A comparative analysis of different pricing models of stock value in the Tehran Stock Exchange and market price

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Abstract

The main objective of this study was to evaluate and comparative analysis of different pricing models of stoke value of Tehran Stock Exchange with a market price of stock of companies listed in Tehran Stock Exchange.These models are based on the book value[1] method, the intrinsic value of the stock, retained earnings per share and a fraction of tax reserves per share, adjusted capital for the exchange rate, stock value by using the stocks index, and stocks value by using adjusted capital for the inflation.The research population has been listed companies in Tehran Stock Exchange during the years 2007 to 2012, which size of the sample with respect to the screening method, and then remove outlier observations is equal to with 133 companies.In this research, in order to test the hypotheses based on significant difference between the actual prices of stock with prices predicted by each of the six models, a test to compare the mean of the two populations is used.To test Average equality in two populations, by using the Levene's test[2], equality of two population variances have been investigated.The results of the analysis of the data at 95% confidence level shows that, the mean accuracy error of the six models have significantly different from each other, so that the model of stock price based on the value of the stock using the adjusted capital for the exchange rate method has the lowest prediction accuracy and stock price model based on the value of the stock using stock index has the highest prediction accuracy.

Keywords: Pricing of stock value, book value method, the intrinsic value of the stock, retained earnings per share and a fraction of tax reserves per share, adjusted capital for the exchange

[1]In accounting, **book value** is the value of an asset according to its balance sheet account balance. For assets, the value is based on the original cost of the asset less any depreciation, amortization or impairment costs made against the asset. Traditionally, a company's book value is its total assets minus intangible assets and liabilities. However, in practice, depending on the source of the calculation, book value may variably include goodwill, intangible assets, or both. When intangible assets and goodwill are explicitly excluded, the metric is often specified to be "tangible book value".In the United Kingdom, the term net asset value may refer to the book value of a company.

[2]In statistics, **Levene's test** is an inferential statistic used to assess the equality of variances for a variable calculated for two or more groups. Some common statistical procedures assume that variances of the populations from which different samples are drawn are equal. Levene's test assesses this assumption. It tests the null hypothesis that the population variances are equal (called *homogeneity of variance* or *homoscedasticity*). If the resulting *P*-value of Levene's test is less than some significance level (typically 0.05), the obtained differences in sample variances are unlikely to have occurred based on random sampling from a population with equal variances. Thus, the null hypothesis of equal variances is rejected and it is concluded that there is a difference between the variances in the population.

Some of the procedures typically assuming homoscedasticity, for which one can use Levene's tests, include analysis of variance and t-tests.

Levene's test is often used before a comparison of means. When Levene's test shows significance, one should switch to generalized tests (non-parametric tests), free from homoscedasticity assumptions.

Levene's test may also be used as a main test for answering a stand-alone question of whether two sub-samples in a given population have equal or different variances.

Introduction

In this study, a comparative analysis different pricing models to value stocks in Tehran stock exchange and value of the stock market price is done,since several models and methods can be used to determine the stock price, often after a short time, automated process of stock price formation in the exchange market causes significant changes in the price offered by the Pricing Committee, and stock prices will be associated with a substantial rise or fall in the market (Mojtahedzadeh, Vida, 2003).It seems that this is due to the mismatch between the pricing model used in pricing Exchange Commission with the thinking and the conditions prevailing in the market (Rahi et al., 2011).These changes have caused confusion investors (JahanKhani, Ali, 1995).This has led to determine stock priceby using different methods and models, and perform comparative analysis for market prices.

