

The Accuracy of Price-Earnings Ratio and Discounted Cash Flow Methods in Predicting the Offer Price of IPO Stocks

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Abstract

In this study accuracy of price-earnings and discounted cash flows methods which are most frequently used methods in stock valuation has been researched for the firms doing initial public offering in 1993-2010 period in Turkey. When they determine initial public offering price, 160 out of total 210 firms which did initial public offering in the research period (investment trusts and mutual funds are excluded) have used price-earnings ratio while 119 of them have used discounted cash flows. In the research, by comparing the prices obtained by using pricing methods and final initial public offering prices forecast errors over these two methods have been calculated. Accordingly, in the firms using price-earnings method on average 35% and in the firms using discounted cash flows method on average 18% error values have been determined. In the cross-sectional regression analysis conducted however, it has been determined that prices obtained with respect to pricing methods have high explanatory power on final initial public offering prices.

Keywords: Price-earnings ratio, discounted cash flow method, price forecast accuracy

JEL Classification Codes: G12, G17, G24

1. Introduction

Before initial public offering is realized in order to determine the price range of its stock to be offered to the public a firm that will do initial public offering should do a valuation for its stocks. Participants involving in valuation process take the valuation of initial public offering firm as a combination of art and science (McCarthy, 1999). Ability of issuers and underwriters in assessing market conditions of initial public offering and scope of potential demand that will possibly be directed to stocks constitute artistic aspect of valuation (How et al., 2007). Scientific side of the valuation process however is related to determination of firm value by using numerical modeling. There are many methods to value a stock. The most frequently use methods are discounted cash flows (DCF) and comparable firms approach which is predicated on comparison of similar firm that are active in similar industries. In comparable firms approach however price-earnings (P/E) ratio is the most fundamental multiplier used. P/E ratio is used as a valuation method on its own. In this case, valuation is done over next year's forecasted earnings of public offering firm. P/E multiplier is a frequently used method in valuation. In this method value of a firm is forecasted through capitalization of its earnings with price earning multipliers of a series of comparable firms. According to Alford (1992) comparable firms to be used in the valuation are determined on the basis of industry. Objective here is that firms in the same industry have similar risk, growth expectation and accounting methods.

Particularly with the companies which will do public offering for the first time valuation emerges as a serious problem. Because of the fact that stocks of these types of companies are not traded previously there is no market value around (İhtiyar, 2006). In such a case if determination of price of stocks is not given the necessary importance there might be severe fluctuations in stock prices after the initial public offering.

There is very limited study on effectiveness of stock valuation methods in international stock markets. Majority of these studies (Alford, 1992; Kaplan and Ruback, 1995; Kim and Ritter, 1998) have been conducted in the US stock market which has the deepest and highest liquidity stock market.

In his study Alford (1992) has researched accuracy of P/E method. When picking up comparable firms he has used industry, firm size and growth in earnings as characteristics. As a result of research it has been concluded that industry is an effective criteria in choosing comparable firms. In his study Alford (1992) has obtained median 24,5% absolute forecast error.

Kaplan and Ruback (1995) have done a research on use of P/E and DCF methods in leveraged buyout valuations. By using adjusted net present value method they have calculated average forecast error with respect to beta choice in the range of 16,7% and 21,1%. For P/E multiplier however they have found the average absolute forecast error to be 18,1%. Due to the facts that firms doing leveraged buyouts have more stable cash flows (Opler and Titman, 1993) and they value the firm as a whole rather than equity axis it is not clear whether results reached in Kaplan and Ruback (1995) studies provide clear evidence with respect to widely used stock valuation measures or not.

Kim and Ritter (1998) have used valuations obtained by using comparable firm approach based on P/E and market value – book value multipliers of initial public offering firms. Contrary to Alford (1992) and Kaplan and Ruback (1995), they have reached the conclusion that comparable firms approach based on P/E, market value-book value and market value-sales multipliers has a plain forecast power. In their study Berkman et al. (2000) have concluded that results obtained from P/E and DCF methods have similar accuracy level. Researchers have used absolute forecast error measure. They have obtained approximately 20% median absolute forecast error values in both methods.

