

**CZECH UNIVERSITY OF LIFE SCIENCES**

**Faculty of Economics and Management**

**Department of Economics**



**DIPLOMA THESIS**

**Estimation of Apple Inc. stock fair value**

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# CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

## DIPLOMA THESIS ASSIGNMENT

Bc. Anastasiya Shamshurina

Economics and Management

Thesis title

Estimation of Apple Inc. stock fair value

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### Objectives of thesis

The main goal of diploma thesis is evaluation or so-called assignment of fair value to Apple Inc. shares from investor's side. After evaluation is done, the goal is to determine the stock(company) position on the market, if shares are underpriced or overpriced. Based on company's analysis through various models by using company's financial quarterly and annual reports. Received information will help to answer the question if company is the one to be invested in or not. If we have to buy the shares when it is underpriced, hold shares in satiation when current shares' price is the same as estimated fair value or sell existing shares in case it is overpriced, when current price of a stock is higher than the calculations. The above information will help investors to make the right choice regarding the corporation. From economic point of view the calculation will also help to predict probable supply and demand on the shares, through the right estimation of the shares fair price. Looking as well at utility and competitors performance. As well there is the review of various factors that have influence on the change in the stock price and its growth or decline. Theoretical part explains such terms as share, fair value, investing, models for fair value estimation, as dividends discount model and others also financial analysis containing reports information of Apple Inc. Given information shows position of a company on the market. Practical part contains financial, fundamental and technical analysis.

### Methodology

Literature review was conducted through the methods of deduction, induction, synthesis and extraction from chosen sources. Analytical part is done through using of quantitative, qualitative, mathematical, statistical and economic methods. Evaluating it with the help of models and various comparisons with current price and as well competitors position on market. Afterwards collected information is transformed into recommendation for investment. Data for evaluation was derived out of the official website of Apple Inc.

All data for the analysis conducted in the thesis were obtained from internet sources, CULS library, online and other sources. As well, the graphs were created from data provided in the quarterly and annual reports on given products found at the Apple Inc. official webpage. Graphs and diagrams were made and calculated with the help of software Microsoft Office Excel 2007 software. Graphs containing stock prices were made at investing.com webpage.

**The proposed extent of the thesis**

60 pages

**Keywords**

fair value of stock, Apple Inc., stock market, technology, innovation, fundamental analysis, financial market, technical analysis

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**Recommended information sources**

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## **Declaration**

I hereby declare, that I have worked on my diploma thesis titled "Estimation of Apple Inc. stock fair value" by myself and I have used only the sources stated at the end bibliography part of this thesis. As the author of the mentioned diploma thesis, I confirm that the thesis does not break copyrights of any third party.

In Prague, 27<sup>th</sup> of March 2018

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Anastassiya Shamshurina

## **Acknowledgement**

I would like to thank my diploma thesis supervisor Ing. Petr Procházka, MSc, Ph.D. for his assistance and professional recommendations related to my diploma thesis, also to my family and friends for all the help and support received from them during the entire process of writing my diploma thesis.

## Vyhodnocení reálné hodnoty akcií společnosti Apple Inc.

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### Souhrn

Tato diplomová práce se zaměřuje na odhad skutečné hodnoty akcií společnosti Apple Inc., která je dnes jednou z vedoucích technologických společností. Odhad reálné hodnoty je jedním z nejdůležitějších faktorů, které je třeba zvážit před investováním.

První část práce tvoří teoretickou část spojenou s názvem tématu. Obsahuje definice burzovního trhu, ocenění akcií, technologického sektoru a akcií samotných. Dále popisuje modely a přístupy, které lze použít pro hodnocení reálné hodnoty podniku. Rovněž jsou v této části vysvětleny výhody a nevýhody pro každou z uvedených metod a dobu, kdy je vhodné je aplikovat.

Druhá část obsahuje výpočty, které byly zmíněny v první části diplomové práce, dále modely, tabulky a grafy potřebné pro odhady. Grafy obsahují údaje týkající se vývoje volných peněžních toků společnosti a struktury dividend. Srovnávací část obsahuje výpočty pro jednoho z hlavních konkurentů společnosti a její výsledky jsou porovnávány s Apple Inc. v doporučovací části.

A konečně, všechny výsledky jsou uvedeny v diskusní části a závěr je učiněn tak, aby investoři pochopili, zda akcie jsou pro potenciální investice dobré.

**Klíčová slova:** realna hodnota, Apple Inc., akciový trh, technologie, inovace, fundamentální analýza, finanční analýza, technická analýza.

## Estimation of Apple Inc. Stock fair value

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### Summary

This Diploma Thesis focuses on the intrinsic value of stock estimation for Apple Inc. one of the leading technological companies nowadays. Fair value estimate is one of the most important factors to consider before investment.

The first part of the thesis consists of theoretical background connected to the topic name. It contains definitions of stock market, stock valuation, technological sector and stock itself. At the same time, it describes models and approaches that can be used for the evaluation of the fair value of firm. There is section explaining advantages and disadvantages for each of the stated methods and time when it is suitable to apply them.

The second part includes calculation which mentioned in the first part of the diploma models and tables and graphs required for the estimations. Graphs contain the data regarding the development of the free cash flows of the company and dividend patterns over the time series of data. There is comparison part which includes calculations for one of the main company's competitors and its results are compared with Apple Inc. at the recommendation part.

And finally, all the results are stated in the discussion part and conclusion is made to help investors understand if shares are good for the potential investment.

**Keywords:** fair value of stock, Apple Inc., stock market, technology, innovation, fundamental analysis, financial market, technical analysis.

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## **1. Introduction**

Apple Inc. was chosen for review in diploma thesis, because it is without any doubt stands in one of the leading places in the modern technology market. With the production of tablets, smart watches, computers, telephones and etc. Its shares increased a lot since the introduction of its products to the world. Company's products became extremely popular during past decade to nowadays. Started with music players, and finishing lately with smart watches. And all this gained due to firm's innovations. It is very popular not only by the ease of use or its content, but as well by its design.

Company's shares are present on NASDAQ stock market. Its market capitalization today is 836.91 billion, which made it one of the most expensive companies. It started with computers production and for the moment the latest product is iWatch. Which shows continuous improvement of corporation and willingness for growth and innovative products.

Fair value of company's stock is very important for decision-making to understand whether to buy or to sell the shares, so that investors only maximize their profits and not losing.

Diploma thesis has two main parts, theoretical part which is mainly literature review. In this part of thesis reader will be able to understand some basic terms important for understanding thesis's main idea. Also there is information regarding competitors of a company and definition on the market nowadays, through the various graphs showing wellbeing of company and its performance patterns. What time is appropriate for buying, selling either holding the shares. And how to invest in a right time.

The second is practical part, part containing calculations, interpreting them, also what kind of information investors and brokers have to look at before buying or selling stocks. In this part different models for evaluation of the intrinsic stock value applied in practice to show the real price of the company's stock and to answer the investing questions. As well comparison with competitors companies used in this part.

## **2. Objectives and Methodology**

### **2.1. Objective**

The main goal of diploma thesis is evaluation or so-called assignment of fair value to Apple Inc. shares from investor's side. After evaluation is done, the goal is to determine the stock (company) position on the market, if shares are underpriced or overpriced. Based on company's analysis through various models and by using company's financial quarterly and annual reports. Received information will help to answer the question if company is the one to be invested in or not. If we have to buy the shares when it is underpriced, hold shares in satiation when current shares' price is the same as estimated fair value or sell existing shares in case it is overpriced, when current price of a stock is higher than the calculations. The above information will help investors to make the right choice regarding the corporation.

From economic point of view the calculation will also help to predict probable supply and demand on the shares, through the right estimation of the shares fair price. Also looking at competitor's performance. As well there is the review of various factors that have influence on the change in the stock price and its growth or decline.

Theoretical part explains such terms as share, fair value, investing, models for fair value estimation, as dividends discount model and others also financial analysis containing reports information of Apple Inc. Given information shows position of a company on the market. Practical part contains financial, fundamental and technical analysis.

### **2.2. Methodology**

Literature review was conducted through the methods of induction and deduction, synthesis and extraction from chosen sources. Analytical part is done through using of quantitative, qualitative, mathematical and economic methods. Evaluating it with the help of models and various comparisons with current price and as well competitor's position on market. Afterwards collected information is transformed into recommendation for investment. Data for evaluation was derived out of the official website of Apple Inc. The company's estimations are compared with its competitor Microsoft to show position of firm more precisely. And check whether it is better to invest in any of these firms.

In order to conclude the answer for the fixed goals for this thesis two research questions were set:

Research question 1: Are all the methods of fair value estimation going to give the same results?

Research question 2: how well does the fair value estimation relate to the actual market price ?

All data for the analysis conducted in the thesis were obtained from internet sources, CULS library, online and other sources. As well, the graphs were created from data provided in the quarterly and annual reports on given products found at the Apple Inc. official webpage. Graphs and diagrams were made and calculated with the help of software Microsoft Office Excel 2007 software.

### **3. Theoretical part and literature review**

This part of thesis consists of basic terms used in diploma, such as stock valuation, fair value, stock, stock market and others as well explains types of the valuation models and ratios. This part is written in order to help the reader get the understanding of the topic and widen the knowledge about valuation of the fair value of firm.

#### **3.1. Stocks**

##### **3.1.1. Stock**

It is a security type, that is claiming the part of company's ownership, proves the ownership of its holder for receiving part of earnings of a firm in a form of dividends. As well as it entitles its owner to take part in managing company's decisions and for the part of company's property that may remain once there is company's liquidation. In this case owner has the right to receive the part of property that is proportional to the amount of shares person holds. Person holding shares of some company is in other words owner of that company. And ownership degree in this case is determined via relationship of amount of shares that shareholder has to the total number of shares.

There are some types of stock existing, but main ones are preferred shares and common shares. Owners that have preferred shares are not able to vote, nonetheless they may pretend on higher part of earnings and assets than the common shareholders. While the ones that have common stock have voting rights at the meetings of stockholders and they may receive dividends as well. In case of firm's liquidation or bankruptcy preferred stocks' holders have priority and they are receiving dividends earlier.

Price of stock may vary in accordance with the announcements company made, new products introduction and changes in industry may affect it as well. Invention of new product by competitive company also can influence it, as well as the other facts. Before investing in stocks of certain company investors have to make research, and make some calculations via financial and technical indicators, probably compare it with the competitors in the same industry. It may be useful to check new companies on the market, because by creation of new product they are attractive to potential customers due to the

fact that they are new variety of already existing product either absolutely new innovative product. And price of such stock is able to grow dramatically in some cases.<sup>1</sup>

### 3.1.2. Stock market

It is the place where trade is happening for the firm's that are publicly listed. It can be described as group of sellers and buyers of various shares and have ownership rights for certain business.<sup>2</sup> Stock exchange is the enormous global network that is creating the marketplace, that ensures move of money via buying or selling of securities. If company's profits increased due to some factors, than the size of the firm's value will be growing as well. It will result in the share price growth. That also helps the investors to earn, as from value they invested in company is case they sell it they will receive more money than they had in the beginning. It helps companies to get extra money that can be reinvested in order to expand their business. The value of company by this may grow because many investors at the same time saw potential in a given company, even if it had weak shares, its value on the market will increase. It is a good opportunity for new young firms, as they will have option to reinvest, it may help them to get over decreasing sales, due to the fact the company's shares became popular on the market.<sup>3</sup>

### 3.1.3. Stock split

In 2014 company experienced stock split in proportion 7 to 1, which means that the market price decreased by 7 times. It was the third split of the company's shares. It made firm's stock more attractive for the potential investors, as they could buy 7 times more shares for the same money. It resulted in increase of number of shares, as shares that were previously owned by investors were multiplied by 7.<sup>4</sup>

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<sup>1</sup> Staff, I. (2017). *Stock*. [online] Investopedia. Available at: <https://www.investopedia.com/terms/s/stock.asp> [Accessed 6 Jun. 2017].

<sup>2</sup> The Economic Times. (2018). *Definition of Stock Market | What is Stock Market ? Stock Market Meaning - The Economic Times*. [online] Available at: <https://economictimes.indiatimes.com/definition/stock-market> [Accessed 13 Nov. 2018].

<sup>3</sup> YouTube. (2018). *How The Stock Exchange Works (For Dummies)*. [online] Available at: <https://www.youtube.com/watch?v=F3QpgXBtDeo> [Accessed 10 Oct. 2018].

<sup>4</sup> FUNDING UNIVERSE, (2012). [online] Available at: Apple Computer, I. (2015). *History of Apple Computer, Inc. – FundingUniverse*. [online] Fundinguniverse.com. Available at: <http://www.fundinguniverse.com/company-histories/> Accessed apple-computer-inc-history/[Accessed 10 May. 2017].

The price share before the split was more than 600\$ per stock, and after split it was 100\$. It is important to mention, as according to this calculations of dividends for the estimate of dividend discount model will be needed. And also for the graphs' preciseness.<sup>5</sup>

#### **3.1.4. Investing**

Investing is the process of increasing amount of the owned capital via putting money into stock of a firm for example, with the goal of receiving certain return. This method in case if used in the right way helps to save earned money from the inflation and in some cases earn extra money via receiving dividends.<sup>6</sup>

A lot of investing methods are known, but not all of them are efficient. There is term known as the value investing. It is extremely useful and it has its own rules. One of them is that the margin of safety has to be used, as it will prevent from the mistakes and it will lower the risks for the potential investments. Using the MOS also helps to increase chances on higher profits and it minimizes risks. It is a strategy for the long-term, it means that some years may fly away until the investor gets profit.<sup>7</sup>

#### **3.1.5. Stock valuation**

It can be stated that there are two main approaches on how to evaluate the fair value. One of them is so called ratio-based approach, it is using various ratios to identify the position of stock. This type of approach for stock valuation used more often than any other, it is connected to the fact that it is simple and easy for calculation, all the needed information in order to perform it, is easily accessible at financial websites. The method mainly comparing the market value of a company from financial aspect of its performance such as book value, cash flow, sales and earnings and etc.. Still there is quite big disadvantage, except calculation of ratio for needed company, investors as well have to look at the historical ratio, ratios of competitors and also the ratio of market as a whole in order to be precise in interpretation of the ratio results obtained after calculations.

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<sup>5</sup> FORBES, (2011). Apple Sinks After WWDC Lacks New 'iWatch'. [online] Available at: <http://www.forbes.com/sites/briansolomon/2014/06/02/apple-shares-sink-after-wwdc-lacks-new-hardware/> [Accessed 25 June. 2017].

<sup>6</sup> Damoney.ru. (2018). *What is investing?* [online] Available at: <http://damoney.ru/invest/chtotakoe-investicii.php> [Accessed 1 Jan. 2018].

<sup>7</sup> STAFF, I. (2017). *Investing*. [online] Investopedia. Available at: <https://www.investopedia.com/terms/i/investing.asp> [Accessed 26 June. 2017].