Statement of the problem

After forming Stock Exchange market in Iran, this market has become increasingly important, and two streams have led to the continuous increase in the listed companies. A stream is related to non-member private companies, which for access to this capital market seek immediate acceptable management and financial reporting standards to achieve acceptance in the Stock Exchange, and the other stream is related to government policy in recent years, namely privatization, which is trying to reduce the government management responsibility, and by the transfer of state-owned enterprises to the private sector is trying to create economic incentives and attract management and technology resources of private sector and extend the property of the shareholders, and reduce huge debts of public sector. On the other hand, investors using stocks purchase are seeking higher returns from their investment opportunities. In this context, the main factor for the transfer of capital is the price of the securities offered. In fact, this question is that "the process of formation of share prices in the stock exchange market follows from what model"?In financial theories, a number of different approaches have been proposed for the pricing of stocks, in the meantime, models of book value, intrinsic value of the stock, the stock value of the coefficient, the value of the shares using retained earnings per share and shortfall in tax reserves per share, the value of the shares by using capital adjusted for the exchange rates, the capital adjusted method for inflation have stronger fundamentals (Mehrani et al., 2010).

The importance of the issue

Portfolio management is done in order to achieve the investment objectives in the pursuit of profit and risk management. Often an investor wants to achieve the highest efficiency at the lowest possible level of risk. Other restrictions may also be in acertain investment. A collection of market constraints and preferences of investors, together with the expected return and risk of assets are determining strategy used by financial managers (Torovibanoo, 2008).In general, two different infrastructural approaches which are used for management of assets and to achieve the expected return and risk of investors are as follows: Active management of the portfolio and passive portfolio management (Bizley and Miad, 2003). Passive management is seeking the return equal to a portfolio of the certain criteria, while, active portfolio management means resource allocation based on an active strategy, and unlike the passive management, its main purpose is not only to achieve positive returns but, it

is seeking higher returns than usual (extra).The excess returns means having a better performance than the standard desired. This standard is generally an existing indicator in the stock market (Grinold, 2000).Portfolio optimization is basis of the investment in the very uncertain and turbulent environment of capital market, and many studies have been devoted to the study and provide guidance in this area.

Background of the study

Internal Background

1. Talebi (1995), in a study has discussed "Research on the problems of stocks pricing methods of companies subject to privatization and providing a suitable pricing method for that", which in this study, the initial stock price of public companies privatized through the privatization organization in the Tehran Stock Exchange withthe present value of their future earnings for a period of three years was calculated and compared, and finally, this result is obtained that, despite the relationship of next changes in stock price relative to the initial price of it, obviously, subsequent changes of stock prices except in limited cases (9 companies from 40 companies),have not shown the significant relationship with tangible and effective change in the expected rate of return on years of study.
2. HavasBeigi, in another study, which was conducted in the period 1993 to 1996, has compared stock transactions with its intrinsic value, which is obtained based on the Gordon model. His main hypothesis was that, between the transaction price and intrinsic value, there is not a big difference. The results showed that, in the years 1993 and 1994, there was no significant difference between the intrinsic value and the transaction value, but in 1995 and 1996, there was a significant difference between them. This means that in the years 1993 and 1994, this model has efficiency in the market, and in 1995 and 1996, it has no efficiency.
3. Dastgir and Hosseini (2003), in a study have discussed "Evaluation of pricing methods of stocks in Tehran Stock Exchange", the aim of this study was to compare the price of the shares on the Tehran Stock Exchange market with prices obtained of selected models from a variety of scientific-theoretical models. In this respect, three pricing models used in financial management theories (Gordon, Walter and the present value of future cash flows) were selected, and the actual data relating to participation in the study was performed in each of the models, and the price of shares obtained from these models were compared with the market price, and it was observed that there is no coincidence between market prices and prices of the models.
4. Imani (2006), in a study has discussed "The investigation of pricing of shares in companies in initial offering on the Tehran Stock Exchange", which some factors affecting the stocks pricing has been considered in this study, including the percentage of offering shares, time of offering shares, type of industry, the price to earnings ratio (P / E) and the amount of capital of the company, which their effect on difference between initial price and Future stock prices is investigated. The results show that, the price of shares in the first offering of stock, significantly is different from its price in the futures transactions, and in this regard, the percentage of offering

shares at the price difference is not effective, but the capital of the company, the type of industry, the offering time and price to earnings ratio (P / E) are effective on the price difference.

