ACCURACY OF DIVIDEND DISCOUNT MODEL VALUATION AT MACEDONIAN STOCK- EXCHANGE

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Abstract

Many analysts believed that Dividend Discount Model (DDM) is obsolete, but much of the intuition that drives discounted cash flow (DCF) valuation is embedded in the DDM model. The basic task of these research is to test DDM valuation models accuracy at Macedonian Stock Exchange (MSE) as emerging market by analyzing two "blue-chip" stocks, one from banking sector and other from industry. The descriptive statistics and regression analysis were used to determine the level of correlation between the stocks' intrinsic value and stock market prices as well as to determine statistical significance of companies' dividends policies and dividend levels for future stock market prices forecasting.

Key words: *valuation, securities, free cash flow, dividends, equity, regression*

1. INTRODUCTION

In order to determine the stock intrinsic value, financial analysts can use various stock valuation models. When they use fundamental analysis they choose appropriate valuation model, in accordance with many parameters required for certain model. The dividend discount model (DDM) is a valuing model based on assumption that a stock value represents the discounted sum of all its future dividend payments (intrinsic value of a stock is a present value of future dividends discounted by required rate of return). However, the forecasting of future dividends is sometimes rather problematic. (Gottwald, 2012)

The DDM is well-known and widely used model for valuing equity. Many analysts viewed it as outmoded, but much of the intuition that drives Discounted Cash Flow (DCF) valuation is embedded in the DDM model (Damodaran, 2001). There are also specific industrial sectors and companies where the DDM remains a useful tool for estimating value.

The Free Cash Flow models (FCF) as most comprehensive valuation models are simple variant on the DDM model. The analysts faced with the task of valuing a firm/asset or its equity has to choose among different approaches: DCF valuation or relative valuation and within each approach, they can choose different valuation models. These choices will be driven largely by the characteristics of the firm/asset being valued, like the level of its earnings, its potential for growth, the sources of earning growth, the stability of its leverage and its dividend policy. (Arnold, 2008)

The basic task of these research is to analyze accuracy of DDM stock pricing in order to determine if this models offer accurate valuation of long-term securities at Macedonian Stock Exchange (MSE). We test the results of equity valuation derived by using two DDM models (Ivanovski, 2013): Gordon DDM model (model of constant dividend growth) as well two-phases DDM model on two "blue-chip" MSE stocks.

The hypothesis of the validity of the DDM is tested by regression analysis. As for statistical evaluation, t-statistic and p-value are used in an effort to confirm or disaprove that the variance of the actual price series is significantly different than the variance of the perfect forecasted price series. We are tested using regression analyses the accuracy of stock pricing and correlation between two variables (stocks' intrinsic value and stock market prices) as well as statstistical significance of company dividends policies and dividend levels for future stock market prices forecasting. Regression analysis can also provide relevant information concerning potential problems in use of valuation models, causes for differences between valuation and market prices and to evaluate basic parameters for valuation on Macedonian financial market. This will also help us to determine the forecasting

potential of indipendent variables (stock intrinsic values and stock dividends) on dependent variable (average stock market price).

In context of above mentioned aspects, this study can be viewed as a contribution for practical implementation of DDM valuation models on financial market of the Republic of Macedonia.

2. LITERATURE REVIEW

DCF models and the DDM in particular, appeared long-time ago when Williams published his text "The Theory of Investment Value" in 1938. He had placed foundation of the theory of DCF valuation, and in particular, dividend based valuation. Damodaran (Damodaran, 2001), Copeland, Weston, and Shastri (Copeland, 2004) (Arnold, 2008), (DeMarzo, 2008), and many others, present a broad and updated review of the large body of literature about these traditional valuation models.

Financial analysts use various modifications of the DDM in the practice. To value a dividend paying stock, three various assumptions about dividend growth or three different models can be used: first, zero-growth model assumes that there is no growth in dividends; second, Gordon model assumes constant rate of dividends' growth and third one assumes non-constant growth in dividends. However, the assumption of no growth in dividends may seem unrealistic. The assumption of constant dividends fits perfectly with the characteristics of preffered stock, which carries a stated dividend of a fixed amount. All preferred stock dividends must be fully paid before any dividend on common stock can be paid. Assumption of constant growth in dividends is reasonable for the mature, large, stable, dividend-paying companies, often referred as "blue chip". Finally, assumption of non-constant dividends growth generally reffered to decline to a rate of growth that is sustainable over the long run. Three-stage model of non-constant growth in dividends is possible, too. Modifications like three-stage model or four-stage model are also used in the practice (Gottwald, 2012).