The other one is intrinsic value approach. This approach is more difficult than the first one, mostly it consists of more calculations than one and each of them has some steps. It is trying to evaluate what the real value of stock is supposed to be. It is using dividends and cash flows information and afterwards projects it with the other factors and characteristics. After the real or so called fair value of a stock is found by one of these methods than it has to be compared with the current stock price so that conclusion regarding the stock can be made. And the answer to this question can be that the stock is overvalued, undervalued or it may be fairly valued. This approach has valuable advantage such as investor got the result regarding the intrinsic value of stock it is quite easy to understand and advise if company is good or bad for potential investment and there is no need to check other characteristics, compare information with the competitors and look at the industry and market as a whole. But conclusion can be made for certain company and it can be named as more precise approach. Still there is also disadvantage of this approach, because it is quite hard and time consuming operation that has to be done in order to predict future cash flows or future dividend flow for a company. Nonetheless it is obvious that the advantage outweigh the disadvantage mentioned above <sup>8</sup>

**Table 1 Interpretation of fair value estimation results**

Result of estimation	Interpretation of result	Recommendation
fair value > current price	overvalued stock	do not invest
fair value < current price	undervalued stock	invest
fair value = current price	fairly valued stock	do not invest

Source of data: own interpretation based on News.morningstar.com, *Two Approaches to Stock Valuation*

The table above explains the possible outcomes from the estimation of the intrinsic stock value. So that for the first case once current share price is lower than the real value of company's stock than the firm's value is overpriced. That tells investors that it is not useful to invest in chosen company, because price of part of its ownership is not corresponding to the correct value for it. This kind of situation may happen due to two main reasons, one of them is that the market price of stock stays the same in a moment when there is decline in firm's sales, revenues, balance sheet, earnings and etc. Either there is another option when it can be overvalued which happens when there is growth of demand for the company's

<sup>8</sup> News.morningstar.com. (2018). *Two Approaches to Stock Valuation*. [online] Available at: <http://news.morningstar.com/classroom2/course.asp?docId=145096&page=5> [Accessed 6 Nov. 2017].

stock that is connected primarily to the perception of investors. When price growth is not connected to the growth of sales, earnings, revenues or other characteristics, investors may state that it is overvalued.<sup>9</sup>

And situation gets opposite when current stock price is higher than the intrinsic value the interpretation for this estimate is following that the company is undervalued. Then it is worth investing, because its price is expected to grow in future by its definition. Stock may be undervalued due to various factors, such as the company is not well known on the market and people are afraid to risk it. Either demand for stock of given firm declines as well due to the perceptions of potential investors and it is not connected to the reality, that there is drop in company's fundamentals. And so the price on the market drops, while real fair value is higher. Or there is last option when fundamentals increase and market price is not changing accordingly.<sup>10</sup>

And in case share price on the market is equal to estimation it is named fairly valued stock.

To answer the question what kind of method is best to use for estimation of the intrinsic value it is hard to answer. As there is number of techniques available for valuation and there is no unique method that may fit every situation, company and industry. Because each industry and firm is unique and it may be better to vary the methods. Also the approaches for valuation may be divided into two categories which are called relative and absolute methods of valuation.

Absolute valuation methods are synonym for mentioned above intrinsic value approach. And methods meant to work for this approach are Dividend Discount model looking into company's dividends, Residual Income model, Discounted Cash Flow model that takes into account cash flows of company and projecting the data into future to predict future cash flows, also asset-based models available for this case. As value of a company is calculated independently and it is afterwards compared to the current price, it helps to understand if returns for this investment are sufficient.

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<sup>9</sup> Investinganswers.com. (2017). *Overvalued Definition & Example | InvestingAnswers*. [online] Available at: <http://www.investinganswers.com/financial-dictionary/investing/overvalued-837> [Accessed 6 Aug. 2017].

<sup>10</sup> Investinganswers.com. (2017). *Undervalued Definition & Example | InvestingAnswers*. [online] Available at: <http://www.investinganswers.com/financial-dictionary/stock-valuation/undervalued-5266> [Accessed 6 Jul. 2017].

**Table 2: Suitability of valuation methods**

<b>Absolute valuation method</b>	<b>Suitable when</b>
<b>DDM</b>	· When dividends are stable and grow at constant rate
	· May be used in most cases
	· When dividends are corresponding to changes in earnings
<b>DCF</b>	· When earnings are negative
	· Best for non-financial firms
	· When dividends are not paid
<b>Residual Income</b>	· Mostly suits when BS is important indicator of earnings and other methods not appropriate
	· Used mostly for financial companies
	· Used less in comparison with other models
<b>Asset-based</b>	· When company is going to be liquidated
	· When the assets are substantial and each can be valued separately

*Source of data: own interpretation based on Aaii.com., Selecting a Valuation Method to Determine a Stock's Worth*

The table helps to navigate investors, when they are not sure about suitability of method for estimation, and that is useful to help get correct evaluation. The investor has to check the sign of earnings, in case they are negative Dividend cash flow model is not able to help in calculation, at the same time DCF is good when firm is not paying dividends, as in this case dividend discount model cannot be used. DDM is good in case of stable dividend payments and when the growth rate of dividends is more or less constant. And when dividends checked it is good to check if they are corresponding to the earnings increases or decline. Residual income works best when it is seen that neither DDM nor DCF are not good, still it is the least used method.

Asset based model is generally used in a case when firm is not sure about its future earnings and cash flows. It fits because company's evaluation is performed upon its own assets. Actually the calculation will look like the company is broken and will be liquidated

and its individual assets were partly sold, at the same time liabilities are paid out and dividends were already paid to the shareholders.<sup>11</sup>

DDM is known as most popular and basic models of absolute stock valuation. To use this model investor has to check if firm at all pays dividends. And then it is not everything, in case company pays dividend investor also has to check if its dividends are predictable and if these are stable. In case it has stable dividends it typically considered to be mature company that comes from well-developed industry. And that gives indication to investor that this method is suitable for its evaluation. It will be suitable because when we can see that there is constant growth of earnings per share and also dividends per share with a constant rate it will be easy to suppose that it will continue to grow at the same rate, and by that it will bring precise estimation at the conclusion.

The same procedure can be applied when estimating the fair value by DCF model, but for this situation not dividends but cash flow patterns have to be observed. There are several forms of this model existing such as three-stage and two-stage DCF. It is known that the two-stage variety is the most popular, it projects free cash flow into future for period from five to ten years. Afterwards cash flows beyond the forecast period have to be taken into account, using previously calculated data. As well as for DDM this type of method is suitable for mature companies, having free cash flows which can be predicted, where free cash flows are stable and also positive. Companies having high capital expenditures due to reinvesting or other factors may be not suitable for this approach.

When none of the mentioned methods is applicable Comparables method can be used. It is working in a way of comparison price of a stock with price of a stock that is relatively over or undervalued. Its principle comes from Law of One Price, that states that two assets that are similar have to be sold for same price. It is very popular method, also because there is a lot of data available to perform it, such as price to cash flow, price to earnings, price to book or price to sales and other ratios. And for sure price to earnings will be the most useful ratio from all others, as it is derived from earnings of company that are

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<sup>11</sup> Aaii.com. (2017). *Selecting a Valuation Method to Determine a Stock's Worth*. [online] Available at: <http://www.aaii.com/journal/article/selecting-a-valuation-method-to-determine-a-stocks-worth.touch> [Accessed 13 Feb. 2017].

known to be the fundamental of the intrinsic stock value. For sure earnings need to be positive and strong, so that there is not much volatility.<sup>12</sup>

And relative valuation method corresponds to ratio-based approach mentioned before, it is mainly comparing company to others in its industry. Generally it is about calculating price to earnings multiples, price to earnings ratio, earnings per share and the others. This approach is not searching for value per share in dollars or it is not looking into company's value as a whole, but instead estimates the price in a comparison with other companies in this sector or with fundamental factors. This methodology includes yield measures as well as ratios, price multiples either their inverse. And once estimation is completed received numbers have to be compared with average of industry or to competitor companies also in the same industry, this will give the investors understanding if company is valued low or high. It may happen that the peer firms from the same industry may also be overvalued, than definitely relative valuation approach is not the best solution, as it will not be able to bring the correct result for evaluation.

**Table 3: Suitability of ratios for evaluation**

Ratio	Suitable when
P/E (price to earnings)	· When earnings are non-zero and positive
	· When earnings are good indicators of company's performance
P/S (price to sales)	· Usually suitable for retail firms
	· When there are negative earnings
P/B (price to book)	· When earnings are negative or near zero
	· When for company its BS is important indicator of its performance
P/D (price to dividend)	· When dividends are stable
	· When dividends correlate with earnings
P/CF (price to cash flow)	· When earnings are not indicating performance of company
	· May be used in most cases
	· For non-financial companies

Source of data: own interpretation based on Aaii.com., *Selecting a Valuation Method to Determine a Stock's Worth*

<sup>12</sup> Nguyen, J. (2018). *How to Choose the Best Stock Valuation Method*. [online] Investopedia. Available at: <https://www.investopedia.com/articles/fundamental-analysis/11/choosing-valuation-methods.asp> [Accessed 12 Jan. 2018].

It is clear from the table above that in case investor has difficulties with one ratio there are other options available to estimate the value using different fundamentals. Before analysis, when check of needed characteristics is performed once investor notices that the pattern of dividends is not stable and it varies a lot across the time series of available data showing past dividends or in case when dividends growth is not corresponding to the decline or grow of the company's earnings conclusion is that the price to dividend ratio is not suitable for that case. In case earnings are checked and it is seen that these are negative it is not appropriate to apply here price to book or price to sales methods. In case earnings are positive price to earnings ratio is a best suitable option for estimation.<sup>13</sup>

Once investor is ready to invest owned amount of money there is a question how to find the right stock and what is its real price then. Answer to this question gives the key to the profitable investing that may bring highest earnings in case several potential companies are considered for investment, than the one with the higher returns will be chosen. To define the intrinsic value of given stock there are known many methods, different ratios. Some of the estimations are done in one step, some need many calculations, as they are more difficult but by the same way they tend to be more precise than the other ones. Also it is not possible to calculate the real value of a stock by only one model.

Some stocks are easy to evaluate some not, this depends on many factors. Among them are type of stock if stock is preferred there are less models existing for evaluation, as well some companies are not publicly traded, limitations may appear once company just introduced itself on the market, either if it was not paying dividends, sometimes it is hard to find data in the sources.

It can be still stated that there is no best method for company valuation, as each of them has its own pros and cons. The choice of evaluation highly depends on the current circumstances.

### **3.1.6. Fair value**

Fair value of stock is estimation that is able to help investors to understand the right value of stock, meaning if the stock price is undervalued or overvalued. It is supposed to be the value the share worth on the open market. This information is able to give investor

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<sup>13</sup> Aaii.com. (2017). *Selecting a Valuation Method to Determine a Stock's Worth*. [online] Available at: <http://www.aaii.com/journal/article/selecting-a-valuation-method-to-determine-a-stocks-worth.touch> [Accessed 13 Feb. 2017].

the right investing advice. There are various models to predict the value, but all of them are the same in a way that they all take into consideration firm's growth rate, profit margins and risk factors. Also all the models contain some kind of a prediction.

Fair value estimate is very important and one of the basic investing subjects. Even if it is not an exact value of share price, still it is one of the key things investors are willing to know. It may show the fair price that may be paid for a given stock.<sup>14</sup>

By all the facts mentioned above intrinsic value of stock is critical definition in valuation of publicly traded securities, as it shows the most realistic value, which may not be clearly seen from the current price for which shares are sold on the market. It will definitely differ from investor to investor, because in order to calculate the fair price models have to be used, all of them consist of several assumptions which need to be stated before the estimation, each analyst states his own assumptions, which are true on his opinion.<sup>15</sup>

It is the value by which the bonds are supposed to be priced in theory. Still it does not always mean that the price at which stock is traded equals or the same as the intrinsic stock value. And in order to make some decision on the investment the prices must be compared. The difference will give the right answer. Even the fair value is calculated it is not the 100% precise as it is just a suggestion, due to the assumptions which are created only according to the investor's feelings and choice.<sup>16</sup>

The amount of money which is fair for both parties the buyer and the seller. In case the investor knows that the fair value of a company is higher than the current market price for the stock, then it is showing that the price of the stock is undervalued and the potential investor shall take the decision to invest into company till the shares are increased in price and then sell it once its fair value is lower than the price of share on the market. And the same works the other way round, once price on the market is higher than the intrinsic stock

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<sup>14</sup> Investinganswers.com. (2017). Fair Value Definition & Example | InvestingAnswers. [online] Available at: <http://www.investinganswers.com/dictionary/fair-value> [Accessed 21 May 2017].

<sup>15</sup> PINTO, J., HENRY, E., ROBINSON, T., 2010. Equity Asset Valuation Workbook, 2nd Edition. United States of America: John Wiley & Sons. 2 p. ISBN 0470395214

<sup>16</sup> YouTube. (2017). What is Fair Value and how is it Calculated?. [online] Available at: [https://www.youtube.com/watch?v=IKZ\\_vHO07mc](https://www.youtube.com/watch?v=IKZ_vHO07mc) [Accessed 20 Jun. 2017].

value then the firm is overvalued and there is no need to invest into it. Not to lose money. Knowing the fair value affects the decision of the smart investors.

### 3.1.7. Financial companies

Financial firms are financial organizations that accept deposits and also they pay interests on them, further they are lending money to other businesses or consumers.<sup>17</sup>

Mainly these are the firms that deal with monetary transactions that include currency exchanges, loans, investments and deposits. Usually they lend money in short-term. These can be credit unions, banks, financial institutions or loan companies.<sup>18</sup>

### 3.1.8. Operating companies

Manufacturing companies that provide goods and services are considered as operating companies from point of company's evaluation. Usually this type of companies belongs to its parent company. And revenue source of parent company in this case generally comes from the percentage of profits that is taken out of the operating company.<sup>19</sup>

Operating companies themselves are responsible for everyday operations of the firm. Mostly in case of operating company it is managed by the holding or so called parent company in a way that owners are controlling it as they have responsibility of executive management, still they have no rights for the ownership. All the main decisions need to be approved by the holding company. In case when operating firm gets troubles with making profits it may happen that it goes out of the business, which is not applied to the holding company, as it will stay.<sup>20</sup>

### 3.1.9. Technological industry

Technological sector is a stock category that is related to the research and development also distribution of technological goods and services. The sector includes companies that are electronics producers, software creators and as well products and

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<sup>17</sup> BusinessDictionary.com. (2015). *What is finance company? definition and meaning*. [online] Available at: <http://www.businessdictionary.com/definition/finance-company.html> [Accessed 13 Aug. 2017].

<sup>18</sup> Staff, I. (2017). *Financial Institution - FI*. [online] Investopedia. Available at: <https://www.investopedia.com/terms/f/financialinstitution.asp> [Accessed 13 Jun. 2017].

<sup>19</sup> BusinessDictionary.com. (2016). *What is operating company? definition and meaning*. [online] Available at: <http://www.businessdictionary.com/definition/operating-company.html> [Accessed 7 Oct. 2017].

<sup>20</sup> Smallbusiness.chron.com. (2017). *What Is the Difference Between an Operating Company And A Holding Company?*. [online] Available at: <http://smallbusiness.chron.com/difference-between-operating-company-holding-company-10752.html> [Accessed 20 May 2017].



computers related to information technology. This sector has wide variety of services and products for other businesses and consumers. For businesses technology sector helps to create firms the software for the enterprises and that is why companies are highly dependent on the latest innovations in this sector. For companies innovations in technological industry are useful due to the fact that they are controlling the logistics systems, they are safeguarding the databases of companies, also provide critical information for companies to be able to make their strategic decisions. For consumers side it offers new varieties of products either same products but with new characteristics such as mobile phones, TVs, home appliances, personal computers, wearable technologies and others.

It is usually very attractive segment for investment. For example in the USA case, companies like Apple, IBM, Microsoft, Netflix, Facebook and others are leading the growth in the technological industry. As well due to their attractiveness to investors and their potential allows them to be sold for higher prices compared to other industries.<sup>21</sup>

## **3.2. Estimation methods**

### **3.2.1. Models for estimation**

#### **3.2.1.1. Dividend Discount Model**

The model helps to determine the fair value of stock. It estimates the right price that investors will be ready to pay for the shares. Model shows if stock price is overvalued or undervalued. The model considers the time value of money as well as future and current cash flows.

The cash flow's measures are dividends, as it is what the investors are getting back from the firm. They are called estimators because they show amount of cash you may receive after investment. And time value of money is important as it also shows if stock worth investing.

Estimate of this model will help investors to know if they have to hold existing shares or sell it, either in case there is question to invest or not to invest either to find another company to invest in.

