Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economic Theories

Diploma Thesis

Approaches to common stock valuation

Akhmerov Artur, Bc.

Supervisor

Ing. Pavel Srbek, Ph.D.

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Bc. Artur Akhmerov

Economics and Management
Economics and Management

Thesis title

Approaches to common stock valuation

Objectives of thesis

The main objective of the thesis is to identify and make a comparison of primary methods of common stock valuation. The purpose of theoretical part is to discover fundamental principles of absolute and relative valuation models. Practical part is aimed to implement valuation models in financial analysis of selected companies with the relative comparison of results.

Methodology

Theoretical part of thesis includes a review of common stock valuation models. The practical part of the thesis is focused on analyzing data of selected companies from secondary sources such as annual stock-holder reports. To achieve the main goal of the thesis and deeply understand research question, financial analysis with comparison of valuation models is used.

The proposed extent of the thesis

60-80

Keywords

Common stock, share, dividend, fundamental analysis, market value, equity valuation,intrinsic value

---

Recommended information sources

FRIDSON, M S. – ALVAREZ, F. *Financial statement analysis : a practitioner's guide.* New York: J. Wiley, 2002. ISBN 978-0-471-40917-5.

FRIEDLOB, G T. – SCHLEIFER, L L F. *Essentials of financial analysis.* New York: John Wiley & Son, 2003. ISBN 9780471228301.

HELFERT, E A. *Financial analysis: tools and techniques : a guide for managers.* New York: McGraw-Hill, 2001. ISBN 0-07-137834-0.

HELFERT, E A. *Techniques of financial analysis.* Homewood: Irwin, 1987. ISBN 0-256-03625-.

PIGNATARO P., Financial Modeling and Valuation: A Practical Guide to Investment Banking and Private Equity, 1st Edition, Wiley, 2013. ISBN-10: 1118558766.

Expected date of thesis defence

2020/21 SS – FEM

The Diploma Thesis Supervisor

Ing. Pavel Srbek, Ph.D.

Supervising department

Department of Economic Theories

Electronic approval: 29. 6. 2019

doc. PhDr. Ing. Lucie Severová, Ph.D.

Head of department

Electronic approval: 14. 10. 2019

Ing. Martin Pelikán, Ph.D.

Dean

Prague on 26. 03. 2021

Declaration

I declare that I have worked on my diploma thesis titled "Approaches to common stock valuation" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 31st March 2021 _____

Acknowledgement

I would like to thank my supervisor, Ing. Paver Srbek, Ph.D., for his help, useful advices, patience and support. I appreciate his feedback that I received while working on the thesis.

Approaches to common stock valuation

Abstract

This diploma thesis devoted to examining of chosen approaches to common stock valuation on the example of selected companies of FANG group from the tech sector, including Facebook, Amazon, Netflix and Alphabet (Google), whose securities are traded in National Association of Securities Dealers Automated Quotation (NASDAQ) and included in Standard & Poor's 500 stock index. In other words, this research is aimed to discover whether underlying values of selected shares are undervalued or overvalued compared to market prices.

The main goal of this work is to value equity stocks through absolute and relative valuation model and establish a degree of applicability of chosen methods. The work is divided into two parts: theoretical and practical. The first part is represented by literature review of crucial aspect of investment process and some chosen valuation models. The second part is based on providing three-step approach of fundamental analysis, where the whole economy, sector and FANG equities are analyzed. Last but not least, valuation techniques, discussed in theoretical part, are applied for selected stocks and intrinsic value are compared to current market prices of shares. Data for analytical part is taken from "Morningstar" global financial services and represents a 10-year period (2011-2020). Financial report such as balance sheet, income and cash flow statements are used as a secondary source of quantitative data.

In conclusion, final results of this work are supported by discussions, explanations and recommendations of potential investment decisions.

Keywords: common stock, share, dividend, fundamental analysis, market value, equity valuation, intrinsic value

Approaches to common stock valuation

Abstrakt

Tato diplomová práce se věnuje zkoumání vybraných přístupů k oceňování běžných akcií na příkladu vybraných společností skupiny FANG z technologického sektoru, včetně Facebook, Amazon, Netflix a Alphabet (Google), jejichž cenné papíry jsou obchodovány v National Association of Securities Dealers Automated Nabídka (NASDAQ) a zahrnuta do akciového indexu Standard & Poor's 500. Jinými slovy, cílem tohoto výzkumu je zjistit, zda jsou podkladové hodnoty vybraných akcií podhodnoceny nebo nadhodnoceny ve srovnání s tržními cenami.

Hlavním cílem této práce je ocenit akcie na základě modelu absolutního a relativního ocenění a určit míru použitelnosti vybraných metod. Práce je rozdělena do dvou částí: teoretické a praktické. První část představuje literární rešerše o zásadním aspektu investičního procesu a vybrané modely oceňování. Druhá část je založena na poskytnutí třístupňového přístupu fundamentální analýzy, kde je analyzována celá ekonomika, sektor a akcie FANG. V neposlední řadě jsou u vybraných akcií aplikovány oceňovací techniky, diskutované v teoretické části, a vnitřní hodnota je porovnána se současnými tržními cenami akcií. Data pro analytickou část jsou převzata z globálních finančních služeb „Morningstar“ a představují 10leté období (2011–2020). Jako sekundární zdroj kvantitativních údajů se používají finanční zprávy, jako jsou rozvaha, výnosy a výkazy peněžních toků.

Závěrem lze říci, že konečné výsledky této práce jsou podpořeny diskusemi, vysvětlením a doporučením potenciálních investičních rozhodnutí.

Klíčová slova: kmenové akcie, akcie, dividendy, fundamentální analýza, tržní hodnota, ocenění akcií, vnitřní hodnota

Contents

List of Tables

List of Figures

List of Formulas

List of abbreviations

AI	Artificial Intelligence
AMEX	American Stock Exchange
AMZN	Amazon stock
APT	Arbitrage Pricing Theory
CAPM	Capital Asset Pricing Model
CapEx	Capital Expenditure
CEO	Chief Executive Officer
CF	Cash Flow
CFO	Cash Flow from Operations
CFS	Cash Flow Statement
CO_2	Carbon Dioxide
COVID-19	CoronaVirus Disease 2019
D&A	Depreciation & Amortization
DCF	Discounted Cash Flow
DDM	Dividend Discount Model
D/E	Debt/Equity
DR	Debt Repayment
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
EMT	Efficient Market Theory
EPS	Earnings per Share
FANG	Facebook, Amazon, Netflix, Google
FANGAM	Facebook, Amazon, Netflix, Google, Apple, Microsoft
FB	Facebook stock
FCF	Free Cash Flow
FCFE	Free Cash Flow to Equity
FCFF	Free Cash Flow to Firm
GDP	Gross Domestic Product
GOOGL	Alphabet stock (A-class stocks with voting rights)
IFC	Investment in Fixed Capital

IWC	Investment in Working Capital
IS	Income Statement
IT	Information Technology
ML	Machine Learning
MPT	Modern Portfolio Theory
MV	Market Value
NASDAQ	National Association of Securities Dealers Automated Quotation
NB	Net Borrowings
NDI	New Debt Issued
NFLX	Netflix stock
NOPAT	Net Operating Profit After Tax
NOPLAT	Net Operating Profit Less Adjusted Taxes
NOWC	Net Operating Working Capital
NRFR	Nominal return on risk-free asset NRFR
NYSE	New York Stock Exchange
OPM	Option Pricing Models
P/B	Price/Book
P/CF	Price/Cash Flow
P/E	Price/Earnings
PM	Profit Margin
P/S	Price/Sales
PV	Present Value
RI	Rate of Investment
ROE	Return on Equity
SML	Security Market Line
S&P	Standard & Poor's
TAT	Total Asset Turnover
TR	Tax Rate
TV	Terminal Value
USA	The United States of America
USD	US dollar
WACC	Weighted Average Cost of Capital

1. Introduction

A valuation of common shares is widely considered to be a significant tool in corporate finance and plays a key role in making crucial business decisions by investors. Therefore, contrasting values of common share prices directly depends on the method used to estimate stocks. This is a significant aspect, which must be taken into account by analysts when evaluating a company since various valuation approaches might show different results.

In a new economy, main priority is to correctly manage equity value such as securities, stocks, bonds and assets. If a company is successful, shareholders profit in the form of dividends. Consequently, at a certain stage, stock valuation is carried out. It is necessary to analyze an ability to pay of an enterprise with a comprehensive analysis of financial condition of the organization, i.e., valuation of stocks and stock market as a whole depends on the combination of all participants' expectations. Estimating stock price properly helps to avoid possible losses and make right decisions about investment plans. Usually, investors are interested in the fair value of shares. Therefore, the main goal of these companies is to increase an accuracy of stock valuation. (Elton, Gruber, Brown, Goetzmann, 2014)

Some analysts tended to claim, that during a "boom" of technological companies in the early 90s high market stock prices of tech companies were an outcome of collectively irrational decisions made by investors, which were often determined by wrong perceptions of supply and demand, not by earning or cashflows. While other investors assumed these valuations were common-sense factors, which showed that tech firms would own the world. Moreover, famous British economist John Keynes believed that pursuit of "real value" based on financial principles seemed to be useless since prices often are not really correlated with the value. Anyways, traditional techniques of valuing share prices did not suit properly in the reality of the new economy. (Damodaran, 2017)

This diploma thesis is devoted to modern valuation techniques of FANG group common stocks, which includes four relatively young[1] American technological companies such as Facebook, Amazon, Netflix and Alphabet (Google). The work is divided into two parts: theoretical and practical. Theoretical part of the thesis includes a review of common stock valuation models. The practical part of the thesis is focused on analyzing data of selected companies collected from secondary sources and application of valuation models.

[1] Author's note: At the time of writing this work, companies of FANG were founded less than 30 years ago.

2. Objectives

The main goal of this work is to *identify the relevance in applicability of certain valuation techniques on FANG common stocks.* The purpose of theoretical part is to discover fundamental principles of investment procedure and chosen valuation models. Practical part is aimed to implement absolute and relative valuation methods in financial analysis of selected companies with relative comparison of the results. The study also aims to find out how much the result will differ when evaluating stocks using various approaches. Another goal of this work is to identify the company which could be considered as a potential object of investment in the future. Thus, **research questions** are as follows:

- *How different are the results received from various valuation approaches of selected companies used in this work?*
- *Does any company show relatively good results among others to be an object of successful investment?*

3. Methodology

Theoretical part is represented by literature review from various sources such financial books, scientific journals and articles, where chosen stock valuation methods needed for practical estimation are examined.

Analytical part involves three-step analysis (market-sector-firm), based on financial indicators of FANG companies, where macroeconomic environment, industry where selected enterprises are operating, and their stocks are separately examined. In the third stage of fundamental approach, profitability analysis using DuPont system is performed and intrinsic values of securities are estimated using chosen valuation models. In the first part of valuation, absolute method - Discounted Cash Flow (DCF) approach is applied, specifically Free Cash Flow to Firm (FCFF) and Equity (FCFE). To support the results and deeply understand the stated research questions, relative valuation techniques using multiples are utilized in the company's analysis.

Data collection for valuation part is proceeded in the period from 2011 to 2020 from publicly available sources such as annual reports (balance sheet, income statements, cash flow statements) of selected firms, obtained from global agency Morningstar, which emphasizes on gathering and analyzing financial information hence secondary data sources are used. Limitation of data collection provided by Morningstar implies only 10-year preceding period covered and reduced financial statements thus a more detailed view is found in 10-K annual reports, which is ensured by US Securities and Exchanges Commission that show in-depth picture of enterprises' financial performance. The latest period was selected as it is assumed that potential investment decision will be made in the near future.

3.1. Input determinants of valuation

Each valuation approach deals with specific input determinants so analysts are able to use this data in the models and estimate fair value of share. These indicators play a crucial role in identifying an intrinsic value of stock.

As it has been already mentioned previously, this work attempts to apply absolute and relative valuation approaches. The first one is represented by two types of DCF models, which are considered to be a foundation of absolute equities analysis. It is based on the idea that company can be estimated by cash flows that are generated throughout firm's existence. To perform any of DCF model analysis in the stock market, firstly, it is required to project

expected Free Cash Flows. Secondly, growth rates that will assume increase or decrease of FCF in the forecasting period and discounting aspect must be identified. To calculate future amounts of FCF, the following variables are utilized in FCFF and FCFE models[2]:

Table 1: DCF variables

Variable	Source	Used in	Description
Net Income	*Income statement*	*FCFF, FCFE*	*Earnings received by a company after all expenses paid, tax and cost deductions*
(+) Total adjustments for non-cash items (non-cash charges)	*Cash Flow Statement*	*FCFF, FCFE,*	*Expenses that do not imply cash outflows; includes depreciation and amortization costs*
(+) Interest expenses(1-Tax Rate)*	*Income statement, Own calculations*	*FCFF*	*Tax shield on interest, which is aimed to reduce income tax obligations due to expenses on interest payments*
(+) Changes in Operating Capital (ΔNOWC)	*Cash Flow Statement*	*FCFF, FCFE*	*Compares changes in NOWC, which is represented by the difference between current assets and liabilities, from previous fiscal year*
(-) Purchase of Property Plant and Equipment (Capital Expenditures)	*Cash Flow Statement*	*FCFF, FCFE*	*Purchase of fixed assets and long-term investments*
(-) Additions to Streaming Content Assets (Part of CapEx)	*Cash Flow Statement*	*FCFF, FCFE*	*Special account for Netflix firm, which includes expenses for content production and its licenses[3]*
(-) Repayments for lease financing (Debt repaymensts)	*Cash Flow Statement*	*FCFE*	*Payments for lease for assets that company has taken for use*
(=) FCFF/FCFE			

Source: own elaboration

For both types of DCF methods, two-stage models are decided to be used as tech companies usually tend grow faster that stable firms hence growth rate for the first stage (5-year projection period) and terminal growth are required to be established. The more detailed view on two-stage FCFF and FCFE models are discovered in the following part of literature review.

[2] Variables that are used in FCFF and FCFE are not the same (see the Table 1)
[3] According to *Overview of Content Accounting*, Investor Relations, Netflix, 2019

Growth rates

As we have previously stated, one of assumptions of the FCF models is to determine growth rate of future cash flows. Usually, analysts estimate this indicator based on previous historical data, considering some important financial indicators of selected company's performance. It is significantly important to point out that despite identification of many factors and determining risks related to changes in expected cash flows, there is no certain way to define appropriate growth rate as it is considered to be a subjective indicator and can be only established approximately based on analyst's estimates. However, there are some suggestions, described by Reilly and Brown (2011), which implies multiplication of ROE and investment rate as a growth rate. In the analysis, the ROE-based growth will be applied for first 5-year period of two-stage model, while the terminal growth at perpetuity is based on projected real GDP growth rate with some adjustments due to previous financial analysis of profitability. The first stage growth rate is expressed in the following formula:

Formula 1: Growth rate of FCF

$$g = ROE * RI,$$

Where

g – Projected growth rate of cash flows

ROE – Return on Equity

RI – Rate of Investment

From the formula above, a Return on Equity (ROE) and Rate of Investment (RI) are separately identified. The first indicator measures firms' net earnings in relation to equity of stockholders. In general, the ratio can be expressed by the following mathematical equation:

Formula 2: Return on Equity

$$ROE = \frac{Net\ income}{Stockholders'equity},$$

In the practical part, ROE ratio is also used to examine firm's profitability under the conditions of DuPont approach, which implies that three components of ROE are analyzed independently thus the direct influence on this value can be found.

Another part of FCF growth rate is Rate of Investment (RI) or sometimes it is called as Retention Rate (RR), which represents the amount of income generated back into the business in the form of retained earnings. It can be expressed by the ratio in the Formula 3:

Formula 3: Rate of Investment

$$RI = \frac{Net\ Income - Dividends}{Net\ Income} = \frac{Retained\ earnings}{Net\ Income}$$

Weighted Average Cost of Capital (WACC)

Koller, Goedhart and Wessels (2015) defines WACC as expected return rate that investors demand from free cash flows discounted at appropriate rate. Thus, the value of WACC is directly affected by rate of return and commonly used as a discount rate in the FCFF model. In other words, it represents structure of firm's capital, considering equity and debt. Depending on changes in these indicators, WACC can also show different results. Stowe, Robinson, Pinto and McLeavey (2007) explain calculation of WACC by the following formula:

Formula 4: Weighted Average Cost of Capital

$$WACC = \frac{MV\ of\ debt}{MV\ of\ debt + MV\ of\ equity} r_d(1 - T) + \frac{MV\ of\ equity}{MV\ of\ debt + MV\ of\ equity} r_e,$$

MV – Market Value

T – Tax Rate

r_d – expected rate of return represented by Cost of Debt

r_e – expected rate of return represented by Cost of Equity

Therefore, WACC multiplies sources of debt and equity by proportion of total equity. Costs of debt and equity are examined as follows:

Post-tax Cost of debt

Cost of debt determines cost of borrowed funds that a firm taken, i.e., it's an interest rate on long-term financing terms that an enterprise pays off (after taxes paid). This indicator can be determined by the following equation:

Formula 5: Post-tax Cost of Debt

$$Post - tax\ Cost\ of\ debt = \frac{Interest\ expense * (1 - Tax\ Rate)}{Total\ debt}$$

Cost of equity

Cost of equity is a required rate of return on common stock, adjusted for risk of a selected company. It is also used as a discounting factor for FCFE model. Stowe, Robinson, Pinto and McLeavey (2007) defines two methods of calculating cost of equity:

1. An equilibrium approach, using Capital Asset Pricing Model (CAPM)[4] or Arbitrage Pricing Theory (APT)
2. Total sum of bond yield and risk premium

Multiples approach

In relative valuation, the valuation ratios of P/E, P/B, P/S and P/CF are used, which are expressed as follows (a more detailed essence of ratios is described in the next part):

Formula 6: Price-to-Earnings ratio

$$Earnings\ multiplier = \frac{Stock\ value}{Earnings\ per\ Share\ (EPS)}$$

Formula 7: Price-to-Book value ratio

$$Price - to - Book = \frac{Stock\ value}{Book\ value\ per\ Share}$$

Formula 8: Price-to-Sales ratio

$$Price - to - Sales = \frac{Price\ per\ Stock}{Revenues\ per\ Stock}$$

Formula 9: Price-to-Cash Flows ratio

$$Price - to - Cash\ Flows = \frac{Price\ per\ Stock}{Operating\ Cash\ Flows\ per\ Stock}$$

[4] In this work, Cost of Equity is determined by application of CAPM, which will be described in the theoretical part.

4. Literature review

This part provides necessary information needed for meeting goals of this thesis. It mainly focuses on principles of investment, overview of common shares and stock markets, modern portfolio theory and selected valuation techniques that will be used in analytical part of this work.