Deloof et al. (2002) have researched accuracy of pricing methods applied by leader underwriters in Belgium market. In their study where they mention about DCF method as the most popular method they have reached the conclusion that dividend discount model is more effective than other valuation methods in forecasting stock price. Besides researchers have reached the conclusion that multiplier based valuations done with respect to earnings and cash flow forecasts for the year following the initial public offering provide more accurate results than multiplier based valuations done with respect to earnings and cash flow forecasts for the initial public offering year. Dittman and Weiner (2005) on the other hand have stated that multipliers calculated from analyst forecasts provide better results than multipliers calculated with respect to historical data.

Firth et al. (2008) have researched the accuracy of valuations based on P/E multipliers partaking in initial public offering prospectuses for China market. Researchers have stated that valuations based on P/E multiplier provide information related to value for the investors.

The studies conducted on valuations based on multipliers usually concentrate on optimal multiplier type (Kim and Ritter, 1998; Cheng and McNamara, 2000; Hermann and Richter, 2003) and determination of most effective multiplier (Beatty et al., 1999; Baker and Ruback, 1999; Hermann and Richter, 2003) primarily in comparing the firms with similar characteristics. In all these studies it has been stated that earnings multipliers provide more accurate forecast results than book value of sales multipliers. P/E ratio is the most widely used earnings multiplier in stock valuation.

In this study however, accuracy of P/E and DCF methods, which are the most frequently used methods in stock valuation, has been researched for ISE in 1993-2010 period. DCF analysis is applied in the form of discounting the cash flow forecasts that are explained in public offering prospectus. P/E ratio approach however, is calculated by discounting to public offering date of profit forecasts given in prospectuses by using P/E multipliers of comparable firms. For both methods when forecasted values are compared to realized market prices a valuation error emerges.

2. Data and Methodology

In this research, in determining public offering price accuracy levels of P/E ratio and DCF method which public offering firms at ISE used in 1993-2010 period in determining their stock price have been researched. Public offering firms can use many different methods when determining their stock's public offering price. As seen in Table 1 among these different methods that public offering firms use in Turkey P/E and DCF methods are the most widely used ones. 160 (77%) of 208 firms which did public offering in the research period have used P/E ratio method, 119 (57%) of them have used DCF method in determining their stock offering price. Among the firms in question 101 (49%) of them have used both P/E and DCF methods in determining stock offering price¹.

When public offering firms' usage level of P/E and DCF methods and intensity of total public offering firms are taken into account, it is seen that in recent years firms have started to use DCF method more frequently. For example when the research period is divided simply into two sub periods as 1993-2000 and 2001-2010, it is seen that of the total 159 firms which did initial public offering in 1993-2000 sub period 126 (79%) of them used P/E ratio method, 77 (48%) of them used DCF method. On the other hand it is seen that of the total 49 firms which did initial public offering in 2001-2010 sub period 34 (69%) of them used P/E ratio method and 42 (86%) of them used DCF method. The trend inclined towards DCF method can be assessed as a result of increasing sensitivity about disclosures to public at the point of informing the investors in capital markets. Public disclosure regulations have shown increase particularly after collapse of internet companies, September 11 attacks and company scandals in 2000s that were experienced in the United States of America (USA) which has the world's largest stock market from the point of market capitalization.

Table 1: Pricing Methods Used in The Stock Valuation (1993-2010)

Panel A: Pricing Methods Used in							
Valation Method		Number of Issue	Valation Method		Number of Issue		
Price-Earnings ratio		160	Adjusted book value		3		
Discounted cash flow		119	Turnover coefficient		3		
Market to book value ratio		71	Sales multiplier		3		
Comparable firm approach		36	Liquidation value		1		
Divident yield		23	Market price value		1		
Stock market indicator		7	Firm value/EBIT		1		
Net asset value		5	Residual income method		1		
Gordon dividnet (growth) model		4	Tobin Q method		1		
Price/net sales		4	Guaranteed equity		1		
Panel B: P/E and DCF Methods Usage by Year							
Year	Total Issue	P/E	DCF	Year	Total Issue	P/E	DCF
1993	15	10	3	2002	3	2	3
1994	24	13	12	2003	2	-	2
1995	22	17	8	2004	10	7	10
1996	20	17	6	2005	5	5	4
1997	27	25	10	2006	9	9	8
1998	14	13	10	2007	4	2	3
1999	3	2	2	2008	1	-	-
2000	34	29	26	2009	1	1	1
2001	-	-	-	2010	14	8	11
Total	159	126	77	Total	49	34	42
Final Total					208	160	119

¹ At this point, it is necessary to state that any of the firms might have used more than one valuation method. Therefore it should be accepted as normal when numbers of firms using valuation method are summed separately the number of sum is higher than total number of public offering firms.