External Background

1. Gonzalez et al (2010), in their study, examined the Book value of stock in predicting stock price during 1990 and 2008 in Malaysia Exchange. They have used in their study Multivariate regression and concluded that the price of shares in Bursa Malaysia has a significant difference with the price obtained from using the book value of shares.
2. Francis et al. (2009), in their study, examined the model power of the intrinsic value of the stock to predict the stock price during 1995 to 2007 in the New York Stock Exchange. In their study, a panel analysis was used and they have concluded that the stock price on the New York Stock Exchange has significant differences with the price obtained from the use of the intrinsic value of stock.
3. Brian and Chen (2006), in their study, examined the model power of value of the stock by using the stock index in predicting stock prices during the years 1992 to 2004 in the Canadian exchange. They, also, in their study, using panel analysis model with random effects concluded that the price of the stock in the Canadian exchange has significant difference with the price obtained from using the model of stocks value using stock index.
4. Later this and Frank (2011), in their study, examined the stock's value model power using adjusted capital method for the exchange rate and inflation rate in predicting the stock price during the 1996 and 2009 in the Tokyo Exchange.
5. Roger and Raymond, in 2000, investigated relationship between book value, earnings and stock price in six Asian countries (Indonesia, Korea, Malaysia, the Philippines, Taiwan and Thailand).Study period was from 1996 to 1987.Their results showed that the explanatory power of the book value and remaining earnings in countries is different; Explanatory power for the countries of Taiwan and Malaysia was low and for Korea and Philippines was high. These differences are related to accounting practices. Comparing the explanatory power of book value and remaining earnings was found that in all six countries, the explanatory power of the remaining earnings is lower than the book value. Also, their study showed that the book value and remaining earnings have positive and significant relationship with stock price in all six countries.

The hypothesis of study

1. Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using the book value model of stocks.
2. Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using the intrinsic value of stocks model.
3. Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using stocks value model using stock index.

4. Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using stocks value model using retained earnings per share, and a fraction of tax reserves per share.
5. Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from the use of stocks value model using adjusted capital method for exchange rate.
6. Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from the use of stocks value model using adjusted capital method for Inflation rate.

Practical purposes

The main objective of the following applied research is to reduce the mismatch between the pricing model used in the Stock Exchange Pricing Committee with thought and conditions governing the market, in fact to compare pricing models of companies with market prices, and choose the optimal methods for determining the price of shares of companies, in order to help investors to buy shares to be successful to achieve a higher return than investment opportunities.

Research Methodology

This study in terms of the purpose is an applied study (what leads to having a applied study is the use of its results of in evaluation of stocks price by the Stock Exchange, financial analysts, brokers and investors) and according to the view of nature and method, it is a correlational study. Also, this research in terms of research data collection is a Posttraumatic causal study since it uses the last data in sample. Therefore, the method of study is a descriptive-correlational study. Data collection method in this research is the library method, in which the necessary information from internal and external research and articles and online resources will be used. Also, the information in the Library Stock Exchange and Stock exchange companies' documents and financial reports will be used. The population is the companies listed in Tehran Stock Exchange. In this research, in order to test the hypotheses based on significant difference between the actual prices of stock with prices predicted by each of the six models, mean test of the two populations is used. To test equality of mean of two populations, it is important that we examine: Are two populations' variances are equal or not. In other words, the equality of variance test is prior to the equality of means test. To test the equality of variances, Fisher statistic is used, which is calculated by the following equation:

$$F = \frac{s_1^2}{s_2^2}$$

In case of equality of variances, degree of freedom is equal to n1 + n2-2 and t-statistics is as follows:

$$S_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$

In case of lack of equality of variances, degree of freedom and t-statistics are calculated as follows:

The results of hypothesis tests

To test the equality of two populations mean (average price of shares in Tehran Stock Exchange with the price obtained from the use of the 6 proposed models), it is necessary that first test of two populations variance be examined.

In other words, the test of equality of variances is prior to the equality of means test:

$$H_0: \sigma_1^2 = \sigma_2^2$$

$$H_1: \sigma_1^2 \neq \sigma_2^2$$

In this test, if significant level of the Levene's (F Statistics) is greater than 0.05, then the results of the first row is used, which accepts the assumption of equality of variances in both groups. But, if significant level of the Levene's (FStatistics) is less than 0.05, then the results of the second row is used, which accepts the assumption of equality of variances in both groups.