4.1. Fundamental analysis

There are two different ways to predict future values of stocks' prices: fundamental and technical. Supporters of technical analysis are interested in how stock prices change, attempting to predict trends of share prices by discovering these changes in the past. By contrast, fundamentalists are focused on true value of an asset as they tend to believe that it is mispriced from market price. According to their belief, market price and intrinsic value are incomparable to each other. They observe economic basis of a company that emphasizes on financial characteristics and events, which directly or indirectly influence financial performance of an enterprise. According to Cunningham (1998), famous American economist Benjamin Graham once stated: "Price is what you pay, and value is what you get". This statement reflects a clear concept of the idea, which fundamentalists follow during stock valuation process. It defines that investor should not pay for a stock more than its worth. However, some traders and investors combine technical and fundamental analysis' methods to gain an optimal result in adequate assessment of investment opportunity.

Fundamental analysis is a significant skill for investors and analysts when investing in the stock market. The origins of value-based approach firstly introduced and popularized in the book "Security analysis" written by two famous American professors and economist Benjamin Graham and David Todd, who are widely considered to be "fathers of value investing". Moreover, it is widely known that W. Buffet, who was a student of B. Graham, applied these techniques in stock markets and became a successful investor. (Damodaran, 2006)

Fundamental approach is based on assumption that each share has a definite intrinsic value at some period of time. Under the influence of internal and external factors, this value can be increased or decreased, depending on degree of attitude of past events. The main idea of fundamentalists is to buy stocks when price is below intrinsic value (undervalued) and sell it when price is above (overvalued), i.e., they tend to believe that real market price can

deviate from the intrinsic value in the short-term, while in the long-term market price corresponds the intrinsic value. (Palat, 2016)

One of the most significant aspects of fundamental analysis is to collect information about the environment, in which an analyzed company operates. Before conducting a fundamental analysis, it is significantly important to gather data, which provides factors that can influence company's performance. Palat (2016) points out that these factors are divided into three levels, which include following valuable information:

1. Overview of the country's *economy*, where company operates as a whole
2. Description of the *sector*, in which a selected enterprise performs
3. Important information about a *firm* itself

The first level implies a study of various key macroeconomic indicators related to political and economic situation of the country such as GDP growth, unemployment, interest and inflation rates. It can also include a comparison of government policies that a country is pursuing and the stage of business cycle of this state. All data for economy analysis can be taken from official authority sources and statistical agencies.

Decades ago, investors were buying stocks without taking into consideration a sector, which enterprise operated in. Thanks to an increasing intensive competition nowadays in the world, industry analysis is recommended to be performed in order to identify main current players in the market and who is company competing with. Moreover, investors should also pay attention on industry cycle (such as growth or declining stages) since different phases might explain changes in expectations from investments. Last but not least, market share and capitalization of selected companies in the sector should be taken into account for deeply understanding of their relative positioning among other participants.

The firm level is represented by analysis of all factors that relates to the performance of an enterprise. There is no clear way of how to perform company analysis, it depends on ingeniousness of investor since everything is important and even small aspects shouldn't be ignored. However, Palat (2014) recommends looking at management structure of selected company, annual reports such as balance sheet, income statement and cash flow statement with a possibility of developing financial ratios to determine some important performance indicators.

These components of company's analysis can be performed in different order. According to initial point of fundamental analysis, three approaches are defined in the table:

Table 2: Approaches of fundamental analysis

Analysis method	Method description
Top-down approach (Economy to entity approach)	Firstly, investors forecast the performance of the entire economy since any economic or political event can affect the price of given stock. It might include macroeconomic analysis, focusing on business cycle stage (whether it is recession or economic growth), significant economic indicators such as inflation rate, GDP growth, fiscal-monetary policies of a country, trade conditions, purchasing power of consumers etc. Secondly, analysts estimate a performance of an entire industry, where company is operating and compare given sector with others. They should especially concentrate on life cycle of the industry together with growth stage existing competition inside it. Third step of this approach is represented by prediction of individual stock performance, using financial reports of companies.
Bottom-up approach (Firm to market approach)	The main idea of bottom-up approach is based on assumption that value of stock is a consequence of company's performance, then industry's conditions and finally, economy of a state as whole, where selected enterprise operates. Therefore, it focuses on selecting stocks regardless the overview of company's sector and market.
Mixed approach	Mixed approach utilizes previously both techniques: top-down approach is used only for analyzing economic performance of a country, while industry and firm conditions are evaluated by using bottom-up approach.

Source: Damodaran, 2018

At the end of fundamental analysis, using all required techniques and necessary valuation models, intrinsic values are obtained and compared with current market values so a decision can be made about potential investment in certain stocks.

4.2. Investment as source of income

People tend to earn and spend money their money throughout the entire life. Some of them are willing to consume products more than they can afford, while others are inclined to have lower demand and save up for other needs. The balance of income and consumption preferences lead to borrowing or saving money depending on the difference between these indicators. In case of remaining savings, people can keep their money, spend them on desired wants or make investments to increase the amount of savings over a certain time period.

Graham (2009) defines investing as a process of meticulous analysis, which guarantees safety of funds and fair return. According to his views, activities, which are beyond this definition can be considered as speculating. Before buying a stock, he also claims that investor should go through some steps, which can help in identifying a worthy investment:

1. Perform a deep analysis of a company
2. Protect investment funds from serious losses
3. Strive to adequate results, not phenomenal

According to Jones (2013), investment can be defined as allocation of funds to certain assets in order to receive benefits from future payments over a specific time frame. An investor can be represented by individual or institutional investor such as government, companies, hedge funds etc. All investors usually proceed through different stages with cyclical order: analyzing of potential object of investment and management of existing portfolios, i.e., its wealth. Jones (2013) also divides investing into two different forms such as direct and indirect investing. The first one is aimed to not only purchase stocks, but also control them directly by a person, who buys it, while the second type implies owning and managing security portfolios through some investment funds or firms. Nowadays, modern investors apply both types of investing throughout their careers.

Stowe, Robinson, Pinto and McLeavey (2007) claim that investment procedure has three various phases. In the first one - planning stage, investor defines primary goals of his future actions and possible limitations. The second one, which is execution step, requires to take measures for achieving previously stated targets. Last but not least, in feedback stage, a potential investor should be interested in not only in assessing whether goals were reached during prior phase, but also making corrections in case that outcome was not satisfied.

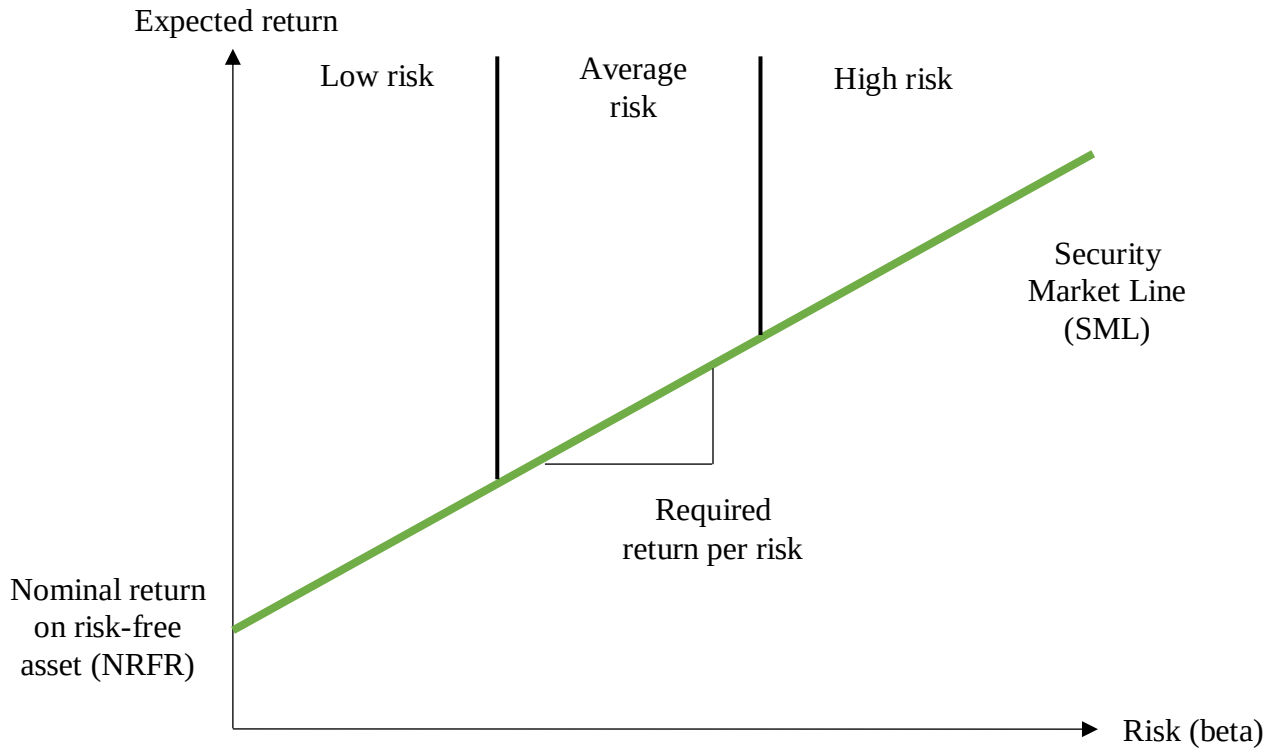
Expected return and uncertainty

The nature of investment process focuses on not only gaining profit from funds allocation, but primarily saving money for the future. According to Reilly and Brown (2011), investment decisions are driven by many factors, however one of the main is rate of return from savings, which compensates a time span, when funds were invested, projected inflation rate and risks related to lack of cash flows. A total sum of these factors can be called as a required return rate that investor expect to receive in the future. Jones (2013) also states that there is a certain distinction between expected and actual return after holding period as it could surpass or miss expectations from initial investment.

Dream of every investor is to maximize their profits from investments, however as we have recently discovered there are some limitations in uncertainty of gaining a desired return. Investors often encounter between a selection of risky stock, but with higher rate of return and less risky stock with lower expected return. Reilly and Brown (2011) claims that usually investors choose the second option as they are believed to be risk-averse.

On the Figure 1, a direct relationship between expected return and risk is shown:

Figure 1: Correlation between return and risk



Source: Reilly, Brown, 2011

4.3. Common shares

According to Elton, Gruber, Brown and Goetzmann (2014), equity of a company is usually represented by certain type of securities. One of them are common stocks, which are represented by the right to partially or fully possess a firm through receiving earnings in the form of dividends and owing assets of an organization. Besides common stocks, an enterprise can also issue preferred stocks, whose holders have higher priority during payout period (usually dividends for owners of preferred stock are paid before common shareholders) and certain conditions in case of business liquidation. The total value of all issued shares can estimate how much a particular enterprise is worth, i.e., price of stock multiplied by amount of shares result in total market capitalization of a selected company.

Common stocks dominate in the proportion of all equities according to market value issued by companies. This type of ownership has an endless life cycle thus there is no maturity period. Moreover, these securities can be issued both with and without par value. In the first case, companies usually establish the par value of stock on low level. It is significant to mention that par value may have nothing to do with market value. (Dunham, Singal, 2018)

Jones (2013) claims that compared to saving money or buying bonds, investing in common shares, in general, have much larger rate of return over a holding period. The capital from ordinary stocks can be considered as primary source of new funds from stockholders. Stock owners have exceptional rights and benefits such as cash flow rights or voting for members of company's board of directors, which in fact is responsible for controlling over the firm or gaining some compensation from investments. If a certain company faces some emerged hardships, stockholders are able to vote for a positive change namely to merge with other corporation or reshuffle in management that could rectify the situation in the company.

Some companies, especially large corporations have their own dividend policies, which lay in ability to pay out a part of profits that company has gained to shareholders. Even though investors are interested in constant and continuous growth of security dividends, payments cannot be guaranteed since they are highly dependent on how successful a company in previous period was. Whenever a company reports profit or loss at the end of each year, top managers make a decision about payout and the size of these payments. Therefore, owners of shares can benefit from buying stock through dividends paid and increase in the value of shares so they can sell them with higher price.

Stock markets

Nowadays, almost everything can become a source of income or can be turned into a profitable capital. The main issue is to find a legal way to extract earnings from any market assets. Since the emergence of stocks, they have been used as an equity to generate net income. Thus, in any developed economy, stock markets are aimed to provide opportunities for companies and individuals to receive future income from a placement of temporary funds.

The securities market occupies a significant share of the financial market and it is highly correlated with money and capital markets. Firstly, it is crucially important to understand the definition of securities market. Market of stocks is an integral part of financial market, where funds are redistributed using financial instruments such as securities. Stock market implies an economic relationship between participants such as investors and issuers regarding the issue and circulation of securities. Investor in securities markets is usually represented by an individual or organization that receives stocks in exchange for its own capital (money) with expectation of gaining financial profits in the future, while issuers are companies, which issues equities of organization and corresponds responsibility for ensuring rights and obligations to the owners of sold stocks. Securities market as a tool of investment is also competing with other sectors such as commodity and money markets since all of them represents an object of capital increase. It is usually regulated by the government of the state and market participants itself.

Elton, Gruber, Brown and Goetzmann (2014) claim that stock markets can be divided into two different types according to purpose of their usage. The first type, which is called primary market, is characterized by selling stocks that were initially issued. The Federal Reserve System of the USA can set a great example of primary market, where a financial institution issues government bonds, which are sold initially. Moreover, some young companies, providing innovative projects, can sell their shares through this type of markets with the prospects of attracting financial investments from main players in this sector such as investments banks or hedge funds, which carefully analyze upcoming startups. The second type – secondary market is represented by equities market, where stocks are resold, i.e., the movement of shares is carried out exclusively between investors thus the companies that have already issued shares do not participate in these relationships. These conditions of secondary market can be seen at NASDAQ stock exchange.

American stock exchanges

The essence of US stock market can be seen from two different perspectives according to making an immense fortune. The first phase is related to a period of 19th and beginning of 20th centuries, when certain group of people become incredibly wealthy thanks to favorable conditions of economic cycles. At such precarious times, which were characterized by instability of banking institutions in the country with its ups and downs, these investors were buying equities of companies during a recession and selling them when the economy was showing a growth. However, a formation of Federal Reserve System of the USA by government of current president Franklin Roosevelt in 1913 turned an American securities market into a second phase, which is commonly considered to be a starting point of stock and exchange markets legislation. The history of that time proved that those, who stayed with certain companies despite some fluctuations of unstable market gained higher fortune, taking less risks than those, who used "buy low, sell high" strategy. Moreover, investors, who were well-connected with some valuable people from financial sector, were more likely to have higher opportunities to create wealthy foundation for future generations. (Fisher, 2003)

Since then, besides changes in legal regulations of stock market in the USA, there were outstanding developments made in corporate management. In the previous decades, CEOs of large enterprises used to ignore interests of other shareholders, considering a company as a personal possession. Moreover, they were focused on transferring power to their family members, disregarding a need for renovation in management of organization. Nowadays, many lessons have been learned and most large corporations switched from autocratic to constantly improving style of management, where heads of companies are conducting deep analysis of how to make things work efficiently. Therefore, today stockholders in the USA have more influence than they used to as most of them are taking part in negotiation processes and making vital decisions for development of companies' structure.

Trading of securities in the USA is widely taking place on stock exchange. The largest exchanges, which create a basis for financial center in the USA are New York Stock Exchange (NYSE), National Association of Securities Dealers Automated Quotation (NASDAQ) and American Stock Exchange (AMEX). The last one was bought by NASDAQ in 1998, however currently it is represented as a part of the NYSE.

4.4. Modern Portfolio Theory

According to Elton, Gruber, Brown and Goetzmann (2014), in the second half of 20th century American economist Harry Markowitz has developed a fundamental work that currently forms a fundamental basis to investment approach. His ideas implied that every investor attempts to solve two problems: maximize return and minimize uncertainty. He also argued that it is not enough just to look at the risk and expected return of a certain financial instrument, but it is crucial to invest in more than one type of financial asset, so investors can reduce risks by diversifying his portfolio. Thus, these actions lead to a formation of investment portfolio in a way of minimizing risk under certain restrictions. However, risk reduction also means a decrease in profitability, so the key task is to find an optimal solution that will allow investors to combine various stocks together in a portfolio. In this work, CAPM is used to determine required rate of return, considering certain risk level.

The theory examines how investors who are afraid of risks can design their portfolios to optimize the expected return for a given level of risk. By analogy, they can follow the path of reverse logic and, for a given level of return, choose a portfolio with the minimum level of risk. For example, assuming that there are two risky assets in the portfolio: one is profitable when the economy is booming, the other when the economy is in the recession thus a portfolio with both assets will always be profitable, no matter what the economic cycle of the country is.

To sum up, the MPT is considered to be an essential tool in formation of investment portfolios, where stocks are selected based on the desired return rates and risks. It has a huge impact on the way how investors approach risk analysis, rate of return and portfolio management. Francis and Kim (2013) highlight four behavioral principles of the MPT:

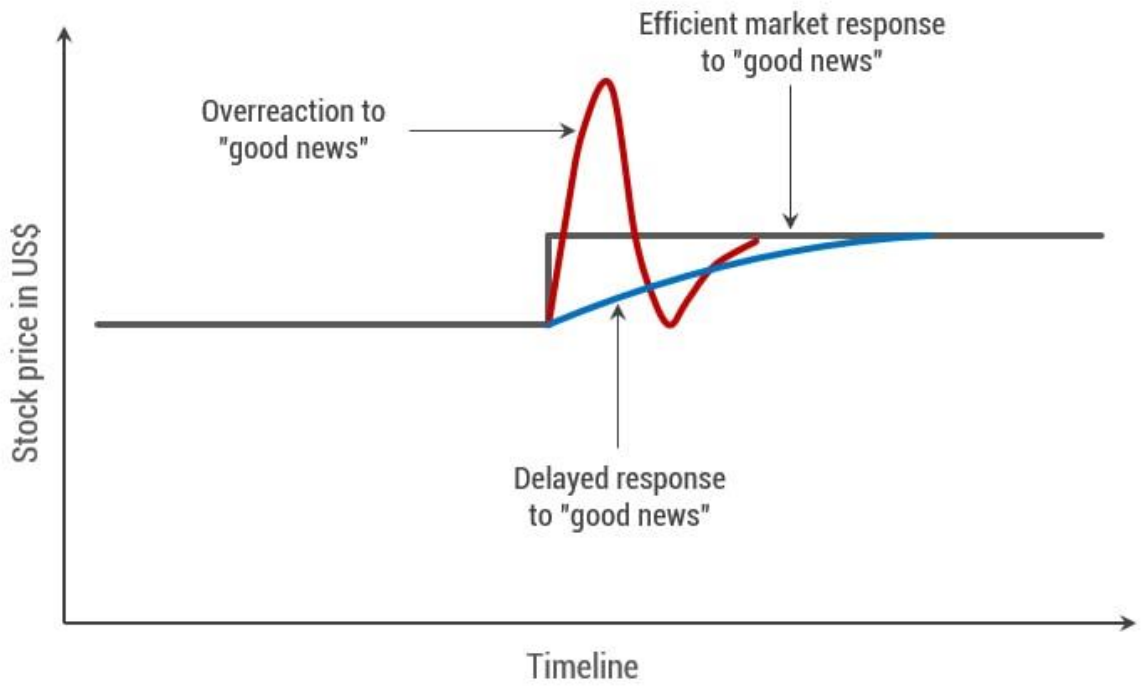
1. A potential buyer of shares sees possibilities to invest through probability distribution of expected returns over the identical time frames.
2. Risk that investors might take is highly correlated with required returns from investments.
3. Investors' decisions are based on reliability of certain indicators such as expected rate of return and risk assessments.
4. Investors would pick higher rate of return over lower one at any level of risk. (it could be also interpreted as "Investors would pick less risky investment rather than riskier")

Efficient market approach

The idea of the Markowitz's theory determines many characteristics of relationship between markets and investors. One of fundamental principles of the MPT can be found in Efficient Market Theory (EMT). According to Thomsett (2006), this theory states that pricing of securities is based on the known collective information of the market at any time, which is reflected in the current market value of stock. Moreover, Palat (2016) explains that this information, provided to investors, can be instantaneously analyzed by all participants of the market. Therefore, there is no possibility to gain more profit using previous data or examining trends of the past.