These events taking place in the USA have damaged the confidence of investors to a large extent and later new regulations to facilitate investor confidence have been brought to the agenda. The most important of them is the enactment of "Public Companies Accounting Reform and Investor's Protection Law" or "Sarbanes–Oxley" law which envisions new changes in public disclosure and financial reporting fields, targets to improvement of firms' control over financial reporting and also emerges as an effort to support effective corporate governance. This law has been prepared to include all public companies trading on exchanges in the USA. With this law, it has been targeted to enforce application of corporate governance by the companies, to increase transparency of companies and after the company and accounting scandals experienced in the USA to reestablish public confidence (Gokalp, 2005). Capital Markets Boards (CMB) has put the articles of Sarbanes-Oxley Law into use in Turkey with the Serie: X No:16 communiqué dated 11.02.2002, and with changes in Serie: X No:19 Communiqué About Making Changes in Communiqué On Independent Audit In Capital Markets.

The accuracy of P/E and DCF methods which are used in determining initial public offering price of the stocks has been put forward by comparing the prices determined by the methods in question and realized final public offering prices. As mentioned about due to the fact that P/E and DCF methods are applied by taking forecast earnings and cash flows the prices to emerge as a result of application of methods can be assessed as forecast prices. Therefore accuracy of stock issue prices (or price forecasts) obtained with respect to P/E and DCF methods will be calculated by using forecast error measurements which are employed widely in the literature (Firth and Smith, 1992; Jaggi, 1997; Jelic et al., 1998; Cheng and Firth, 2000; Dittmann and Weiner, 2005). In their study Pricer and Johnson (1997) they have measured the accuracy of forecasted public offering price in accordance with forecast error measurements as follows.

$$\text{Forecast Error (TH)} = \frac{\text{Actual Offer Price} - \text{Predicted Offer Price}}{\text{Actual Offer Price}} \times 100$$

Average forecast error is a measure of tendency in forecast operation. And this shows if the initial public offering firms in Turkey systematically low or high forecasted the public offering price with respect to P/E ratio and DCF method. The sign of obtained average forecast error (positive or negative), by taking also high or low forecasts of public offering firms into account provides sign about whether firms are optimistic or pessimistic about stock offering price which have been obtained from P/E ratio or DCF method. A forecast error with positive sign ($FE > 0$) shows that public offering prices obtained with respect to P/E and DCF methods are lower than final public offering price and hence firms' forecasts regarding future earnings or cash flows have a negative tendency. Likewise, an average forecast error with negative sign ($FE < 0$) shows that public offering prices obtained with respect to P/E and DCF methods are higher than final public offering price and hence firms' forecasts regarding future earnings or cash flows have an optimistic tendency. In order to put forward the relative divergence of realized final public offering price from the price obtained with respect to P/E ratio and DCF methods and in order to put forward the extent of absolute approximation of the price obtained with respect to pricing methods to public offering price the absolute forecast error (AFE) will be used.

$$\text{Absolute Forecast Error (ATH)} = \left| \frac{\text{Actual Offer Price} - \text{Predicted offer Price}}{\text{Actual Offer Price}} \right| \times 100$$

In addition to these two measurements Deloof et al. (2002) have used a third method as in the form of squared forecast error (SQFE). By giving more weight to larger forecast errors SQFE has been calculated as follows;

$$\text{Squared Forecast Error (SQFE)} = \left(\frac{\text{Actual Offer Price} - \text{Predicted offer Price}}{\text{Actual Offer Price}} \right)^2 \times 100$$

Firth and Smith (1992) characterize this measurement as the most appropriate model to determine losses / costs that are based on forecast or valuation errors of investors. Likewise, Deloof et al. (2002) state that absolute forecast error assumes cost of valuation error increases linearly, squared

forecast error assumes cost of valuation error increases quadratically. From this it is understood that squared forecast error measurement is a clearer indicator of valuation error costs.

Majority of required data related to all these measurements have been obtained from initial public offering prospectuses of public offering firms and for some from price determination reports presented to CMB. Due to the fact that investment trusts and mutual funds are offered to the public at nominal value and therefore they do not do pricing they have been excluded from the scope of the research.

