The Study of Usefulness of Different Earnings Forecast Models (Usefulness of Different Earnings Forecast Models by Management Compared to Earnings Forecast through Time Series Models)

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Abstract: Earning forecast is of particular importance for investors, because it is considered an important factor in the stock assessment methods, and in most cases, it is an essential component of the stock selection methods. The importance of this forecast depends on its deviation from the reality. The less the deviation is, the more accurate the forecast will be and this is considered important for both users and suppliers. Having related and timely information, management tries to estimate the future earning so that it would attract the trust of users. In contrast, the investors can estimate future earnings using other methods such as time series models. This study compares the accuracy of the managers in forecasting the future earning with forecast of time series models. For this purpose, the forecasts of 19 companies, including 171 observations, were examined between 1999 and 2007. Considering the results of the sub-hypotheses, the result of the main hypothesis suggests that among the three used models, the best model to forecast with the least error in these companies was the moving average method. Also regarding the comparison of management earning forecast with time series forecasting methods, it was concluded that given that the two models out of three used quantitative models (time series model) forecast earnings with less error than the management forecast method. Thus, it can be said that management forecasts is more useful than time series methods. [Abdolahi, S., Hadinia, S., and Babaei, H. **The Study of Usefulness of Different Earnings Forecast Models (Usefulness of Different Earnings Forecast Models by Management Compared to Earnings Forecast through Time Series Models).** *Life Sci J* 2013;10(7s):225-232] (ISSN:1097-8135). http://www.lifesciencesite.com. 35

Keywords: Earnings Forecast, Management Earnings Forecasts, Earnings Forecasts Through, Time Series Models.

Introduction

Decision makers, i.e. investors, creditors, employees, managers, analysts and other users use earnings for short-term planning in various fields, including progress preservation and making investment decisions, loans, policy of earning payment, corporate assessment, tax calculation and other decisions related to the company. The information provided by the company and therefore earnings, is based on previous events of the company, but mentioned users need information on the future of the company. Users can get the information on future earnings of the company from various sources including management forecast, analyst forecasting and time series forecasting. Therefore, the present study intends to examine and study the usefulness of earnings forecast by management and time series and compared to them. The study results are expected to be practical guidelines for the management, financial analysts, investors and other users and be a lead for future research.

Importance and Necessity of Research

Since investment requires information about the company's future prospects to make decisions, the companies are required to provide a forecast of the earnings per share along with earnings per share this year. Certainly, management has more and better information in hand to forecast the company's future. Research indicates that the forecast of earnings per share has information content. But if management does not provide the investors with such information, they will have to do it or get help from the financial analysts. The importance of earnings forecasts accuracy is due to the variety of sources. The source that leads to fewer errors will be more reliable, i.e. its forecast is closer to the reality. Throughout the world, many researchers have compared the accuracy of earnings forecasts by managers with earnings forecasts by time series models or the earnings forecasts by analysts with time series models or compared all three models together. The research results suggest that forecast by managers or analysts is more accurate than time series models. However, in long-term periods, the result will become inverse. These studies verify the importance of this issue. The above research has been conducted considering few existing research in this field and also due to the importance of earning forecast accuracy in making optimal decisions by inter-organizational and outer-organizational users. Therefore, the earnings

forecasts by managers and time series will be explained as follows:

Earnings Forecasts by Managers

Corporate manager are those financial statements users who are present in the company and consequently, acquire more information than external users. In addition to financial statements, managers have access to information that is confidential to the company. Meanwhile, information will be presented to the managers faster and in less time. Quality of the forecasts provided by management is much higher than the forecasts which are done by people outside the organization, because management has more information about the company status, is aware of the current plans of the company and has access to the financial details of the previous accounting periods. Moreover, it devotes considerable resources to financial forecasts. Despite the advantages, a management forecast is associated with some problems. For example, managers make the maximum profit of corporate earnings. High earnings, increase corporate value and enhances managers' rewards. Thus, it is likely that the management will make a biased forecast and overestimate earning by applying earning management. On the other hand, management forecasts are often influenced by management policy. Conservative managers consider the minimum estimate and optimistic managers consider the maximum estimate. Also, management may be committed to fulfilling forecasts and to achieve this purpose, adopt short-term decisions that do not generally benefit the stockholders. Lack of success of profit units in achieving the forecasts can dissatisfy shareholders.