Prices on stocks are subject to change over the time. Melicher and Norton (2014) points out that there are many factors that might contain sensitive points in change of the value of securities, mostly they are determined by two main components: expected cash flows and discount rate. Thus, a change in price of stock will whether implicitly or directly reflect on one of these factors or both. The graph below shows how certain events can affect price of stock:

Figure 2: Efficient market response to news



Source: Smirnov

Melicher and Norton (2014) also explains that the term "market efficiency", which was formulated by famous American economist and Nobel prize winner Eugene Fama, implies that if market set prices of stocks immediately after the arrival of unexpected crucial news, it can be called as an *informationally efficient market*. Consequently, in such type of market, a return that investor expect to receive is laid out in current price of share. This explains that when purchasing stocks, they demand for a relevant gain from investment, which corresponds to alleged degree of risk.

It is commonly known that news events, whether they are provided in positive or negative degree, could also affect a volatility of stocks' value. For example, unexpected, good news could result in positive view of investors on prices of shares, i.e., the value of company's assets might rapidly soar since investors will consider them to become less risky and there is high probability of future growth in cash flows. On the other hand, a relatively bad news might lead to opposite response: analysts might assume that buying assets of the company contain higher risk than it should be and expected cash flows will more likely decrease in the future. As a result, there will be a significant decline in the market price of stock. According to different assumptions about how much information is reflected in security prices, an efficient market has three different forms:

- ***Weak-form*** of efficient market assumes whether all information represented in the past such as previous annual reports, statement about earnings and other last news, i.e., historical knowledge about price of stocks fully reflects in current prices. This type of market efficiency does not meet the requirements of technical analysis and considers to be useless for technicians since "they cannot earn above-average, risk-adjusted profits by projecting past trends in market variables".
- ***Semistrong form*** of efficient market provides an idea that all information publicly known whether it is past or current can be fully reflected in stock prices. American stock market can set a great example of how this type of market efficiency performs in the real life, where changes in stock prices are supported by "news about economy and individual firms without subsequent trends or price reversals".
- ***Strong-form*** of efficient market is a type of market, in which security prices fully reflect all past and current publicly available and private information. In such type of market efficiency, as well as in weak-form, investors are not able to gain profit with adjusted risk from either buying or selling securities.

4.5. Intrinsic and market values

Finding an intrinsic value represents a reasonable indicator of decision-making for investment process, rationally explaining whether investor should purchase or sell stocks. American investor W. Buffet defines it as the discounted value of cash, which can be withdrawn from the company during its existence on the market. He also claims that it is significant to keep in mind that intrinsic value is not the exact number that shows a real price of security, but only an approximate assessment of true value performed according to chosen valuation methods. This value is subject to differ with changes in interest rates and projections of future cash flows. (Cunningham, 1998)

Intrinsic value is an essential indicator used by fundamentalists as they attempt to buy stocks of companies at lower price and sell them over a purchase price so in this case, they can receive benefits based on the price differences. Investors believe that every share has a certain intrinsic value, and it has to be based on benefits that they accrue in the share, assuming that market and intrinsic values will differ in short-term, while in long-term they could. In other words, it represents an actual true value of stocks, while market value is reflected by public opinion: usually market value differs significantly from intrinsic, having higher or lower prices of stocks. If intrinsic value exceeds market value of stock ($V_0 > P_0$), then it means that share is undervalued, and investors have a good opportunity to buy it. On the opposite, if intrinsic value is lower than market value ($V_0 < P_0$),, stocks are considered to be overvalued and investors should sell them. Therefore, intrinsic value is determined as present value of all cash payments to investor, i.e., dividends, discounted according to risk adjusted interest rate. The formula of stocks' intrinsic value can be stated in the following equation:

Formula 10: Intrinsic value of stock

$$V_0 = \frac{E(D) + E(P)}{1 + k}$$

V_0 - Intrinsic value

$E(D)$ - Expected dividend yield

$E(P)$ - Stock price at the end of the year

k - Required rate of return on stock

4.6. Valuation models

Since each assets of a company have its own value, it is significantly important to know the real price of these assets. According to Reilly and Brown (2011), when investing in the asset, analysts expect to receive some return during ownership period, so it is required to discount the stream of expected returns at a certain rate. Moreover, Barker (2001) points out that there is a certain probability that future returns might not occur due to various reasons, so the expected return should be adjusted to risk indicator. Therefore, we can conclude that the value of any asset is dependent on two indicators: rate of expected return and its risk of failure.

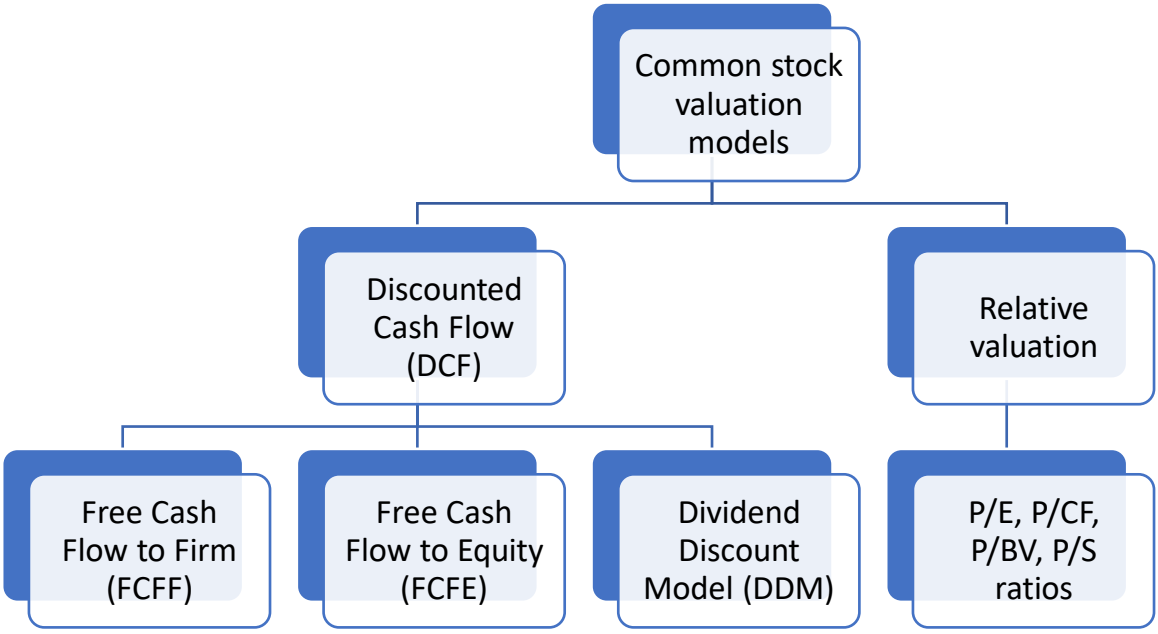
A return from investment that investors could expect can be in different forms such as dividends, cash flows, earning etc. and vary by the length of time frames and growth rate of these returns. Therefore, depending upon which foundation for expected return is used for estimating value of stocks, various valuation models are applied. However, as we have already mentioned, there is a certain uncertainty about expected return. Reilly and Brown (2011) consider that expected return rate is affected by sum of country's risk-free rate of return, inflation rate at period of stock ownership and risk premium, which defines possibility of not receiving a return from investment.

Damodaran (2017) claims that one of the rules of intelligent investment lies in that a person who is willing to buy a stock, should not pay more than its real value so knowing a true value of shares can lead investor to make a right decision of buying or selling an asset. Hence, to confirm that a required rate of return of investment is satisfied, investors should find an intrinsic value of share and then compare it with market value of stock. One of the main signs of buying or holding a stock is the condition when estimated real value of stock exceeds market value and vice versa if intrinsic value is lower than price of stock, investors should withdraw from purchasing a stock or sell it in case of they own it. For instance, after estimating by a chosen valuation model that intrinsic value of share equals to 50 USD dollars, while it is currently traded on stock exchange with its last price of 40 USD dollars, investor makes a decision of buying or holding a stock (intrinsic value > market value). By contrast, if a true value of stock is 50 USD dollars and market value exceeds real one, accounting for 60 USD dollars per share, investors should not buy or sell it (intrinsic value < market value).

At various times, investors use different valuation techniques, having common essence in required return rate of the stock as it serves as a foundation for discount rate and

growth rate of various indicators (e.g., dividends), that investors expect as a return, but vary between each other by relevance of usage and complexity of approaches. Reilly and Brown (2011) note two basic and most widely used approaches to common stock valuation: discounted cash flow models and relative valuation, based on comparison of selected multiples. The Figure 2 summarizes valuation techniques and their subsequent models:

Figure 3: Common stock valuation models



Source: Reilly and Brown, 2011

According to Reilly and Brown (2011), these approaches mentioned above should be considered as complementary, not competitive hence it is recommended to use both of them jointly. Besides Discounted Cash Flow and relative valuation models, Stowe, Robinson, Pinto and McLeavey (2007) also identify *residual income* and *asset-based* models as a part of absolute valuation techniques. The first approach is devoted to accounting income in abundance of the cost of generating this income and can be seen as an aternative to the DDM when a firm does not pay out dividends or generate negative cash flows. The second one is based on valuation of assets that a selected enterprise owns and widely used to estimate intrinsic value of natural resource enterprises. Damodaran (2006) claims that asset-based valuation can be performed based on liquidation value and replacement cost. The first one is focused on assessment of enterprise's equity by gaining net profit from selling all assets and paying off its liabilities. The main assumption for this technique is the existence of a

reliable evidence that a selected company is in liquidation phase. The second technique of asset-based valuation is represented by estimation of how much would it cost to a company to replace all assets that it owns. It cannot be seen as an alternative to the DCF or relative valuation since liquidation values and replacement costs can be found only by using one of these methods.

Damodaran (2006) also highlights *contingent claim* valuation method. It uses option pricing models to determine an intrinsic value of an asset, which pays off under specific conditions. One of the limitations for using the OPM is the length period of dividend payments so it's not applicable if dividend payouts are made in a short-term.

Valuing stock vs. bond

Despite the fact that present value procedure can be implemented for stock and bonds equally, there are still certain distinicitions that must be taken into consideration. Viebeg, Poddig and Varmaz (2008) point out that there are several differences in identifying an intrinsic value of shares and bonds:

1. The expected cash flows of equities are more complex to estimate than bonds' since, in most cases, coupon payouts are, in general, fixed and can be forecasted with greater confidence, while stocks cannot be due to uncertainty in cash flows to shareholders.
2. Stockholders are not eligible for a book yield at the end of repayment period. This means that by possessing some portion of a certain enterprise, they have rights to obtain cash flows during a holding period.
3. It is quite difficult to examine an opportunity cost of capital in stock markets thus financers have developed different techniques to evaluate cost of equity, which are suitable for these markets. One of the most commonly used by analysts is Capital Asset Pricing Model (CAPM), which explains value of certain assets under equal conditions.
4. Usually there are more factors that can influence price of stocks than bonds. While bond value is highly affected by only changes in rate of return, value of stock is dependent on several aspects such as opportunity costs, turnover growth, operating margins etc. Therefore, it is more complex to estimate the value of share than price of bond.

Choosing appropriate models

A selection of the right valuation approach is the major key to successful investment. The DCF technique can be suitable for our case since it is the most common model that is used in valuation of stocks and based on predicting expected cash flows. Another special case - the DDM will not be applied since enterprises from FANG group do not pay dividends, except Alphabet, which used cash buybacks instead of dividends in 2018. Anyways, payments to stock holders are proceeded not constantly or in most of firms, there was a lack of dividend payouts at all thus it will be nearly impossible to estimate growth determinants of dividends. Thus, instead of the DDM, the Free Cash Flow to Equity model will be used as an alternative to non-dividend scenario.

Regarding asset-based valuation, such approach is widely used for companies, which operate in extractive industries, estimating a real value of tangible and intangible assets that a company owns. This technique is commonly applied by analysts during mergers or acquisitions to evaluate a real worth of net assets. Since we are focused more on equities valuation, this model also will not be used in the following procedures. Moreover, a special type of asset approach – liquidation valuation will not be suitable for stock assessment since there were no compelling proofs that any of the companies from FANG group meet the assumptions of valuation technique (liquidation stage) hence this model will not be used in the analysis as well.

The subsequent valuation approach, proposed by Damodaran, contingent claim method have certain restriction concerning time frame of dividend payment. Since we have recently discovered that selected companies do not pay dividends to stockholders, this model will not be relevant to valuation of stocks.

Valuation methods mentioned above evaluate companies disregarding a comparison between themselves. It is significantly important to use relative valuation as a complementary instrument for the DCF technique, which helps analysts and investors to compare similar assets of companies among each other using multiples. Therefore, this type of valuation approach will be used for analysis of underlying values of FANG common stocks.

To sum up, in this work, the Discounted Cash Flow models such as FCFF and FCFE and relative valuation techniques will be used as tools to estimate intrinsic value of selected stocks.

4.7. Discounted Cash Flow model

Penman (1992) states that DCF approach is one of the most essential models in finance since most decisions' that investors make are connected to projection of expected cash flows. It emphasizes on bringing the value of expected cash flows to the current moment in time. DCF process is based on economic law of the diminishing value of money. In other words, over time, money loses its value in comparison with the current one, therefore, it is necessary to take the current moment of assessment as a starting point and discount all future cash inflows and outflows to present time. The major difference between using valuation through multiples such as Debt-to-Equity or Price-to-Earnings and DCF model is that the first method helps to estimate shares in comparison with other companies on the market, while the second approach aims to determine an absolute value of the company.

According to Damodaran (2006), in the DCF model, value of stock is the present value (PV) of expected cash flows that shareholders will receive from it, discounted at certain rate of risk, i.e., it evaluates value of share by discounting future cash flows to the present. In other words, this technique values a company on estimation of how much money this firm will make in the future. We consider that any asset of the company has its own intrinsic value, which we try to evaluate by looking at fundamentals of asset. This means that assets with great foreseeable cash flows are expected to be valued higher than those assets with low changeable cash flows.

Formula 11: Present Value of DCF

$$PV = \frac{CF_1}{(1+i)^1} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} \dots + \frac{CF_n}{(1+i)^n}$$

Where

CF_n - Cash Flow at certain period

i - Discount rate

n - Number of periods

Nowadays, the DCF approach is widely used by many investment organizations. Using this model, analysts must assess future cash flows during a potential holding period of chosen stocks, terminal value and opportunity cost of equity. The last one is represented

by a sum of risk-free rate and risk premium. DCF analysis is based on the concept of time value of money, i.e., one dollar today has greater value than one dollar, which might be received after some time, since it can be invested in financial or property assets with a probability of gaining supplementary income in the future.

Limitations of DCF usage

Damodaran (2012) also defines some various factors that might lower a degree of accuracy when applying DCF approach. He explains that it does not mean the model cannot be applied, but additional actions must be taken in order to prevent from inaccurate results. Negative earnings and cash flows indicates higher risk of a scenario when a certain company goes bankrupt. Moreover, under these conditions, it becomes more challenging to project expected free cash flows. Another situation that might cause issues with DCF estimate is cyclicity of company's performance, when financial indicators are implied to reiterate trends in the economy. An existence of certain assets that do not affect cash inflows and outflow will lead to different amount projected FCF. These assets could be represented by intangible resources such as goodwill, intellectual property, trademarks etc. Enterprises that involved in mergers and acquisitions are also implied to difficulties in real value evaluation, caused by possible changes in structure of assets or capital, dividend policies etc. Last but not least, private entities, whose stocks have never previously been traded and cannot provide historical data of assets value are subjected to more complicated FCF forecasts.

Moreover, despite the wide use of DCF model as quite reasonable approach by analysts, it is significantly essential to note that sometimes it might lead to illusion of approriateness due to several aspects when applying such technique. As Viebeg, Poddig and Varmay (2008) state that some analysts tend to believe the DCF method does not involve an ability of managers to make decisions according to sudden changes in the markets. Focusing more on quantitative components, there is a certain possibility of not taking into consideration non-quantitative elements by top management, which sometimes have crucially important influence on the right decision about investments. In this case, a human factor plays critical role in the decision-making process as investors can not see each investment possibility in isolation from complicated structure of business environment. Therefore, the main deviation of using this method consists in such aspect that analysts, who decide whether to invest or not in a certain stock, seeks to maximize wealth of stockowners. However, there are many companies, whose values do not match investors' views.

4.7.1. Free Cash Flow valuation (FCFE and FCFF)

To survive in competitive market, firms invest earnings back to the company with a purpose of expansion or develop own future projects. While some amount of money will be reinvested to a certain company, the rest of funds could be distributed between stockholders and creditors. Brealey, Myers, and Allen (2006) defines free cash flow as the amount of cash that will not be used in business operations or invested into own capital. Basic model is represented by gross cash flow after investing a working capital and tax paid by a company. The formula for the FCF is shown below:

Formula 12: Free Cash Flow

$$FCF = NOPLAT - Net\ investments,$$

Where

FCF – Free Cash Flow

$NOPLAT$ – Net Operating Profit Less Adjusted Taxes (i.e., earnings received from business operations after paying taxes on this income)

$Net\ investments$ = Invested Capital$_{t+1}$ – Invested capital$_t$

These models are applicable in the case when a firm do not pay dividends or dividends are paid disproportionally to enterprise's earnings. Unlike the DDM approach, which mostly based on cash flows paid in the form of dividends, the FCF is focused on projecting cash flows that will be distributed between shareholders. While information about dividends for the DDM can be easily taken from available financial reports, projected cash flows must be calculated. A forecasting of expected cash flow is usually performed for a 5-year period, but it is non-mandatory condition as a time frames can be extended due to specifications of industry, where a chosen firm operates, stage of business cycle or confidence in stable cash flows. According to Rosenbaum and Pearl (2009), this process is based on different aspect of financial performance such as company's growth, profitability indicators, costs of equity, reinvestment demands etc. Since a forecasting of these financial indicators in the future is challenging, the FCF approach uses a terminal value to make a point that a selected business will grow at a certain rate constantly during a projection period.