Concerning the fact that returns on emerging markets significantly differs from returns at developed markets there is need for a broad analyzes of stock's valuation on emerging stock markets. This paper can be seen as contribution for emerging markets of South-East Europe (SEE), analyzing accuracy of DDM valuation results at MSE. MSE is good representative of emerging markets. Therefore, we argue that our results are valid for other similar stock markets.

The application of DDM models at MSE were rarely analyzed in financial papers. Bogov in his paper "The Determinants of Stock Prices at MSE" published in 2006 argues that DDM used on individual stocks from MBI-10 provides best results for companies with stable growth and stable dividend payout ratio. He has used DDM Gordon model in his research for empirical analysis although he considered possibility that two-stage growth model fits better for stock valuation at MSE. He assumed that dividend growth rate is equal with nominal GDP growth rate (projected at 7%, where 4% is real GDP growth rate and 3% is inflation rate). In order to determine required rate of return he used CAPM model. Finally, he concluded that stocks' intrinsic values calculated with DDM were regulary underpriced compared with stock market prices. The wider analysis of Macedonian companies' dividend policies can be found in Arsov paper (Arsov, 2011).

There are a lot of problems and limitations for stock valuation at MSE like absence of treasury securities with different maturity, absence of corporate bonds and companies' credit rankings, market short history and absence of historical averages for market risk premiums and other historical data, etc. However, one of the basic problems concerning the use of DDM model at MSE is non-consistency of companies' dividend policies which is *conditio sine qua non* for dividend models application. Macedonian companies listed at MSE have unstable dividend policies. Paid dividends in previous years affects the process of growth rate – g determination. In such conditions it is difficult to determine precisely the growth rate as relationship between dividend yield and ROE.

Unconsistency of dividend policy makes it difficult for researchers to identify one determined dividend policy which can be used for companies' stocks valuation. Dividends' financial signalization effect does not function at MSE. DCF models also assumes constant long-term dividends' rate of

growth after several years, which in terms of unstable dividend policy is almost impossible to be supported by relevant and accurate data from past period.

3. DESCRIPTIVE STATISTICS

MSE (www.mse.com.mk) was established in 1995 but first trading started in 1996. Macedonia capital market is very young compared with capital markets in developed countries. Market short history negatively affects valuation as well as derivation of significant conclusions about its behaviour and characteristics. Since 04.01.2005, MSE use new index MBI-10, which is a price index weighted with the market capitalization. It is consisted of up to 10 listed ordinary shares, chosen by the Stock Exchange Index Commission, according to the criteria from the Methodology. The Commission performs regular (twice a year) and extraordinary (if extraordinary circumstances occur) revisions to the index. The Stock Exchange Index Commission has decided that the first ten shares-components of MBI-10 are: Alkaloid AD Skopje, Toplifikacija AD Skopje, Komercijalna banka AD Skopje, Makpetrol AD Skopje, Fersped AD Skopje, Stopanska banka AD Bitola, Granit AD Skopje, Makedonijaturist AD Skopje, Evropa AD Skopje and Ohridska banka AD Ohrid. Base of the index, valued 1.000, is 30.12.2004. Historical trading data are available from the following link http://www.mse.com.mk/Statistics.aspx?MenuId=9

We analyze results of DDM stocks valuation calculated by two-phases growth model as well as Gordon model of dividends constant growth (Ivanovski, 2013) for two "blue-chip" stocks quoted at MSE: Alkaloid (ISIN Code: ALK) and Komercijalna Banka (ISIN Code: KMB). This two companies have relativelly stable dividend policies in analyzed periods what has been considered as most important requirement for our analysis and reason for their selection from MBI-10 list.