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<sup>21</sup> Staff, I. (2016). Technology Sector. [online] Investopedia. Available at: [https://www.investopedia.com/terms/t/technology\\_sector.asp](https://www.investopedia.com/terms/t/technology_sector.asp) [Accessed 13 Oct. 2017].

Advantages and disadvantages of the model, the model is easy to use, as there are not many calculations required. It is good for stocks valuation because it considers growth of the dividends and dividend payments comparably with the stock price. Before the application of the model, dividend payments amount has to be viewed. The model cannot be applied for the companies, which are not paying dividends. It works perfectly for shares that are already paying dividends. This is difficult to find, due to the fact that 60% of companies that are publicly traded are not paying out the dividends, because these money are used for the reinvestment for future growth. Model can be used for firms which are not paying dividends only in case the researcher creates assumptions which relate to the time when and how much the company will start paying. Still for the rest companies, assumptions have to be made regarding the required rate of return and growth rate of a firm. Slight miscalculation can be the result of dramatic mistakes. Then stock cannot be evaluated in the right way. <sup>22</sup>

The disadvantage of the model is that it cannot be applied, in case when the required rate of return for the firm is lower that the growth of its dividends. When growth of dividends is higher, then the value will get negative sign, which is not correct and cannot be used for further evaluation of company. This model is good point of start in evaluation of investment, as it may show the risks and connection of returns and growth of firm's dividends over the time.

#### 3.2.1.1.1. DDM types

There are 3 types of dividend discount models:

- ❖ Zero-growth model
- ❖ Constant-growth model (Gordon Model)
- ❖ Variable-growth model

Zero-growth model is method that is based on the assumption that there is constantly non-growing dividend trend. It is the most simple of all dividend models. In this case then there is no change in the dividend amount from year to year, then:

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<sup>22</sup> Investinganswers.com. (2017). | InvestingAnswers. [online] Available at: <http://www.investinganswers.com/education/stock-valuation/how-find-stocks-value-using-dividend-discount-model-2386> [Accessed 24 Nov. 2017].

$$D_1 = D_2 = D_3 = \dots = D_\infty$$

The fair value equals to the present value of a dividend that is discounted by the rate  $k$ . This type is suitable for valuation of preferred stock, as it is the case when dividends are paid at a fixed rate on the annual basis.<sup>23</sup>

Constant-growth or Gordon model is also very popular method of fair value estimation of stocks same as zero growth model, but it is used more often because may be applied not only to the preferred stock. It has some assumptions, one of them is that growth rate of dividends has to be lower than the required rate of return and another one is assuming that dividends will grow at a constant rate. If first assumption is not valid, then fair value may not be calculated from mathematical point of view, because it will bring negative value.

Requirements for using this type of the model are following:

- Growth speed of the company's earnings is close to the economy growth or lower
- Existence of stable dividend politics and stable payment coefficient (if company is not paying the dividend in some years, then it cannot be stated that company's stock's fair value is objective)
- Stability of firm's activities and expected financial results of a company

The model is not suitable for the valuation of fast growing companies either firm's dividend politics is not stable.<sup>24</sup>

$$P_0 = \frac{D_1}{k_s - g} \quad (1-1)$$

$P_0$ ...Price of stock

$D_1$ ...next year's dividends per share

$g$ ...constant growth rate of dividends

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<sup>23</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 326 p. ISBN 0-321-31150-7

<sup>24</sup> YouTube. (2017). *Estimation of Dividend Discount Model*. [online] Available at: [https://www.youtube.com/watch?v=VDVupYg\\_56k](https://www.youtube.com/watch?v=VDVupYg_56k) [Accessed 24 Nov. 2017].

$k_s$ ...required rate of return

To make estimation of the intrinsic value of stock by the Gordon model, some steps have to be done. First of all in order to predict  $D_0$  historical growth rate of the dividends has to be known either calculated, by arithmetical average of all the dividends paid through chosen period of time also may be estimated through the geometric average. Then it has to be assumed that this rate will stay constant during future time period, based on this next year's dividend may be calculated.

So that assumed constant growth rate of dividends is multiplied by the latest dividend paid by the firm. And required rate of return may be predicted by the CAPM.<sup>25</sup>

Variable-growth model assumes that the rate of dividends' growth may be fluctuating over the time. It is advantage of the model, because two others mentioned above are not allowing any growth of the dividends. In this model single change and multiple change of the growth rate are possible. It is in some way more useful, as it will count with unexpected circumstances such as introduction of new products by the company, which may lead to the growth of its dividends or its competitors' new products, which will lead other way round to the possible decline in the company's growth and as a consequence to the lower growth rate. It consists of four main steps.

The first step is determination of the cash dividend value for the time frame of the each year ending, which is noted as  $D_t$ , during the time period of the first year to  $N$ . In most cases to calculate this step the latest dividend has to be adjusted. It may be recalculated with the help of the dividend growth rate. The formula looks as follows:

$$D_t = D_0 \times (1 + g_1)^t = D_0 \times FVIF_{g_1,t} \quad (1-2)$$

The second step is calculating the present value for the expected dividends which were calculated in the previous step, for the initial growth period. And it may be calculated by the following formula:

$$\sum_{t=1}^N \frac{D_0 \times (1+g_1)^t}{(1+k_s)^t} = \sum_{t=1}^N \frac{D_t}{(1+k_s)^t} = \sum_{t=1}^N (D_t \times PVIF_{k_s,t}) \quad (1-3)$$

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<sup>25</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 327 p. ISBN 0-321-31150-7

In the next step the value of stock has to be estimated for the initial growth period ending, and it is equal to the present value of sum of all the expected dividends from the 1<sup>st</sup> year to the infinity, with the assumption of the constant dividend rate of growth. It may be calculated with the application of the Gordon model.

The fourth and final step is calculation of the fair value which is done by summarizing the values estimated in the third and second steps. <sup>26</sup>

#### 3.2.1.1.2. CAPM

CAPM is capital asset pricing model it is basic model that links risk and return on all the stocks. It is mostly based on the historical data. Required rate of the return estimated by the CAPM is not very precise and may be considered only as approximation, it is like this due to the fact that the beta indexes are not always reflecting future return variability. It was created to help understand investors behavior of chosen stock and its prices. This calculation has assumption of the efficient market. Which means following there is no taxes, there are not so many potential investors, all of them have access to the information and it is the same for everyone, investments are not restricted and there is no cost of the transactions. <sup>27</sup>

#### 3.2.1.1.3. Required rate of return

Given number shows minimal acceptable rate of return on the chosen stock investment. It helps financial analysts and potential investors to identify in further calculations minimum return that is acceptable to make investment. To calculate it market rate of return, risk free rate and beta for the chosen stock has to be considered as well. Lower rate of return is less risky, but when rate of return is higher, investment is believed to be riskier. <sup>28</sup>

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<sup>26</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 327 p. ISBN 0-321-31150-7

<sup>27</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 233 p. ISBN 0-321-31150-7

<sup>28</sup> The Economic Times. (2017). *Definition of Required Rate Of Return / What is Required Rate Of Return ? Required Rate Of Return Meaning - The Economic Times*. [online] Available at: <https://economictimes.indiatimes.com/definition/required-rate-of-return> [Accessed 12 Sep. 2017].

#### 3.2.1.1.4. Beta

The following estimate is measuring risk of chosen stock, showing how returns may be volatile, indicating stock price change fluctuations with respect to the market. It is index, that describes relation between change in the rate of return of the market and degree with which return on the asset reacts on it. It may be measured with the usage of historical rate of return on the stock.<sup>29</sup> It may be found in many sources for stocks that are actively traded. Beta, which has value of 1 tells that return that is expected from security is the same as market rate of return. Negative beta states perfectly negative correlation of security and market. Positive beta shows percentage amount of return's volatility on the market, it is as well norm.

#### 3.2.1.1.5. Risk-free rate

This estimate has to be used in correspondence with the country in which investment is going to be done. It detects time value of money, in most of the cases it equals to 10 year government bond's yield.<sup>30</sup> Usually these are the treasury rates that are used as risk free rates. It is rate for the return of hypothetical investment, when there are no financial losses possible and in fact supposed to be by this no risk in such investment during time period. At the same time when there is no risk, the return for this investment is going to be lower, then the investment into stock that is risky, so that investors are willing to invest into it.<sup>31</sup>

#### 3.2.1.1.5. Market rate of return

Or in other words market risk premium, it is standard interest rate that is considered as accepted in the chosen industry. This rate is highly dependent upon the risks, market environment, economic conditions. Market rate of return may be fluctuating over the time

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<sup>29</sup> Corporate Finance Institute. (2018). *What is CAPM - Capital Asset Pricing Model - Formula, Example.* [online] Available at: <https://corporatefinanceinstitute.com/resources/knowledge/finance/what-is-capm-formula/> [Accessed 6 Oct. 2017].

<sup>30</sup> Corporate Finance Institute. (2017). *What is CAPM - Capital Asset Pricing Model - Formula, Example.* [online] Available at: <https://corporatefinanceinstitute.com/resources/knowledge/finance/what-is-capm-formula/> [Accessed 15 Sep. 2017].

<sup>31</sup> Staff, I. (2017). *Risk-Free Rate Of Return.* [online] Investopedia. Available at: <https://www.investopedia.com/terms/r/risk-freerate.asp> [Accessed 15 Jul. 2017].

due to the changes in the economy and other factors mentioned previously, also according to the industry. As well demand and supply and inflation have their influence on the rate.<sup>32</sup>

### *3.2.1.2. Free Cash Flow model*

#### *3.2.1.2.1. Free Cash Flow model definition*

The calculation is performed based on the projections of company's free cash flows, this approach is good alternative to the Dividend Discount Model. Its advantage in comparison with the DDM is that in case company does not pay dividends and as the consequence there is no available dividend history, due to the fact that firm is reinvesting its earnings to grow the market share or in situation when it is just at the beginning and it is still startup, either it may happen once the valuation is done not for the whole firm but for some of its parts.<sup>33</sup>

The method is based as well as the others on assumptions. It measures free cash flows that are expected by the firm instead of measurement of its expected dividends. As free cash flows show amount of money that are available after all debts and liabilities are covered. Its premise is that the intrinsic value of a stock equals to the sum of all calculated cash flows in the future from next year to the infinity that are discounted into their present value. It is calculated through four main steps, which consist of several calculations each.

The first step of the model consists of the calculation of growth rate for the past free cash flows, it is easy to calculate, the percentage change of the value from year to year of cash flows has to be calculated by the dividing of the higher value by the lower, and positive or negative sign has to be added accordingly if there was an increase or decrease in the value, then arithmetic average from all numbers has to be calculated, obtained number will show the value of growth of the free cash flows. Once it is known free cash flow values for the next 5 years are to be calculated, this will be estimated through the discounting of the last free cash flow value known for the company, into next 5 years for each one of them separately.

The next calculation in this step is finding the present value for the free cash flows that will appear from the 6<sup>th</sup> year to infinity. This calculation will use weighted average

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<sup>32</sup> Course, M. (2017). What is Market Rate of Return? - Definition | Meaning | Example. [online] My Accounting Course. Available at: <https://www.myaccountingcourse.com/accounting-dictionary/market-rate> [Accessed 10 Oct. 2017].

<sup>33</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 329 p. ISBN 0-321-31150-7

cost of capital, noted as  $k_a$  its value may be found in the internet, growth rate of free cash flows and value of the free cash flow that is expected to occur during the 6<sup>th</sup> year of prediction. It simply may be estimated by discounting of 5<sup>th</sup> years free cash flow with future value interest factor.

The expected cash flows are calculated for the 5 years because it is the number of years which is usually chosen for the prediction. Due to the reason that it is very hard to predict it for more years and it is median number. It is assumed that the constant growth rate will occur from the 6<sup>th</sup> year to the infinity.<sup>34</sup>

The second step is the founding the value of total free cash flow for the last predicted year, through the sum of two values, one that was calculated in the first step, and the second one is value that was predicted for mentioned time period at the beginning of the first step. It was estimated through the FVIF multiplied by the last predicted year.

The third step is about finding the cost of the whole company. New table with 5 year predictions will need to be formulated, there will be information about the 5 years, expected free cash flows for them calculated in step 1 and for the 5<sup>th</sup> year free cash flow amount will be changed to the last number calculated in the second step. Then present value interest factor has to be calculated for each of the 5 years. Once it is calculated the next column is the present value of these cash flows. It is obtained through the multiplication of present value interest factor by the expected free cash flows. All the numbers have to be summed up and then this is the value of the entire company.

The fourth step is concluding, its aim as first of all is to calculate the market value of the common stock  $V_s$ , in order to do that market value of the whole company  $V_c$ , that was calculated in the third step will be used. Also to count the common stock value two others values are important to know, one of them is the market value of company's debt, noted as  $V_d$  and the other one is market value of preferred stock of a company which is  $V_p$ .<sup>35</sup>

The value of debt for a company that is traded on the bond's market calculation will be following, data for equation is available on the financial internet sources, debt values

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<sup>34</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 332 p. ISBN 0-321-31150-7

<sup>35</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 331 p. ISBN 0-321-31150-7



have to be checked, as firm may have both types of a debt such as long-term and short-term these have to be found. When they are known then the market value of debt is sum of both values mentioned above.<sup>36</sup>

Calculation of preferred stock's market value is done by the following formula:

$$V_p = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \dots + \frac{D_n}{(1+r)^n} \quad (1-4)$$

Where:

$V_p$ ...market value of preferred stock

$D_n$ ...next period's dividend

$r$ ...required rate of return

Preferred type of stock has fixed dividend amount. So that to calculate its market value per one share all the next periods' dividends have to be summed up after they are discounted to their present value as shown in the formula. After it is done calculated number has to be multiplied by the number of preferred shares outstanding, which may be found from the financial internet resources.<sup>37</sup>

Then at the time when market value of the debt and of preferred stock is known, market value of the common stock will be calculated through the subtraction of these numbers from the market value of entire company calculated in the previous step. Once evaluation is done, the number will need to be divided by the total number of common shares outstanding. This value will be the fair value of stock.

Finally it may be stated that this model is different from the DDM in a way of consideration of the free cash flows.<sup>38</sup>

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<sup>36</sup> *How to Calculate the Market Value of Debt*. [online] Available at: <https://bizfluent.com/how-7642356-calculate-market-value-debt.html> [Accessed 24 Nov. 2017].

<sup>37</sup> Staff, I. (2017). *Valuation Of A Preferred Stock*. [online] Investopedia. Available at: <https://www.investopedia.com/articles/fundamental-analysis/11/valuation-preferred-stock.asp> [Accessed 24 Nov. 2017].

<sup>38</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 323 p. ISBN 0-321-31150-7

### 3.2.1.2.2. Weighted average cost of capital

This estimation shows the cost of the firm's capital, and it is done by the valuation of capital by the categories and it is weighted proportionally.

The evaluation includes all of the capital sources, such as bonds, preferred stock, common stock, long-term debt and the others. Weighted average cost of capital is highly dependent on the firm's beta ratio mentioned above and also on the required rate of the return, as the consequence decreasing WACC identifies that the risk got lower and that there is increase in the stock value.

$$WACC = \frac{E}{V} * R_e + \frac{D}{V} * R_D * (1 - T_c) \quad (1-5)$$

Where:

E...firm's equity market value

D...firm's debt market value

V=E+D...total market value of the firm's debt and equity

T<sub>c</sub>...corporate tax rate

R<sub>e</sub>...cost of the equity

R<sub>d</sub>...cost of the debt <sup>39</sup>

### 3.2.1.3. Residual income model

The approach is least known than the others listed above. Still it is useful in practice, residual income itself is amount that is received by the subtraction of charges for opportunity cost of common stock shareholders' from the net income of a company. It is remaining amount of net income.<sup>40</sup>

This method assumes that company's value is determined by its current book value. The book value of a company is calculated by the following equation net assets minus liabilities from the firm's balance sheet. And further it sums up calculated value with

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<sup>39</sup> Staff, I. (2017). *Weighted Average Cost Of Capital - WACC*. [online] Investopedia. Available at: <https://www.investopedia.com/terms/w/wacc.asp> [Accessed 1 Nov. 2017].