Earnings Forecasts Using Time Series Models

Many questions are daily raised about the future behavior of phenomena around us, the answer to which is subject to sufficient knowledge and awareness of the mechanism of the occurrence of those phenomena. The weather forecast, oil prices forecast, corporate earnings forecasts, and dozens of similar questions are our favorite. In a scientific classic look, to answer to any of the above questions, it is necessary to have enough analytical knowledge of the mechanism of occurrence of each phenomenon and the effect of each factor in its occurrence. Obviously, in many cases it is very difficult and unattainable, if not impossible, to achieve these mechanisms. In a different look, if each event occurs as a sequence and is examined and considered in the form of numbers and quantities, it can be a solution to forecast its future values. These sequences are analyzed under the title of "time series", regardless of what phenomenon they are related to, what mechanism they arise from and what factors they are affected by. Although accounting information is presented to the users in the form of financial statements about the history of the commercial unit, the same information can usefully shape their future expectations. The examination of time series of previous earnings helps them forecast the company's future earnings. If earnings increase, it is expected to increase in the future and if it decreases, it is expected to decrease in the future. It means that there is a positive serial correlation in the earnings changes. Knowing this, future earnings can be forecasted. If correlation is serial negative (i.e., if reduction of earnings leads to increase of future earnings) earnings in the next year is expected to reduce with an increase in earnings this year. However, it should be noted that so many assumptions and information about a phenomenon can be used and applied to analyze the respective time series.

$x_1, xX_2, \dots, x_n$

Future values of a time series is a function of its previous values.

$$x_k = f(x_{k-1}, x_{k-2}, \dots, x_{k-p} \quad (1)$$

In linear time series models, there are various classical methods of "Estimation and Identification" through which future values of time series can be calculated based on previous values. Time series models include simple exponential smoothing, periodic change forecast, weighted moving average forecast, Holt-Winters exponential smoothing, Double Exponential Smoothing and Box Jenkins model. In all the methods mentioned earlier, regression or formula should be used to estimate earnings forecast. In this study, methods such as weighted moving average method, double exponential smoothing method and the method and Holt-Winters method have been used to forecast earnings. These methods analyze the previous data with the aim to forecast the future value of the intended variable. In time series models (quantitative models); first, the previous data are obtained that are quantitatively measurable. All these models assume that the trend in the previous data will be the same in the future. In other words, quantitative forecasting models can be regarded as special filter that separates the pattern used to forecast from random fluctuations or interferences.

Literature Reviews

Many studies have been conducted, especially in the 1960s and 1970s on earnings forecast accuracy. The main objective of most of these researches is to review and determine the accuracy of earnings forecasts by financial analysts, management and time series. This study is based on a very strong theoretical and empirical background and supports the idea that investors are interested in corporate

earnings forecast. For example, Givoly and Lakonishok (1979) claim that earning per share is a very important factor which investors highly value. Several studies have examined the accuracy of earnings forecast by management and financial analysts, and despite these studies, no identical results are achieved. Comparing the accuracy of earnings forecasts by management and financial analysts, Basi et al. (1977) concluded that earnings forecast by management is much more accurate than earnings forecast by financial analysts. However, their results were not statistically significant.

Ruland (1978) also tested an example of financial analysts' forecast before and after the release of management forecasts and he also failed to reject the statistical Zero hypothesis. Thus, his investigating was also similar to Basi's researches. In a research similar to the study of Roland conducted in 1980, Jackie concluded that management forecast is significantly better than forecasts by financial analysts.

Waymire (1984) also tested forecasts of financial analysts before broadcasting the management forecast. He came to the conclusion that management forecasts are significantly more accurate than forecasts of financial analysts. It also showed that management forecasts contain information. Green and Segall (1966) tested and compared management forecasts with forecasts of simple time series models in twenty-five companies between 1963 and 1965. The results the research of these two researchers showed no significant difference between forecasts. Copeland and Marion (1972) tested the question of earnings forecast accuracy with bigger and more accurate sample. Comparing earnings forecasts by management and six simple time series models for fifty companies whose management forecasts were published in the Wall Street Journal, they concluded that management forecasts are more accurate than earnings forecasts by time series models.