There are two main different viewpoints of how the DCF can be performed: *equity* and *enterprise* valuation, which will be reviewed in the following parts.

4.7.1.1. Enterprise valuation

The firm view of the DCF, which is called enterprise valuation, have a lot in common with an equity model. However, there are some distinctions, which have to be taken into consideration. According to Damodaran (2006), there are two major aspects that can be highlighted. Firstly, a foundation of Free Cash Flow to Firm (FCFF) is based on usage of debt such repayment of existing debt, interest costs and taxes, while the FCFF uses after-tax operating earnings and deducting interest expenditures. Jones (2013) also adds, that in entity valuation, analysts may also require to take into consideration preferred stocks of selected company. He defines the FCFF according to formula below:

Formula 13: FCFF using Net Operating Profit After Tax

$$FCFF = NOPAT + D\&A - Capex - Change\ in\ NWC,$$

Where

$NOPAT$ – Net Operating Profit After Tax

$D\&A$ – Depreciation and amortization

$Capex$ – Capital expenditure

NWC –Net Working Capital

Stowe, Robinson, Pinto and McLeavey (2007) suggests other few methods of identifying the FCFF:

1. *Using cash flow operations:*

Formula 14: FCFF using Cash Flow Operations

$$FCFF = CFO - I(-TR) - IFC$$

Where

CFO – Cash Flow from Operations

TR – Tax rate

IFC – Investment in Fixed Capital

2. *Using EBIT (Earnings Before Interest and Taxes) or EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) from income statement:*

Formula 15: FCFF using EBIT

$$FCFF = EBIT(1 - TR) + D - IFC - IWC$$

Where

$EBIT$ – Earnings Before Interest and Taxes

D – Depreciation

TR – Tax rate

IFC – Investment in Fixed Capital

IWC – Investment in Working Capital

Formula 16: FCFF using EBITDA

$$FCFF = EBITDA(1 - TR) + D(TR) - IFC - IWC$$

Where

$EBITDA$ – Earnings Before Interest, Taxes, Depreciation and Amortization

D – Depreciation

TR – Tax rate

IFC – Investment in Fixed Capital

IWC – Investment in Working Capital

To estimate an equity value of a certain company through the FCFF approach, it is necessary to find a PV, which consists of the total sum of free cash flows, discounted at an appropriate rate:

Formula 17: Present value of FCFF

$$V_i = \sum_{t=1}^{\infty} \frac{FCFF_t}{(1 + WACC)^t}$$

Where

t – Time period

$FCFF_t$ – Free Cash Flow to Firm of company at period t

$WACC$ – Weighted Average Cost of Capital

4.7.1.2. Equity valuation

The equity DCF model is commonly considered to be an alternative to the DDM approach, which sometimes can provide an exact same result, while in others, the result can significantly differ from the DDM. In the second case, it might be affected by a scenario, when a company is obliged to pay dividends, which are amounted above the free cash flow (FCF). Overall, the FCFE is represented by a cash flow, which stockholders have access to, after deducting operating and interest expenditures, debt payments to creditors and taxes paid. Jones (2013) ensures a more detailed essence of the FCFE, calculated from net income. It is expressed in the formula below:

Formula 18: FCFE using Net Income

$$FCFE = NI + D - Capex - Change\ in\ non - cash\ WC - NDI - DR$$

Where

NI – Net Income

D – Depreciation

$Capex$ – Capital Expenditure

WC – Working capital

NDI – New Debt Issued

DR – Debt Repayment

Stowe, Robinson, Pinto and McLeavey (2007) also provide other ways for calculating the FCFE:

1. *Using cash flow operations:*

Formula 19: FCFE using Cash Flow Operations

$$FCFE = CFO - IFC + NB$$

Where

CFO – Cash Flow from Operations

IFC – Investment in Fixed Capital

NB – Net Borrowings

2. *Using Free Cash Flow to Firm (FCFF):*

Formula 20: FCFE using FCFF

$$FCFE = FCFF - I(-TR) + NB$$

Where

$FCFF$ – Free Cash Flow to Firm

TR – Tax rate

NB – Net borrowings

As well as for entity model, equity value examined through the FCFE approach is represented total sum of free cash flows, discounted at appropriate rate:

Formula 21: Value of company's share using FCFE

$$V_j = \sum_{t=1}^{n} \frac{FCFE_t}{(1 + r_j)^t}$$

Where

V_j – Value of company's share

$FCFE_t$ – Free Cash Flow to Equity of company at period t

t – period of time

n – Number of periods

r_j – Cost of equity (rate of return)

Stowe, Robinson, Pinto and McLeavey (2007) state that value equity can be also found from firm's value, subtracting market value of debt:

Formula 22: Equity value from Firm value

$$Value\ of\ Equity = V_i - MV\ of\ debt,$$

Where

V_i – Value of enterprise

MV – Market value

4.7.2. Single-stage growth model

Besides interests to local stocks, investors quite often are interested in purchasing stocks from abroad. Valuation of intrinsic values is crucially important for investors buying international stocks. To determine a common model of international valuation and apply it to all countries, single-stage FCF model was developed. It implies that a value of free cash flow increases at chosen constant growth rate, taking as a foundation value from previous period. Formulas for the FCFF and the FCFF, considering a constant growth of expected cash flows are defined by Stowe, Robinson, Pinto and McLeavey (2007) as follows:

Formula 23: Constant growth FCFF model

$$V_0 = \frac{FCFF_1}{WACC - g} = \frac{FCFF_0}{WACC - g}$$

Where

$FCFF$ – Free Cash Flow to Firm

$WACC$ - Weighted Average Cost of Capital

g – Growth rate

Formula 24: Constant growth FCFE model

$$V_0 = \frac{FCFE_1}{r - g} = \frac{FCFF_0(1 + g)}{r - g}$$

Where

$FCFE$ – Free Cash Flow to Equity

r – Cost of equity (rate of return)

g – Growth rate

4.7.3. Two-stage growth model

Another type of multistage FCF models that will be used in the future analysis is determined by two different constant growth rates on each stage. While the first phase implies a chosen potential of free cash flows to change limited by used length of time frame, the second interval, which is called terminal period, is defined by perpetual constant rate.

When deciding about the degree of terminal value growth, analyst should look at sector's life cycle: in case that it is declining, an appropriate rate can be selected on the below average level of country's economic growth, while for industry that tends to expand in next years of projection period, an applicable potential can be chosen above real GDP growth. Stowe, Robinson, Pinto and McLeavey (2007) stated a procedure of calculation intrinsic value of stock utilizing two-stage FCF valuation model. The present values for both FCFF and FCFE are represented by a total sum of FCF and terminal value PVs and shown in the formula below:

Formula 25: Present value of two-stage FCFF

$$V_0 = \sum_{t=1}^{n} \frac{FCFF_t}{(1+WACC)^t} + \frac{FCFF_{n+1}}{(WACC-g)} * \frac{1}{(1+WACC)^n}$$

Where

$FCFF_t$ – Free Cash Flow to Firm of company at period t

$FCFE_{n+1}$ – Free Cash Flow to Firm of company at termina period

n – number of periods

t – period of time

$WACC$ – Weighted Average Cost of Capital

g – Growth rate

Formula 26: Present value of two-stage FCFE

$$V_0 = \sum_{t=1}^{n} \frac{FCFE_t}{(1+r)^t} + \frac{FCFE_{n+1}}{(r-g)} * \frac{1}{(1+r)^t}$$

Where

$FCFF_t$ – Free Cash Flow to Equity of company at period t

$FCFE_{n+1}$ – Free Cash Flow to Equity of company at termina period

n - number of periods

t - period of time

r - Cost of equity (rate of return)

g – Growth rate

4.7.4. Capital Asset Pricing Model

The required rate of return is a crucial input determinant that represents a minimum amount of fund that must be received back, considering all risk factors. CAPM is considered to the most commonly used techniques in cost of equity valuation. It theoretically explains relationship between required rate of return and risk, assuming that a required rate of return can be defined by applicable risk measures. The fundamental idea of CAPM is similar to MPT (sometimes it is viewed by analysts as a development of Markowitz theory), however it differs in applying more realistic scenario of how investors actually behave rather than how they should since the model includes alternative risk indicators to measure risky stocks. To use this approach, analyst should clarify the value of risk-free rate, which can be acceptable to use, ways of equity risk premium estimation and systematic risk for stock, which is explained by beta coefficient. The whole mathematical expression of CAPM is expressed in the Formula 21:

Formula 27: Capital Asset Pricing Model

$$E(R_i) = R_f + \beta[E(R_m) - R_F]$$

Where

$E(R_i)$ – Required return on stock

R_f – Risk-free rate of return

$E(R_m)$ – Required return on market

β – Sensitivity of stock to returns on market portfolio (Beta coefficient)

Risk-free rate

Risk-free rate is the theoretical interest rate with no uncertainty about risk factors such as inflation, future cash flows etc. This scenario is less likely to happen as risks is one of the most essential factors of investment process. For a risk-free rate of return in the markets, it is customary to take yield of bonds issued by government. Some analysts consider a 3-month Treasury (T-bill) to be the most secured investment as it has almost zero risk of default on securities, however its return is lower compared to other investments. In the following analysis, a yield of 10-year Treasury Bond is used as a base for risk averse scenario.

Equity Risk Premium

Equity risk premium assumes a supplementary return that investor requires for higher risks on stocks. It is calculated by deducting risk-free rate from required return on the market and represented in the following mathematical equation:

Formula 28: Equity Risk Premium

$$Equity\ risk\ premium = E(R_m) - R_F,$$

Where

$E(R_m)$ – Expected rate of return on the market

R_F – Risk-free rate

In most cases, risk-free scenario is unrealistic as there are always some factors that can influence expected results from investment. Hence, investors require higher return rates as there are some additional risks exist, which is reflected in risk premium. Reilly and Brown (2011) identify some major risk indicators:

1. ***Business risk***

It is related to probability of failing expected cash flows in the company, which is based by business model of the firm. The less transparency in cash flows, the less confident is investor in future cash flows.

2. ***Leverage risk***

Explains sources from which company can pay for its investments. In case, that a firm borrows funds for such investments, there is a certain risk that shareholders might not receive their earnings before the debt will be repaid.

3. ***Liquidity risk***

A risk that is connected to how fast an investor can turn common stock and income from investments into cash and use it to other purposes. The harder to proceed this, the higher liquidity risk.

4. ***Exchange rate risk***

An uncertainty of losing income from acquisition of companies' stocks in currency that is distinct from investor's capital currency.

5. ***Political risk***

Risk that is related to changes in political and economic aspects of a certain state.

In the following stock valuation part, equity risk premium is extracted from the average of 10-year annual S&P 500 indicator.

Systematic risk (beta coefficient)

This coefficient represents the sensitivity of a specific stock to change the return rate of the market portfolio. The greater beta coefficient, the greater risk for stock hence investors should increase rate of return required from investment. This definition can be written mathematically as follows:

Formula 29: Beta coefficient

$$\beta = \frac{Cov\ (R_S; R_m)}{Var\ (R_m)}$$

Where

$Cov\ (R_S; R_m)$ – covariance of returns between stock and market

$Var\ (R_m)$ – variance of market return

4.4. Relative valuation

Dukes, Peng and Philip (2006) conducted a research, where they discovered that most of investment analysts apply relative valuation methods rather than the DCF technique. Generally, relative stock valuation is implied to identify intrinsic share value in relation to value of assets, which considered to be relevant to compare such as earnings, sales, book value, cash flows etc. This type of approach is based on idea that similar valued assets must be sold at the same price. While every valuation method is subject to error, comparable technique can summarize the ongoing valuation and provide some significant insights. However, the DCF approach is still considered as the most accurate and adjustable method. Relative valuation also ensures the point of how markets view share value at this moment by using certain indicators. One of the main issues when valuing stocks by multiples is that underlying stock values are compared to average of industries, where companies usually operate. In other words, this approach is not able to express a real worth of chosen stock or how much it is undervalued or overperformed.

Stowe, Robinson, Pinto and McLeavey (2007) explain that multiples method can be performed in two different forms based on: comparables and projected cash flows (e.g.,

forecasting earnings per share in P/E indicator). While the first approach compares share ratio with similar assets at current time, the second one is aimed to predict future values of equities fundamentals instead of comparing them with other shares value. As our goal is to identify the most beneficial share to be invested in among tech stocks of the big four group, the first type of relative valuation will be applied.

There are various multipliers that can be used in relative valuation, however the following main ratios will be used in the next part of this work:

1. Earnings Multiplier

One of the main indicators of investment attractiveness, used in relative valuation approach is earnings multiplier. The main assumptions for this ratio is the absence of negative income thus P/E cannot be applied in such case since value will be below zero, meaning that it is irrelevant to compare value with others stock. Jones (2013) claims that the Price-to-Earnings value shows the possibility of market to pay per 1 dollar of earnings, received during the last year. Overall, the higher multiple the more investors are able to pay for a price of stock, as they have greater expectations of income growth in the future.

2. Price-to-Book multiplier

This ratio is commonly applied when evaluating bank assets since most of them are represented by bonds and loans, whose value contributes total accounting value. It reflects the relation of stock market values and stockholder's equity after deduction of all expenses required for a quick liquidation. In other words, by applying this indicator, analysts can identify whether investors overpay for the balance, that he or she can receive in case of enterprise's bankruptcy. Overall, it shows how much investors pay for net assets of a firm.

3. Price-to-Sales multiplier

This approach evaluates a firm by sales volume and provides insights of how much a potential investor pays for one dollar of company's revenue. Jones (2013) claims that this ratio is useful when estimating any public enterprise. In case that a firm has lack of income or its value is negative, it is still possible to apply P/S as earnings that are below zero do not necessarily imply lack of sales.

4. Price-to-Cash Flow multiplier

Another ratio compares market value of a firm and value of its cash flows from business activities. In general, this multiple shows the ability of an enterprise to generate inflows and outflows from major operations.

5. Practical part

This part of thesis is aimed to implement selected stock valuation techniques on chosen group of tech companies by applying tools of fundamental analysis. Annual reports for valuation were taken from Morningstar financial advisory service and supported by 10-K comprehensive reports from US Securities and Exchange Commission, as mentioned earli

5.1. FANG group

The term "FANG" was firstly introduced by American television personality of CNBC Jim Cramer in 2013. Nowadays, it is widely used among many investors and analysts. The original FANG group includes stocks of following enterprises: Facebook, Amazon, Netflix and Google. (Franck, 2017)

According to Damodaran (2018), FANG is unique since relatively young and small firms could become "tech giants" in last recent years with an impressive growth in stock prices. In the Table 3, we can see market capitalization FANG companies from 2012 to 2020:

Table 3: Historical market capitalization of FANG

Date (as of December)	*Facebook (bln. USD)*	*Amazon (bln. USD)*	*Netflix (bln. USD)*	*Alphabet (bln. USD)*	*Total FANG market cap (bln. USD)*
2012	70,821	123,985	9,228	248,461	452,495
2013	159,537	164,734	24,185	398,788	747,244
2014	218,323	164,638	26,849	359,747	769,557
2015	310,558	278,364	40,415	478,168	1107,505
2016	378,530	394,840	61,132	500,588	1335,270
2017	560,927	692,249	123,497	727,021	2129,335
2018	374,130	737,467	130,020	744,325	1985,942
2019	585,373	920,224	141,985	920,318	2567,9
2020	778,232	1638,235	239,487	1182,908	3838,862

Source: Damodaran, 2018, own calculations based on data from Yahoo Finance and Morningstar

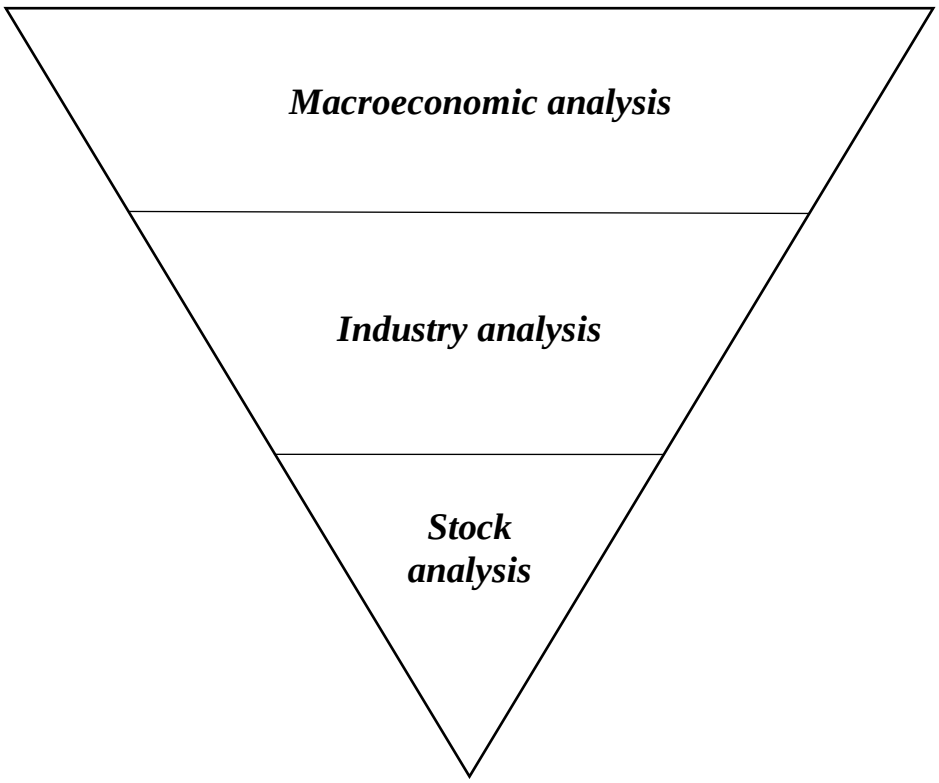
According to the table, FANG value has increased by 8,5 times since 2012. Overall, there was a positive trend in growth of market values of equity, except 2018, when Facebook -Cambridge Analytica scandal occurred, which resulted in decline of market capitalization.