<sup>40</sup> PINTO, J., HENRY, E., ROBINSON, T., 2010. *Equity Asset Valuation Workbook*, 2nd Edition. United States of America: John Wiley & Sons. 210 p. ISBN 0470395214

excess earnings that company is able to generate in future at their present value. And excess earnings equal to the difference between firm's earnings that firm is able to generate in reality and the earnings that are required by its investors.

The assumption of the model is also that the company's earnings are going to decrease to the required level by the investors, so that there will be no excess earnings available. Also it fits when it is hard to differentiate the company's future cash flows. It may happen in case of financial companies, due to the fact that its cash flows are very different from the cash flows of operating companies.<sup>41</sup>

#### *3.2.1.4. Comparison of valuation methods*

As intrinsic value is crucial while making decision regarding the investment, there are various ways known that help to predict real or so called fair value. As this measurement shows if the stock's value is profitable for investment and it may be used for potential investment either in case it is other way round overpriced then it helps the investors to save the capital and not to lose any amount of money as it is already in the wrong phase. And so methods known for the evaluation are:

- P/E ratio
- PEG ratio
- DCF model
- DDM model
- Residual income model
- Book value multiples
- EPS
- Graham number

Also other methods are known, but at the same time mentioned above methods are known to be the most popular and exact ones. As per the number of the equations needed for the estimation of the value of stock through the methods of Dividend Discounted Model or Free Cash Flow models can be named as the most difficult ones but at the same time more

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<sup>41</sup> Aaii.com. (2017). *Selecting a Valuation Method to Determine a Stock's Worth*. [online] Available at: <http://www.aaii.com/journal/article/selecting-a-valuation-method-to-determine-a-stocks-worth.touch> [Accessed 13 Feb. 2017].

precise ones, because they consist of more than 1 calculation and they take into account possible risk factors. Also they use margin of safety for this aim.

Then the less difficult, but still complicated is residual income model and book value multiples. The simplest ones are the earnings per share, the Graham number, price to earnings ratio, due to the fact that these are the one equation estimates. They do not take too much time to calculate and meanwhile not as precise as more difficult ones mentioned above.

### **3.2.2. Alternative methods for estimation**

#### **3.2.2.1. EPS**

Earnings per share is the estimate that is able to help in evaluation of firm's profit, which was received from the investment in its stock. It may identify the price of stock. It determines the amount of money earned from each share that was purchased, for chosen time period. This is very popular indicator among investors, which shall be used before the investment is done, as it is showing the success of the firm. Lower earnings per share show lower returns from the investment, then higher estimate shows better wellbeing of a company. To be precise and useful it is better to make comparison of EPS of the company with its competitors.<sup>42</sup>

#### **3.2.2.2. P/E**

Price to earnings is ratio that is explaining the value of money that is satisfying for the investors to be purchased in the company's stock per every dollar that is earned by the firm. By this identifies level of stockholder's confidence in the future development of the company. Low value of the estimate relates to the low confidence level. It is interpreting amount of money spent by the investors for every dollar earned.<sup>43</sup>

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<sup>42</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 13 p. ISBN 0-321-31150-7

<sup>43</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 70 p. ISBN 0-321-31150-7

### 3.2.2.3. P/E multiple

The price to earnings ratio, which is used in calculation of the P/E multiple is used to show the amount of money that potential investors are ready to pay for every dollar of earnings on the given stock. The average price to earnings estimate for an industry can be used in the estimations, as it is believed to be a good measure because analysts are measuring value of a company's shares in the same way as they would do in the average company in the same industry. This method is very common in terms of estimation firm's value. To calculate this technique average P/E for an industry and expected earnings per share for the company are needed. While industry's average value may be obtained from various internet sources as one of them Standard and Poor's Industrial Ratios may be used.

This approach is also suitable for the companies that are not traded publicly. The advantage of this method is that it uses the earnings that are expected, while for example liquidation approach or book value not using such estimates.

Still once calculation is performed, it is not very precise and may not be stated as 100% right as well as wrong. And this is connected to the fact that preciseness of the answer is dependent upon the assumptions that were made at the beginning stage of the calculations. Usually professionals in the field of firm's valuations are using more than one approach for calculations of the real price of the stock. And after all calculations are done then in case the analyst is pleased with the obtained results he makes the conclusion about the intrinsic value of stock, usually it is done by comparison of the estimated results and then once all the numbers are known, the decision is made in a way that the stock is valued by the biggest estimate.<sup>44</sup>

### 3.2.2.4. Book value multiples

Book value is the very popular approach in valuing stocks. As the difference between book value and the market price may help to understand whether the investment worth it or not. If book value of equity is higher than its market price then the stock is believed to be undervalued and its worth investing, while when it is lower the portfolio of a company is supposed to be overpriced.<sup>45</sup>

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<sup>44</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 334 p. ISBN 0-321-31150-7

<sup>45</sup> DAMODARAN, A., 2006. *Damodaran on valuation. Security analysis for investment and corporate finance*. 2nd ed. United States of America: John Wiley & Sons, Inc. 19 ch. 1 p. ISBN-13: 978-0471751212

### 3.2.2.5. PVIF

Present value interest factor is a multiplier created for the estimation of the present value of some amount of money that is going to be received at specified discount rate in future time period. Its formula is:

$$PVIF_{i,n} = \frac{1}{(1+i)^n} \quad (1-6)$$

Where:

i...percentage rate

n...period<sup>46</sup>

### 3.2.2.6. Graham number

It is the estimate that is considering 2 main indicators of a firm, these are the book value per share and firm's earnings per share by this measuring stock's value. Calculated estimate shows the maximal level of the share price range that should be paid for a given stock by investors. So that once it is calculated it has to be compared with the current stock price and in case that the stock price is lower than the Graham number stock is supposed to be underpriced by its theory and it can be bought. And in the opposite case when the stock price is higher than the Graham number the stock is told to be overpriced and it is not suitable for the investment. This estimate is calculated by the following formula:

$$\text{The Graham number} = \sqrt{22.5 * \text{EPS} * \text{BV per share}} \quad (1-7)$$

Its name comes from the Benjamin Graham as he is known as the father of value investing. Investors refer to this calculation as to the general or main testing for identification of stock position and if its current price is worthy of buying it. Number 22.5 is included in formula because in Benjamin Graham's opinion there are certain levels above which two other indicators from this formula cannot exceed, so that the price to book ratio cannot exceed 1.5 and at the same time price to earnings ratio maximum value is above 15. Which is finally  $15 * 1.5 = 22.5$ .

So that the formula may look like:

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<sup>46</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 160 p. ISBN 0-321-31150-7

$$\text{The Graham number} = \sqrt{15 * 1.5 * \frac{\text{net income}}{\text{number of shares outstanding}} * \frac{\text{equity of shareholders}}{\text{number of shares outstanding}}}$$

As seen estimate is one of the simplest ones, it is showing in case firm can be a good investment or it is better to avoid investing. Still this estimation does not take into account a lot of other characteristics that also may be very important for the correct evaluation of the intrinsic value.<sup>47</sup>

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<sup>47</sup> Staff, I. (2017). *Graham Number*. [online] Investopedia. Available at: <https://www.investopedia.com/terms/g/graham-number.asp> [Accessed 29 Jun. 2017].

## 4. Practical part:

### 4.1. Analysis of stock

Stock analysis may help potential investors to avoid mistakes when they make their choice regarding the company they are going to invest money in. It evaluates businesses by their earnings, performance, competitiveness and other options. It is able to predict future behavior of certain shares of a company. This is a method that is able to help to take decisions on the stock exchange. To make conscious decisions investors may study and analyze past performance of company and its shares. There are various types of analyses known that help to evaluate firms, these are technical and fundamental. They use records and reports of companies their market share and others.<sup>48</sup>

#### 4.1.1. Dividend history

**Table 4: Dividends value from 1988-2017**

Year	Total Yearly Value	Paid
1988	0.10 USD	annually
1989	0.41 USD	quarterly
1990	0.45 USD	quarterly
1991	0.48 USD	quarterly
1992	0.48 USD	quarterly
1993	0.48 USD	quarterly
1994	0.48 USD	quarterly
1995	0.48 USD	quarterly
2012	5.30 USD	semiannually
2013	11.80 USD	quarterly
2014	7.28 USD	quarterly
2015	2.03 USD	quarterly
2016	2.23 USD	quarterly
2017	2.46 USD	quarterly

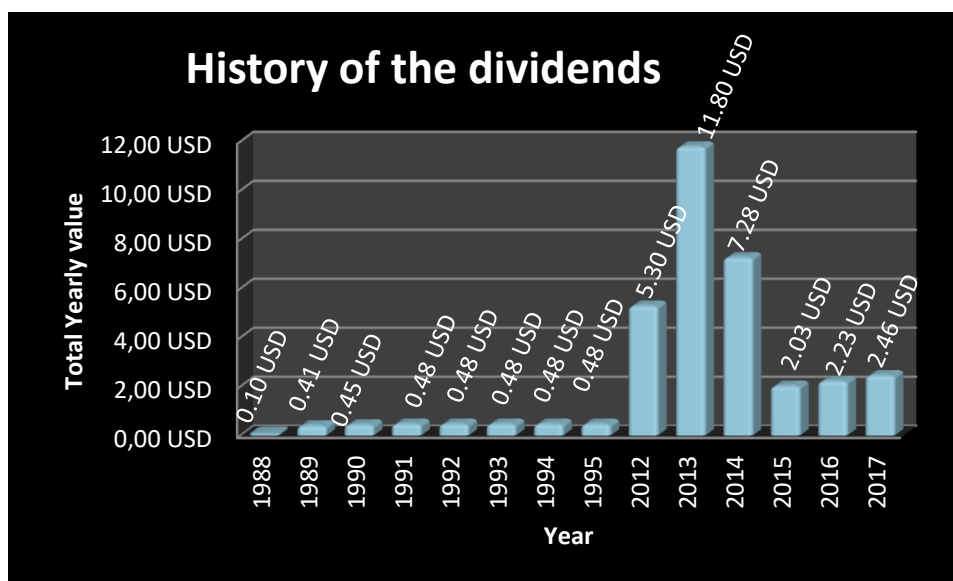
*Source of data: own interpretation based on Apple.com, dividend history*

<sup>48</sup> Momoh, O. (2018). *Stock Analysis*. [online] Investopedia. Available at: <https://www.investopedia.com/terms/s/stock-analysis.asp> [Accessed 4 Nov. 2018].



Dividend payments were not constantly paid every year, as may be seen from the table.<sup>49</sup> During 1988 company paid dividend only once a year, while the rest of the years when it paid dividends it was paid on the quarterly basis, except 2012, it was paid twice a year. And also 2012 is the first year after a big gap of non-paying the dividends to the shareholders. It may be found out that there were no dividend payments from the year 1995 till 2012.

**Figure 1: Dividends development 1988-2017**



*Source of data: own interpretation based on NASDAQ.com, dividend history*

First dividends paid by the company were received by shareholders in 1988, since 1988 till 1995 dividend amount per year was only growing, it grew up during this 8 year period from 0.1\$/share/year till 0.48\$/share/year, which is nearly 5 times increase. Then in order to analyze the data from 2012 till 2017 proportion has to be calculated. Because for example in 2012 the dividend was paid semiannually as may be seen from the table, also in the year 2014 stock split happened, 7 to 1, which actually means that from 2012 till 2014 dividend amount is 7 times higher in comparison with 2015 till 2017 due to this fact. In order to compare all these values, it is better to create a proportion in a way that the values will be per already splitted stock and paid annually. Proportion calculation looks as follows:

$$D_{2012} = 5.3\$ \div 7 = 0.76\$$$

<sup>49</sup> NASDAQ.com. (2017). Dividend History. [online] Available at: <http://www.nasdaq.com/symbol/aapl/dividend-history> [Accessed 10 Sep. 2017].

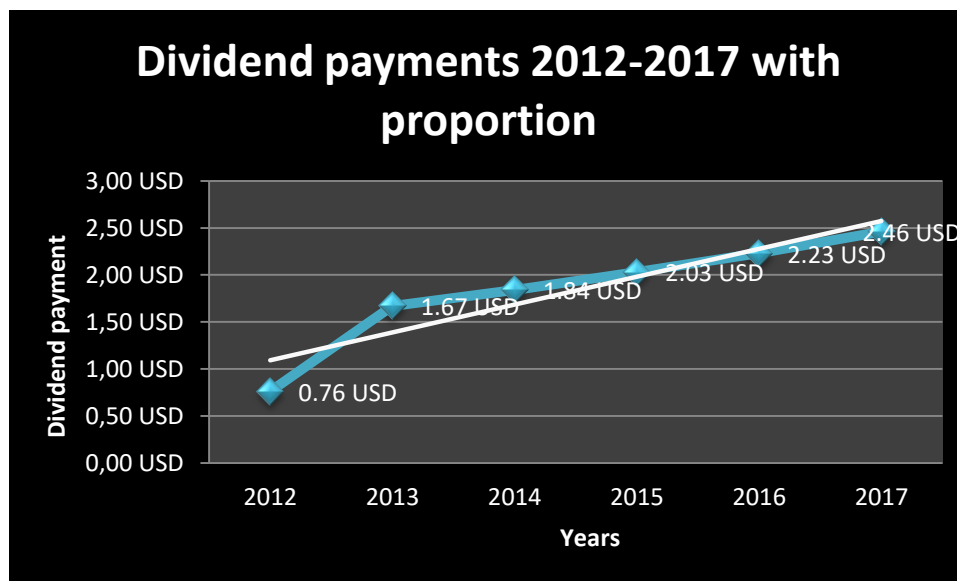
$$D_{2013} = 11.8\$ \div 7 = 1.67\$$$

For 2014 first half of a year only there was no split, then:

$$D_{2014} = (3.29\$ + 3.05\$) \div 7 + 0.47\$ \times 2 = 1.84\$$$

Then new graph for 2012 till 2017 as follows:

**Figure 2: Dividends payments proportion 2012-2017**



*Source of data: own interpretation based on NASDAQ.com, dividend history*

It is now showing correctly the data, and it may be observed once again, that the dividend payment trend was upward sloping. And proportionally it increased during this time period of 5 years by  $2.46\$ \div 0.76\$ = 3.24$  times.

### 4.1.2. EPS

Formula helps to identify the earnings per share is following:

$$EPS = \frac{\text{Net income}}{\text{Total shares outstanding}} \quad (1-8)$$

**Table 5: Earnings per Share 2013-2017**

Year	# shares outstanding	Net Income	EPS
2013	6,522,000,000	37,037,000,000\$	5.678779515
2014	6,123,000,000	39,510,000,000\$	6.452719255
2015	5,793,000,000	53,394,000,000\$	9.216986018
2016	5,500,000,000	45,687,000,000\$	8.306727273
2017	5,252,000,000	48,351,000,000\$	9.206207159

Source of data: own interpretation based on *Financials.morningstar.com*, *Financial Ratios for Apple Inc*

$$EPS_{2013} = 37,037,000,000\$ \div 6,522,000,000 = 5.678779515 \quad (1-8)$$

$$EPS_{2014} = 39,510,000,000 \div 6,123,000,000 = 6.452719255 \quad (1-8)$$

$$EPS_{2015} = 53,394,000,000 \div 5,793,000,000 = 9.216986018 \quad (1-8)$$

$$EPS_{2016} = 45,687,000,000\$ \div 5,500,000,000 = 8.306727273 \quad (1-8)$$

$$EPS_{2017} = 48,351,000,000\$ \div 5,252,000,000 = 9.206207159 \quad (1-8)$$

Estimates show that company was doing better in 2015, as the higher the value the better it is. It means it earned 9.21 dollars per each share. While in the 2013 it was the worst, it may be seen that it was only 5.68 dollars per share.