Garrod and Rees (2005) tested six variables including the salary of share-holders, net interest, operational cash flow and three variables of accrual items, DPS interest and share price, as the fundamental variables for predicting changes in the future interest. The primary results indicate that if combined with net interest, operational cash flow and accrual items will have an increased prediction power. In fact, the two variables mentioned above are the two explanatory variables added in 2005, which, according to the primary results, were related to the interest of the following year.

Bird et al. (2001) has examined the importance of accounting information for predicting the coming changes in interest and their relation with profitable investment strategy. His study and the study he has done in collaboration with Penman span a wider time range for American, European and Australian markets. Their findings are summarized in Table 1.

Table 1: The summary of Bird's et al. (2001) study

Location	Number of years studied	Number of firms	Number of variables utilized in the model
US	15	1700	63
Europe	12	450	52
Australia	12	255	47

The results indicate that a prediction model on the basis of accounting information can be designed for interest changes. This model, however, cannot be used for investment strategy.

Fama and Kenneth (2000) examined the prediction of future profitability, modifying the previous models by profit before interest cost for 2343 firms in each year. The statistical model they used was cross-sectional correlative regression for each year. The results showed that the behaviour of interest followed the behaviour of return to the mean or fixed expectations.

Charitou et al. (2000) conducted a study in Japan, which was entitled "The relationship between interest value and cash flow". The study indicated that interests and cash flow affect the future interests. The sample included 529 firms for each year between 1994-1990. The statistical model was multiple regressions.

Freeman et al. (1982) examined the role of book return in predicting interest changes. Experimental results showed that book rate of return follows a return process to the mean and that there are strong links between changes in book rate of return and changes in interest. The statistical method they used was logit model and pair measurement. The sample included 30 firms randomly selected from among Composite and about which there was information regarding interest and salary of share-holders for years 1946 to 1977.

Research Objectives:

The present study aims to compare the accuracy of corporate earnings forecast by managers and earnings forecasts based on time series models. Criterion for accurate measurement is less error for each model. Other objectives of the study are to enhance the level of public trust in the management forecasts in case their forecast is more accurate than time series or suggest making a more accurate forecast to obtain this trust, if the management forecast is not accurate.

Research Hypotheses:

The main hypothesis: management earnings forecast is more useful than forecast of time series models.

Sub-hypotheses:

1. Earning forecast by management is more useful than weighted moving average model.
2. Earning forecast by management is more useful than double exponential smoothing model.
3. Earning forecast by management is more useful than Holt-Winters model.

Methodology:

Given the multidimensional and complex nature of the studies, various categories of studies are presented. If we want to classify this research in terms of "objective based methodology", it is an applied research. If we want to classify it in terms of "implementation based methodology", it is a descriptive-comparative study. Simply, this research is descriptive-comparative in terms of implementation and is applied in terms of objective.

Domain of Research:

Thematic domain of research is field of financial management and investment management. This study discusses various methods of forecasting earnings (management, time series).

Spatial domain of research is Tehran Stock Exchange from the beginning of 1999 to the end of 2007.

Statistical community, sampling method and sample size determination

Pharmaceutical companies listed in Tehran Stock Exchange from the beginning of 1999 to the end of 2007, are the study community by sampling from which, analysis and conclusion has been carried out. Sampling method is improbable and is based on targeted sampling method. In this method, the researcher assumes that his information can help to select a representative sample of the community. Therefore, sample group is selected to study and collect research data through targeted (judgmental) sampling. The investigated sample in this study is earnings of the pharmaceutical companies listed in Tehran Stock Exchange from 1999 to 2007.

Data Collection Tool

The information needed to calculate the variable of this research has been prepared and collected through magazines and yearbooks published by the Stock Exchange, reports of ordinary and extraordinary general assembly's of the companies listed on the stock exchange and also through the pars portfolio website and Rahavard software. The research literature has been collected through library research. Books, dissertations, domestic and foreign magazines have been used in order to write research literature. Also, Minitab software has been used to analyze time series and forecasting.

Research Variables

The independent variables of this study are actual annual operating earnings. The independent variable is a variable the effect of dependent variable on which is measured and determined. In this study, the forecasted earnings (future earnings) will be the dependent variable.

Methods of analysis and testing research hypotheses

For earnings forecast through time series models is the first step in charting observations. From this chart, we can understand whether the series have the trend of periodic changes, seasonal changes or irregular changes or not.