5.2. Three-step approach

As it has been already mentioned in the beginning of this work, there are three different ways how to perform a valuation of a certain company: top-down, bottom-top and mixed. The most common one is top-down approach or three-step analysis (economy-industry-firm). Supporters of this method tend to think that market and industry have a direct influence on a particular company, which performs inside this economic environment. Indeed, it seems to be logically rational to use such approach as it is nearly impossible to avoid effects from changes in the entire sector and aggregate market of a chosen company. Therefore, the aim of three-step approach is to collect relevant information about factors that might have possible effects on market value of securities and its expected return rate to make a successful investment in the future. Reilly and Brown (2011) claim that these approaches are widely applied by analysts, but at the same time they recommend using this type of approach since bottom-up is more complicated to use due to disregarding an important information from estimation of economy and industry of a company.

The hierarchy of top-down technique is shown on the figure below:

Figure 4: Three-step approach



Source: Stowe, Robinson, Pinto and McLeavey, 2007

5.2.1. Macroeconomic analysis

Based on previous collected information about how prices of stocks change thanks to various factors, a detailed picture about the economy or market, where chosen firms operate, must be examined. It becomes clear, that an economic performance of a country has a significant impact on investment decisions since most of them are made on a basis of future expectations. An investor should be aware of dynamics of current economy as a whole, avoiding some unexpected events, which might lead to adverse results. Therefore, in this part, essential economic and financial indicators will be reviewed to identify the current stage of economic cycle of origin country, i.e., the USA, since each member of FANG group comes from this state.

Real GDP growth

In 2020, the global economy has faced an unprecedented pandemic crisis, which caused one of the largest collapses in the history. The spread of coronavirus has led to quarantine limitations in almost every part of the world, countries closed their borders and movement of people has been restricted. According to the WESP Report (2021), in the previous year due to restrictive measures such as a ban on activities in certain industries, obligations to wear a mask in crowded places etc., introduced by many states, the world economy decreased by 4,3% in 2020. Such lockdowns leaded to the greatest economic damage and, the crisis, caused by coronavirus infection, is considered to be the most dramatic in the last 90 years. This situation has affected mostly developed countries as many European countries and some of states from the USA imposed strict measures since the beginning of the global pandemic. As a result, the consequences of such event caused many unfavorable economic issues such as high growth of global debt, negative oil prices, weakening of the dollar etc.

Before the COVID-19, the US economy was going through its one of the best times ever, thriving with the lowest unemployment rate in last 50 years and acceptable inflation rate. However, the Bureau of Economic Analysis (2021) claimed that due to pandemic, real GDP contracted at 3,5% in 2020, compared to annual performance of previous year. Such fall has negatively affected in consumption expenditures, imports and export volumes, different types of investments etc. Furthermore, as some of the states announced shutdowns of local economies, this leaded to increase in federal government spending such as healthcare assistance and financial contributions to the population.

Changes in a real GDP growth rates of the USA and the world in a previous decade (2011-2020) is presented in the table below:

Table 4: Real GDP growth rates of the USA and the world

	USA (%)	World (%)
2011	*1,551*	*3,138*
2012	*2,25*	*2,519*
2013	*1,842*	*2,666*
2014	*2,526*	*2,861*
2015	*2,908*	*2,874*
2016	*1,638*	*2,606*
2017	*2,37*	*3,299*
2018	*2,927*	*2,977*
2019	*2,161*	*2,365*
2020	*-3,5*	*-4,2*
2021	*3,2 (projected)*	*4,2 (projected)*

Source: Worldbank, OECD and the BEA

According to the tableabove , we can summarize that the economy of the USA showed on average 1,6673% of growth, considering the last year of decline, while the world's average was higher and accounted for 2,1105% in last 10 years. The maximum increase of the US GDP was in 2019, accounting for 2,927%, while in the world, the highest value of 3,299% was seen in 2017. Therefore, it can be concluded that despite lower average of growth of the US economy, the downfall of 2020 was also lower, which can be explained by more strict quarantine measures in the rest of the world during the COVID-19 pandemic.

GDP Projections

Although it is hard to predict the exact future of the US economy and dynamics of possible recovery, the Congressional Budget Office (2021) attempted to forecast future economic performance of the country and pointed out some projections in the period from 2021 to 2025. Real GDP will recover to pre-coronavirus level in the mid-2021 and outrun a potential growth of the economy only in early 2025. On average, it is expected that the average growth rate will be 2,6%, while potential GDP will be slightly lower – 1,9%. Overall, it is estimated that the economy will strengthen in the next 5 years and supplementary financial funds will not be required.

Current macroeconomic policy

In the USA, monetary and fiscal policies are applied to impact an economic performance of the country. The first one refers to control of money supply and aimed to ensure sufficient growth of the economy, stable inflation and low unemployment. The Federal Reserve System (also known as "the Fed") is responsible for implementation of certain tools to achieve pre-defined targets. The Fed have wide options of lowering interest to encourage boost of the economy or raising it in the case of opposite targets such as slowdown of economic activity. The purpose of the second approach is to manage government spending and tax allocations. Fiscal actions are carried out by the president of the US and the US Congress. Both policies can be used together, however monetary policy is performed independently thus it smooths negative consequences from fiscal policy, especially expansionary and contractionary types, which might lead to rapid surge of interest rates.

The global pandemic, started in 2020, leaded to the decrease in economic activity of the USA as well as in many countries. Since the beginning of the crisis, the US government introduced fiscal measures to stimulate the economy such as direct payment packages to citizens, including unemployment payouts, subordinate mortgages to small firms, loan deferment etc. Overall, the outcome of fiscal policy decisions in this case were represented by:

1. Assistance to firms and individuals, which aimed to protect companies from bankruptcy and maintain employment of population.
2. Stimulation of aggregate demand to reduce negative effects from the recession (these tools are not related to help enterprises and individuals, but the economy in general)

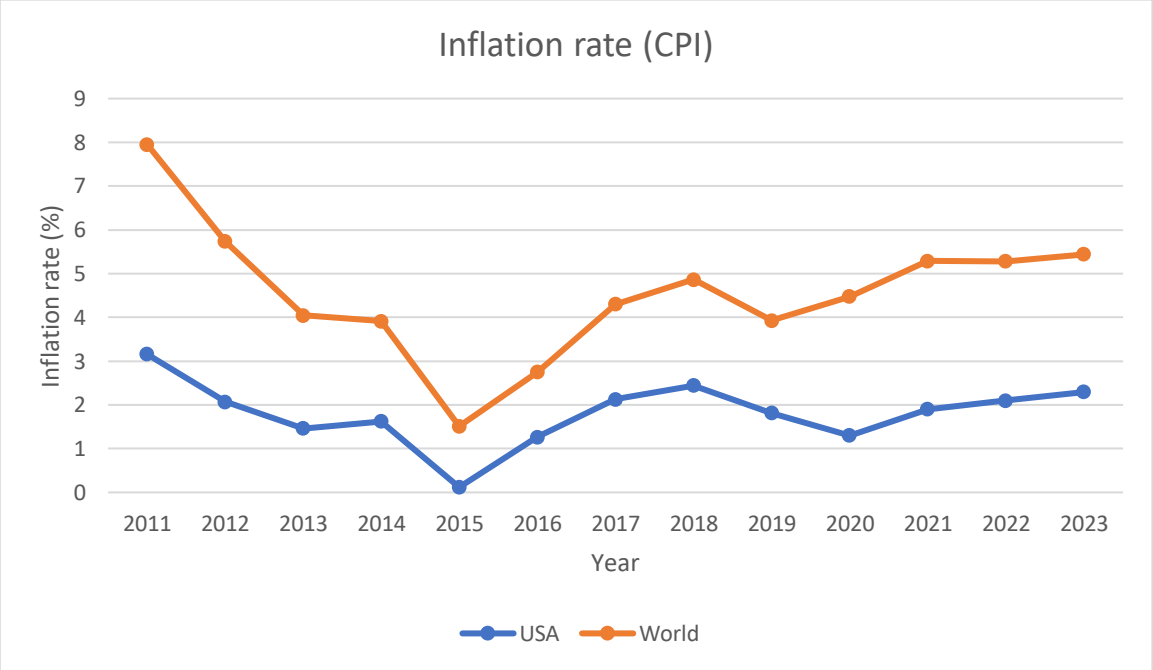
At the same time, the Fed has also taken crucial steps to respond to the recession of the COVID-19. It initiated the emergency lending to decrease interest rates and ensure liquidity of assets in the banking system so companies can have access to required financial assistance. The Fed also lowered a federal funds rate to the range of 0%-0,25% on March 15th of 2020. Such a drop to "zero level" was seen the second time in the history of the US economy after the first appearance during the Great Recession. (The Congressional Research Service, 2021)

Inflation rate

It is expected that inflation rate will slightly increase in the next couple years and after 2022, the growth of prices will be above 2% on condition that the Federal Reserve System of the USA will keep rate of interest at low level and remain buying long-term equities. (The Congressional Budget Office, 2021)

The graph below shows inflation rate (Consumer Price Index) of the USA and the world with predicted values for next years (2011-2023):

Figure 5: USA inflation rate



Source: Worldbank and the Congressional Budget Office, 2021

According to the graph, we can see that inflation rate was rapidly decreasing in the period from 2011 to 2015 (with exception of 2014), reaching the lowest point in the final year, amounting for 0,119% and 1,393% for the USA and the world, respectively. After such a drop, inflation was gradually increasing before 2018, however there were no extreme fluctuations noticed. After 2018, inflation started to fall till the next year in the USA and till 2020 in the world. There were projections of inflation rate made by the Congressional Budget Office. According to them, the implications of global pandemic will not cause a rapid surge of inflation, but a slight increase in consumer prices.

Central Bank Interest rate

In the Table 5, historical information about interest rate of the USA is presented with percentage changes from previous periods:

Table 5: Average US Central Bank Interest rate

	Interest rate (%)	Change from previous period (%)
2011	*1,137*	-
2012	*1,307*	*0,17*
2013	*1,469*	*0,162*
2014	*1,375*	*-0,094*
2015	*2,196*	*0,821*
2016	*2,451*	*0,255*
2017	*2,172*	*-0,279*
2018	*2,409*	*0,237*
2019	*3,277*	*0,868*
2020	*1,2*	*-2,077*
2021	*1,9 (projected)*	*0,7*
2022	*2,2 (projected)*	*0,3*

Source: Worldbank, and the Congressional Budget Office, 2021

As it can be seen from the table, the average interest rate in the USA in the 10-year period from 2011 to 2020 was 1,8993%. The maximum value vas observed in 2019 with 3,277% of interest, while the minimum was seen in 2020 with 1,2%, which can be explained by rate reduction due to the world pandemic.

Correlation among inflation and interest rate

Analyzing crucial economic indicators of a country, we can conclude that inflation and interest rate has a significant impact on investment environment. As for bonds, when investors expect a growth of inflation rate, this means that they look for higher yields to compensate such risk. The greater CPI, the lower purchasing power of bonds. As for stocks, the correlation between inflation and interest rate is indirect since when valuing a stock, we are mostly focused on future cash flows, while they can vary regardless changes in interest and inflation. Reilly and Brown (2011) suggest three possible scenarios that shows relationship among these indicators, which as a result affects price of stocks (based on the DDM approach):

1. *Perfect scenario*. A growth of inflation triggers a surge in interest rate and corporate income also increases due to the ability of companies to raise prices as a result of increased expenses. In this scenario, market value of shares may not experience high volatility or remain stable. It can be explained by the fact that an increased expected rate of return from investors due to growth of inflation can be compensated by higher income. This leads to increase in price of securities, which rises with inflation simultaneously, i.e., stocks serve as an assurance from inflation.
2. *Slightly pessimistic scenario*. Increase in inflation boosts interest rate and as a result expected return rate rises, but growth of future cash flows remains at previous rate, considering that prices slightly increase at lower growth rates than inflation and increased expenses. As well as for bond, this can affect in decrease of share prices since expected rate of return increases, but future potential earnings remain constant.
3. *Pessimistic scenario*. Inflation and interest rates increase, causing higher required rate of return for investors and cash flows experience a decrease due to unavailability of companies to increase prices in the period of high inflation thus it leads to decline in profitability of a company. In this case, market values of stock are more likely to decrease.

To sum up, inflation and interest rates can have various influence on market values of shares, depending on the source of change in these indicators and industries, where companies operate.

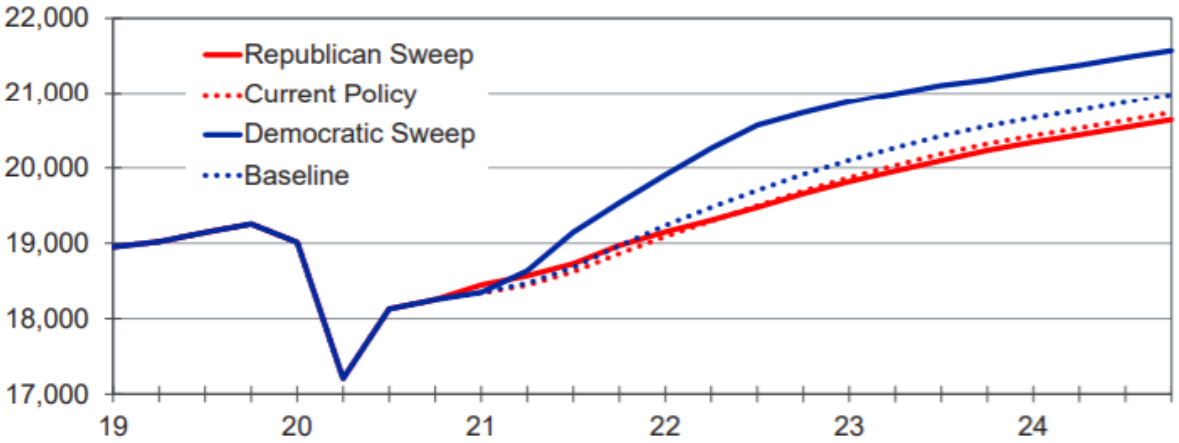
Political and economic factors

Stock markets have been always responded to presidential elections at some point in the USA. Although, there is no strong evidence of it, but volatility of these markets is always based on future returns thus a new president can bring some adjustments to price values.

Before the presidential elections of 2020, international rating agency Moody's (2021) made predictions about the economic performance of the USA with republican and democratic presidents separately. Overall, according to its projections, Biden's plan seems to be more effective than proposals of previous president Donald Trump and can be resulted

in higher growth of the economy. On the figure below, changes in the GDP of the USA are shown according to different outcomes of last elections:

Figure 6: Real GDP under different election outcomes



Source: Moody's Analytics, 2021

As it can be seen from the graph, Moody's analysts (2021) forecast higher economic growth of the USA under democrats. Undoubtedly, a current American president Joe Biden seems to be more attractive for investors as his campaign was aimed to implement more expansionary fiscal policy than Trump's ideology. Changes in trade policies and expansion of immigration possibilities will also positively affect the GDP growth. It is also estimated, job opportunities under J. Biden will bring 7,4 million more jobs than under republicans. Therefore, Moody's (2021) projects that democratic president contributed to faster rebound of the US economy and as a consequence, it will lead to 4,5% (or 960 billion difference) of leap in the GDP growth by 2024 compared to Trump's scenario. However, some aspects must be taken into consideration. Firstly, Joe Biden intends to increase corporate tax, which can negatively affect business environment and its investments. Secondly, since the beginning of his presidency, he faces many challenges due to the crisis, caused by the COVID-19 disease. One of the main shocks that the US government has to deal with is to take the country out of recession as the US economy, which have already declined by approximately 3,5% in 2020 thanks to the global pandemic.

The rollout of vaccines will have also a crucial impact on the future economy recovery and the current Biden's administration is responsible for managing an immunization campaign so investment environment is more likely to change, depending on how fast vaccination process will take place. Another obstacle that Joe Biden faces is

increased government spending during the lockdowns, which results in higher federal deficit. Moreover, following the trend of reducing CO_2 emissions and preventing the world from environmental contamination, the US administration is more likely to concentrate on energy industry, initiating to use more renewable sources, however it is still unknown how fast this process will go, but the recession definitely boosts this transfer.

5.2.2. Industry analysis

The analysis of sector is the second step of top-down approach. For potential investors, it is crucially important to have a clear picture of companies that supply similar products and services to estimate an overall market. Moreover, when valuing a selected industry, analysts should perform deep analysis of certain factors such as internal labour market, government intervention, factors affecting price of goods in the sector etc.

The FANG is represented in the tech industry. To be more specific, Facebook is represented in sub-industries such as social media and advertising, Amazon is in retail sales, e-commerce, etc., Netflix is in streaming services, advertising and finally, Alphabet (Google) is in internet services, cloud computing, artificial intelligence etc. These enterprises are often inclined to introduce new products thus it is quite difficult to allocate them to one industry. To sum up, each company from this group can cover more than one sectors.

5.2.2.1. Tech sector

Nowadays tech sector is highly valued in the modern economy, especially during the COVD-19 era since a lot of businesses are shifting to digital. In 2020, despite a slowdown of economy, industry of information technologies fared well, compared to other industries. Some sectors such as energy or tourism even have experiences a decline during the crisis.

Largest companies engaged in producing software, hardware equipment and providing technological services are included in Standard & Poor's 500 index[5] and represent an information technology sector. It is significantly important to mention that list of companies in the S&P 500 index is not the same as list of largest corporations in the USA since it does not include private firms or enterprises, whose stocks are insufficiently liquid. Sometimes, this index is considered to be a condition indicator of US economy by some

[5] Stock index that contains largest public enterprises by market capitalization listed on the US stock exchanges.

investors. Overall, there are some criteria, according to which, committee of the organization decides whether to include a certain company in the index or not. According to S&P Dow Jones Indices (2021), the number of units in the IT sector is accounted 76 technological firms from the USA and total market capitalization exceeds 9 trillion US dollars as of February 26th, 2021. All companies from FANG are included in S&P 500 index.

In the table below, a performance scoreboard of all S&P 500 sectors is shown (as on March 3rd, 2021):

Table 6: S&P 500 industries share

	Index value	**Percentage of S&P 500 (%)**	**Price change compared to previous year (%)**
Communication services	232,08	11,08	22,2
Consumer discretionary	1294,47	12,4	32,1
Consumer staples	649,39	5,97	7,6
Energy	360,19	2,84	-37,3
Financials	535,64	11,22	-4,1
Healthcare	1311,27	13,12	11,4
Industrials	764,55	8,43	9
Information technology	2293,4	27,37	42,2
Material	461,11	2,63	18,1
Real Estate	232,26	2,43	-5,2
Utilities	295,35	2,51	-2,8
Total S&P 500	**3811,15**	**100**	**16,3**

Source: Standard & Poor's Global, 2021

From the Table 6 it is seen that tech sector confirmed its leading position among other industries, increasing by 42,4% since the beginning of 2021. Such a rapid growth can be explained that the global pandemic has boosted earnings of the sector as during lockdowns, the majority of population worked remotely, communicating and shopping online. Moreover, the coronavirus situation can help to business of tech companies. It has good chances to exceed previous surge on the market during this year even after removal of quarantine restrictions and return to normal life. Self-isolation forces people to use services of tech entities more often and they can continue to do so in the future. Therefore, this crisis

has triggered structural changes on the labour market and remote work will not be considered as something extraordinary. However, some people are not able to work remotely at all due to job specifications, so they are more likely to use hybrid model, combining work from home and office together.