### 4.1.3. P/E

Formula for the calculation is following:

$$P/E = \frac{\text{Price per share}}{EPS} \quad (1-9)$$

**Table 6: Price to Earnings ratio 2013-2017**

Date	Market Price	EPS	P/E
27.09.2013	68.96\$	5.68	12.14084507
26.09.2014	100.75\$	6.45	15.62015504
25.09.2015	114.71\$	9.22	12.44143176
30.09.2016	113.05\$	8.31	13.60409146
29.09.2017	154.12\$	9.21	16.7339848

Source of data: own interpretation based on *Financials.morningstar.com*, *Financial Ratios for Apple Inc.*

Estimation of the ratio used the earnings per share calculations performed above. Looks the following way:

$$P/E_{2013} = 68.96\$ \div 5.68 = 12.14084507 \quad (1-9)$$

$$P/E_{2014} = 100.75\$ \div 6.45 = 15.62015504 \quad (1-9)$$

$$P/E_{2015} = 114.71\$ \div 9.22 = 12.44143176 \quad (1-9)$$

$$P/E_{2016} = 113.05\$ \div 8.31 = 13.60409146 \quad (1-9)$$

$$P/E_{2017} = 154.12\$ \div 9.21 = 16.7339848 \quad (1-9)$$

The highest estimate was in 2017, it shows that per every dollar earned by the company, there was 16.74 dollar investment done by the shareholders, then the best value of all 5 analyzed years is 2013, when investors purchased 12.41 dollars per every 1 dollar of earnings, this means less effort made to get money.

## 4.2. Fair value estimations

### 4.2.1. P/E approach

Price to earnings may be calculated using couple of methods. Still all of them are supposed to give the same results.

#### 4.2.1.1. P/E approach:

##### 1<sup>st</sup> way to calculate price to earnings approach:

In the first step average price to earnings ratio has to be calculated:

$$P/E_{2013-2017} = \frac{14.1+17.1+11.4+13.9+18.9}{5} = \frac{75.4}{5} = 15.08 \quad (1-10)$$

Then  $EPS_{2017} = 9.21\$^{50}$  and growth rate of the dividends  $g = 9.67\%$  which was estimated above by DDM. Still as  $g$  was calculated based on the historical performance it is prediction, and it is not always good to rely on predictions, that is why it is good to apply Margin of Safety to prevent some errors. For this case 25% will be used, then:

$$g = 9.67\% \times 0.75 = 7.2525\%$$

Then the fair value in 5 years time will be :

$$\text{Fair value} = P/E_{2013-2017} \times EPS \times g^n \quad (1-11)$$

$$FV = 15.08 \times 9.21 \times 1.072525^5 = 197.1\$/\text{share} \quad (1-11)$$

Then present value has to be discounted:

$$\text{Fair value's PV} = FV \times \frac{1}{(1+r)^n} \quad (1-12)$$

Where:

$r \dots$  market rate of return (10%)<sup>51</sup>

$$\text{Fair value's PV} = \frac{197.1\$}{(1.1)^5} = 122.38\$ \quad (1-12)$$

Market price 174\$ is higher than estimated fair value of 122.38\$, stock is overpriced, investment should not be made.

#### 4.2.1.2. P/E multiples approach

This approach is very simple as it includes only couple of steps, it determines fair value of stock by multiplication of average Price to Earnings ratio by expected earnings per share.

The first step is to calculate expected earnings per share by the formula:

$$EPS_{n+1} = EPS_n \times g \quad (1-13)$$

$g = 9.67\%$  as calculated in the DDM

$EPS_{2017} = 9.21\$$  as calculated earlier

<sup>50</sup> NASDAQ.com. (2017). *APPL EPS forecast*. [online] Available at:

<https://www.nasdaq.com/symbol/aapl/eps-forecast> [Accessed 25 Mar. 2017].

<sup>51</sup> Cherewyk, P. (2017). *How to Calculate Required Rate of Return*. [online] Investopedia. Available at: <https://www.investopedia.com/articles/fundamental-analysis/11/calculating-required-rate-of-return.asp> [Accessed 17 Sep. 2017].

Then:

$$\text{EPS}_{2018} = \text{EPS}_{2017} \times g = 9.21 \times 1.0967 = 10.1\$$$

Meaning that EPS for 2018 is expected to be 10.1\$

The next step is to calculate the average P/E  $_{2013-2017} = 15.08$ , was estimated in the previous step.<sup>52</sup>

The fair value calculation by this method is :

$$\text{FV} = \text{EPS}_{2018} \times \text{P/E}_{2013-2017} \quad (1-14)$$

Then:

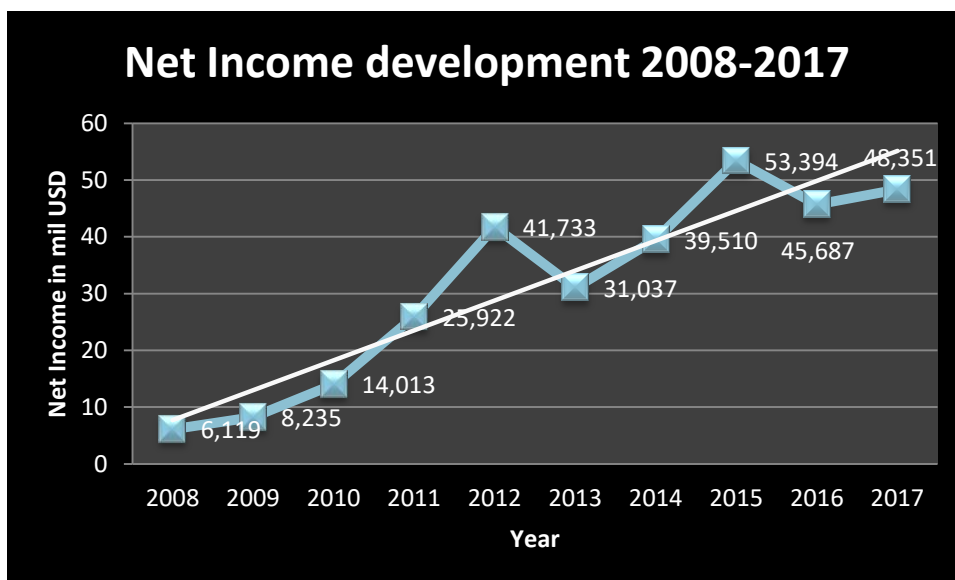
$$\text{FV} = \text{EPS}_{2018} \times \text{P/E}_{2013-2017} = 10.1 \times 15.08 = 152.3\$/\text{share} \quad (1-14)$$

As market price is 174\$/share that means value of company's shares are overpriced.

#### 4.2.2. PEG approach

The first step in this method is calculation of average growth rate with net income data

**Figure 3: Net income development 2008-2017**



Source of data: own interpretation based on *Financials.morningstar.com*, *Financial Ratios for Apple Inc*.

<sup>52</sup> *Financials.morningstar.com*. (2018). *Growth, Profitability, and Financial Ratios for Apple Inc (AAPL)* from *Morningstar.com*. [online] Available at: <http://financials.morningstar.com/ratios/r.html?t=AAPL> [Accessed 15 Oct. 2017].

From the following graph it may be seen that from 2008 till 2017 company has upward sloping trend for the net income. Still there happened two declines, one from the year 2012 till 2013, actually in the year 2012 company started paying the dividends twice a year after a long time of not paying them since 90s. And the second decline is obviously happened from 2015 to 2016. In total net income value grew by  $48,351,000,000\$ \div 6,119,000,000\$ = 7.9$  approximately 8 times during the 10 year period, which is very significant result. And it also connected to the introduction of new products, such as tablets, watched and others. Also due to the innovative operation system. Then the calculations will look as follows:

**Table 7: Net income 2008-2017**

Year	Net Income
2008	6,119,000,000\$
2009	8,235,000,000\$
2010	14,013,000,000\$
2011	25,922,000,000\$
2012	41,733,000,000\$
2013	31,037,000,000\$
2014	39,510,000,000\$
2015	53,394,000,000\$
2016	45,687,000,000\$
2017	48,351,000,000\$

Source of data: own interpretation based on *Financials.morningstar.com*, *Financial Ratios for Apple Inc.*

$$g_{2008-2017} = \left( \frac{\text{Net income}_{2017}}{\text{Net income}_{2008}} \right)^{\frac{1}{n-1}-1} = \left( \frac{48,351,000,000\$}{6,119,000,000\$} \right)^{\frac{1}{10-1}-1} = 25.8\% \quad (1-15)$$

Then as the average growth rate is 25.8%, and  $P/E_{2017} = 18.6$ , price to earnings to growth may be calculated:<sup>53</sup>

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<sup>53</sup> YouTube. (2017). *Peter Lynch Fair Value / What Is PEG Ratio? / How To Calculate PEG Ratio ?*. [online] Available at: <https://www.youtube.com/watch?v=puC2CfTml7o> [Accessed 24 Nov. 2017].

$$PEG = \frac{P/E_{2017}}{g_{2008-2017}} \quad (1-16)$$

Then:

$$PEG = \frac{18.6}{25.8\%} = 0.72 \quad (1-16)$$

### 4.2.3. Graham number

As the formula looks as follows :

$$\text{The Graham number} = \sqrt{22.5 \times \text{EPS} \times \text{BV per share}} \quad (1-7)$$

It is known that the EPS value for the company for 2017 is 9.21\$ and the book value per share is 24.99\$. Then the estimate will look as follows:

$$\text{The Graham number}_{APPL} = \sqrt{22.5 \times 9.21\$/\text{share} \times 24.99\$/\text{share}} \quad (1-17)$$

The Graham number in this case is 71.96\$/share which is telling to the investor that it is the maximal price for which the stock shall be bought in order to bring the profit in future. And real market price is 174\$/share then it can be seen that the real price is 2.4 times higher than the Graham number, it is believed that the stock price in this case is overpriced. So that the investors are going to avoid investing in Apple for the moment.

### 4.2.4. DDM Model

To calculate fair value by the DDM the first step it:

The first assumption is that  $g$ , future growth rate of dividends is equal to the average historical growth rate. In order to find out  $g$ , analysis of dividends payments has to be performed, for that procedure payment amount of dividends per year has to be analyzed over the time, and trend has to be identified. After time period for collection of data is specified, all the dividend yearly payments are known, difference between the numbers has to be calculated. This change will show if dividend payments were growing or slowing down over the years, also if the change was negative or positive.



**Table 8: Yearly change of dividend payments 2013-2017**

Year	Payment date	Dividend value	Yearly value	Difference
2017	16.11.17	0.63\$	2.46\$	10.3%
	17.08.17	0.63\$		
	18.05.17	0.63\$		
	16.02.17	0.57\$		
2016	10.11.16	0.57\$	2.23\$	9.9%
	11.08.16	0.57\$		
	12.05.16	0.57\$		
	11.02.16	0.52\$		
2015	12.11.15	0.52\$	2.03\$	9.7%
	13.08.15	0.52\$		
	14.05.15	0.52\$		
	12.02.15	0.47\$		
2014	10.11.14	0.47\$	1.85\$	8.8%
	11.08.14	0.47\$		
	02.06.14	7-for-1 Stock Split		
	23.04.14	3.29\$/7=0.47\$		
	10.02.14	3.05\$/7=0.44\$		
2013	11.11.13	3.05\$/7=0.44\$	1.7\$	*
	12.08.13	3.05\$/7=0.44\$		
	13.03.13	3.05\$/7=0.44\$		
	23.01.13	2.65\$/7=0.38\$		

*Source of data: own interpretation based on Apple.com, dividend history*

In order to calculate value of change correctly, adjustment of dividends value was performed, as can be seen during the year 2014 company performed split of stock 7 for 1, which means that for the year 2013 and first half of the year 2014 all the dividend payments were divided by 7, this proportion will help to calculate the correct yearly payment of dividends as well.

As can be seen there were 5 years of dividends payments analyzed for the time period of the year 2013 till the year 2017. As Apple was paying the dividends quarterly then first of all yearly values were calculated by summing up the quarterly values for the chosen year:

$$D_{2013} = 0.44\$ \times 3 + 0.38\$ = 1.7\$/\text{share}/\text{year}$$

$$D_{2014} = 0.47\$ \times 3 + 0.44\$ = 1.85\$/\text{share}/\text{year}$$

$$D_{2015} = 0.52\$ \times 3 + 0.47\$ = 2.03\$/\text{share}/\text{year}$$

$$D_{2016} = 0.57\$ \times 3 + 0.52\$ = 2.23\$/\text{share}/\text{year}$$

$$D_{2017} = 0.63\$ \times 3 + 0.57\$ = 2.46\$/\text{share}/\text{year}$$

Accordingly 4 of the differences calculated, so that the higher value divided by the smaller and its percentage change received:

$$D_{2013-2014\Delta} = 1.85\$ \div 1.7\$ = +8.8\%$$

$$D_{2014-2015\Delta} = 2.03\$ \div 1.85\$ = +9.7\%$$

$$D_{2015-2016\Delta} = 2.23\$ \div 2.03\$ = +9.9\%$$

$$D_{2016-2017\Delta} = 2.46\$ \div 2.23\$ = +10.3\%$$

Finally once all the yearly payments are found  $g$  may be calculated by the arithmetic average:

$$g = \frac{10.3\% + 9.9\% + 9.7\% + 8.8\%}{4} = \frac{38.7\%}{4} = 9.67\% \quad (1-15)$$

Also  $g$  can be calculated by the geometric average. And the following formula will help in that:

$$D_{2017} = D_{2013} \times (1+g)^4 \quad (1-2)$$

$$2.46\$ = 1.7\$ \times (1+g)^4$$

$$2.46\$ \div 1.7\$ = (1+g)^4$$

$$1.447\$ = (1+g)^4$$

$$(1.09677)^4 = (1+g)^4$$

$$1.09677 - 1 = g$$

$$g = 0.9677\%$$

The geometric average calculation gave approximately the same result as the arithmetic average, as the first method is mentioned in more of the resources of calculation, then it was decided to use  $g$  calculated by the first method.

The second step is that the expected  $D_0$  has to be calculated by the following formula:

$$D_{n+1} = D_n \times g^{54} \quad (1-17)$$

$$D_{2018} = D_{2017} \times 1.0967\% = 2.46\$ \times 1.0967\% = 2.7\$$$

Then the expected value of the dividend for the next 2018 year is approximately 2.7\$.

The third step contains estimation of required rate of return  $k_s$ , formula below shows how to calculate it:<sup>55</sup>

$$k_s = r_f + \beta_a \times (r_m - r_f) \quad (1-18)$$

Where:

$k_s$ ...required rate of return of the asset

$r_f$ ...risk-free rate (government bond yield)

$r_m$ ... market rate of return

$\beta_a$  ...Beta of stock

Then:

$$r_f = 2.43\% \quad ^{56}$$

$$r_m = 10\% \quad ^{57}$$

$$\beta_a = 1.4 \quad ^{58}$$

$$k_s = 2.43\% + 1.4 \times (10\% - 2.43\%) = 13\% \quad (1-18)$$

<sup>54</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 326 p. ISBN 0-321-31150-7

<sup>55</sup> Study.com. (2017). *Required Rate of Return (RRR): Formula & Calculation - Video & Lesson Transcript* / Study.com. [online] Available at: <http://study.com/academy/lesson/required-rate-of-return-rrr-formula-calculation.html> [Accessed 24 Nov. 2017].

<sup>56</sup> Bloomberg.com. (2017). *Rates & Bonds*. [online] Available at: <https://www.bloomberg.com/markets/rates-bonds> [Accessed 18 Aug. 2017].

<sup>57</sup> Corporate Finance Institute. (2017). *What is CAPM - Capital Asset Pricing Model - Formula, Example*. [online] Available at: <https://corporatefinanceinstitute.com/resources/knowledge/finance/what-is-capm-formula/> [Accessed 19 Jul. 2017].