Drawing the data chart, it was shown that the series has a trend. It means that time series are non-stationary time series. Since the theory of time series probability is more concerned with stationary time series, it is necessary to converse non-stationary time series into stationary time series in order to analyze time series. For this purpose, differentiation has been used for conversion into stationary time series.

$$Y_t = X_{T+1} - X_t \qquad (2)$$

After performing the above steps, earnings will be forecasted using three forecasting models for the desired period and then, the error of these forecasting models and management forecast will be calculated to the actual earnings. In addition, in order to examine the normality of data, Kolmogorov-Smirnov (K-S) test is used the output of which is shown in Table 2.

Table2: Kolmogorov-Smirnov Test

	Exponential smoothing	Holt-Winters	Management	Moving average
N	19	19	19	19
Mean	2.9514E8	2.1177E9	3.0317E8	1.5571E8
Normal Parameters				
Std. Deviation	5.29293E8	3.14185E9	3.96076E8	1.94294E8
Absolute	0.303	0.323	0.288	0.250
Most Extreme				
Positive	0.303	0.323	0.288	0.250
Differences				
Negative	-0.292	-0.251	-0.227	-2.13
Kolmogorov-Smirnov Z	1.322	1.409	1.254	1.088
Asymp. Sig. (2-tailed)	0.61	0.048	0.86	0.187

Through the calculations performed at the level of α= 5%, Z is determined 1.96 and its corresponding values in table are 1.088, 1.254, 1.409, 1.322 that are in the normality acceptation range. As a result, T-test can be used to test hypotheses.

Results

First Hypothesis Testing:

H_0: Earning forecast by management is not more useful than weighted moving average model.

H_1 : Earning forecast by management is more useful than weighted moving average model.

In this method, after calculating the earnings forecast for 1999 to 2007, and the forecast error of management and forecast error of weighted moving average (Table 4), and using T-test (Table 3), it is concluded that since the obtained p-value is greater than α= 0.05 the mean square deviations of weighted moving average method is less than the mean square deviations of management forecast. Thus, weighted moving average method forecasts earnings with much less error than management.

Table 3: T-Test

Levene's Test for Equality of Variances			t-test for Equality of Means						
	F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	4.209	0.48	-1.457	36	0.154	-1.47458E8	1.01210E8	-3.52721E8	5.78060E7
Equal variances not assumed	-	-	-1.457	26.189	0.157	-1.47458E8	1.01210E8	-3.52721E8	6.05097E7

In addition, for 15 companies out of 19 studied companies, weighted moving average method has less error than management. Therefore, we conclude that weighted moving average forecasting method is more useful than management forecast method. It means that H_1 will be rejected and H_0 will be confirmed. Therefore, management earnings forecast is not more useful than weighted moving average model.

Table 4: The Error of Management Forecast and Error of Forecast of Time Series Models

Company Name	Holt-Winters method	Exponential Smoothing	Moving average	Management
Jabrabnhyan	4,790,215,102	346,811,857	474,723,655	345,729,862
Tehran Drug	12,919,634	5,001,142	1,038,505	7,152,718
Kosar Pharmacy	882,738,359	85,272,080	201,145,450	124,453,614
Loqman drug	52,314,285	44,630,591	21,445,212	88,858,793
Darupakhsh	12,138,300,000	2,374,302,540	766,800,981	1,521,864,508
Injectable products	102,171,737	76,410,337	14,556,447	66,160,072
Kymydaru	1,000,398,387	490,173,782	177,926,083	451,553,430
Sinadaru	775,527,347	180,910,526	97,565,850	73,124,456
Aburayhan drug	35,620,033	201,616,726	69,198,361	129,000,470
Osvh Drug	980,946,808	58,029,323	185,922,248	119,796,315
Amn daru	14,033,661	73,272,939	30,980,395	88,386,763
Alborz dar	821,098,681	106,478,190	162,882,511	144,022,422
Pars daru	1,802,085,460	345,933,432	89,591,245	512,961,756
Elixr daru	4,720,855,889	110,957,426	79,855,555	390,161,118
Obad drug	205,448,165	97,701,780	40,381,024	56,933,002
Farabi Pharmaceutical	6,628,186,496	339,489,139	112,217,701	1,106,985,149
Drug Damlran	166,784,970	65,905,661	4,634,127	12,871,547
Razk drug	821,355,377	31,011,402	44,113,315	89,206,702
Drug Zahravy	4,284,741,889	573,833,276	383,490,926	430,939,432
Average Error of each Method	2,117,670,646	295,144,324	155,708,926	303,166,428

Second Hypothesis Testing:

H_0: Earning forecast by management is not more useful than double exponential smoothing model.

