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Abstract

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:

$$FCE_{i\tau} = EPS_{i\tau} - FEPS_{i\tau}$$

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

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

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

$$= [E(FCE)]^2 + (1 - \beta)^2 . \sigma^2(FEPS) + (1 - r^2) . \sigma^2(EPS)$$

= bias + inefficiency + 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 ($\overline{FEPS}$) which is equal to average EPS ($\overline{EPS}$). In this case, the regression equation passes through the point (x,y) = ($\overline{FEPS}$, $\overline{EPS}$) on the 45-degree line of perfect fit.

Inefficiency of a forecast is represented by the magnitude of σ^2(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 (β) must be equal to unity. This implies that σ^2(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, β is not equal to unity and σ^2(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:

$$EPS_{it} = \alpha_t + \beta_t \,.\, FEPS_{it} + \varepsilon_{it}$$

where

EPS_{it} = actual earnings per share for firm i and fiscal year t

$FEPS_{it}$ = earnings forecast per share for firm i and fiscal year t

The null hypothesis β=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.

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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 forecasts (FEPS) and the sign of actual earnings (EPS) and 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.

		FEPS<0				FEPS>0				TOTAL			
	Year	N	# Over	Mean EPS	Average Error	N	# Over	Mean EPS	Average Error	N	# Over	Mean EPS	Average Error
EPS >0	1991					17	3	.1221	-.0111	17	3	.1221	-.0111
	1992	6	0	.1150	***.3481	92	34	.1569	.0130	98	34	.1543	***.0335
	1993	4	0	.1878	.4474	138	59	.0948	*.0051	142	59	.0974	*.0176
	1994	3	0	.0478	.0970	152	77	.0695	***.0234	155	77	.0691	.0042
	1995					179	108	.1057	***-.0090	179	108	.1057	***.0090
	1991-95	13	0	.1219	***.3207	578	281	.1022	.0008	591	281	.1026	**.0078
EPS<0	1991												
	1992	9	3	-.3104	.0397	5	5	-.2104	***-.2744	14	8	-.2747	-.0725
	1993	3	1	-.0650	.0111	6	6	-.1891	**-.2180	9	7	-.1476	*-.1416
	1994	9	3	-1402	.0352	10	10	-.0430	***-.0637	19	13	-.0890	-.0169
	1995	9	1	-.1044	-.0149	3	3	-.0180	**-.1134	12	4	-.0829	-.0395
	1991-95	30	8	-.1730	.0191	24	24	-.1113	***-.1524	54	32	-.1455	**-.0571
TOTAL	1991					17	3	.1221	-.0111	17	3	.1221	-.0111
	1992	15	3	-.1402	**.1631	97	39	.1379	-.0018	112	42	.1007	.0203
	1993	7	1	.0796	.2604	144	65	.0830	-.0042	151	66	.0828	.0081
	1994	12	3	-.0932	*.0506	162	87	.0626	-.0017	174	90	.0518	.0019
	1995	9	1	-.1044	-.0149	182	111	.1036	***-.0107	191	112	.0938	***-.0109
	1991-95	43	8	-.0838	*** .1103	602	305	.0937	**-.0053	645	313	.0819	.0024

*** significant at a 1% confidence level , ** significant at a 5% confidence level , * significant at a 10% confidence level

Table 2. Summary of OLS Regressions EPS Against FEPS

$$EPS_{it} = \alpha_i + \beta_i \, . \, FEPS_{it} + \varepsilon_{it}$$

where

EPS_{it} = actual earnings per share for firm i and fiscal year t
$FEPS_{it}$ = 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 (α_i) and slope (β_i) 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.

Sample Period	N	Bias E(EPS) – E(FEPS)	Inefficiency β	r^2
1991	17	-.0111 (.0091)	.8680 (.1130)	7980
1992	112	.0203 (.0142)	***.6720 (.0680)	.4730
1993	151	.0042 (.0104)	***.2070 (.1050)	.0250
1994	174	-.0019 (.0042)	***.8300 (.0520)	.5950
1995	191	*** -.0109 (.0036)	.9550 (.0370)	.7750
1991-95	645	.0024 (.0038)	***.6980 (.0310)	.4370

*** 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:

$$
\begin{aligned}
MSE &= E[(EPS - FEPS)^2] = E[(FCE)^2] = [E(FCE)]^2 + \sigma^2(FCE) \\
&= [E(FCE)]^2 + [\sigma^2(FCE) - \sigma^2(\varepsilon)] + \sigma^2(\varepsilon) \\
&= [E(FCE)]^2 + (1 - \beta)^2 \cdot \sigma^2(FEPS) + (1 - r^2) \cdot \sigma^2(EPS) \\
&= \text{Bias} + \text{Inefficiency} + \text{Error}
\end{aligned}
$$

where r^2 is the coefficient of determination of the regression model. The variance of the forecast error is denoted $\sigma^2(FCE)$ and the variance of the residual from the regression equation is denoted $\sigma^2(\varepsilon)$.

Year	Bias	Inefficiency	Error
1991	8.01%	7.71%	84.28%
1992	1.79%	17.28%	80.93%
1993	0.40%	27.46%	72.14%
1994	0.11%	5.80%	94.08%
1995	4.64%	0.72%	94.64%
1991-95	0.06%	12.69%	87.25%