<sup>58</sup> Finance.yahoo.com. (2017). *AAPL Key Statistics / Apple Inc. Stock - Yahoo Finance*. [online] Available at: <https://finance.yahoo.com/quote/AAPL/key-statistics/> [Accessed 24 Nov. 2017].

The final fourth step is estimation of the fair value:

$$P_0 = \frac{D_1}{k_s - g} \quad (1-1)$$

Where:

$P_0$ ...fair value of stock

Then:

$$P_0 = \frac{2.7\$}{0.13 - 0.0976} = 83.33\$/share \quad (1-1)$$

Current share market price is 174\$. In this case it can be found out that the market price is higher than the fair value estimated by Dividends Discount Model. The value shows that the stock price is overvalued, and it is not recommended to invest into stock of the company at this moment.

#### 4.2.5. DCF Model

The first step is to find the value of FCF from 2018 to infinity, to be calculated by the below formula:<sup>59</sup>

$$FCF_{n \rightarrow \infty} = \frac{FCF_{n+1}}{k_a - g_{fcf}} \quad (1-19)$$

Where:

$k_a$ ...weighted average cost of capital

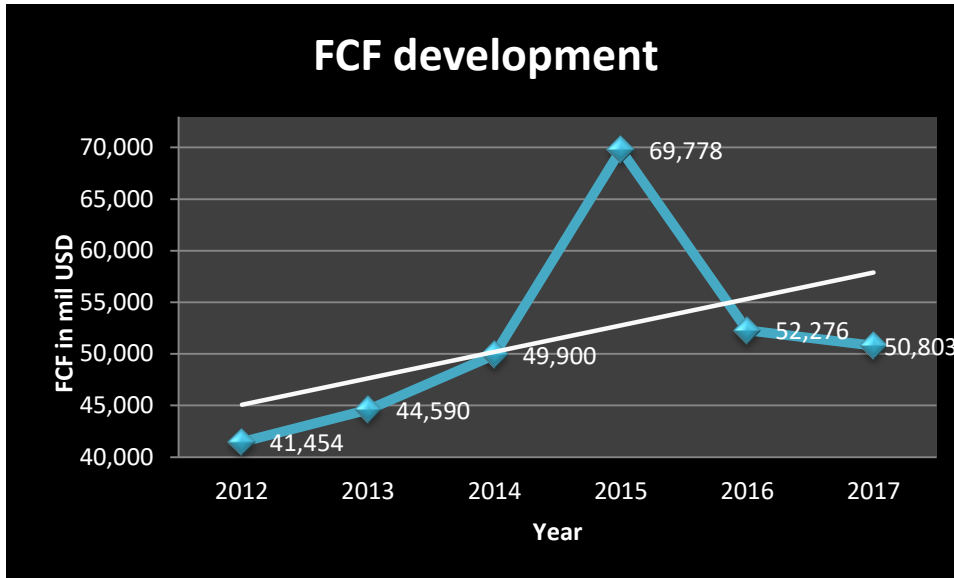
$g_{fcf}$ ...growth rate of the free cash flow

To find the growth rate of free cash flows, the changes in the FCF amounts from year to year have to be analyzed.

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<sup>59</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 327 p. ISBN 0-321-31150-7

**Figure 4: Free cash flow development 2012-2017**



Source of data: own interpretation based on Financials.morningstar.com, Financial Ratios for Apple Inc.

The graph shows the changes in free cash flow values of a company from the year 2012 till 2017. Two declines in the value may be observed from 2015 till 2016, and the next one till 2017. From 2012 till 2015 value of free cash flows changed by:

$69,778,000,000\$ \div 41,454,000,000\$ = 1.68$  which means that the value grew by 68%. And then from 2015 till 2017 value decreased by:

$69,778,000,000\$ \div 50,803,000,000\$ = 1.37$  showing that it has declined by the 37%.

**Table 9: Yearly change of free cash flows 2012-2017**

Year	Free Cash Flow value	Change	Sign
2012	41,454,000,000\$	*	*
2013	44,590,000,000\$	1.075650118	7.565
2014	49,900,000,000\$	1.119084997	11.9085
2015	69,778,000,000\$	1.398356713	39.8357
2016	52,276,000,000\$	1.334799908	-33.48
2017	50,803,000,000\$	1.028994351	-2.8994
		Total	22.9298
		Average	4.58596

Source of data: own interpretation based on Financials.morningstar.com, Financial Ratios for Apple Inc.

$$FCF_{2012-2013\Delta} = 44,590,000,000\$ \div 41,454,000,000\$ = +7.565\%$$

$$FCF_{2013-2014\Delta} = 49,900,000,000\$ \div 44,590,000,000\$ = +11.9085\%$$

$$FCF_{2014-2015\Delta} = 69,778,000,000\$ \div 49,900,000,000\$ = +39.8357\%$$

$$FCF_{2015-2016\Delta} = 69,778,000,000\$ \div 52,276,000,000\$ = -33.48\%$$

$$FCF_{2016-2017\Delta} = 52,276,000,000\$ \div 50,803,000,000\$ = -2.8994\%$$

Average value then is:

$$g_{fcf} = \frac{7.57\% + 11.9\% + 39.8\% - 33.48\% - 2.9\%}{5} = \frac{22.9298\%}{5} = 4.58596\%$$

may be rounded to 5% growth rate, then:

$$k_a = 14.62\%^{60}$$

$$g_{fcf} = 5\%$$

To perform the model approximations expected cash flows have to be found, based on the  $FCF_{2017}$  multiplied by FVIF:

**Table 10: Expected free cash flows 2018-2022**

Year	FVIF = $(1+g)^t$	FCF expected
2018	1.05	53,343,150,000\$
2019	1.1025	56,010,307,500\$
2020	1.157625	58,810,822,875\$
2021	1.21550625	61,751,364,019\$
2022	1.276281563	64,838,932,220\$

Source of data: own interpretation based on *Financials.morningstar.com*, *Financial Ratios for Apple Inc.*

Then the future value interest factor:

$$FVIF_{2018} = (1+0.05)^1 = 1.05 \quad (1-20)$$

$$FVIF_{2019} = (1+0.05)^2 = 1.1025 \quad (1-20)$$

$$FVIF_{2020} = (1+0.05)^3 = 1.157625 \quad (1-20)$$

<sup>60</sup> Stock Analysis on Net. (2017). *Apple Inc. (AAPL) / PV of FCFF*. [online] Available at: <https://www.stock-analysis-on.net/NASDAQ/Company/Apple-Inc/DCF/Present-Value-of-FCFF> [Accessed 24 Nov. 2017].

$$FVIF_{2021} = (1+0.05)^4 = 1.21550625 \quad (1-20)$$

$$FVIF_{2022} = (1+0.05)^5 = 1.276281563 \quad (1-20)$$

Accordingly then expected free cash flow values are last known free cash flow for 2017 multiplied by calculated above future value interest factor:

$$FCF_{2018} = FCF_{2017} \times FVIF_{2018} = 50,803,000,000\$ \times 1.05 = 53,343,150,000\$ \quad (1-21)$$

$$FCF_{2019} = FCF_{2017} \times FVIF_{2019} = 50,803,000,000\$ \times 1.1025 = 56,010,307,500\$ \quad (1-21)$$

$$FCF_{2020} = FCF_{2017} \times FVIF_{2020} = 50,803,000,000\$ \times 1.157625 = 58,810,822,875\$ \quad (1-21)$$

$$FCF_{2021} = FCF_{2017} \times FVIF_{2021} = 50,803,000,000\$ \times 1.21550625 = 61,751,364,019\$ \quad (1-21)$$

$$FCF_{2022} = FCF_{2017} \times FVIF_{2022} = 50,803,000,000\$ \times 1.276281563 = 64,838,932,220\$ \quad (1-21)$$

$$\text{Then: } FCF_{2023} = FCF_{2022} \times g_{fcf} \quad (1-22)$$

$$FCF_{2023} = 64,838,932,220\$ \times 1.05 = 68,080,878,831\$$$

$$FCF_{2023 \rightarrow \infty} = \frac{FCF_{2023}}{k_a - g_{fcf}} = \frac{68,080,878,831\$}{0.1462 - 0.05} = 707,701,443,100\$$$

The second step is to calculate the total FCF for 2022, will be then:

$$\text{Total } FCF_{2022} = FCF_{2023 \rightarrow \infty} + \text{expected } FCF_{2022} = 707,701,443,100\$ + 64,838,932,220\$ = 772,540,357,300\$ \quad (1-23)$$

The third step is estimation of the value of the entire company, which has to be calculated through the adding present values of free cash flows from 2018 till 2022, also expected  $FCF_{2022}$  has to be added as calculated in step 2:

**Table 11: Expected free cash flows' at present value 2018-2022**

Year	FVIF = (1+g) <sup>t</sup>	FCF expected	PVIF 13%,t	PV of FCF
2018	1.05	53,343,150,000\$	0.884955752	47,206,327,434\$
2019	1.1025	56,010,307,500\$	0.783146683	43,864,286,553\$
2020	1.157625	58,810,822,875\$	0.693050162	40,758,850,337\$
2021	1.21550625	61,751,364,019\$	0.613318728	37,873,268,012\$
2022	1.276281563	772,540,357,300\$	0.542759936	419,303,964,700\$
			Vc	589,006,697,000\$

Source of data: own interpretation based on Financials.morningstar.com, Financial Ratios for Apple Inc.

Present value interest factor for 2018 till 2022 calculation looks as follows:

$$PVIF_{13\%,1} = \frac{1}{(1+0.13)^1} = 0.884955752 \quad (1-6)$$

$$PVIF_{13\%,2} = \frac{1}{(1+0.13)^2} = 0.783146683 \quad (1-6)$$

$$PVIF_{13\%,3} = \frac{1}{(1+0.13)^3} = 0.693050162 \quad (1-6)$$

$$PVIF_{13\%,4} = \frac{1}{(1+0.13)^4} = 0.613318728 \quad (1-6)$$

$$PVIF_{13\%,5} = \frac{1}{(1+0.13)^5} = 0.542759936 \quad (1-6)$$

And then the present value of the expected free cash flows are the multiplication of the expected free cash flows that were calculated previously by the present value interest factors above:

$$FCF_{PV2018} = PVIF_{13\%,1} \times FCF_{2018} = 0.884955752 \times 53,343,150,000\$ = 47,206,327,434\$$$

$$FCF_{PV2019} = PVIF_{13\%,2} \times FCF_{2019} = 0.783146683 \times 56,010,307,500\$ = 43,864,286,553\$$$

$$FCF_{PV2020} = PVIF_{13\%,3} \times FCF_{2020} = 0.693050162 \times 58,810,822,875\$ = 40,758,850,337\$$$

$$FCF_{PV2021} = PVIF_{13\%,4} \times FCF_{2021} = 0.613318728 \times 61,751,364,019\$ = 37,873,268,012\$$$

$$FCF_{PV2022} = PVIF_{13\%,5} \times FCF_{2022} = 0.542759936 \times 772,540,357,300\$ = 419,303,964,700\$$$

Afterwards the value of the entire company is:

$$V_c = 47,206,327,434\$ + 43,864,286,553\$ + 40,758,850,337\$ + 37,873,268,012\$ + 419,303,964,700\$ = 589,006,697,000\$ \quad (1-24)$$

The fourth step is the estimation of common stock's value, which may be performed by the following formula:

$$V_s = V_c - V_d - V_p \quad (1-25)$$



Where

$V_s$ ...value of common stock

$V_c$ ...market value of entire company

$V_d$ ...market value of firm's debt

$V_p$ ...market value of preferred stock

As there is no preferred stock for Apple Inc., then its market value is 0.<sup>61</sup>

$$V_c = 589,006,697,000\$$$

Then to calculate market value of all company's debt long term and short termed debts have to be summed up:

$$\text{Short-term debt}_{2017} = 18,473,000,000\$$$

$$\text{Long-term debt}_{2017} = 97,207,000,000\$^{62}$$

$$V_{d2017} = 97,207,000,000\$ + 18,473,000,000\$ = 115,680,000,000\$^{63} \quad (1-26)$$

Then, market value of shares:

$$V_s = 589,006,697,000\$ - 115,680,000,000\$ = 473,326,697,000\$ \quad (1-25)$$

There are 5,252,000,000 shares outstanding<sup>64</sup>

$$\text{And FV}_{2017} = 473,326,697,000\$ \div 5,252,000,000 = 90.12\$ \text{ per share}$$

For the moment market price is higher than the fair value, nearly 2 times, shares are overvalued, there is no point in investing right now.

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<sup>61</sup> NASDAQ.com. (2017). Apple Inc. (AAPL) Stock Report – NASDAQ.com. [online] Available at: <http://www.nasdaq.com/symbol/aapl/stock-report> [Accessed 24 Nov. 2017].

<sup>62</sup> Morningstar.com, (2017). [online] Available at: <http://financials.morningstar.com/balancesheet/bs.html?t=AAPL&region=usa&culture=en-US> [Accessed 27 Apr. 2017].

<sup>63</sup> Bizfluent. (2017). *How to Calculate the Market Value of Debt*. [online] Available at: <https://bizfluent.com/how-7642356-calculate-market-value-debt.html> [Accessed 24 Nov. 2017].

<sup>64</sup> Financials.morningstar.com. (2016). *Growth, Profitability, and Financial Ratios for Apple Inc (AAPL) from Morningstar.com*. [online] Available at: <http://financials.morningstar.com/ratios/r.html?t=AAPL> [Accessed 14 Mar. 2017].

As the model contains several assumptions, it means that the fair value may be calculated in a different way, if some values in the assumptions are recalculated or changed, for example, still using the FCF model in case  $g_{fcf}$  that is calculated from 2011 and not 2012, then the  $g$  will be different, in this case the calculations are listed below.

The first step is the same to find the value of FCF from 2018 to infinity, and as one more year of observations was added growth rate of free cash flows will be recalculated as follows:

**Table 12: Free cash flows development 2011-2017**

Year	Free Cash Flow value	Change	Sign
2011	30,077,000,000\$	*	*
2012	41,454,000,000\$	1.37826246	37.8262
2013	44,590,000,000\$	1.075650118	7.565
2014	49,900,000,000\$	1.119084997	11.9085
2015	69,778,000,000\$	1.398356713	39.8357
2016	52,276,000,000\$	1.334799908	-33.48
2017	50,803,000,000\$	1.028994351	-2.8994
		Total	60.756
		Average	10.126

Source of data: own interpretation based on *Financials.morningstar.com*, *Financial Ratios for Apple Inc.*

Free cash flow changes are:

$$FCF_{2011-2012\Delta} = 41,454,000,000\$ \div 30,077,000,000\$ = +37.82\%$$

$$FCF_{2012-2013\Delta} = +7.565\%$$

$$FCF_{2013-2014\Delta} = +11.9085\%$$

$$FCF_{2014-2015\Delta} = +39.8357\%$$

$$FCF_{2015-2016\Delta} = -33.48\%$$

$$FCF_{2016-2017\Delta} = -2.8994\%$$

Average value then is:

$$g_{fcf} = \frac{37.82\% + 7.6\% + 11.9\% + 39.8\% - 33.48\% - 2.9\%}{6} = \frac{60.756\%}{6} = 10.126\%$$

rounded to 10% growth rate, to secure the estimation, it is better to use the margin of safety, and the growth rate will be  $10\% \times 0.75 = 7.5\%$

$k_a = 14.62\%$ <sup>65</sup> stays the same

Expected cash flows projected with the usage of  $FCF_{2017}$  multiplied by FVIF :

**Table 13: Expected free cash flows development 2018-2022**

Year	FVIF = $(1+g)^t$	FCF expected
2018	1.075	54,613,225,000\$
2019	1.155625	58,709,216,875\$
2020	1.242296875	63,112,408,141\$
2021	1.335469141	67,845,838,751\$
2022	1.435629326	72,934,276,658\$

Source of data: own interpretation based on *Financials.morningstar.com*, *Financial Ratios for Apple Inc.*

The future value interest factor calculation:

$$FVIF_{2018} = (1+0.075)^1 = 1.075 \quad (1-20)$$

$$FVIF_{2019} = (1+0.075)^2 = 1.155625 \quad (1-20)$$

$$FVIF_{2020} = (1+0.075)^3 = 1.242296875 \quad (1-20)$$

$$FVIF_{2021} = (1+0.075)^4 = 1.335469141 \quad (1-20)$$

$$FVIF_{2022} = (1+0.075)^5 = 1.435629326 \quad (1-20)$$

Expected free cash flow estimations are:

$$FCF_{2018} = FCF_{2017} \times FVIF_{2018} = 50,803,000,000\$ \times 1.075 = 54,613,225,000\$ \quad (1-21)$$

$$FCF_{2019} = FCF_{2017} \times FVIF_{2019} = 50,803,000,000\$ \times 1.155625 = 58,709,216,875\$ \quad (1-21)$$

$$FCF_{2020} = FCF_{2017} \times FVIF_{2020} = 50,803,000,000\$ \times 1.25 = 63,112,408,141\$ \quad (1-21)$$

$$FCF_{2021} = FCF_{2017} \times FVIF_{2021} = 50,803,000,000\$ \times 1.34 = 67,845,838,751\$ \quad (1-21)$$

$$FCF_{2022} = FCF_{2017} \times FVIF_{2022} = 50,803,000,000\$ \times 1.44 = 72,934,276,658\$ \quad (1-21)$$

<sup>65</sup> Stock Analysis on Net. (2017). *Apple Inc. (AAPL) / PV of FCFF*. [online] Available at: <https://www.stock-analysis-on.net/NASDAQ/Company/Apple-Inc/DCF/Present-Value-of-FCFF> [Accessed 24 Nov. 2017].