Considering above said, we can define a stage of life cycle of technological sector. Jones (2013) highlights four main phases of industry cycle: pioneering, growth, stabilization and declining stages. The growth of information technology industry in 2020 was the highest among other sectors overpassed average performance S&P 500 companies with more than 43% of increase, the most of any industry. Thus, taking into account these factors, we can conclude that tech sector applies to growth stage.

Despite a spectacular performance of tech industry during COVID-19 era and quick adoption of technology by many firms, nowadays the sector experiences three main challenges that may be faced the future. According to Deloitte (2021), these barriers include:

1. ***Increased efforts of digital transformation***

A growing competition among companies from tech industry becomes more and more intense as user involvement will be one of the main factors of success in the future. To win a race and overcome arising barriers, firms are obliged to advance flexibility and improve automatization processes thus it might lead to making additional efforts such as development cloud framework, demand on data handling and cybersecurity. Hence, due to changing environment conditions, modification of business model is needed.

2. ***Retraining of workforce***

Changes have affected not only external business environment, but internal as well. During a COVID-19 era, technological enterprises have been vigorously implementing remote work. To increase efficiency of employees, modern technological tools have been used, including artificial intelligence and machine learning so nowadays workers are always in demand of supplementary assistance and development trainings.

3. ***Rethinking of production processes***

The global pandemic leaded to break the ties in a supply chain of many technological firms as well as in other industries. Some of them found a replacement of suppliers, however others have experienced outages thus a lack of agility of these enterprises caused inability to protect crucial components. In this case, technological firms should examine the issues of production relocation and diversification of output.

Therefore, it becomes evident that business digitalization will be one of the main trends in the post-COVID era, which will have undoubtedly a positive impact on the entire tech industry. As an example, risks related to cybersecurity, increased with massive shifts of employees to remote work can be seen as additional opportunities for growth of the companies involved in the development of related software.

Historical performance of tech sector

As we have recently found out, in 2020, IT sector showed dramatic growth compared to other industries. The year before, an increase was even greater and amounted for 50,29%, however in 2018, there was a decline in information technology sector by 0,29% of total return. A historical performance of information technology industry in the period from 2011 to 2020 is shown below:

- *Price return* is a return on investment portfolio, i.e., it simply explains a return from index in percentage. It does not include gains or loss from interest and dividends.
- *Net total return* reinvests dividends subtracting withholding taxes.
- *Total return* is a stock index that counts as increase in capital as cash reinvestments, including dividend and interest payments.

Table 7: Annual performance of IT sector in the USA

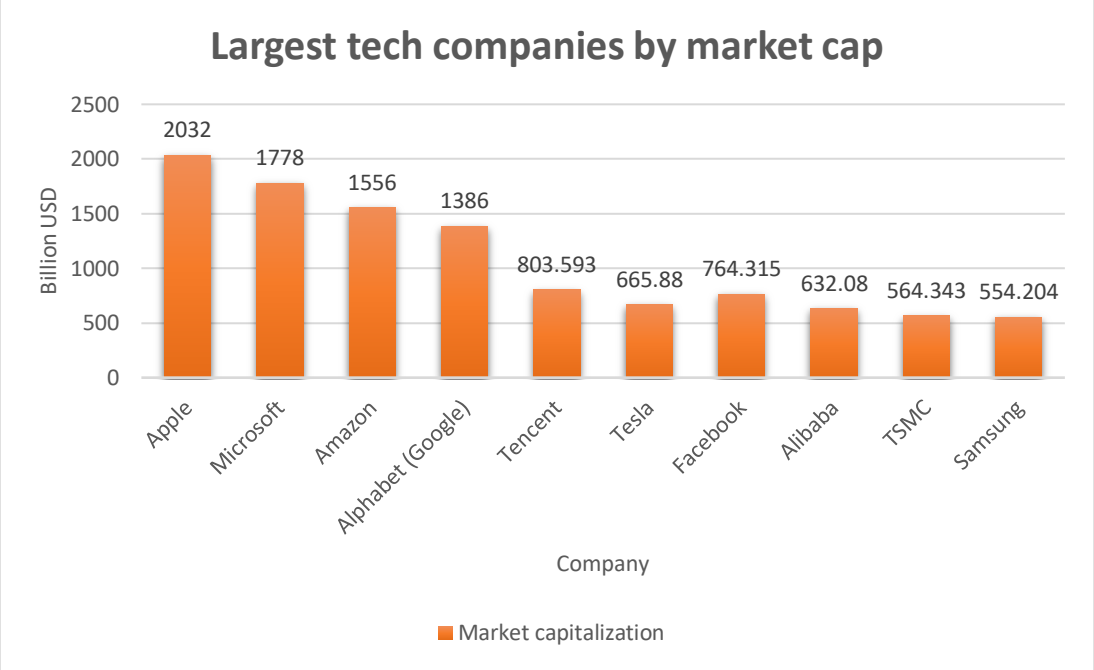
	Price return (%)	**Net total return (%)**	**Total return (%)**
2011	1,33	2,09	2,41
2012	13,15	14,32	14,82
2013	26,23	27,77	28,43
2014	18,18	19,53	20,12
2015	4,27	5,43	5,92
2016	11,98	13,29	13,85
2017	36,91	38,25	38,83
2018	-1,62	-0,69	-0,29
2019	48,04	49,61	50,29
2020	42,21	43,39	43,89

Source: Standard & Poor's Global, 2021

Largest tech companies

Nowadays, the technology sector is one of the most powerful, shaping the global economy, driving development and global trends. Until quite recently, it was commonly believed that the most successful tech companies come from the United States. However, times have changed and several corporations from Asia have shown an outstanding performance last year, competing with other tech giants. On the Figure 7, the ranking of largest tech enterprises based on market capitalization is presented (as of 14th of March 2021):

Figure 7: Largest tech companies



Source: Yahoo! Finance, 2021

In 2020, Apple Inc. overperformed Microsoft and became world's most valuable company, whose market capitalization exceed 2 trillion USD for the first time in the history. From the figure above, we can observe companies from Asia such as Tencent, Alibaba, TSMC and Samsung, which attempt to compete with American tech corporations. As for FANG group, all members are included in the top ten list except Netflix.

In a couple of decades, these giants have radically changed the lives of many, turning upside down not only ordinary human communication and everyday leisure time, but also global economic and political processes. Nowadays, possessing vast resources and

tremendous influence on audience of billions of people, these major tech companies are simultaneously becoming a subject of geopolitical conflicts. Recent disputes about Russia's interference in the US elections of 2016 can set a great example of how Facebook corporation was used to pursue goals of countries, using social media users.

Trends in tech industry

Coronavirus has made its own adjustments to the growth of IT industry in 2020. As a result, it caused negative consequences such as reduced entrepreneurial activity, supply chain disruption, cancellation of global events and missed opportunities for cooperation. However, as we recently noted, the crisis boosted transformation of businesses to digital, there are some trends that cannot be ignored as they will determine the direction of tech industry development in the future:

1. ***5G networks***

The 5G standard appeared quite recently, but leading telecom companies have already deployed this generation networks. Despite the fact that most of 5th generation network zones are in test operations, they might become one of the main powers of tech industry in the following years.

2. ***Big data analytics***

Data and its processing in real time and in-depth analysis, allow you to identify hidden problems, promising trends, and make reliable forecasts. Big Data tools allow you to interpret information in various slices for the rational use of resources and risk management. Therefore, with digitalization of business, there will be plenty of data to process and examine, making data analytics one of the most demanded activity.

3. ***Cloud-based solutions***

Cloud technologies can automate many work processes and ensure the security of stored data. Quarantine measures and travel restrictions prompted most companies to turn to cloud technologies, even if such solutions were not previously considered for some reasons. Consequently, most companies needed to find new ways to keep employees connected and communicate quickly. Computer clouds turned out to be the simplest and most affordable solution to the assigned tasks, helping employees to keep important data in storage servers. Therefore, with increasing popularity of remote work, cloud-based service might become vital and irreplaceable in our day-to-day life.

4. Artificial intelligence (AI) and machine learning (ML)

According to ReportCrux Market Research (2020), the expected revenue from Artificial Intelligence products in the information technology industry by the end of 2027 will be around 15,72 billion USD. AI technologies accompany people in many fields such as medicine, economics, education, science and even creativity. In the upcoming years, large enterprises will continue to develop services for visual and sound search for goods. This will make shopping more convenient and increase customer satisfaction. Moreover, by this way manufacturers will be able to better study the audience: they will receive more accurate information about the preferences of buyers and will be able to predict demand with the assistance of Machine Learning tools. Firms will offer customers the best prices for popular products, which will drive sales. This is beneficial for both parties - buyers get what they need, and sellers will establish close contact with the target audience.

5. Cybersecurity

People trust electronic devices with their phones, addresses, bank card details and passports. This leads to the need of protecting personal information. Moreover, thanks to remote work, many business processes are exposed to threats since many employees are working outside of secure office environment. This coup, triggered by COVID-19, has enabled cybercriminals to revive and attack vulnerable employees. Remote employees often work without special means of securing corporate networks, and hackers take advantage of this. Enterprises unknowingly can also provide such criminals with open access to intrude on their protected data unless they expect to adopt a proper technology or corporate security policies to enforce cybersecurity on company devices. Therefore, a protection from cyber-attacks will be also in demand in the upcoming years.

5.2.3. Stock analysis

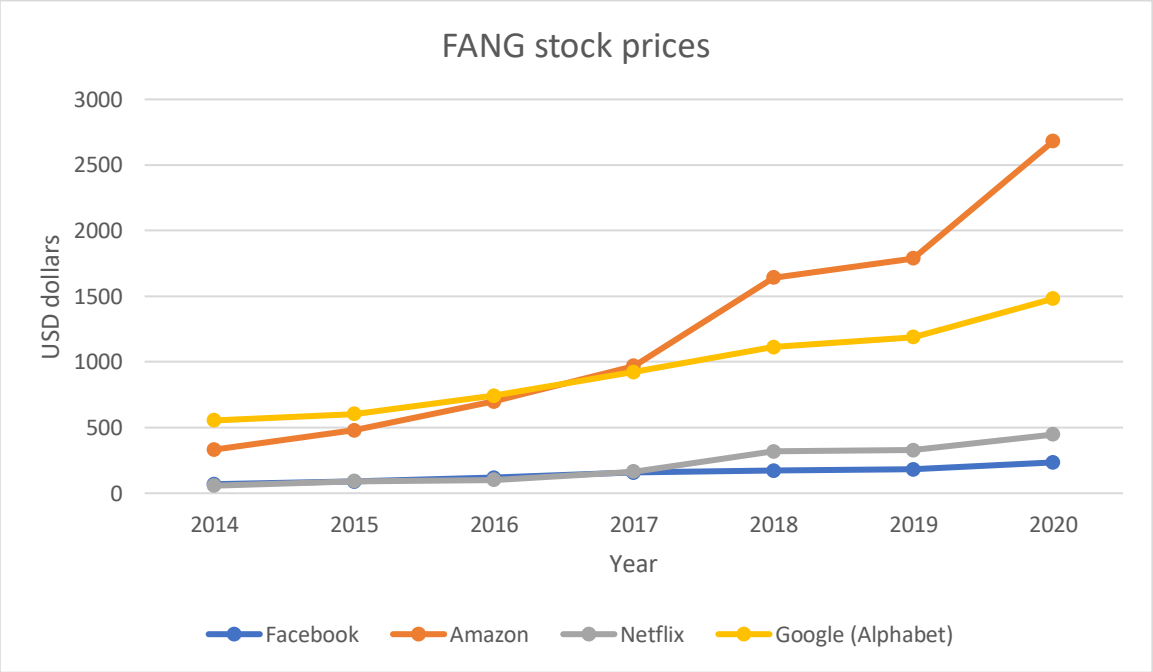
As soon as economy and industry analysis are performed, analysis of selected companies is required to be processed by analysts. Stock investments are always related to estimating earnings as it is one of the main aspects in decision-making process. Therefore, it is crucially important to evaluate profitability performance of selected firms.

There is a difference between company analysis and stock valuation. After analyzing a company and obtaining a clear picture about its strength and weaknesses, intrinsic value of stocks needs to be identified and compared to current market price.

Historical prices of selected stocks

We have recently discovered that shares can have market value, which is represented by a price of stock at which it is bought and sold in the market. There are many various factors that can influence on volatility such as changes in supply and demand, shifts in management, unexpected events, related to a certain company etc. Average prices of chosen stocks are shown in the graph below (data is taken from 2014 to 2020[6]):

Figure 8: Historical stock prices of FANG



Source: own elaboration based on data from Yahoo! Finance

Overall, the figure above shows us a positive trend in growth of stock prices of chosen companies. We can clearly see that since 2017, Amazon's average share market values rocketed compared to other securities, while Google's growth rate was relatively stable throughout the period. As for Netflix and Facebook stocks, their market value lines corresponded to each other till 2017, however in 2018, there was a slight increase in price of Netflix's shares. Eventually, Facebook's prices of equities were not rapidly increasing as Amazon's or Alphabet's stocks and showed the lowest growth rate among others.

[6] Limitation of time period is explained by unavailability of data earlier than 2014.

5.2.3.1. Analysis of profitability

In this part, so-called "investor ratios" will be reviewed as potential investors are interested in returns from investments. Therefore, this part is devoted to review of financial performance of selected FANG companies with comparison between each other.

DuPont System

When providing analysis of stocks, it is significantly important to examine the return on owner's equity (ROE). This indicator explains rate of return on equity capital. In other words, it shows earnings on shareholders' capital gained by management of a chosen company deducting all dividend payouts.

In the DuPont analysis, ROE is provided by three-element disaggregation and divided into components that can deeply explain the influence of changes in various factors on this indicator. These elements include: Profit Margin, Total Asset Turnover and Financial Leverage. The first part is related to measuring company's profitability to sales, the second component studies the efficiency, while the third one shows the extent of leverage. Reilly and Brown (2011) claim a formula of ROE calculation under the DuPont terms:

Formula 30: ROE in DuPont model

$$ROE = Profit\ Margin * Total\ Asset\ Turnover * Financial\ Leverage$$

Profit margin

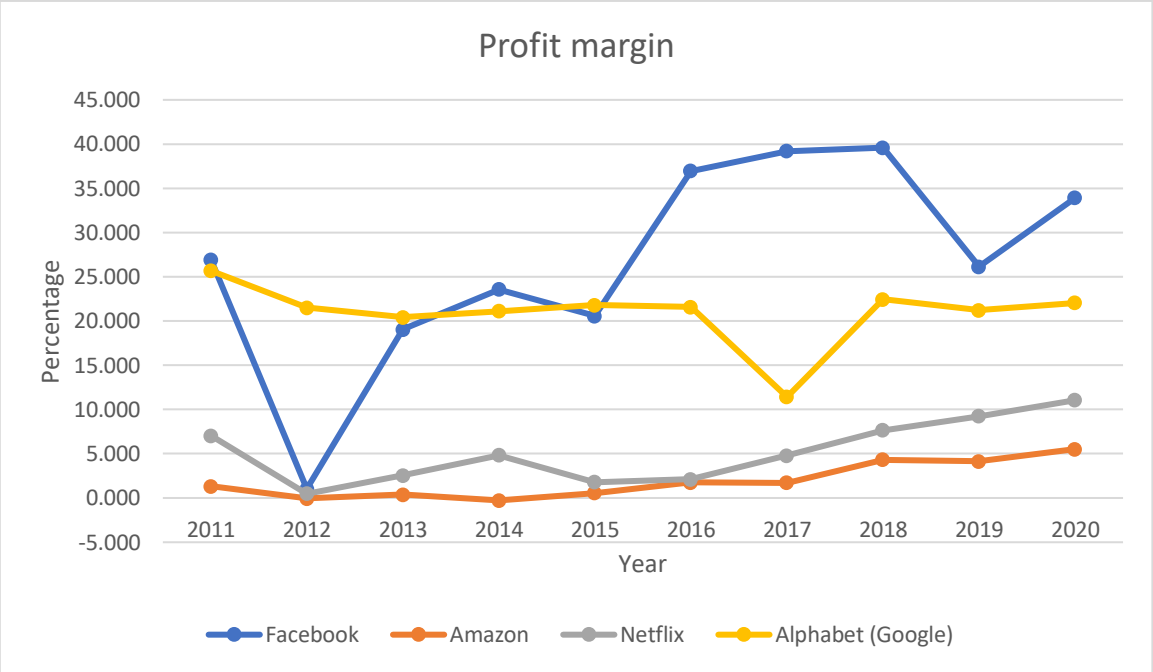
Profit margin indices net profit to sales ratio after tax deductions and expenses paid. In other words, its shows what proportion of sales was turned into profits, i.e., how many cents is gained by each dollar of sale. The higher the profit margin of a company, the more financial healthy it is. Since, our goal is to evaluate common shareholder's equity, we subtract preferred dividends from net income. Therefore, profit margin is defined by the formula below:

Formula 31: Profit margin

$$Profit\ margin = \frac{Net\ income - Preferred\ dividends}{Net\ sales}$$

In the Figure 9, Profit Margin for FANG members is presented in the graph:

Figure 9: Profit Margin



Own calculations based on data from Morningstar (see Appendix)

From the graph, we can summarize that Amazon and Netflix had relatively stable Profit Margin, however the values were lower, compared to Facebook and Alphabet. Netflix company experienced declines in 2012 and 2015 due lower net incomes these years. Moreover, Amazon had negative value in 2014 and 2016 since there were losses these years (the company had negative earnings). Therefore, Profit Margins of Netflix and Amazon showed a positive trend in growth of values, which increased by 36,13% and 76,26% respectively over the 10-year period.

As for Facebook, we can see a dramatic fall of net income in 2012 from 1 billion in the previous year to 53 million USD thus the value appeared to be much lower. However, in the subsequent years, the PM indicator leveled off and showed positive trend in growth with slight declined in 2015 and 2019. In a 2-year period, starting from 2012 to 2014, a growth in net income resulted in increase of PM value by 23,6%. In 2015, there was a small drop caused by relative increase of cost of revenue. In the following years, from 2015 to 2018, Profit Margin was rapidly increasing with an average value of 34% during this period. In 2019, income decreased by 16%, which leaded to lower ratio. Overall, Facebook is financial healthier nowadays than other firms from the group.