The first hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using the book value model of stocks.

Table 8-1 Mean test for two populations

		levene's test (equality of variances)		T Test (equality of means)						
		StatisticsF	Significance level	Statistics t	Degrees of freedom	Significance level	The mean difference	Standard error difference	Confidence level 95%	
									Lower limit	Upper limit
Average price of shares	Equality of variance	7. 704	0 .041	- 3. 121	35	0.013	- 0.0931	0.1067	- 0. 1, 3671	- 0. 0 4951
	Inequality			- 2. 909	28. 868	0.021	- 0.0931	0.1134	- 0.12782	- 0. 0584

Reference: Software EViews

The second hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using the intrinsic value model of stocks.

Table 8-2 Mean test for two populations

		levene's test (equality of variances)		T Test (equality of means)						
		StatisticsF	Significance level	Statistics t	Degrees of freedom	Significance level	The mean difference	Standard error difference	Confidence level 95%	
									Lower limit	Upper limit
Average price of shares	Equality of variance	10. 611	0 .0 11	- 4. 509	35	0 .0054	- 0. 1098	0. 08723	- 0 109 432	- 0 .0267
	Inequality			- 3. 602	28. 868	0 .0087	- 0. 1098	0. 1423	- 0. 16231	- 0 .0321

Reference: Software EViews

The third hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using stocks value model using stock index.

Table 8-3 Mean test for two populations

		levene's test (equality of variances)		T Test (equality of means)						
		StatisticsF	Significance level	Statistics t	Degrees of freedom	Significance level	The mean difference	Standard error difference	Confidence level 95%	
									Lower limit	Upper limit
Average price of shares	Equality of variance	8. 121	0 .0 48	- 4. 432	35	0.001	- 0.0 889	0. 11543	- 0. 15876	- 0 .06432
	Unequal variance			- 3. 656	28. 868	0 .012	- 0.0 889	0. 11765	- 0. 16098	- 0 .07231

Reference: Software EViews

The fourth hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using stocks value model using retained earnings per share, and a fraction of tax reserves per share.

Table 8-4 Mean test for two populations

		levene's test (equality of variances)		T Test (equality of means)						
		StatisticsF	Significance level	Statistics t	Degrees of freedom	Significance level	The mean difference	Standard error difference	Confidence level 95%	
									Lower limit	Upper limit
Average price of shares	Equality of variance	12. 907	0 . 0017	- 2. 913	35	0 . 021	0. 1087	0. 13675	- 0. 11205	- 0 . 0567
	Inequality			- 2. 618	28. 868	0 . 032	0. 1087	0. 12785	- 0. 10712	- 0 . 0412

Reference: Software EViews

The fifth hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from the use of stocks value model using adjusted capital method for exchange rate.

Table 8-5 Mean test for two populations

		levene's test (equality of variances)		T Test (equality of means)						
		StatisticsF	Significance level	Statistics t	Degrees of freedom	Significance level	The mean difference	Standard error difference	Confidence level 95%	
									Lower limit	Upper limit
Average price of shares	Equality of variance	9. 126	0 . 027	- 2. 887	35	0 .029	0. 11982	0. 0954	- 0. 10732	- 0 .06921
	Inequality			- 3. 194	28. 868	0 .021	0. 11982	0. 0913	- 0.1 0 7 45	- 0 .07231

Reference: Software EViews

The sixth hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from the use of stocks value model using adjusted capital method for Inflation rate.