Then the FCF for 2023:

$$FCF_{2023} = FCF_{2022} \times g_{fcf} \quad (1-22)$$

$$FCF_{2023} = 72,934,276,658\$ \times 1.075 = 78,404,347,407\$ \quad (1-22)$$

$$FCF_{2023 \rightarrow \infty} = \frac{FCF_{2023}}{k_a - g_{fcf}} = \frac{78,404,347,407\$}{0.1462 - 0.075} = 1,101,185,033,806\$ \quad (1-19)$$

In the second step, calculation of the total FCF for 2022:

$$\text{Total FCF}_{2022} = FCF_{2023 \rightarrow \infty} + \text{expected FCF}_{2022} = 1,101,185,033,806\$ + 72,934,276,658\$ = 1,174,119,310,464\$$$

**Table 14: The value of the entire company calculation**

Year	FVIF = (1+g) <sup>t</sup>	FCF expected	PVIF 13%,t	PV of FCF
2018	1.075	54,613,225,000\$	0.884955752	48,330,287,611\$
2019	1.155625	58,709,216,875\$	0.783146683	45,977,928,479\$
2020	1.242296875	63,112,408,141\$	0.693050162	43,740,064,704\$
2021	1.335469141	67,845,838,751\$	0.613318728	41,611,123,501\$
2022	1.435629326	1,174,119,310,464\$	0.542759936	637,265,921,803\$
			V <sub>c</sub>	816,924,326,098\$

Source of data: own interpretation based on Financials.morningstar.com, Financial Ratios for Apple Inc.

Present value interest factor for 2018 till 2022 as calculated above. And the present value of the expected free cash flows:

$$FCF_{PV2018} = PVIF_{13\%,1} \times FCF_{2018} = 0.884955752 \times 54,613,225,000\$ = 48,330,287,611\$$$

$$FCF_{PV2019} = PVIF_{13\%,2} \times FCF_{2019} = 0.783146683 \times 58,709,216,875\$ = 45,977,928,479\$$$

$$FCF_{PV2020} = PVIF_{13\%,3} \times FCF_{2020} = 0.693050162 \times 63,112,408,141\$ = 43,740,064,704\$$$

$$FCF_{PV2021} = PVIF_{13\%,4} \times FCF_{2021} = 0.613318728 \times 67,845,838,751\$ = 41,611,123,501\$$$

$$FCF_{PV2022} = PVIF_{13\%,5} \times FCF_{2022} = 0.542759936 \times 1,174,119,310,464\$ = 637,265,921,803\$$$

The value of the whole company is:

$$V_c = 48,330,287,611\$ + 45,977,928,479\$ + 43,740,064,704\$ + 41,611,123,501\$ + 637,265,921,803\$ = 816,924,326,098\$ \quad (1-24)$$

The common stock's value then:

$$V_s = V_c - V_d - V_p \quad (1-25)$$

$$V_p = 0$$

$$V_c = 816,924,326,098\$$$

$$V_{d\ 2017} = 115,680,000,000\$$$

Then, market value of shares:

$$V_s = 816,924,326,098\$ - 115,680,000,000\$ = 701,244,120,274\$ \quad (1-25)$$

$$\text{Total shares outstanding} = 5,252,000,000$$

$$\text{And } FV_{2017} = 701,244,120,274\$ \div 5,252,000,000 = 133.52\$ \text{ per share}$$

Market price is higher, then also result showed the same answer, that for the moment there is no sense in the investment.

## 4.2.6. Residual Income

### 4.2.6.1. Book value

This estimate is also considered to be used by financial analysts and investors in order to clarify the real price of a stock, as the others mentioned above.<sup>66</sup> Its formula is:

$$\text{Book value} = \frac{\text{Total assets} - \text{Total liabilities}}{\text{Total shares outstanding}} \quad (1-26)$$

$$\text{Total assets}_{2017} = 375,319,000,000\$$$

$$\text{Total liabilities}_{2017} = 241,272,000,000\$$$

$$\text{Total shares outstanding}_{2017} = 5,252,000,000\$$$

$$\text{Book value} = \frac{375,319,000,000\$ - 241,272,000,000\$}{5,252,000,000\$} = 25.52\$ \quad (1-26)$$

Calculated estimate is not always representing minimal share price, which is used on the market. It just has assumption that all the assets may be sold for their book value. And in fact in reality shares are usually sold for higher price then estimated by the book value of stock. But as well it is possible to find shares that are sold for the lower price, in this case

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<sup>66</sup> GITMAN, L.J., 2006. *Principles of Managerial Finance*. 11th ed. United States of America: Pearson Education, Inc. 334 p. ISBN 0-321-31150-7

it shows to the investors that company's liabilities are understated or that the assets are overvalued.

#### 4.2.6.2. Residual Income

This estimation uses previous estimation to calculate the fair value of shares.  $BV = 25.52\$/share$ . The formula contains sum of book value of stock and present value of future residual income:

$$RI_t = E_t - rB_{t-1} \quad (1-27)$$

$RI_t$  ... future periods' annual residual income

$E_t$  ... net income during period t (EPS)

$r$  ... required rate of return =  $k$  (CAPM)

$B_{t-1}$  ... book value per share<sup>67</sup>

$$EPS_{2017} = 9.21\$\$$

Then,

$$RI_{2018} = 9.21\$ + 0.13 * 25.52\$ = 12.5276\$\quad (1-27)$$

To calculate present value of future residual income:

$$RI_t/r = 12.5276\$/0.13 = 96.366\$\$$

$$\text{Fair value}_{2017} = 96.366\$ + 25.52\$ = 121.89\$\$$

Stock is overpriced.

#### 4.2.7. Competitors overview

Apple Inc. has a lot of competitors and in order to understand what is the real company's position in the market, it is better to check who are the competitors and what are their indexes, ratios and prices. Comparison with competitor firms may give the investors advice if it is better to invest in Apple or there are other good potential investments.

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<sup>67</sup> M.wikihow.com. (2017). *5 Ways to Calculate Intrinsic Value - wikiHow*. [online] Available at: [https://m.wikihow.com/Calculate-Intrinsic-Value#Understanding\\_Investing\\_Basics](https://m.wikihow.com/Calculate-Intrinsic-Value#Understanding_Investing_Basics) [Accessed 24 Nov. 2017]

Definitely the first Apple's competitor is Samsung, mostly it is valid for the mobile phones market. As the Samsung is very strong corporation, with good image. And if to take a closer look it may be observed that the prices for the Samsung's products in many cases are much lower than the ones for the Apple, which makes it sometimes more attractive to the customers. Still Apple has its own software which is different from the other mobile phones, that support Android operation systems. It is also stated that the Apple company's products and software may not broke from the viruses and there is no need in installation of antivirus for firm's products. Lots of company's competitors try to work hard together in order to kick off the company from the leading position in the market share.

In terms of online payment systems company is in business for about 2 years by now, and its biggest competitor is the PayPal, the company is the biggest and most recognizable by the customers in this segment. Still in future it may change, as Apple may install its payment system to its devices, which will change the market share of the PayPal significantly. Because Apple has a lot of loyal customers using their products.

The other competitor is stated to be Amazon, it is competing with Apple in video streaming service. Apple did not enable Amazon's service, so that finally Amazon stopped selling Apple TV. And they invented their own TVs.

Dell is the competitor in laptops segment. Currently Dell is planning to re-brand its PCs in order to make it more popular for younger generation. It has its strong side in a way that it have not had chance to get bad reputation in comparison with Apple's products.

Sony is the other competitor, in the mobile phone market. Their advantage is that their new models of mobile phones are waterproof and shockproof.

Fitbit is the competitive firm with Apple's iWatch. They were popular as wearable technology company, before Apple invented iWatch. They have lower cost of the products.<sup>68</sup>

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<sup>68</sup> Eskify. (2017). *10 Of Apple's Biggest Competitors*. [online] Available at: <http://eskify.com/10-apples-biggest-competitors/> [Accessed 14 Mar. 2017].

#### 4.2.7.1. DDM calculation for Microsoft (MSFT)

The first step of the model is assuming that  $g$ , is the same as the average historical growth rate. Then the estimation of yearly values of the dividend payments and difference between them as follows shown in the table below. Result of the data analysis will give the growth rate of the Microsoft's dividends.<sup>69</sup>

**Table 15: MSFT dividends value from 2014-2017**

Year	Payment date	Dividend value	Yearly value	Difference
2017	14.12.2017	0.42\$	1.59\$	8.16%
	14.09.2017	0.39\$		
	08.06.2017	0.39\$		
	09.03.2017	0.39\$		
2016	08.12.2016	0.39\$	1.47\$	13.95%
	08.09.2016	0.36\$		
	09.06.2016	0.36\$		
	10.03.2016	0.36\$		
2015	10.12.2015	0.36\$	1.29\$	12.17%
	10.09.2015	0.31\$		
	11.06.2015	0.31\$		
	12.03.2015	0.31\$		
2014	11.12.2016	0.31\$	1.15\$	*
	11.09.2016	0.28\$		
	12.06.2016	0.28\$		
	13.03.2016	0.28\$		

Source of data: own interpretation based on NASDAQ.com, dividend history

Analysis of data will be performed for 4 years time series of data with dividend payments from the 2014 till 2017. First of all yearly dividend payment amounts need to be calculated, as there were quarterly dividend payments. All quarterly values separately per each year are going to be summed up:

$$D_{MSFT,2014} = 0.28\$ \times 3 + 0.31\$ = 1.15\$/share/year$$

$$D_{MSFT,2015} = 0.31\$ \times 3 + 0.36\$ = 1.29\$/share/year$$

$$D_{MSFT,2016} = 0.36\$ \times 3 + 0.39\$ = 1.47\$/share/year$$

$$D_{MSFT,2017} = 0.39\$ \times 3 + 0.42\$ = 1.59\$/share/year$$

<sup>69</sup> NASDAQ.com. (2017). *Dividend History*. [online] Available at: <http://www.nasdaq.com/symbol/msft/dividend-history> [Accessed 15 May 2017].



Then 3 differences between the payment years are calculated, by division of the higher dividend payment by the lower one:

$$D_{2014-2015\Delta MSFT} = 1.29\$ \div 1.15\$ = +12.17\%$$

$$D_{2015-2016\Delta MSFT} = 1.47\$ \div 1.29\$ = +13.95\%$$

$$D_{2016-2017\Delta MSFT} = 1.59\$ \div 1.47\$ = +8.16\%$$

And  $g_{MSFT}$  calculation:

$$g = \frac{12.17\% + 13.95\% + 8.16\%}{3} = \frac{34.28\%}{3} = 11.43\%$$

The next step is to estimate the expected  $D_{0,MSFT}$ :

$$D_{2018,MSFT} = D_{2017,MSFT} \times 1.11437\% = 1.59\$ \times 1.1143\% = 1.77\$ \quad (1-17)$$

The expected dividend for 2018 is approximately 1.77\$.

The third step is required rate of return estimation  $k_s$ :

$$r_f = 2.43\% \text{ as stated above}$$

$$r_m = 10\% \text{ as mentioned previously}$$

$$\beta_a = 1.45^{70}$$

$$k_{s,MSFT} = 2.43\% + 1.45 \times (10\% - 2.43\%) = 13.4065\% \quad (1-18)$$

The final step then:

$$P_{0,MSFT} = \frac{1.77\$}{0.134065 - 0.1143} = 15.23\$/share \quad (1-1)$$

The market price for the moment is 83.26\$ per share, which is higher than calculated intrinsic value for the stock of Microsoft company, it is about  $93.05\$ \div 15.23\$ = 5.5$  times higher than the market value, showing that the stock dramatically overvalued. And there is no need in the investment.

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<sup>70</sup> Finance.yahoo.com. (2016). *MSFT Key Statistics / Microsoft Corporation Stock - Yahoo Finance*. [online] Available at: <https://finance.yahoo.com/quote/MSFT/key-statistics/> [Accessed 29 Aug. 2017].

#### 4.2.7.2. Graham number calculation for Microsoft (MSFT)

Total assets<sub>2017</sub> = 193 694 000 000\$

Total liabilities<sub>2017</sub> = 121 697 000 000\$

Total shares outstanding<sub>2017</sub> = 7 714 590 000<sup>71</sup>

$$\text{Book value} = \frac{193,694,000,000\$ - 121,697,000,000\$}{7,714,590,000} = 9.33\$/\text{share} \quad (1-26)$$

It is known that the book value per share is 9.33\$ and the earnings per share 2.74\$.<sup>72</sup>

The Graham number then:

$$\text{The Graham number}_{\text{MSFT}} = \sqrt{22.5 \times 9.33\$/\text{share} \times 2.74\$/\text{share}} = 23.98 \quad (1-7)$$

Current price is 93.05\$ here it is 3.88 times higher than the estimate, so as by above evaluation maximal profitable price is about 4 times exceeded investors should not invest in Microsoft at the moment.

#### 4.2.7.3. P/E approach for MSFT

##### 4.2.7.3.1. P/E approach (MSFT):

At first average P/E ratio has to be estimated:

$$P/E_{2013-2017(\text{MSFT})} = \frac{14.0+18.2+36.8+29.8+30.2}{5} = \frac{129}{5} = 25.8 \quad (1-10)$$

EPS<sub>2017 MSFT</sub> = 2.71\$<sup>73</sup> and dividends growth rate estimated by DDM was

$g = 11.43\%$ . Because  $g$  was estimated using the historical performance it is still prediction, Margin of Safety will be applied prevent errors.

$$g = 11.43\% \times 0.75 = 8.5725\%$$

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<sup>71</sup> NASDAQ.com. (2018). *Microsoft Corporation (MSFT) Stock Report – NASDAQ.com*. [online] Available at: <https://www.nasdaq.com/g00/symbol/msft/stock-report?i10c.encReferrer=&i10c.ua=1&i10c.dv=13> [Accessed 15 Nov. 2017].