By contrast, a volatility of Alphabet's Profit Margin was not as high as Facebook's, except a drop of value in 2017. From 2011 to 2016, the value slowly declined by 16%, but in 2017 it plummeted by 53%, which can be explained by decreased income of the company. In general, Alphabet takes the 2nd place in measuring profit to sales ratio after Facebook.

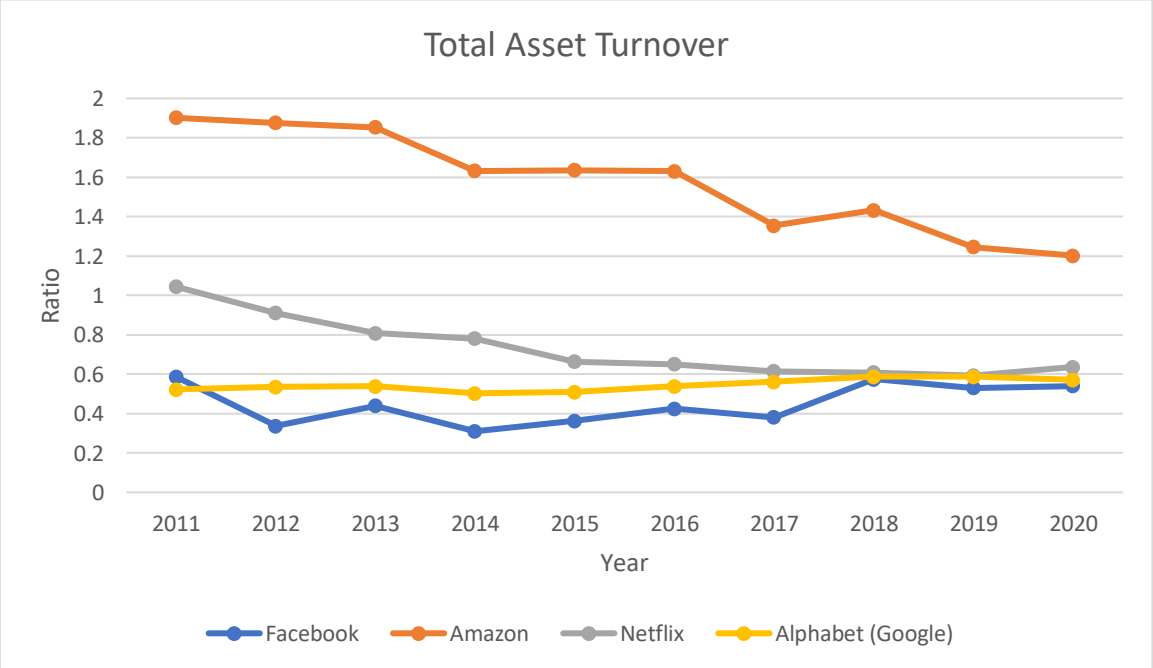
Total Asset Turnover

This indicator explains how effective a selected company uses its own total assets after deducting depreciation on long-term assets. Reilly and Brown (2011) clarify that this ratio can be volatile, depending on the sector of company's operation. For instance, in capital-costly sectors (e.g., auto manufacturing enterprises), the value can be lower than 1, while in retail firms it can exceed the value of 10. The higher ratio, the more efficient a firm can generate revenue from its assets. Therefore, we are interested in a company with higher values, meaning that firm can perform with fewer assets than a competitor thus less debt and capital is needed for operations. The formula and the graph for TAT are stated below:

Formula 32: Total Asset Turnover

$$Total\ Asset\ Turnover = \frac{Net\ sales}{Total\ Assets}$$

Figure 10: Total Asset Turnover



Own calculations based on data from Morningstar (see Appendix)

As it can be seen from the graph above, Amazon's TAT ratio is superior to values of other members of FANG. According to the line, noticeable drops were seen in 2014, 2017 and 2019 with 12%, 17% and 13% of decline respectively. It can be explained by expansion of companies' total assets and slower growth of net sales. Overall, the negative change in value is accounted for 63,2 in a 10-year period from 2011 to 2020. Despite the negative trend of TAT ratio, Amazon still effectively uses its own assets to generate income, compared to other selected companies.

From 2011 to 2019 TAT indicator of Netflix company was declining with 57% of total drop, however in 2020 the value increased by approximately 7%. In 2020, Netflix was 2nd in efficiency of assets usage among other firms.

By contrast, Alphabet showed fairly stable results of TAT with average value of 0,545. Overall, there were no dramatic fluctuations found during a chosen period. In the financial efficiency ranking, it takes the 3rd place following after Amazon and Netflix.

Last but not least, Facebook's TAT showed the most unstable values, ranging from 0,31 to 0,586 in a given period. Moreover, its indicator showed the lowest results so the enterprise has low ability to make earnings from its own assets.

Financial Leverage

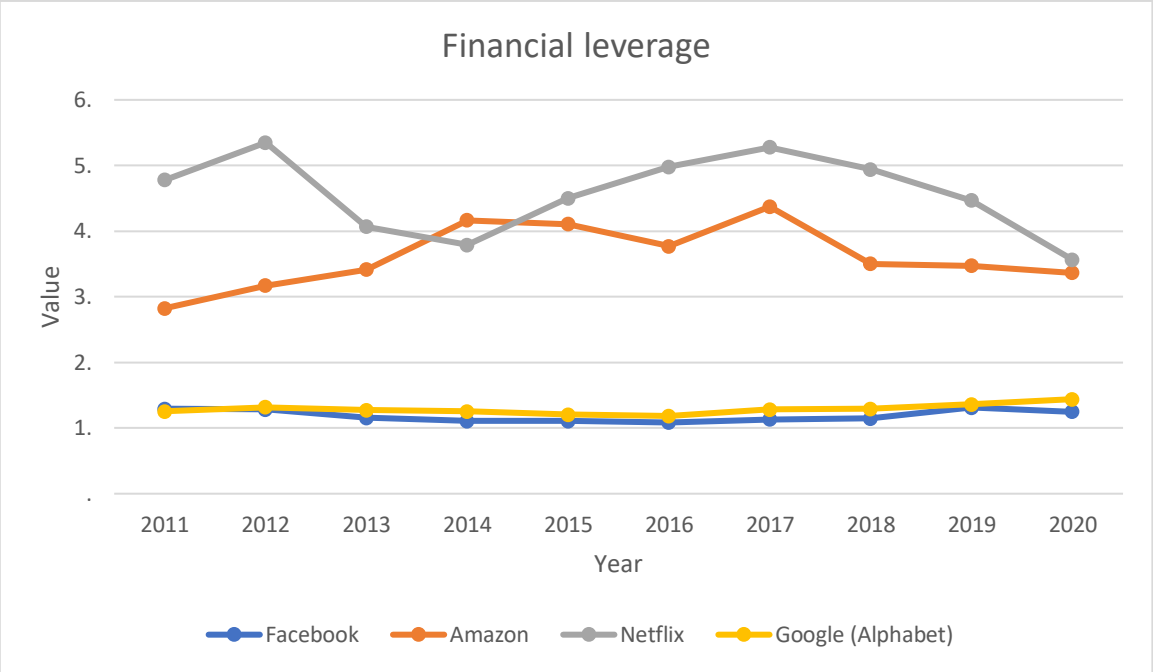
In a third part of ROE identification, a measure of financial leverage is represented by equity multiplier that shows what is the percentage of firm's assets financed by shareholder's capital. Reilly and Brown (2011) claim that, in general, assets can be financed by either equity or short-term and long-term debt. The higher the financial leverage ratio, the higher amount of debt is used for asset financing. Conversely, the lower equity multiplier, the lower debt is required to fund assets.

Formula 33: Financial Leverage

$$Financial\ Leverage\ (Equity\ Multiplier) = \frac{Total\ Assets}{Common\ equity}$$

In this case, common equity is represented by value of common stocks plus additional paid-in capital and retained earnings. For calculating common equity from the formula, we summarize capital stock (deducting a preferred stock from it) and retained earnings from balance sheet (see Appendix). The graph of financial leverage indicators for FANG group during a previous 10-year period is shown below:

Figure 11: Financial Leverage



Own calculations based on data from Morningstar (see Appendix)

From the Figure 11, it can be seen that Facebook's and Alphabet's lines of equity multiplier correspond to each other throughout a chosen period. Moreover, values of these companies are the lowest in the group and range between 1,085 and 1,44, meaning that the small proportion of stockholder's equity is used to finance assets of companies during business operations.

Amazon's financial leverage ratio was less stable compared to the previous two members from 2011 to 2020. After growth till 2016, the value slightly declined due to an increase of common equity. However, in 2017 the equity multiplier even surpassed previous values. In last three years, a financial leverage has been declining so the company is on the right way of financing assets less from shareholder's equity sources.

By contrast, Netflix shows the worst results among FANG members. In the period from 2012 to 2014, the firm was reducing its asset financing through equity, but starting with the year 2014, the values were going rapidly up till 2017. An overall increase in this period was accounted for approximately 40%. As well as Amazon, Netflix has shown decent outcomes, reducing the equity multiplier by 32,5%. We can conclude, that despite the highest amount of debt used for funding company's assets, it reduces the usage of capital needed for operations in last years.

To have clearer picture about financial leverage, we can use another indicator of Debt-to-Equity ratio that identify sources of financing in the company. There is a strong correlation between equity multiplier and Debt-to-Equity ratio. As financial leverage increases, the debt/equity indicator increases as well. A summary of companies' values is presented in the table below:

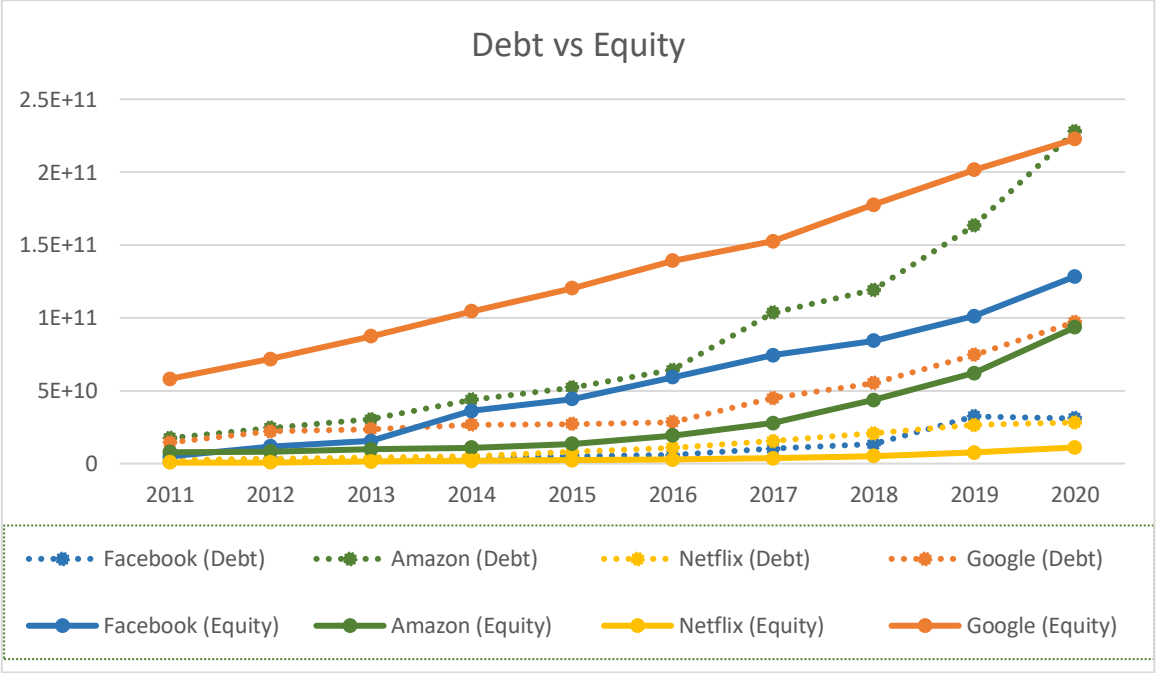
Table 8: Debt-to-Equity

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
FB	0,292	0,285	0,157	0,113	0,117	0,097	0,137	0,157	0,320	0,242
AMZN	2,259	2,974	3,121	4,074	3,890	3,325	3,739	2,735	2,630	2,439
NFLX	3,775	4,328	3,059	2,799	3,589	4,070	4,308	3,958	3,481	2,550
GOOG	0,248	0,308	0,270	0,255	0,225	0,205	0,294	0,311	0,370	0,436

Own calculations based on data from Morningstar (see Appendix)

As well as equity multiplier, Debt-to-Equity indicators shows quite similar results. An overall conditions of FANG companies' equity and debt are presented in the Figure 12:

Figure 12: Debt vs Equity



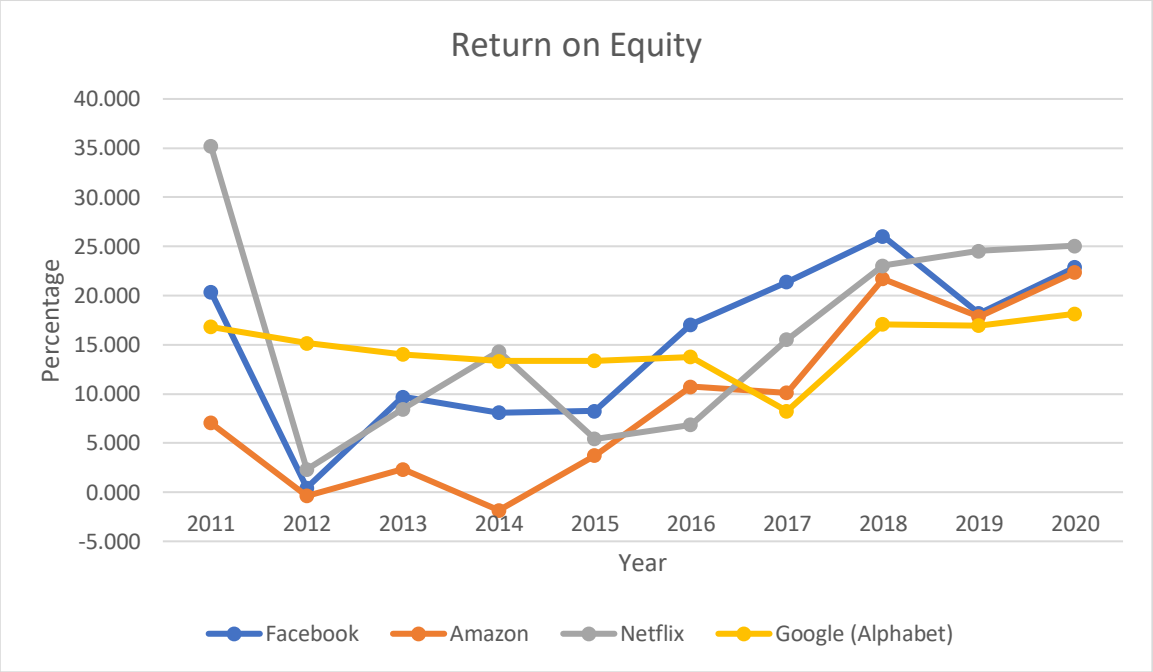
Own calculations based on data from Morningstar (see Appendix)

From the graph, we can clearly see that Google (Alphabet) has the highest shareholders' equity value, while Amazon is the most debt dependent company as in 2020.

Return on Stockholders' Funds

After examining all three components of ROE indicator, we are required to multiply them between each other. The results of this procedure are displayed in the figure below (see Appendix):

Figure 13: Return on Equity



Own calculations based on data from Morningstar (see Appendix)

From the Figure 13, we can summarize that ROE of Google (Alphabet) was less sensitive to changes in the company's structure with an average value of 14,689% at a 10-year period. From 2011 to 2016, the company had fairly stable values with a gradual decrease by 18% during the period. In 2017, there was a dramatic fall, caused by a decline in Profit Margin by 47% this year. However, in the following three year, the ratio levelled off with a positive growth in trend line. Despite minor changes in ROE over the chosen period, Google's indicator in the previous year showed lower performance than other members of FANG group. Overall, since 2011, ROE has increased by almost 8%.

Amazon's measure of financial performance was the only one that had negative values in 2012 and 2014. This was happened due to negative Profit Margins during these years as company faced financial losses. Starting from 2011, company's ROE was fluctuating up and down. From 2014 to 2016, there was a continuous increase by 2,87 times,

caused by a significant surge in Profit Margin. In 2017, the indicator slightly decreased, however in the next year the value doubled for the same reasons as in the previous increase. In general, the indicator has risen by more than 3 times over a 10-year time frame, having average ROE rate of 9,363%.

Facebook's ROE line almost repeats changes in the values of the previously described company. As well as Amazon's financial performance in 2012, there was a dramatic drop in the value, accounting for 98% of decline. From 2012 till 2018, the indicator was rapidly increasing, with exception of 2014, when value slightly decreased by 17%. In 2019, there was a slight decrease as well as it was seen in Amazon's ratio. Generally, Facebook takes the 3rd place in ROE ranking, considering the last year of 2020. The total growth over a given period has amounted for approximately 11% with average value of 15,245%.

Considering previous year of selected period, Netflix's ROE is the highest among its member of the group with value of 25,056%. In 2012, the company's performance plummeted by 93,5%, but increased in the next couple years by approximately 6 times. In 2014, the company experienced a decrease by 63%, however in the next year value levelled off and continued to increase till 2020. Average value during a 10-year period has accounted for 16,071%.

To sum up, we can reach the conclusion that examining ROE of all FANG members, Netflix's financial performance seems to be the most attractive. However, indicators of other firms have not gone so far, considering the previous year of period. Despite the fact that Google's (Alphabet) performance is lower at the moment, its ROE is less volatile.

Earnings per Share

There are other ways to measure enterprises' profitability by calculating Earnings per Share (EPS) and Dividend per Share (DPS) ratios. However, we have already identified that our chosen companies have not paid dividends last year hence the second indicator will not be used as its application seems to be impractical. Pike and Neale (2009) defines EPS as relationship between earnings represented by after tax income and equity stock. Unlike previous indicators, this ratio emphasizes more on stockholders rather firm's performance. They also determine EPS by the following formula below[7]:

[7] Preferred dividends were deducted from Net Income since our focus primarily lies on common stock.

Formula 34: Earnings per Share

$$EPS = \frac{Profit\ after\ tax - Preferred\ Dividends}{Average\ Outstanding\ Shares}$$

In the Table 9, EPS ratio of FANG companies is presented in the period from 2011 to 2020:

Table 9: Earnings per Share

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
FB	0,49	0,02	0,62	1,12	1,31	3,56	5,49	7,65	6,48	10,22
AMZN	1,39	-0,09	0,60	-0,52	1,28	5,01	6,32	20,68	23,46	42,64
NFLX	0,61	0,04	0,28	0,63	0,29	0,44	1,29	2,78	4,26	6,26
GOOGL	15,1	16,42	19,43	21,37	23,11	28,32	18,27	44,22	49,59	59,15

Source: Morningstar annual reports (Income statement)

From the given table, it is clearly seen that Amazon went from negative EPS to extremely high values (such as 42,64 USD in 2020) in the previous three years, compared to other enterprises. Facebook and Google showed a gradual growth, while Netflix's EPS have not had high fluctuation, ranging from 2,55 to 4,07. Although, Netflix's indicator is not that volatile as others', in the last year it showed the lower result of firm's performance.

