The summary statistics of earnings forecast errors, which are presented in Table 1, indicate that forecast errors are not statistically significant in the pooled sample across years. In a comparative study of earnings forecasts in four developed equity markets, Saraoglu (1995) shows that analysts tend to overestimate earnings when they report negative forecasts and, when the forecasts correspond to negative earnings outcomes. Overoptimistic bias in analysts' earnings forecasts of poorly performing firms is also documented by Moses (1990), and Dowen (1996). Research suggests that this bias may relate to the analyst being on the sell side, or not wanting to alienate managers with negative reports (Lin and McNichols (1991); and Dugar and Nathan (1995)). Following the findings of these studies, a breakdown of results according to the sign of the forecasts is also presented. This analysis reveals that positive forecasts are overoptimistic, while negative forecasts underestimate the actual earnings in Turkey. Analysts' positive earnings forecasts in the pooled sample contain a statistically significant average error of -.0053, which corresponds to an earnings-price ratio of about .5%. Negative earnings forecasts in the pooled sample has an average forecast error of .1130, which is significant at the 1% level.

The theoretical relationship between earnings per share and the forecasts of earnings per share is a 45-degree line passing through the origin. The null hypothesis in our study is that analysts' earnings forecasts of Turkish firms are unbiased and efficient.

At this point, it is useful to review the concept of bias and inefficiency in the composition of mean square error (MSE). Forecast error (FCE) can be computed as:

\[ FCE_{it} = EPS_{it} - FEPS_{it} \]

The variance of the forecast error is denoted \( \sigma^2(FCE) \) and the variance of the residual from the regression equation is denoted \( \sigma^2(\epsilon) \). Applying the method suggested by Theil (1966), the mean square error of the forecast can be decomposed as follows:

\[
MSE = E[(EPS - FEPS)^2] = E[(FCE)^2] = [E(FCE)]^2 + \sigma^2(FCE)
\]

\[
= [E(FCE)]^2 + [\sigma^2(FCE) - \sigma^2(\epsilon)] + \sigma^2(\epsilon)
\]

\[
= [E(FCE)]^2 + (1 - \beta)^2 \cdot \sigma^2(FEPS) + (1 - \tau^2) \cdot \sigma^2(EPS)
\]

\[ = \text{bias} + \text{inefficiency} + \text{error} \]
where $r^2$ denotes the coefficient of determination of the regression model.

Bias in the prediction of EPS relates to the difference between the actual average EPS and the average FEPS. In line with a rational expectations framework, an unbiased estimate involves an average FEPS ($\bar{\text{FEPS}}$) which is equal to average EPS ($\bar{\text{EPS}}$). In this case, the regression equation passes through the point $(x,y) = (\bar{\text{FEPS}}, \bar{\text{EPS}})$ on the 45-degree line of perfect fit.

Inefficiency of a forecast is represented by the magnitude of $\sigma^2(\text{FCE})$ relative to the residual variance $\sigma^2(\varepsilon)$ in the regression equation. When the forecast error (FCE) is uncorrelated with the FEPS, the slope coefficient ($\beta$) must be equal to unity. This implies that $\sigma^2(\text{FCE}) = \sigma^2(\varepsilon)$ and the EPS prediction is efficient. If, however, the FCE is related to the FEPS, then the forecast is inefficient. In this case, $\beta$ is not equal to unity and $\sigma^2(\text{FCE})$ is different from $\sigma^2(\varepsilon)$.

In order to investigate the efficiency of forecasts the following OLS regression is run using samples from the 1991-95 period for each year that forecast and earnings per share data are available:

$$\text{EPS}_{it} = \alpha_t + \beta_t \cdot \text{FEPS}_{it} + \epsilon_{it}$$

where

$$\text{EPS}_{it} = \text{actual earnings per share for firm } i \text{ and fiscal year } t$$

$$\text{FEPS}_{it} = \text{earnings forecast per share for firm } i \text{ and fiscal year } t$$

The null hypothesis $\beta=1$ is tested using the regression results. Forecasts are said to be efficient if the null cannot be rejected. To examine the bias in forecasts, the null hypothesis that the average forecast error is zero is tested. If this hypothesis cannot be rejected, one can conclude that the forecasts are unbiased.