H_1 : Earning forecast by management is more useful than double exponential smoothing model.

In this method, after calculating the earnings forecast for 1999 to 2007, and the forecast error of management and forecast error of double exponential smoothing model (Table 4), and using T-test (Table 5), it is concluded that since

the obtained p-value is greater than α=0.05, the mean square deviations of double exponential smoothing model is less than the mean square deviations of management forecast. Thus, double exponential smoothing model forecasts earnings with much less error than management.

Table 5: T-Test

Levene's Test for Equality of Variances			t-test for Equality of Means						
	F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	0.003	0.957	-0.053	36	0.958	-8.02210E6	1.51662E8	-3.15607E8	2.99563E8
VAR00001									
Equal variances not assumed	-	-	-0.053	33.347	0.958	-8.02210E6	1.51662E8	-3.16459E8	3.00415E8

In addition, for 11 companies out of 19 studied companies, double exponential smoothing model has less error than management. Therefore, we conclude that double exponential smoothing model is more useful than management forecast method. Thus, H_1 will be rejected and H_0 will be confirmed. Therefore, management earnings forecast is not more useful than double exponential smoothing model.

Third Hypothesis Testing:

H_0: Earning forecast by management is not more useful than Holt-Winters model.

H_1: Earning forecast by management is more useful than Holt-Winters model.

In this method, after calculating the earnings forecast for 1999 to 2007, and the forecast error of management and forecast error of Holt-Winters model (Table 4), and using T-test (Table 6), it is concluded that since the obtained p-value is less than α=0.05, the mean square deviations of Holt-Winters model is less than the mean square deviations of management forecast. Thus, management forecasts earnings with much less error than Holt-Winters model.

Table 6: T-Test

Levene's Test for Equality of Variances			t-test for Equality of Means						
	F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	18.308	0.000	2.498	36	0.017	1.81450E9	7.26494E8	3.41106E8	3.28790E9
Equal variances not assumed	-	-	2.498	18.572	0.022	1.81450E9	7.26494E8	2.91559E8	3.33745E9

In addition, for 17 companies out of 19 studied companies, management has less error than Holt-Winters model. Therefore, we conclude that management forecast is more useful than Holt-Winters model. Thus, H_0 will be rejected and H_1 will be confirmed. Therefore, management earnings forecast is more useful than Holt-Winters model.

Comparison of three quantitative forecasting methods (Time Series Methods)

Conducting ANOVA test according to Table 7, it can be concluded that since obtained P-value in this test is equal to 0.03 and less than 0.05, there is a significant difference between time series forecasting methods and each of these methods can be compared with management forecast, and the difference can be examined. According to the Table8 and 2 related to the quantitative forecasting methods, it can be concluded that the moving average model has much less error than the two other models. Thus, it is recommended that moving average method should be used for future forecasts in these companies. Moreover, since moving average method forecast earnings with less error and in higher number of companies than management forecast, it is a better method to use to forecast corporate earnings.

Table 7: ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.554E19	2	2.277E19	6.704	.003
Within Groups	1.834E20	54	3.396E18		
Total	2.289E20	56			

Table 8: A Comparison of the Mean Square Deviations for all Three Time Series Models

Method model	Moving average	Double Exponential	Winters' Method
Jabrabnhyan	474,723,655	346,811,857	4,790,215,102
Tehran Drug	1,038,505	5,001,142	12,919,634
Kosar Pharmacy	201,145,450	85,272,080	882,738,359
Loqman drug	21,445,212	44,630,591	52,314,285
Darupakhsh	766,800,981	2,374,302,540	12,138,300,000
Injectable products	14,556,447	76,410,337	102,171,737
Kymydaru	177,926,083	490,173,782	1,000,398,387
Sinadaru	97,565,850	180,910,526	775,527,347
Aburayhan drug	69,198,361	201,616,726	35,620,033
Osvh Drug	185,922,248	58,029,323	980,946,808
Amn daru	30,980,395	73,272,939	14,033,661
Alborz dar	162,882,511	106,478,190	821,098,681
Pars daru	89,591,245	345,933,432	1,802,085,460
Elixr daru	79,855,555	110,957,426	4,720,855,889
Obad drug	40,381,024	97,701,780	205,448,165
Farabi Pharmaceutical	112,217,701	339,489,139	6,628,186,496
Drug Damlran	4,634,127	65,905,661	166,784,970
Razk drug	44,113,315	31,011,402	821,355,377
Drug Zahravy	383,490,926	573,833,276	4,284,741,889