Using data from MSE average stocks market prices were derived for two analyzed companies for the period 2006-2011, as follows:

Table 1. The Average stocks market prices (In MKD)

	2006	**2007**	**2008**	**2009**	**2010**	**2011**
KMB	5.174	6.957	5.397	2.651	3.096	3.372
ALK	4.606	9.665	7.536	4.240	4.155	4.233

We present in next table all calculated values using two DDM valuation models (Ivanovski, 2013) as well the average stock market prices for 2006-2011 time series, in order to compare which of calculated values gravitated closer around stocks average prices:

Table 2. Summary of data (In MKD)

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**Average**
KMB (average price)	5.174	6.957	5.397	2.651	3.096	3.372	4.441
KMB (DDM Two Phases)						4.678	4.678
KMB (DDM)	2.887	3.325	3.325	2.975	3.500	3.500	3.252
ALK (average price)	4.606	9.665	7.536	4.240	4.155	4.233	5.739
ALK (DDM Two Phases)						5.617	5.617
ALK (DDM)	1.207	1.500	1.845	2.040	2.,250	1.626	2.093

The accuracy of stocks valuation was tested by regression analysis. Regression analysis is a powerful tool for determining the relationship between the variables and for forecasting. However, first we are testing correlation between stocks intrinsic value calculated by DDM and average market prices. In next table we present separatelly results and data for KMB stock:

Table 3. KMB stock (In MKD)

Year	Average Market Price	Intrinsic Value
2006	5.174	2.887
2007	6.957	3.325
2008	5.397	3.325
2009	2.651	2.975
2010	3.096	3.500
2011	3.372	3.500

Graphical presentation of correlation between two variables is presented on folowing Figure 1:

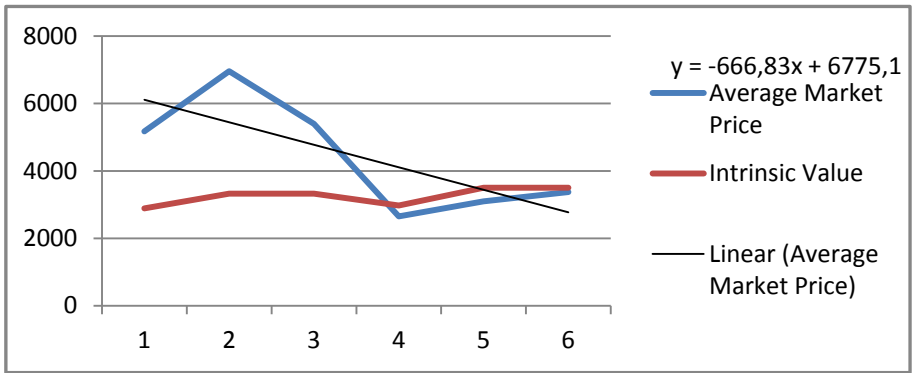


Figure 1. Correlation between KMB average markets prices and intrinsic values

We can see from the chart that there is low correlation between stock intrinsic value and stock market prices. Using correlation function in Excel we are calculating corellation coeficient:

Table 4. KMB Correlation coefficient calculation

	Average Market Price	*Intrinsic Value*
Average Market Price	1	
Intrinsic Value	-0,053431834	1

In order to confirm our findings for low correlation coefficient between two variables we use regression analysis. Regression statistics confirms our findings (where we ask for 95% level of confidence). Values for Multiple R (coefficient of correlation) and R Square (coefficient of determination) are around 0 which lead us to conclusion that there is no statistical significant relationship between analyzed variables. The R^2 tells us that the proportion of the total correlation in the dependent variable (KMB stock market price) can not be explained by the independent variable

(KMB stock's intrinsic value). This results are confirmed by t-statistic and p-value. A general rule is that a t-statistic greater than 2,00 is significant. We also use derived results for p-value. We can see that p-value is 0,9199 which means that we are only 8% confident that our coefficient is significant.

Table 5. Regression results for KMB

Regression Statistics	
Multiple R	5%
R Square	0%
Adjusted R Square	-25%
Standard Error	1863,972652
Observations	6

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	39790,63722	39790,64	0,011453	0,919928522
Residual	4	13897576,2	3474394		
Total	5	13937366,83			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5547,794954	10368,68333	0,535053	0,620974	-23240,28513
Intrinsic Value	-0,340291601	3,179803767	-0,10702	0,919929	-9,168842205

Using same methodology we were using regression analysis to determine statistical significance in relationship between dividends as independent variable and average stock market price as dependent variable. We derive data for both mentioned variable as follows:

Table 6. KMB stock data (In MKD)

Year	**Dividends**	**Average Market prices**
2006	165	5.174
2007	190	6.957
2008	190	5.397
2009	170	2.651
2010	200	3.096
2011	200	3.372

Regression statistics confirms our findings (with 95% level of confidence). Values for Multiple R (coefficient of correlation) and R Square (coefficient of determination) are around 0 which shows that there is no statistical significant relationship between the KMB dividends and average stock market price. The R^2 tells us that the proportion of the total correlation in the dependent variable (KMB stock market price) can not be explained by the independent variable (KMB dividends). This results were

confirmed by t-statistic and p-value. A t-statistics' value is bellow 2,00 which means that it is not significant. We can also see that p-value is 0,92 which shows only 8% confidence that our coefficient is significant.