Test results, which are summarized in Table 2, indicate that analysts' earnings forecasts of Turkish companies are inefficient in the pooled sample of 1991-95, while the hypothesis that they are unbiased cannot be rejected. An examination of results from annual samples reveals that forecasts are inefficient in three of the five years studied. Forecasts have a statistically significant optimistic bias in only one of the sample periods. The observation that the forecasts are inefficient can be interpreted as a lack of accuracy in predicting a volatile target. This finding has important implications in reflecting an environment of high inflation and earnings uncertainty.

Table 3, which presents the decomposition of the MSE in annual samples as well as the pooled sample between 1991-95, provides further insight to the sources of error in the forecasts.

4. Summary and Directions for Future Research

In this study, accuracy of security analysts' median consensus forecasts of earnings per share in Turkey is investigated using a samples from the 1991-95 period. Regression results demonstrate that analysts' forecasts in Turkey deviate from the theoretical relationship between forecasts and actual earnings represented by a 45-degree line passing through the origin. Forecasts are shown to be inefficient in the pooled sample covering the time period 1991-95. The observation that the forecasts are inefficient can be interpreted as a lack of accuracy in predicting a volatile target. This finding has important implications for equity investors in light of the continuing uncertainty in the emerging markets. In light of these results, further research must look into
the market association of earnings forecasts in Turkey. The extent of stock price response to actual earnings announcements would reveal how market participants interpret analysts' forecasts in an emerging market.

References


"Why the Big Emerging Markets?, " *Business America*, 1994, p. 17


Table 1: Predictions of Earnings Per Share in Turkey

Number of observations (N), percentage of forecasts overestimating the actual earnings, and the size of average forecast error are reported for each sample period, as well as the pooled sample period of 1991-95. A breakdown of results according to the sign of forecast (FEPS) and the sign of actual earnings (EPS) is also presented. Forecast error is calculated as actual earnings per share minus the forecast of earnings per share. A negative number for bias indicates an overoptimistic forecast.

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Over</th>
<th>EPS</th>
<th>Average Error</th>
<th>N</th>
<th>Over</th>
<th>EPS</th>
<th>Average Error</th>
<th>N</th>
<th>Over</th>
<th>EPS</th>
<th>Average Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>17</td>
<td>3</td>
<td>-0.121</td>
<td>-0.011</td>
<td>17</td>
<td>5</td>
<td>-0.121</td>
<td>-0.011</td>
<td>17</td>
<td>7</td>
<td>-0.121</td>
<td>-0.011</td>
</tr>
<tr>
<td>1992</td>
<td>6</td>
<td>0</td>
<td>0.078</td>
<td>0.078</td>
<td>6</td>
<td>0</td>
<td>0.078</td>
<td>0.078</td>
<td>6</td>
<td>0</td>
<td>0.078</td>
<td>0.078</td>
</tr>
<tr>
<td>1993</td>
<td>4</td>
<td>0</td>
<td>0.127</td>
<td>0.108</td>
<td>4</td>
<td>0</td>
<td>0.127</td>
<td>0.108</td>
<td>4</td>
<td>0</td>
<td>0.127</td>
<td>0.108</td>
</tr>
<tr>
<td>1994</td>
<td>3</td>
<td>0</td>
<td>0.047</td>
<td>0.047</td>
<td>3</td>
<td>0</td>
<td>0.047</td>
<td>0.047</td>
<td>3</td>
<td>0</td>
<td>0.047</td>
<td>0.047</td>
</tr>
<tr>
<td>1995</td>
<td>3</td>
<td>0</td>
<td>0.047</td>
<td>0.047</td>
<td>3</td>
<td>0</td>
<td>0.047</td>
<td>0.047</td>
<td>3</td>
<td>0</td>
<td>0.047</td>
<td>0.047</td>
</tr>
<tr>
<td>1991-95</td>
<td>38</td>
<td>0</td>
<td>0.078</td>
<td>0.078</td>
<td>38</td>
<td>0</td>
<td>0.078</td>
<td>0.078</td>
<td>38</td>
<td>0</td>
<td>0.078</td>
<td>0.078</td>
</tr>
</tbody>
</table>