Table 8-6 Mean test for two populations

		levene's test (equality of variances)		T Test (equality of means)						
		StatisticsF	Significance level	Statistics t	Degrees of freedom	Significance level	The mean difference	Standard error difference	Confidence level 95%	
									Lower limit	Upper limit
Average price of shares	Equality of variance	9. 654	0 .031	- 3. 987	35	0.013	- 0. 0992	0. 1298	- 0. 1176	- 0 .06781
	Inequality			- 3. 165	28. 868	0 0.0 19	- 0.0 992	0. 1298	- 0.1 176	- 0 .07911

Reference: Software EViews

The results show that since the amount of Flevene's test at 5% error level is less than 5% (sig), therefore, in the following, the second row of t-test is used.Test results show that, because the t-statistic is smaller than -2 and its significance level (sig) is smaller than 5%,thus, Thus, hypothesis H0 (there is no significant difference between the average price of the shares on the Tehran Stock Exchange with the price obtained from the use of 6 models) is rejected, and hypothesis H1 is accepted.

Investigation and Comparison of the models power to predict stock prices

In Table 4.10, the mean error of the model is presented to predict the stock price.To compare the ability (prediction error) of the desired models, the compare mean test of populations (statisticsF) is used.The results of these tests are presented in Table 4-10.In test of F, hypotheses H0 and H1 are as follows:

H0: Mean accuracy of forecasting models to stock prices have not significant differences with each other.

H1: Mean accuracy of forecasting models to stock prices havesignificant differences with each other.

Table 9-1:Comparison ofprediction power of different models		
Models to predict stock prices		**Mean error**
Stock price based on book value model	P_1	-0.0931
Stock price based on the the intrinsic value of stock	P_2	-0.1098
Stock price based on the value of the stocks using stock index	P_3	-0.0889
Stock price based on the value of the stocksmodel per share andShortfall in tax reserves per share	P_4	0.1087
Stock price based on the value of the stock using the adjusted capital for exchange rate	P_5	0.11982
Stock price based on the The value of the stock using adjusted capital for inflation rate	P_6	-0.0992
F statistics	121/10	
Significant (P-Value)	0032/0	

According to Table (9-1), the results of the F test to compare the mean error (precision) of predicting the six models have been proposed, these results suggest that, at 95% confidence level, the mean accuracy error of the six models have significant differences with each other, because the values of the statistic F of this test is greater than the minimum acceptable value for the 95% confidence level. As a result, at the level of acceptable error of 5%, Statistical hypothesis about having significant differences among the mean accuracy (error) of prediction of six models is not rejected, and H1 hypothesis is approved that based on it, the mean error (precision) of prediction of six models to predict stock price have significant differences with each other. On the other hand, according to the absolute value of the mean error of the mentioned models, it can be concluded that, the stocks price based on the stock value model using adjusted method for the exchange rate (the fifth model) has maximum error (0.11982), and the stock price model based on the value of the stock model using stock index (the third model) has the lowest error (0.0889) to predict the stock price.

Evaluation and description of the results of hypothesis tests

First hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using the book value model of stocks.

In this study, it was observed that there is a significant difference between the mean price of the stocks in the Tehran Stock Exchange and the price of stocks using book value of stocks model. On the other hand, the mean error of prediction of desired model is -0.0931, which indicates that the model on average forecasts price of the stocks 9.3% less than the actual value. These results are consistent with the results of Gonzalez et al (2010), in their study they concluded that stock prices on Malaysia Exchange have significant difference with the price of stocks using the book value model.

Second hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using the intrinsic value of stocks model.

In this study, it was observed that there is a significant difference between the mean price of the stocks in the Tehran Stock Exchange and the price of stocks using the intrinsic value of stocks model. On the other hand, the mean error of prediction of desired model is -0.1098, which indicates that the model on average forecasts price of the stocks10.98% less than the actual value. These results are consistent with the results of Francis et al (2009), in their study they concluded that stock prices on New York Exchange have significant difference with the price of the stocks using the intrinsic value of stocks model.

Third hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using stocksvalue model using stock index.

In this study, it was observed that there is a significant differencebetween the mean price of the stocksin the Tehran Stock Exchange and the price of stocks usingthe value of stocksmodelby using Stock index.On the other hand, the mean error of prediction of desired model is -0.1098, which indicates that the model on average forecasts price of the stocks8.89% less than the actual value.These results are consistent with the results ofBrian and Chen (2006), in their study they concluded that stock prices on Canada Exchange havesignificant difference with the price of using the value of stocksmodel by using Stock index.