Table 7. Regression results for KMB

Regression Statistics					
Multiple R	0,053293				
R Square	0,00284				
Adjusted R Square	-0,24645				
Standard Error	1863,987				
Observations	6				
ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	39583,67348	39583,67	0,011393	0,920136636
Residual	4	13897783,16	3474446		
Total	5	13937366,83			
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5545,528	10374,50348	0,534534	0,621301	-23258,71154
Dividends	-5,94275	55,6765416	-0,10674	0,920137	-160,5256123

We have used same descriptive statistics for ALK stock. Stock valuation results and data for ALK are as follows:

Table 8. ALK stock data (In MKD)

Year	**Average Market Price**	**Intrinsic Value**
2006	4.606	1.207
2007	9.665	1.500
2008	7.536	1.845
2009	4.240	2.040
2010	4.155	2.250
2011	4.233	1.626

Graphical presentation of correlation results is on folowing figure:

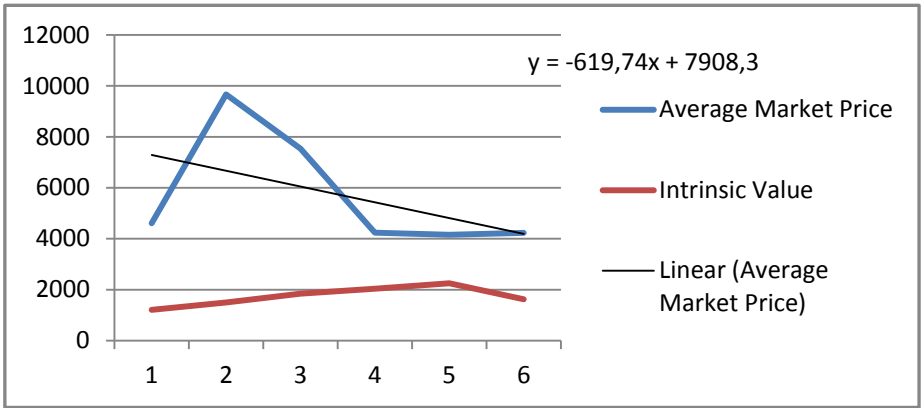


Figure 2. Correlation between ALK average markets prices and intrinsic values

We can see from the chart that there is low correlation between stock intrinsic value calculation and stock market prices. Using Excel we are calculating corellation coeficient:

Table 9. ALK Correlation coefficient calculation

	Average Market Price	*Intrinsic Value*
Average Market Price	1	
Intrinsic Value	-0,281325914	1

We are testing our findings with regression analysis. Regression statistics confirmed our findings (with 95% level of confidence). Values for Multiple R (coefficient of correlation) and R Square (coefficient of determination) are around 0 which implies that there is not statistical significant relationship between the analyzed two variables. The R^2 tells us that the proportion of the total correlation in the dependent variable (ALK stock market price) can not be explained by the independent variable (ALK stock's intrinsic value). A t-statistic is -0,58 and is not significant. We can also see that p-value is 0,59, or we are only 41% confident that our coefficient is significant.

Table 10. Regression results for ALK

Regression Statistics	
Multiple R	0,281325914
R Square	0,07914427
Adjusted R Square	-0,151069662
Standard Error	2490,857875
Observations	6

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2132975,025	2132975	0,343785753	0,589143796
Residual	4	24817491,81	6204373		
Total	5	26950466,83			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	8751,105241	5236,595537	1,671144	0,170012707	-5788,014805
Intrinsic Value	-1,726369072	2,944351869	-0,58633	0,589143796	-9,901200407

Using same methodology we are using regression analysis to determine statistical significance in relationship between dividens (as indipendent) and average stock market price as dependent variable. We derive data for both mentioned variable as follows:

Table 11. ALK stock data (In MKD)

Year	**Dividends**	**Average Market Prices**
2006	80,5	4.606
2007	100	9.665
2008	123	7.536
2009	136	4.240
2010	150	4.155