Table 2: Summary of OLS Regressions EPS Against FEPS

\[
EPS_i = \alpha + \beta \cdot FEPS_i + \epsilon_i
\]

where

- \( EPS_i \) = actual earnings per share for firm \( i \) and fiscal year \( t \)
- \( FEPS_i \) = earnings forecast per share for firm \( i \) and fiscal year \( t \)

Coefficients of OLS regression are estimated for annual samples as well as the pooled sample across years. Parameters for the intercept (\( \alpha \)) and slope (\( \beta \)) terms are estimated, and their values are reported with their standard errors underneath. The intercept term is tested against zero, and the slope term is tested against one. For each regression \( r^2 \) are reported as well. The null hypotheses that the forecasts are unbiased is tested, the results of the test are reported under Bias.

<table>
<thead>
<tr>
<th>Sample Period</th>
<th>N</th>
<th>Bias ( E(\text{EPS}) - E(\text{FEPS}) )</th>
<th>Inefficiency ( \beta )</th>
<th>( r^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>17</td>
<td>-0.011 (.0091)</td>
<td>.8680 (.1130)</td>
<td>7980</td>
</tr>
<tr>
<td>1992</td>
<td>112</td>
<td>0.023 (.0142)</td>
<td>.5620 (.0580)</td>
<td>4730</td>
</tr>
<tr>
<td>1993</td>
<td>151</td>
<td>0.042 (.0104)</td>
<td>.2070 (.1050)</td>
<td>0250</td>
</tr>
<tr>
<td>1994</td>
<td>174</td>
<td>-0.019 (.0042)</td>
<td>.8300 (.0520)</td>
<td>5950</td>
</tr>
<tr>
<td>1995</td>
<td>191</td>
<td>-0.019 (.0036)</td>
<td>.9550 (.0370)</td>
<td>7750</td>
</tr>
<tr>
<td>1991-95</td>
<td>645</td>
<td>0.024 (.0038)</td>
<td>.5680 (.0310)</td>
<td>4370</td>
</tr>
</tbody>
</table>

*** significant at a 1% confidence level, ** significant at a 5% confidence level, * significant at a 10% confidence level
Table 3. Decomposition of the Mean Squared Error

Applying the method suggested by Theil (1966), the mean square error of the forecast can be decomposed as follows:

\[
\text{MSE} = \text{E}[(\text{EPS} - \text{FEPS})^2] = \text{E}[(\text{FCE})^2 + \sigma^2(\text{FCE})] \\
= \text{E}[(\text{FCE})^2] + \sigma^2(\text{FCE}) - \sigma^2(\text{e}) \\
= \text{Bias} + \text{Inefficiency} + \text{Error}
\]

where \( \hat{\rho} \) is the coefficient of determination of the regression model. The variance of the forecast error is denoted \( \sigma^2(\text{FCE}) \) and the variance of the residual from the regression equation is denoted \( \sigma^2(\text{e}) \).

<table>
<thead>
<tr>
<th>Year</th>
<th>Bias</th>
<th>Inefficiency</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>8.01%</td>
<td>7.71%</td>
<td>84.28%</td>
</tr>
<tr>
<td>1992</td>
<td>1.79%</td>
<td>17.28%</td>
<td>80.93%</td>
</tr>
<tr>
<td>1993</td>
<td>0.40%</td>
<td>27.46%</td>
<td>72.14%</td>
</tr>
<tr>
<td>1994</td>
<td>0.11%</td>
<td>5.88%</td>
<td>94.08%</td>
</tr>
<tr>
<td>1995</td>
<td>4.64%</td>
<td>0.72%</td>
<td>94.64%</td>
</tr>
<tr>
<td>1991-95</td>
<td>0.06%</td>
<td>12.69%</td>
<td>87.25%</td>
</tr>
</tbody>
</table>