3. Findings and Discussion

The obtained results related to forecast error measurements that are calculated when final offering prices are taken into account to determine accuracy of offering prices calculated as a result of P/E and DCF methods which are most commonly used methods that public offering firms (or investment banks) use to determine stock offering price are presented in Table 2. Forecast error values for two pricing methods have been separately calculated with respect to forecast error (FE), absolute forecast error (AFE) and squared forecast error (SQFE).

It has been found that when final offering prices are taken into account, stock offering prices that public offering firms have calculated (or forecasted) by using P/E ratio are on average -27,72% mistaken. In this case, final public offering prices of stocks have been realized on average 27,72% below the public offering prices calculated (or forecasted) with respect to P/E ratio method. When final offering prices are taken into account, a conclusion has been reached that stock offering prices that public offering firms calculated (or forecasted because it is based on forecast) by using DCF, are on average -15,76% mistaken. In this case however, final public offering prices of stocks have been realized on average 15,76% below the public offering prices calculated (or forecasted) with respect to DCF method. These results show that stock offering prices obtained with respect to each of the two methods are higher than realized public offering price. In order to put forward the extent of absolute approximation of the offering price obtained with respect to pricing methods to public offering price the absolute forecast errors have been used. Accordingly, stock offering prices that public offering firms calculated (or forecasted) with respect to P/E ratio are different from final offering prices at 21,98% on relative average terms. Stock offering prices calculated (or forecasted) with respect to DCF method however, are different from final offering prices at the relative rate of 17,93% on average.

The squared forecast error which gives more weight to larger forecast errors and in which probable costs dependent on forecasts errors are stated as important indicators for researchers puts forward similar results as the other two measurements. According to obtained squared forecast error findings, stock offering prices that public offering firms calculated (or forecasted) with respect to DCF method show important difference from final offering prices. The average squared forecast error calculated for P/E ratio method (124,86%) has been obtained more than average squared forecast error value calculated for DCF method (10,43%). As the other forecast error measurements show as well, this situation can be assessed as P/E ratio method's giving more erroneous results than DCF method. This result can also be an indicator showing that there might be extreme tail values in the forecast errors obtained with respect to P/E ratio method. As a matter of fact, when the forecast error values calculated with respect to forecast error measurement results are analyzed it has been seen that there are extreme end values in the series. Existence of high standard deviations can be assessed as the indicator of deviation from average meaning that there is high risk and volatility. When the facts that minimum and maximum values are very high and the difference between them is too much as well as standard deviation values are too high are considered together, making the assessments regarding forecast errors by using median values instead of average values can lead to better results.

When looked at from the perspective of median values, it has been found that stock offering prices that public offering firms calculated (or forecasted) by using P/E ratio are error free when final offering prices are taken into account. As it will be seen in the further analysis it is possible to link this result to two reasons. As a first reason it can be stated that approximately 35% of firms using P/E ratio

have determined their final public offering price with respect to P/E ratio. The second reason can be that stock offering prices obtained with respect to P/E method have a more balanced distribution around final offering prices.

Results calculated to determine whether or not forecast error, absolute forecast error and squared forecast error values are different from zero which was tested by t test for those which show accordance with normal distribution and by Kolmogorov-Smirnov Z test for those which do not show accordance with normal distribution are presented in Table 2. Results state that all forecast error measurements that have been calculated by taking into account offering prices that were determined with respect to P/E and DCF methods are significantly different from zero.