Fourth hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from using stocks value model using retained earnings per share, and a fraction of tax reserves per share.

In this study, it was observed that there is a significant difference between the mean price of the stocksin the Tehran Stock Exchange and the price of stocks using the value of stocksmodel by using retained earnings per share, and a fraction of tax reserves per share. On the other hand, the mean error of prediction of desired model is 0.1087, which indicates that the model on average forecasts price of the stocks10.87% less than the actual value. These results are consistent with the results of Leeet al (2008), in their study they concluded that stock prices on Canada Exchange have no significant difference with the price of using retained earnings per share, and a fraction of tax reserves per share.

Fifth hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from the use of stocks value model using adjusted capital method for exchange rate.

In this study, it was observed that there is a significant difference between the mean price of the stocks in the Tehran Stock Exchange and the price obtained from the use of stocks value model using adjusted capital method for exchange rate. On the other hand, the mean error of prediction of desired model is 0.11982, which indicates that the model on average forecasts price of the stocks11.98% less than the actual value. These results are consistent with the results of Latradys and Frank (2011), in their study they concluded that stock prices on Tokyo Exchange have significant difference with the price obtained from the use of stocks value model using adjusted capital method for exchange rate.

Sixth hypothesis

Stocks price in Tehran Stock Exchange has significantly difference with the price obtained from the use of stocks value model using adjusted capital method for Inflation rate.

In this study, it was observed that there is a significant difference between the mean price of the stocks in the Tehran Stock Exchange and the price obtained from the use of stocks value model using adjusted capital method for Inflation rate. On the other hand, the mean error of prediction of desired model is -0.0992, which indicates that the model on average forecasts price of the stocks9.92% less than the actual value. These results are consistent with the results of Latradys and Frank (2011), in their study they concluded that stock prices on Tokyo Exchange have significant difference with the price obtained from the use of stocks value model using adjusted capital method for Inflation rate.

Comparison of the models to predict stock prices

In Table 9-1, the mean error of the model is presented to predict the stock price.The results indicated that at 95% confidence level, the mean accuracy error of the six models are different, because the values of the statistic F of this test is greater than the minimum acceptable value for the 95% confidence level. As a result, at the level of acceptable error of 5%, Statistical hypothesis about having significant differences among the mean accuracy (error) of prediction of six models is not rejected, and H1 hypothesis is approved that based on it, the mean error (precision) of prediction of six models to predict stock price have significant differences with each other. On the other hand, according to the absolute value of the mean error of the mentioned models, it can be concluded that, the stocks price based on the stock value model using adjusted method for the exchange rate (the fifth model) has maximum error (0.11982), and the stock price model based on the value of the stock model using stock index (the third model) has the lowest error (0.0889) to predict the stock price.

Recommendations based on the findings

- According to the results of the first or sixth hypothesis of this study, which show that each of the six models: book value, intrinsic value of stocks, value stocks using stock index, the value of the shares using retained earnings per share and shortfall in tax reserves per share, stocks value by using adjusted capital method for exchange rates, stocks value using adjusted capital method for inflation rates, has ability to efficiently predict the stock price of the Tehran Stock Exchange, we suggested to capital market

participants, decision-makers, financial analysts and potential and the actual investors of stock exchange that mentioned models are also used along with other pricing stocks models in the analysis of investment projects, and their management in financial assets and securities with other pricing stocks models.

- According to the results of the first or sixth hypothesis of this study, which show that of the six models, the value of the stock model using stock index (third model) has the lowest prediction error for stock price, we suggested to capital market participants, decision-makers, financial analysts and potential and the actual investors of stock exchange that mentioned models are also used along with other pricing stocks models in the analysis of investment projects, and their management in financial assets and securities with other pricing stocks models. Because, the use of this model has led to the selection of the optimal portfolio with minimum risk and maximum efficiency, while the transparency of the decision-making environment and the results will be doubled.

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