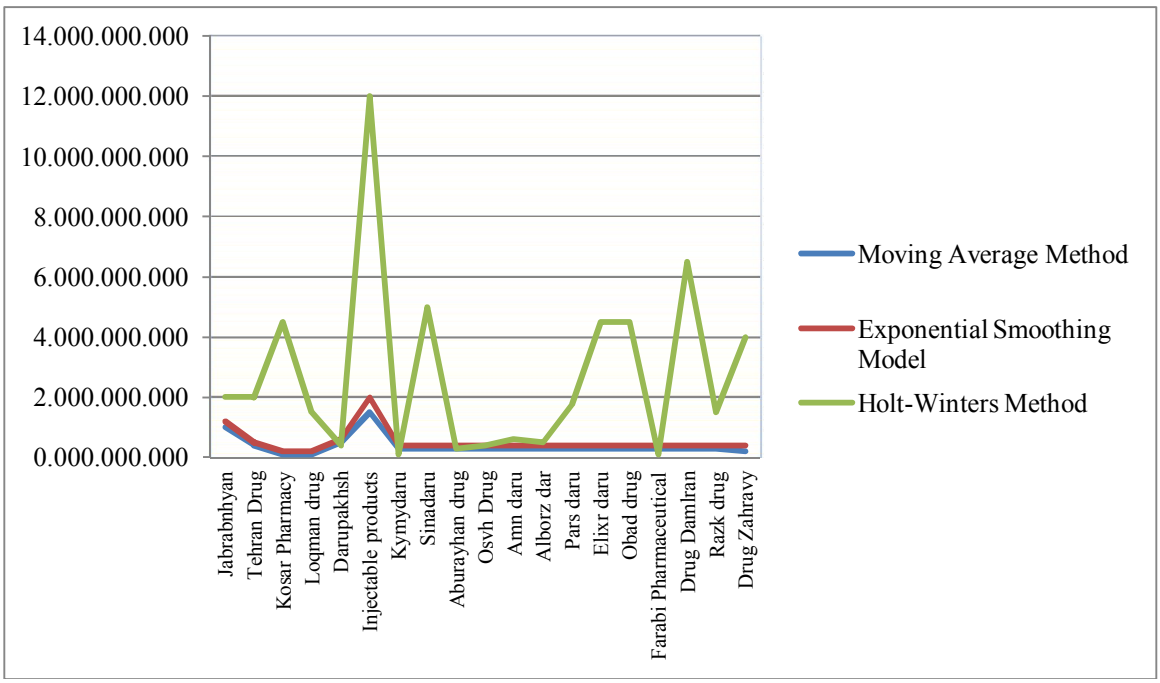

Figure 1: Comparative graph of the mean square deviations

Conclusion

In the present study, it was observed that at confidence level of 95%, weighted moving average method forecast earnings more accurately than management. Therefore, it is concluded that the earnings forecast by management is not more useful than moving average model. In addition, it was observed that at confidence level of 95%, double exponential smoothing model forecast earnings more accurately than management. Therefore, it is concluded that earnings forecast by management is not more useful than double exponential smoothing model. It was also observed that at confidence level of 95%, management forecast earnings more accurately than Holt-Winters model. Therefore, it is concluded that earnings forecast by management is more useful than Holt-Winters model. According to the presented information and the results of sub-hypotheses, it can be concluded that among the three applied models, the best model to forecast with the least error in these companies is moving average method. In addition, to compare management forecast earnings and time series forecasting methods, it was concluded that since the two models out of three used quantitative models forecast earnings with less error than management forecast method, it can be said that management forecast is not more useful than time series methods.

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1/7/2013