Table 2: Summary Statistics Related to Accuracy of Pricing Methods

Panel A: Descriptive Statistics							
		Number of Issue	Mean	Median	Standart Deviation	Minimum	Maximum
P/E	FE (%)	160	-27,72	0,00	1,091	-354,55	99,88
	AFE (%)	160	35,02	7,68	1,070	0,00	354,55
	SQFE (%)	160	124,86	0,59	9,069	0,00	8100,00
DCF	FE (%)	119	-14,98	-2,08	0,287	-192,41	26,86
	AFE (%)	119	17,93	9,09	0,270	0,00	192,41
	SQFE (%)	119	10,43	0,83	0,374	0,00	370,22
Panel B: Parametric and Non Parametric Tests							
		Parametric Test (One sample t test)			Non parametric tests		
		t test	p value	K-S test	p value	Wilcoxon	p value
P/E	FE (%)	-3,213	0,002**	3,791	0,000**	-7,374	0,000**
	AFE (%)	4,139	0,000**	4,702	0,000**		
	SQFE (%)	1,742	0,084*	5,857	0,000**		
DCF	FE (%)	-5,688	0,000**	2,000	0,001**	-6,846	0,000**
	AFE (%)	7,251	0,000**	2,761	0,000**		
	SQFE (%)	3,044	0,003**	4,255	0,000**		
Panel C: Error Values Related to The Firms Using P/E and DCF Methods at The Same Time							
		Number of Issue	Mean	Median	Standart Deviation	Minimum	Maximum
P/E	FE (%)	101	-16,40	0,00	0,362	-183,26	26,85
	AFE (%)	101	21,98	7,83	0,331	0,00	183,26
	SQFE (%)	101	15,66	0,61	0,418	0,00	335,90
DCF	FE (%)	101	-15,76	-4,67	0,295	-192,41	26,86
	AFE (%)	101	18,89	9,72	0,276	0,00	192,41
	SQFE (%)	101	11,10	0,95	0,400	0,00	370,23

* and ** show the statistical significance levels at 0.10, 0.01 respectively.

When the firms which use both P/E and DCF methods simultaneously when they determine stock offering price are taken into account it has been concluded that again prices obtained with P/E ratio method are more erroneous.

Table 3 presents distribution of forecast accuracy measurement in the form of forecast error and absolute forecast error which was calculated from offering prices that public offering firms have calculated by using P/E ratio and DCF method. The obtained distribution results show that at 85 (53,12%) of 160 firms using P/E ratio method in determining offering price the method in question forecasted the final public offering price incorrectly in the range of -20% - 0%. As mentioned previously, at majority of these firms the price obtained with respect to P/E method was determined to be final public offering price, meaning that error rate was realized to be 0%. As a matter of fact when the relative deviations from final public offering price are taken into account most of the distribution (56, 25%) corresponds to an interval pointing to 10% and below.

Similarly results in the table show that at 71 (59,67%) out of 119 firms using DCF in determining offering price the method in question has forecasted the final public offering price

incorrectly in the range of -20% - 0%. When relative deviations from public offering price are taken into account majority of the distribution (52,95%) corresponds to an interval pointing to 10% and below. At 9 of the firms using P/E ratio method (5,63%) the method in question has forecasted the stock price high with an error over 100%. At only 2 of the firms using DCF method (1,68%) the method in question has forecasted the stock price high with an error over 100%. This situation can be assessed as one of the reasons of having higher average forecast error measurements at the firms using P/E ratio.

Table 3: Error Distributions on Price Projections

Panel A: FE and AFE Distributions Based on the P/E Method					
Distribution of AFE	Number of Issue	Cum Percentage	Distribution of FE	Number of Issue	Cum Percentage
AFE ≤ 0,1	90	56,25	FE ≤ -1,00	9	5,63
0,1 < AFE ≤ 0,2	20	12,50	-1,00 < FE ≤ -0,8	4	2,50
0,2 < AFE ≤ 0,3	7	4,38	-0,8 < FE ≤ -0,6	5	3,12
0,3 < AFE ≤ 0,4	10	6,25	-0,6 < FE ≤ -0,4	12	7,50
0,4 < AFE ≤ 0,5	6	3,75	-0,4 < FE ≤ -0,2	15	9,38
0,5 < AFE ≤ 0,6	6	3,75	-0,2 < FE ≤ 0	85	53,12
0,6 < AFE ≤ 0,7	2	1,25	0 < FE ≤ 0,2	25	15,63
0,7 < AFE ≤ 0,8	3	1,87	0,2 < FE ≤ 0,4	2	1,25
0,8 < AFE ≤ 0,9	5	3,12	0,4 < FE ≤ 0,6	-	0,00
0,9 < AFE ≤ 1,00	2	1,25	0,6 < FE ≤ 0,8	-	0,00
1,00 ≤ AFE	9	5,63	0,8 < FE ≤ 1,00	3	1,87
			1,00 ≤ FE	-	0,00
Total (P/E)	160	100,00		160	100,00
Panel B: FE and AFE Distributions Based on the DCF Method					
Distribution of AFE	Number of Issue	Cum Percentage	Distribution of FE	Number of Issue	Cum Percentage
AFE ≤ 0,1	63	52,95	FE ≤ -1,00	2	1,68
0,1 < AFE ≤ 0,2	21	17,65	-1,00 < FE ≤ -0,8	2	1,68
0,2 < AFE ≤ 0,3	11	9,24	-0,8 < FE ≤ -0,6	3	2,52
0,3 < AFE ≤ 0,4	6	5,04	-0,6 < FE ≤ -0,4	11	9,24
0,4 < AFE ≤ 0,5	6	5,04	-0,4 < FE ≤ -0,2	16	13,45
0,5 < AFE ≤ 0,6	5	4,20	-0,2 < FE ≤ 0	71	59,67
0,6 < AFE ≤ 0,7	2	1,68	0 < FE ≤ 0,2	13	10,92
0,7 < AFE ≤ 0,8	1	0,84	0,2 < FE ≤ 0,4	1	0,84
0,8 < AFE ≤ 0,9	2	1,68	0,4 < FE ≤ 0,6	-	0,00
0,9 < AFE ≤ 1,00	-	0,00	0,6 < FE ≤ 0,8	-	0,00
1,00 ≤ AFE	2	1,68	0,8 < FE ≤ 1,00	-	0,00
			1,00 ≤ FE	-	0,00
Total (DCF)	119	100,00		119	100,00