Table 12. Regression results for ALK

Regression Statistics	
Multiple R	0,352718
R Square	0,12441
Adjusted R Square	-0,16745
Standard Error	2659,197
Observations	5

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3014228,067	3014228	0,426260353	0,56039979
Residual	3	21213993,13	7071331		
Total	4	24228221,2			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	9714,889	5752,342172	1,688858	0,189829194	-8591,63088
Dividends	-31,1662	47,73596444	-0,65289	0,56039979	-183,0832947

Regression statistics confirmed our findings (with 95% level of confidence). Values for Multiple R and R Square are like in previous case around 0 which confirms that there is not statistical significant relationship between the dividends and average stock market price. The R^2 tells us that the proportion of the total correlation in the dependent variable (ALK stock market price) can not be explained by the independent variable (ALK dividends). This results are confirmed by t-statistic and p-value. A t-statstic is -0,625 and is not significant. We can see that p-value is 0,56 which means that we are only 44% confident that our coefficient is significant.

Finally, regression analysis results lead us to conclusion that there is no statistical significance between two variables and that stock intrinsic values calculated with DDM model as well as dividends are not reliable in stocks market prices forecasting at MSE.

Although we did not find statstistical significant relationship between variables we can not absolutely reject the use of DDM model for stock valuation at MSE. In our research we have analyzed limited (from five to six years) time-series. Probably, statistically more significant results can be expected with the use of larger, at least ten-year time-series. Moreover, we have analyzed time-period when MSE had bullish trend (2006-2008, before the financial crises, at the end of 2008), and after that period MSE has dominant bearish trend until nowadays. This dominant trends significantly affects the movement of stocks market prices and results of our research.

4. CONCLUSION

The basic task of this research is to analyze accuracy of DDM valuation at MSE. We compare stocks' intrinsic value calculated using two DDM valuation models (two-phases model and Gordon model) with the average stock market prices in period 2006-2011 in order to determine which of calculated values gravitated closer around stocks average prices. Both DDM valuation models lead us to conclusion that stock market prices are generally overpriced, except the last two years (after the "boom" at MSE). This is expected conclusion based on irrational enthusiasm of investors in the period

of 2005-2008 when MSE experienced high stocks' prices growth and MBI-10 reached 9.000 (current value around 1.700).

We can conclude that DDM, especially Gordon model is reliable tool and provide accurate stock intrinsic value calculation in "normal" period at stock-exchange. We can confirm it with analyses of KMB stock as representative of banking sector at MSE. On the other side, the use of DDM Gordon model for calculation of stock value for ALK and derived results showed significant deviation from average market prices and average stock prices are significantly higher than their intrinsic values.

Our next conclusion is that valuation of both stocks with DDM two-phase growth rate model confirmed that market value oscillated over stocks intrinsic value. This prove the accuracy and reliability of DDM two-phases model at MSE.

However, significantly big discrepancies between stocks' average prices and their intrinsic values calculated by two DDM valuation models in five/six-years time series lead us to conclusion that DDM model generally overerpriced stocks at MSE. This is the main reason why we suggest DDM model only as additional tool for Bank stocks valuation at MSE, while for other industries we suggest DCF and relative valuation models

Beside testing accuracy and reliability of DDM model compared with market prices, in our paper we try to analyze relationship between calculated intrinsic values and market prices as well dividend levels and stock market prices. We use regression analysis as a very powerful tool for such analysis and relationship determination, with final goal to use our findings for stock price forecasting. Generally, in regression analysis, the best relationship is defined one that minimizes the sum of squared errors.

Using regression statistics we have tested our findings (with 95% level of confidence). Values for Multiple R (coefficient of correlation) and R Square (coefficient of determination) for both analyzing stocks are around 0 which lead us to conclusion that there are not statistical significant relationships between the stocks' intrinsic values and dividends as independent variables and average stock market prices as dependent variable. The calculated R^2 tells us that the proportion of the total correlation in the dependent variables (KMB and ALK stock market prices) can not be explained by the independent variable (KMB and ALK intrinsic values and their dividends levels). This results are confirmed by t-statistic and p-value. We did not find a t-statistic value that can be significant for both analyzed stocks. We confirm our findings with the use of p-value, where calculated p-values show low percentage of confidence of statistically significance of analyzed coefficients.

We can finally conclude that there is no statistical significance between two variables which lead us to another conclusion that stock intrinsic values calculated with DDM model as well as paid dividends are not useful for stocks' market prices forecasting at MSE.

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