<sup>72</sup> Financials.morningstar.com. (2018). *Income Statement for Microsoft Corp (MSFT) from Morningstar.com*. [online] Available at: <http://financials.morningstar.com/income-statement/is.html?t=MSFT&region=usa> [Accessed 27 Oct. 2017].

<sup>73</sup> Finance.yahoo.com. (2016). *MSFT Key Statistics | Microsoft Corporation Stock - Yahoo Finance*. [online] Available at: <https://finance.yahoo.com/quote/MSFT/key-statistics/> [Accessed 29 Aug. 2017].

Then the fair value in 5 years time is:

$$FV = 25.8 \times 2.71 \times 1.085725^5 = 105.48 \text{ \$/share}$$

Then present value has to be discounted:

$$\text{Fair value's PV} = \frac{105.48\$}{(1.1)^5} = 65.5\$ \quad (1-12)$$

Market price of 93.05\$ per share is 1.5 times higher than estimated fair value of 65.5\$, stock is overvalued, investment should not be done.

#### **4.2.7.3.2. P/E multiples approach**

At first step expected earnings per share to be calculated by the following:

$$g = 11.43\%$$

$$EPS_{2017 \text{ MSFT}} = 2.71\$$$

Then:

$$EPS_{2018 \text{ (MSFT)}} = EPS_{2017 \text{ (MSFT)}} \times g_{\text{MSFT}} = 2.71 \times 1.1143 = 3.019753\$ \quad (1-13)$$

EPS for 2018 is expected to be 3.019753\$

The average P/E<sub>2013-2017</sub> = 25.8,

The fair value calculation by this method:

$$FV = EPS_{2018 \text{ (MSFT)}} \times P/E_{2013-2017} = 3.019753 \times 25.8 = 77.91 \text{ \$/share}$$

Current market price is higher as it is 93.05\$/share, and so the shares are overvalued.

#### **4.2.7.4 Residual Income calculation MSFT**

##### **4.2.7.4.1. Book value for MSFT:**

$$\text{Total assets}_{2017} = 241,086,000,000\$$$

$$\text{Total liabilities}_{2017} = 168,692,000,000\$$$

$$\text{Total shares outstanding}_{2017} = 7,832,000,000\$$$

$$\text{Book value} = \frac{241,086,000,000\$ - 168,692,000,000\$}{7,832,000,000\$} = 9.24\$$$

In this case 9.24\$/share is the price under which the stock should not be sold.

#### 4.2.7.4.2. Residual Income approach for MSFT

BV = 9.24\$/share.

$$\beta_{a \text{ MSFT}} = 1.32^{74}$$

$$k_{s \text{ MSFT}} = 2.43\% + 1.32 \times (10\% - 2.43\%) = 12\%$$

$$\text{EPS}_{2017 \text{ MSFT}} = 2.71\$$$

Then:

$$\text{RI}_{2018 \text{ MSFT}} = 2.71\$ + 0.12 \times 9.24\$ = 3.818\$$$

Present value of future residual income:

$$\text{RI}_t / r = 3.818\$ / 0.12 = 31.82\$$$

$$\text{Fair value}_{2017} = 31.82\$ + 25.52\$ = 57.34\$$$

Stock is overvalued in this case.

#### 4.2.7.5. DCF Mode for MSFT

The first step, value of FCF from 2018 to infinity, has to be estimated.

$$\text{Weighted average cost of capital} = 11.54\%^{75}$$

The growth rate of free cash flows must be investigated:

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<sup>74</sup> Finance.yahoo.com. (2017). *MSFT Key Statistics | Microsoft Corporation Stock - Yahoo Finance*. [online] Available at: <https://finance.yahoo.com/quote/MSFT/key-statistics?p=MSFT> [Accessed 14 Aug. 2017].

<sup>75</sup> NASDAQ.com, (2016). [online] Available at: [https://www.stock-analysis-on.net/NASDAQ/Company/Microsoft-Corp/DCF/Present-Value-of-FCFF\\_](https://www.stock-analysis-on.net/NASDAQ/Company/Microsoft-Corp/DCF/Present-Value-of-FCFF_) [Accessed 21 Jul. 2017].

**Table 16: The growth of MSFT free cash flow**

Year	Free Cash Flow value	Change	Sign
2012	29,321,000,000\$	*	*
2013	24,576,000,000\$	1.19307	-19.307
2014	26,746,000,000\$	1.0883	8.83
2015	23,136,000,000\$	1.15603	-15.603
2016	24,982,000,000\$	1.07979	7.979
2017	31,378,000,000\$	1.25602	25.602
		Total	7.501
		Average	1.5002

Source of data: own interpretation based on Financials.morningstar.com, Growth and profitability Ratios for MSFT

Average value of FCF growth:

$$g_{fcf\ MSFT} = \frac{-19.3\% + 8.83\% - 15.6\% + 7.98\% + 25.6\%}{5} = 1.5\%$$

Can be rounded then  $g_{fcf\ MSFT} = 2\%$

**Table 17: The expected MSFT free cash flow 2018-2018**

Year	FVIF = $(1+g)^t$	FCF expected
2018	1.02	32,005,560,000\$
2019	1.0404	32,645,671,200\$
2020	1.061208	33,298,584,624\$
2021	1.08243216	33,964,556,317\$
2022	1.104080803	34,643,847,443\$

Source of data: own interpretation based on Financials.morningstar.com, Growth and profitability Ratios for MSFT

Expected free cash flow estimates are:

$$FCF_{2018\ MSFT} = FCF_{2017} \times FVIF_{2018} = 31,378,000,000\$ \times 1.02 = 32,005,560,000\$ \quad (1-21)$$

$$FCF_{2019\ MSFT} = FCF_{2017} \times FVIF_{2019} = 31,378,000,000\$ \times 1.0404 = 32,645,671,200\$ \quad (1-21)$$

$$FCF_{2020\ MSFT} = FCF_{2017} \times FVIF_{2020} = 31,378,000,000\$ \times 1.061208 = 33,298,584,624\$ \quad (1-21)$$

$$FCF_{2021 \text{ MSFT}} = FCF_{2017} \times FVIF_{2021} = 31,378,000,000\$ \times 1.08243216 = 33,964,556,317\$$$

$$FCF_{2022 \text{ MSFT}} = FCF_{2017} \times FVIF_{2022} = 31,378,000,000\$ \times 1.104080803 = 34,643,847,443\$$$

Then:

$$FCF_{2023} = 34,643,847,443\$ \times 1.02 = 35,336,724,392\$ \quad (1-22)$$

$$FCF_{2023 \rightarrow \infty} = \frac{35,336,724,392\$}{0.1154 - 0.02} = 370,405,916,055.20\$ \quad (1-19)$$

The next step is estimate of the total FCF for 2022:

$$\text{Total } FCF_{2022} = FCF_{2023 \rightarrow \infty} + \text{expected } FCF_{2022} = 370,405,916,055.20\$ + 34,643,847,443\$ = 405,049,763,498\$$$

The value of the entire company estimation, using FCF PVs from 2018 till 2022 and expected FCF<sub>2022</sub>:

**Table 18: The value of the entire company MSFT**

Year	FVIF = (1+g) <sup>t</sup>	FCF expected	PVIF 13%,t	PV of FCF
2018	1.02	32,005,560,000\$	0.884955752	28,323,504,418\$
2019	1.0404	32,645,671,200\$	0.783146683	25,566,349,115\$
2020	1.061208	33,298,584,624\$	0.693050162	23,077,589,468\$
2021	1.08243216	33,964,556,317\$	0.613318728	20,831,098,478\$
2022	1.104080803	34,643,847,443\$	0.542759936	18,803,292,421\$
			V <sub>c</sub>	116,601,833,899\$

Source of data: own interpretation based on Financials.morningstar.com, Growth and profitability Ratios for MSFT

The value of the entire company is:

$$V_c = 28,323,504,418\$ + 25,566,349,115\$ + 23,077,589,468\$ + 20,831,098,478\$ + 18,803,292,421\$ = 116,601,833,899\$ \quad (1-24)$$

The estimation of common stock's value:

$V_p$  is 0 as there is no preferred stock<sup>76</sup>

$$V_c = 116,601,833,899\$$$

$V_d$  the market value of all company's debt is then:

$$\text{Short-term debt}_{2017} = 10,121,000,000\$$$

$$\text{Long-term debt}_{2017} = 76,073,000,000\$^{77}$$

$$V_{d2017} = 76,073,000,000\$ + 10,121,000,000\$ = 86,194,000,000\$ \quad (1-26)$$

Then, market value of shares:

$$V_s = 116,601,833,899\$ - 86,194,000,000\$ = 30,407,833,899\$ \quad (1-25)$$

$$\text{Total shares outstanding}_{2017} = 7\,714\,590\,000^{78}$$

$$\text{And FV}_{2017 \text{ MSFT}} = 30,407,833,899\$ \div 7,714,590,000 = 3.94\$ \text{ per share}$$

For the moment market price is higher, they shares are overpriced.

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<sup>76</sup> Gurufocus.com. (2017). *Microsoft Corp Preferred Stock (MSFT)*. [online] Available at: <https://www.gurufocus.com/term/Preferred+Stock/MSFT/Preferred-Stock/Microsoft-Corp> [Accessed 14 Jan. 2017].

<sup>77</sup> Financials.morningstar.com. (2017). *Balance Sheet for Microsoft Corp (MSFT) from Morningstar.com*. [online] Available at: <http://financials.morningstar.com/balance-sheet/bs.html?t=MSFT&region=usa&culture=en-US> [Accessed 6 Aug. 2017].

<sup>78</sup> NASDAQ.com. (2018). *Microsoft Corporation (MSFT) Stock Report – NASDAQ.com*. [online] Available at: <https://www.nasdaq.com/g00/symbol/msft/stock-report?i10c.encReferrer=&i10c.ua=1&i10c.dv=13> [Accessed 15 Nov. 2017].

## 5. Discussion and results

**Table 19: comparison of the results for APPL and MSFT**

Approach	APPL estimate	APPL market price	MSFT estimate	MSFT market price
DDM	83.33 \$/share	< 174 \$/share	15.23 \$/share	< 93.05 \$/share
1. P/E	122.38 \$/share	< 174 \$/share	65.5 \$/share	< 93.05 \$/share
2. P/E	152.3 \$/share	< 174 \$/share	77.91 \$/share	< 93.05 \$/share
Graham number	71.96 \$/share	< 174 \$/share	23.98 \$/share	< 93.05 \$/share
BV	25.52 \$/share	< 174 \$/share	9.24 \$/share	< 93.05 \$/share
Residual Income	121.89 \$/share	< 174 \$/share	57.34 \$/share	< 93.05 \$/share
DCF	133.52 \$/share	< 174 \$/share	3.94 \$/share	< 93.05 \$/share

*Source of data: own calculation based on quarterly reports*

The above table contains estimation results that were conducted in practical part of this diploma thesis for Apple Inc. as well as for its competitor in the same technological industry Microsoft. First column shows the approach by which the estimation was conducted and second and fourth column contain data corresponding to the calculations performed for Apple and Microsoft per the methods of calculation. The third and fifth column compare the estimations conducted in the thesis with the current market price and show if current price or estimate is higher, it interprets the result of evaluation of given stocks, and shows if these are over or under priced.

The analysis of the stock value was done with the usage of Discounted Cash Flow Model, Residual Income model, Price to earnings multiples, Graham number and Dividend discount model. Time series of available data were analyzed, and this data was collected from financial webpages as well as from the official company's website.

In case of Apple Inc. the minimal fair value was estimated by the book value estimate which equals to 25.52 \$ per share. And the maximal value was estimated by the Price to earnings multiple and was 152.3 \$ per share. The medium value from all the values calculated in diploma is 101.56 \$ per share. Meanwhile the current market price is 174 \$ per share, all this proves that the price per shares is overvalued. While for Microsoft minimum estimate was 3.94 \$ per share by DCF model and the maximal was 77.91 \$ per



share estimated by the Price to earnings multiple. The average estimated value of all 7 methods is 36.16 \$ per share, while market price is 93.05 \$ per share. It is clear that for Microsoft the average fair value estimate is 3 times lower than the current market value. And for Apple Inc. intrinsic value estimate is less than 1 times lower than the real market price. This is showing that for the moment the Apple is in better position than Microsoft, nonetheless both of companies are overvalued.

For both companies, current stock prices are overvalued, the following conclusion can be made, there is no sense to invest in chosen companies right now. All the 4 approaches calculated for both companies proved that. As the current stock prices are much higher than the fair values of the firms' stock prices.

## 6. Conclusion

The answer for the first research question is following that not all the approaches and methods for estimation of the intrinsic stock value are giving the same result. To be more precise none of the possible options for evaluation of the fair value is giving equal result, they vary per the assumptions that are stated at the first phase of each model. So that the values stated in the assumption have very high impact on the final numbers. Also, some of the estimation methods are supposed to be more exact than the others, as some more complicated to calculate and consider many numbers from the company's income statements and balance sheets. All of the methods use different characteristics and measures of the company for calculation such as some of them use free cash flow values and others use dividends. Sometimes firm may be performing better in dividend payments or at its free cash flow for example, and that is why the outcomes from calculations will vary. In case company reinvesting it may happen that the DCF model is not correct one for estimation, because company does not have a lot of free cash. And that is why it is not applicable model for the firm.

All the approaches showed different results, the closest ones to the current market price were price to earnings multiple approach that showed 153.3\$/share than the DCF model estimate was 133.5\$/share, the DDM showed much lower result of 83.33\$/share. And the current market price was 174\$/share, which by this proved that the price of firm's share is overpriced. For the moment it is not recommended to invest in Apple Inc. as per above calculations it is obvious that price for the stock is overvalued, and fair values that were estimated in this thesis prove that, as they are lower than the real market price. Even the fair values' estimations varied from model to model, still each of the estimated numbers was below the market price. Then the investors shall try to search for another company showing better results and invest in it.

In order to show the position of company comparison with one of the leading competitors in technology sector was conducted. For this goal, Microsoft company was chosen. As per received results it is not useful to invest in Microsoft either. As the intrinsic value results are much lower than the current market price of stock of a company. While Apple's shares are about 2 times overvalued shares of Microsoft overvalued more than 3 times.

The answer for the second research question is following the fair value mostly does not relate to the current market price. In case it does than the stock is fairly valued. The example of Apple and Microsoft showed in this diploma proves that they are overpriced which means that the fair value of both companies does not relate to the actual market price. Because it is not the same.

There are various reasons that influenced the current price of stock and the fair value. The overvaluation of the company's stock is connected to the many important factors. These factors are connected to the death of Apple's CEO Stive Jobs. As it is well known that he had main ideas connected to the products Apple is manufacturing and he was one of the main influencers and inspirers of the corporation's development. And it is due to his extraordinary vision company grew up and its products became well know. The other factor which has influence is that Samsung became as popular as Apple, due to the innovations it brought to the mobile phone market and also they have phones with more powerful battery than Apple. Lately a lot of Apple's customers complained regarding the lifetime of the battery. Latest iPhone models since the death of the CEO are not much different in its design from the old ones. As well the price of the products plays a big role, because Samsung's products are sold sometimes for the lower prices and the quality is still high. As well boom in the company's growth already happened, until it introduces some new features that are not yet existing they still may grow.

It was profitable to invest in Apple company in 2004 for example, because by that time company had price of 92\$ per share and its fair value calculated by the Discounted Cash Flow model was 184\$. It means that the stock prices of company were 2 undervalued. And the thing is that the company nearly gained the intrinsic value calculated in 2004 by now and it is just 10\$ less than it was predicted. It shows right now how much the shares grew up.<sup>79</sup>

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<sup>79</sup> Udemy. (2017). *Value Investing Bootcamp: How to Invest Wisely / Udemy*. [online] Available at: <https://www.udemy.com/value-investing-bootcamp-how-to-invest-wisely/> [Accessed 27 Mar. 2017].

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