When error free and extremely erroneous forecasts are excluded, it is seen that at the firms which use P/E method in determining offering price the method in question in general incorrectly forecasted final stock public offering price as high or low in the range of 20%-40%. At 15 (9,38%) of the firms in question the method has provided incorrect result in the range of -40% - -20%. Likewise, at 25 of the firms (15,63%) the method has provided incorrect result in the range of 0% - -20%. A similar distribution has taken shape for the firms using DCF, as well. When error free and extremely erroneous forecasts are excluded, it becomes evident that at the firms which use DCF method in determining offering price the method in question in general incorrectly forecasted final stock public offering price as high or low in the range of 20%-40%. At 16 (13,45%) of the firms in question the method has provided incorrect result in the range of -40% - -20%. Likewise, at 13 of the firms (10,92%) using DCF method the method has provided incorrect result in the range of 0% - -20%.

Table 4 presents optimistic or pessimistic trend of price forecasts which public offering firms made with P/E and DCF methods about public offering price of the stock. According to results in Table

4, it is seen that at the firms which did initial public offering in the analysis period and used P/E ratio or DCF methods in determining stock's public offering price the pricing methods in question forecasted the public offering price higher than final public offering price. At the 72 (45%) out of 160 firms which used P/E ratio method in determining public offering price the pricing method in question has forecasted the public offering price higher than final public offering price. At the 61 (51,26%) out of 119 firms which used DCF method in determining public offering price the pricing method in question has forecasted the public offering price higher than final public offering price, as well.

On the other hand, according to results in Table 4 at the 30 (18,75%) out of 160 firms which used P/E ratio method in determining public offering price the pricing method in question has forecasted the public offering price lower than final public offering price. At the 14 (11,76%) out of 119 firms which used DCF method in determining public offering price the pricing method in question has forecasted the public offering price lower than final public offering price. At the 58 (36,25%) of firms which used P/E ratio method and at the 44 (36,97%) of firms which used DCF method however, public offering price obtained with the pricing method in question and final public offering price were the same.

Table 4: Forecast Error (FE) Categorisation by Pessimistic / Optimistic Forecast

Panel A: Categorisation of Pessimistic / Optimistic Forecast				
	Trend of Forecast	Number of Issue	FE Mean (%)	FE Median (%)
P/E	Pessimistic	30	19,46	9,41
	Optimistic	72	-69,71	-32,02
	All	160	-27,72	0,000
DCF	Pessimistic	14	12,54	12,00
	Optimistic	61	-32,08	-23,26
	All	119	-14,98	-2,08
Panel B: Statistics for Difference in Means and Medians				
	t statistic for difference in means (FE)		Wilcoxon statistic for difference in median (FE)	
P/E	-4,803 (0,000)*		-4,782 (0,000)*	
DCF	-10,224 (0,000)*		-3,296 (0,000)*	

* shows the statistical significance levels at 0.01

While the average forecast error is 69,71% at the firms where public offering price obtained with P/E ratio method is higher than final public offering price, at the firms where public offering price is lower than final public offering price average forecast error has turned out to be 19,46%. While the average forecast error is 32,08% at the firms where public offering price obtained with DCF method is higher than final public offering price, at the firms where public offering price is lower than final public offering price average forecast error has turned out to be 12,54%. It has been determined that there are statistically significant differences between average and median forecast error values of the firms which forecast the public offering price with respect to each of the two pricing methods above or below the final public offering price.

In order to determine to what extent public offering firms' price determinations by using P/E ratio and DCF method explain public offering price of stocks cross sectional regression analysis has been employed. In their study exploring this subject because Berkman et al.. (2000) examine industry and market based pricings separately they have taken the rate of forecasted market value - book value as dependent variable, and the rate of market value - book value as independent variable. In this study however, prices that have been forecasted with respect to each of two pricing methods have been taken as independent variables and realized public offering prices have been taken as dependent variables and the following models have been used.

$$\text{Offer Price}_i = \alpha + \beta \text{ Price with specified P/E}_i + \varepsilon_i$$

$$\text{Offer Price}_i = \alpha + \beta \text{ Price with specified DCF}_i + \varepsilon_i$$

The results obtained with respect to each of the two regression models have been shown in Table 5.

Table 5: Cross Sectional Regression Results

Model	Constant (α)	Coefficient (β)	Standart Deviation	t statistic (p value)	Adjusted R ²	F statistic (p value)	N
P/E	-8,277	0,846	0,025	2,903 (0,004)*	0,880	1.168,66 (0,000)*	160
DCF	-707,253	0,949	0,018	3,337 (0,001)*	0,957	2.654,95 (0,000)*	119

* shows the statistical significance levels at 0.01

According to cross-sectional regression analysis results, at the firms using P/E ratio method the public offering price obtained with respect to this method explains 88% of final public offering price. At the firms using DCF method however, the public offering price obtained with respect to this method explains 95,7% of final public offering price. These results are also indicators showing that DCF method forecasts public offering price more correctly than P/E ratio method.

Conclucions

Determination of public offering price constitutes an important stage of public offering process. When determining public offering price however many methods are used. Among these methods P/E ratio and DCF methods are the most widely used pricing methods. P/E ratio method is used in the two ways in stock valuation. When stock price is determined with respect to this method either the stock price is determined by predicating on P/E ratios of the firms trading on stock exchange with similar characteristics or stock price is determined by dividing the market value of the firm to per share profit that the company will obtain at the end of year and by multiplying with per share earnings. In DCF method however, firm value is found by summing up the discounted values of the free cash flows that the firm will have as a result of its activities in the future years. Afterwards by subtracting the financial debts from calculated firm value total value of firm shares is calculated. By dividing total value of firm shares to total number of shares stock price is calculated.

Both P/E ratio method and DCF method are the methods that require future oriented forecasts. In P/E ratio method year-end earnings forecasts are made, in DCF method however cash flow forecasts are made throughout the projection period. When one looks at it from this perspective having correct results from each of the two pricing methods is related to quality of forecasts made. In this study as an indicator of this quality in a sense, the question of to what extent stock public offering prices which have been obtained as a result of pricing methods forecast the realized public offering price is explored from different angles. Pricing methods' forecast accuracy of final public offering price has been calculated with respect to various forecast error measurements in the literature. According to obtained forecast measurement results DCF method's forecasting accuracy of final public offering price is higher than P/E ratio. While P/E ratio method has forecasted final public offering price incorrectly at an average rate of -27,72% this rate in DCF has turned out to be -14,98%. When relative deviations are taken into account, forecast error in P/E ratio method has occurred at the level of 35,02% and forecast error in DCF method occurred at the level of 19,93%. At the firms using each of the two methods in determining public offering price DCF method again has provided more accurate results.

According to the results obtained from the research, at the firms using P/E ratio and DCF method stocks' public offering prices obtained with respect to both pricing methods have been above the final public offering prices. When error free and extremely erroneous forecasts are excluded,

When error free and extremely erroneous forecasts are excluded, it is seen that at the firms which use P/E method in determining offering price the method in question in general incorrectly forecasted final stock public offering price as high or low in the range of 20%-40% and at the firms which use DCF method the method in question in general incorrectly forecasted final stock public offering price as high or low in the range of 20%-40%.

The conducted cross-sectional regression analysis results have shown that public offering prices obtained by using both P/E ratio and DCF method explain an important part of final public offering prices of stocks. This result puts forward that traditional pricing methods have an important adequacy in forecasting final public offering prices. Notwithstanding this, assessment of pricing methods quality by taking the price movements after public offering into account would provide a different dimension to the subject.

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