5.2.4. Application of valuation models

In this part of work selected valuation approaches are applied on FANG stocks to identify intrinsic values. Before beginning valuation process, certain assumptions should be specified and it is crucially important to identify input indicators such as growth rates, rate of returns and discounting factors. They are vitally needed for future calculation of FCFF and FCFE models. At the end, valuation using multiples is carried out to complement our outcome of underlying values of chosen stocks. For estimating future cash flows, it is decided to choose 5-year projection period. Usually, analysts and investors forecast for 10-years or 20-years horizon. However, given the circumstances that were caused by the global pandemic of 2020, it was found that this time frame is more suitable and practically acceptable for the given period. Moreover, in the absolute valuation, two-stage FCFF and FCFE models are utilized since tech companies have tendency to grow rapidly than other

stable firms (the first stage is represented by 5-year period, as mentioned before, while the second stage is perpetual).

One of the most significant and challenging parts in valuing equities through the DCF is the projection of free cash flows. When it comes to prediction of annual amount of FCF, there is no strict rule for this process, and can be established based on analyst's estimates. For example, assuming a high growth rate of FCF in the long-term, the result of terminal value in the final year could be much greater in reality and nearly impossible to achieve, considering all factors and risks in to account. By contrast, assuming a relatively low projected increase in free cash flows, we expect that company's management will not be able to introduce innovation, reinvest into firm, enhance business process that a potential firm's estimation will be decreased.

Determining growth rates

As proposed by Reilly and Brown (2011), the growth potential of firm can be determined by two factors: the amount funds invested back into enterprise and rate of return from these resources. The first factor is represented by return on company's equity (ROE) and the second one is defined by investment rate. Therefore, investors seek to a company, which reinvests its income back into the firm more, meanings that it has great chances to expand its business.

To determine a retention rate of companies, net income and dividend payments must be examined. Since none of chosen technological companies have ever declared dividends, we may ignore retention rate. This means that each member of FANG group reinvests all earnings back into the company as there were never dividend payouts. The calculation of rate of investment is provided as follows:

$$Retention\ Rate = \frac{Net\ Income - Dividends\ Payouts}{Net\ Income} = 1,$$

Since rate of investment is always equal to 1 for each company, ROE indicator will be the only used as growth rate. To identify firms' potential in the first stage, average calculated value in the previous 10-year period was taken. As for the second stage, terminal growth rate is applied as we expect that FCF will grow indefinitely after projected period. Unlike the ROE, this value is defined separately for each enterprise, based on examination of its previous financial performance.

The foundation of perpetual growth is projected real GDP of the USA for the future year. As we have recently discovered, the US Bureau of Economic Analysis predicted the increase of US real GDP rate by 3,2%. It is also known that nowadays tech corporations are showing the highest performance among any industries and even over pacing the country's economic growth. Considering these factors, terminal growth potential can be slightly greater, accounting for 4% for each company, except Amazon and Alphabet. The exclusion of these companies is explained by extremely high values of EPS ratio in the last year of 2020 for Amazon and Google (42,64 and 59,15 respectively compared to 18,47 of average among other members of FANG). For these companies, an expected indefinite growth after forecasting period is set on 6%. A summary of established growth rate for each company is shown in the Table 10:

Table 10: Selected growth rates

	Growth rate of the first stage (average ROE)	Terminal growth rate (in perpetuity)
Facebook	15,245%	4%
Amazon	9,363%	6%
Netflix	16,071%	4%
Google	14,689%	6%

Own calculations based on data from Morningstar (see Appendix)

Estimating discounting factors

Analyzing Free Cash Flow models, it is required to discount present value of FCF by appropriate rate. While the firm value's interest rate is represented by WACC, the equity approach utilizes cost of equity only as debt is not counted in this model. Initially, we identify equity cost for each company since it is the component of cost of capital and will be used in WACC calculations. All indicators are taken from year 2020, as we are interested in recent values.

The elements of equity cost are based on opportunity cost and include risk-free rate, beta coefficient and market risk premium. Risk-free base is represented by recent yield of US 10-year Treasury Bond, whose value is 1,69% as on 22nd of March, 2021. Systematic risk, represented by beta coefficient, is taken from Yahoo! Finance data, calculated in the previous 5-year period of returns monthly. Market risk premium is defined by S&P US

equity risk premium index of annualized 10-year period, which is accounted for approximately 6% of total return. Therefore, summarizing the required data, discounting rates for FCFE are calculated using CAPM by adding a multiplied value of beta and equity risk premium to risk-free rate, which are showed in the Table 11:

Table 11: Cost of Equity summary

	Facebook	**Amazon**	**Netflix**	**Alphabet**
Risk-free rate	1,69%	1,69%	1,69%	1,69%
Beta (β)	1,25	1,13	0,83	1
Equity risk premium	6%	6%	6%	6%
Cost of Equity	***9,19%***	***8,47%***	***6,67%***	***7,69%***

Own calculations based on data from US Department of the Treasury, Yahoo! Finance, S&P 500 Global,

Calculations of Cost of Equity:

Facebook: $1{,}69 + 1{,}25 * 6 = 9{,}19\%$

Amazon: $1{,}69 + 1{,}13 * 6 = 8{,}47\%$

Netflix: $1{,}69 + 0{,}83 * 6 = 6{,}67\%$

Google: $1{,}69 + 1{,}00 * 6 = 7{,}69\%$

From the table 11, it can be seen that Netflix has the lowest required rate of return among FANG group as its stock prices less volatile than market (β<1), while Facebook's cost of equity is the highest among members, meaning that market values of shares fluctuate more that market itself (β>1).

As we have already mentioned, to determine discount factors for firm valuation model, elements of WACC must be examined. One of the components – cost of equity, was previously calculated so market value of equity, debt and its cost are described below.

The after-tax cost of debt calculation requires three variables: interest expenses, tax rate and market value of debt itself. Interest expenses were taken from income statements, representing net interest expenses account. Tax indicator is calculated on the basis of effective tax rate average in the previous two-year period (2019 and 2020). Market value of debt is defined from 10-K form of US Securities and Exchanges Commission reports. To determine the post-tax value of debt cost, interest tax shield (interest expenses multiplied by (1-Tax Rate)) are divided by debt. Total representation of cost of debt calculations is seen in

the Table 12 (values for interest expenses and debt are displayed in million USD, while tax rate is expressed in percentages):

Table 12: After-tax Cost of Debt summary

	Facebook	**Amazon**	**Netflix**	**Alphabet**
Interest expenses	20[8]	1092	1385,94	135
MV of Debt	9631	73797	21857,087	15201
Average 2 year tax rate	18,76%	15,18%	11,58%	16,0%
After-tax Cost of Debt	***0,168%***	***1,65%***	***5,6%***	***7,46%***

Own calculations based on data from US Securities and Exchange Commission, Morningstar (see Appendix)

Calculation of Cost of Debt:

Facebook: $\frac{20}{9631} * (100 - 18{,}76) = 0{,}168\%$

Amazon: $\frac{1092}{73797} * (100 - 15{,}18) = 1{,}65\%$

Netflix: $\frac{1385{,}94}{21857{,}087} * (100 - 11{,}58) = 5{,}6\%$

Google: $\frac{1730}{15201} * (100 - 16) = 7{,}46\%$

These results show that Facebook pays the lowest 0,168% on its debt after taxes paid on interest, while Google's cost of debt is 7,46%, which is the highest among FANG group.

Another component of WACC is market value of equity. It is defined by multiplication of current stock price and number of outstanding shares Tthe first variable is represented by US dollars, the second one is determined by units, market capitalization is expressed in billions USD. Collected data for calculating market capitalization of companies is represented in the Table 13 (current prices of stocks are taken from Yahoo! Finance data as on 26th of March, 2021, number of shares outstanding are extracted from balance sheets):

Table 13: Market Value of Equity summary

	Facebook	**Amazon**	**Netflix**	**Alphabet**
Price of stock	280,35	3038,77	502,66	2032,09
Number of shares	2849000000	527000000	442895261	675222000
MV of Equity	***798,71715***	***1601,43179***	***222,62573189426***	***1372,11187398***

Own calculations based on data from Yahoo! Finance, Morningstar (see Appendix)

[8] In 2020, Facebook had no interest expenses and no long-term debt. In this case average value from 2019 and 2020 was taken for interest expense and capital lease obligation were counted as current debt.

Calculation of MV of equity:

Facebook: $280{,}35 * 2849000000 = 798{,}71715\ bln.USD$

Amazon: $3038{,}66 * 52000000 = 1601{,}43179\ bln.USD$

Netflix: $502{,}66 * 442895261 = 222{,}62573189426\ bln.USD$

Google: $2032{,}09 * 675222000 = 1372{,}11187398\ bln.USD$

Market capitalization of Amazon is the highest among members and exceeds 1,6 trillion USD, while Netflix has the lowest value with 0,222 trillion USD compared to others.

After defining all constituents of cost of capital, including MVs of equity and debt, Costs of equity and debt were defined, WACC is calculated, based on summary of gathered information in the table below (MV of equity and debt are expressed in billions USD, Costs of equity and debt are represented in percentage):

Table 14: Weighted Average Cost of Capital summary

	Facebook	**Amazon**	**Netflix**	**Alphabet**
MV of Equity	798,7171	1601,4318	222,6257	1372,112
MV of Debt	9,631	73,797	21,857087	15,201
Cost of Equity	9,19	8,47	6,67	7,69
Cost of Debt	0,168	1,65	5,6	7,46
WACC	***9,0825165%***	***8,1288719%***	***6,5749345%***	***7,6874819%***

Own calculations based on data from Morningstar (see Appendix)

Calculation of Weighted Average Cost of Capital:

Facebook: $\frac{798{,}7171}{798{,}7171+9{,}631} * 9{,}19 + \frac{9{,}631}{798{,}7171+9{,}631} * 0{,}168 = 9{,}0825165\%$

Amazon: $\frac{1601{,}4318}{1601{,}4318+73{,}797} * 8{,}47 + \frac{73{,}797}{1601{,}4318+73{,}797} * 1{,}65 = 8{,}1288719\%$

Netflix: $\frac{222{,}6257}{222{,}6257+21{,}857087} * 6{,}67 + \frac{21{,}857087}{222{,}6257+21{,}857087} * 5{,}6 = 6{,}5749345\%$

Google: $\frac{1372{,}112}{1372{,}112+15{,}201} * 7{,}69 + \frac{15{,}201}{1372{,}112+15{,}201} * 7{,}46 = 7{,}6874819\%$

Therefore, expected return to stockholders is higher in Facebook's value, amounting for 9,08%, while the lowest opportunity cost of taking the risk of investing into a firm is seen in Netflix value with 6,575% of WACC.

5.2.4.1. FCFF valuation

After required assumptions for FCFF model were established, the following step of valuation is to forecast future free cash flows of selected companies. Free cash flows calculations were provided for covered period from 2011 to 2020 (see Appendix), however to project FCF, the last year, which is 2020, is needed to be estimated. In the table below, components of FCFF approach are estimated for each (values are expressed in millions USD):

Table 15: FCFF base year (2020)

	Facebook	**Amazon**	**Netflix**	**Alphabet**
Net Income	29146	21331	2761,395	40269
Non-cash exp.	12324	31252	11476,839	23028
ASCA[9]	N/A	N/A	-11779,284	N/A
Interest	N/A	1425,12154150198	1196,220789	109,329991
ΔNWC	-2723	13481	-31,873	1827
CapEx	-15115	-40140	-497,923	-22281
FCFF	***23632***	***27349,1215415***	***3125,374789***	***42952,329991***

Own calculations based on data from Morningstar (see Appendix)

FCFF values are positive, explaining that firms have left cash after all expenses deducted. The final year (2020) is now considered to be a base year for future projections. Assuming previously established growth rates, FCFF for the next 5-year period and values of terminal year are forecasted in the Table 14 (values are expressed in millions USD):

Table 16: FCFF projections

	Facebook	**Amazon**	**Netflix**	**Alphabet**
2020	23632	27349,1215415	3125,37478939	42952,329991
2021P[10]	27234,79321647	29909,93870174	3627,66106881	49261,81162
2022P	31386,84671394	32710,53630679	4210,67094893	56498,124422
2023P	36171,897426	35773,36604221	4887,37770807	64797,41524402
2024P	41686,44831773	39122,98184254	5672,83959042	74315,83022044
2025P	48041,71461842	42786,23673393	6584,53488576	85232,45256861
Terminal Year	***983044,18728052***	***2131105,93688301***	***266063,04707536***	***5356637,8023325***

Own calculations based on data from Morningstar (see Appendix)

[9] Additions to Streaming Content Assets (Available only for Netflix company).
[10] "P" stands for projected year.

After future cash flows were determined, value of FCFFs and terminal value are discounted at chosen rate, based on WACC indicator as calculated previously. Total sum of present values is shown in the following table:

Table 17: Present values of FCFF and TV

	Facebook	Amazon	Netflix	Alphabet
2021P	24967,14788555	27661,56183022	3403,89594192	45745,524624
2022P	31130,04838784	32495,84588491	4192,55292572	56166,270472
2023P	36144,81643128	35754,16592474	4885,98967142	64768,000329
2024P	41683,61176979	39121,27425633	5672,73365117	74313,23598744
2025P	48041,417693,4	42786,08493644	6584,52680215	85232,22386009
PV of TV	***636498,37184155***	***1441819,55788116***	***193522,92279514***	***3698992,48660647***
Sum of PV	***818465,414009,4***	***1619638,49071379***	***218262,62178752***	***4025217,7418798***

Own calculations based on data from Morningstar (see Appendix)

Considering all necessary indicators that required for identification of intrinsic value, it can be found by dividing sum FCFE and TV present values by number of outstanding stock (all values are expressed in US dollars, number of shared is represented by units)

Table 18: Intrinsic value from FCFF

	Facebook	Amazon	Netflix	Alphabet
Number of Shares	2849000000	527000000	442895261	675222000
Sum of PVs	818465,414009,4	1619638,49071379	218262,62178752	4025217,7418798
Intrinsic value	***287,28***	***3073,32***	***492,80***	***5961 ,32***
Market value	280,35	3038,77	502,66	2032,09
Investment decision	***Buy/Hold***	***Buy/Hold***	***Sell/ Not to buy***	***Buy/Hold***

Own elaboration based on data from Morningstar, Yahoo! Finance (see Appendix)

According to estimates through FCFF approach, Facebook, Amazon and Alphabet stocks are undervalued towards current market price, fair price of Netflix's securities is overvalued compared to market value. Investment recommendation to buy or hold a certain stock can be applied for Facebook, Amazon and Google, while Netflix's shares should not be bought or sold in case of their possession.

5.2.4.2. FCFE valuation

The process of FCFE valuation is similar to the previous procedure, however it differs in variables included in the model, which were described in methodological part.[11] Firstly, we examine last year of forecasting period. FCFE elements are determined in the Table 19 (data is expressed in millions USD):

Table 19: FCFE base year (2020)

	Facebook	Amazon	Netflix	Alphabet
Net Income	29146	21331	2761,395	40269
Non-cash ex.	12324	31252	11476,839	23028
ATSS	N/A	N/A	-11779,284	N/A
ΔNWC	-2723	13481	-31,873	1827
CapEx	-15115	-40140	-497,923	-22281
Debt rep.	-604	-10695	N/A	N/A
FCFF	***23028***	***15229***	***1929,154***	***42843***

Own calculations based on data from Morningstar (see Appendix)

FCFE values and terminal value are projected in the following 5-year period at chosen growth rates, considering base year of 2020. The results from FCF forecast are shown in the table (values are in millions USD):

Table 20: FCFE projections

	Facebook	Amazon	Netflix	Alphabet
2020	23028	15229	1929,154	42843
2021P	26538,7109931	16654,95748365	2239,192843	49136,42160176
2022P	30584,64396279	18214,43356636	2599,058753	56354,31523998
2023P	35247,39564683	19919,93017509	3016,759554	64632,48121537
2024P	40621,00253303	21785,11984657	3501,590025	74126,66821106
2025P	46813,83734906	23824,95533658	4064,338733	85015,50360976
Terminal Value	***604402000838,75***	***680914850969,92***	***114630582312,86***	***3681632267155,24***

Own calculations based on data from Morningstar (see Appendix)

The subsequent step is to discount obtained values of free cash flows to previously calculated cost of equity. The outcome of discounting can be seen in the Table 21:

[11] As it was described in literature review, FCFE approach deducts debt repayments compared to FCFF model.

Table 21: Present value of FCFE and TV

	Facebook	Amazon	Netflix	Alphabet
2021P	*24305,07463421*	*15500,19309786*	*2099,17769145*	*4562,765493710*
2022P	*30328,50126919*	*18113,89691004*	*2587,54704118*	*56023,01696661*
2023P	*35220,05954271*	*19911,69681540*	*3015,86462321*	*64603,10252753*
2024P	*40618,10531148*	*21784,44877063*	*3501,52072083*	*74124,07603407*
2025P	*46813,53048293*	*23824,90065860*	*4064,33336783*	*85015,27498215*
PV of TV	***604402000838,75***	***680914850969,92***	***114630582312,86***	***3681632267155,24***
Sum of PV	***781687,27207927***	***779870,66344655***	***129899,02575735***	***4007025,39260271***

Own calculations based on data from Morningstar (see Appendix)

By summarizing all data needed for fair value calculation, sum of present values is divided by total quantity of stocks:

Table 22: Intrinsic value from FCFE

	Facebook	Amazon	Netflix	Alphabet
Number of Shares	2849000000	527000000	442895261	675222000
Sum of PVs	781687,27207927	779870,66344655	129899,02575735	4007025,39260271
Intrinsic value	***274,37***	***1479,83***	***293,29***	***5934,38***
Market value	280,35	3038,77	502,66	2032,09
Investment decision	***Sell/ Not to buy***	***Sell/ Not to buy***	***Sell/ Not to buy***	***Buy/Hold***

Own elaboration based on data from Morningstar, Yahoo! Finance (see Appendix)

Valuation using FCFE model brought significantly lower results for some firms, thus investment recommendation for Facebook and Amazon has changed when using FCFF from Buy/Hold to Sell/Not to buy. Therefore, a detailed description of outcome from FCFF and FCFE models and discussion of obtained results will be provided in the following part.

5.2.4.3. Relative valuation

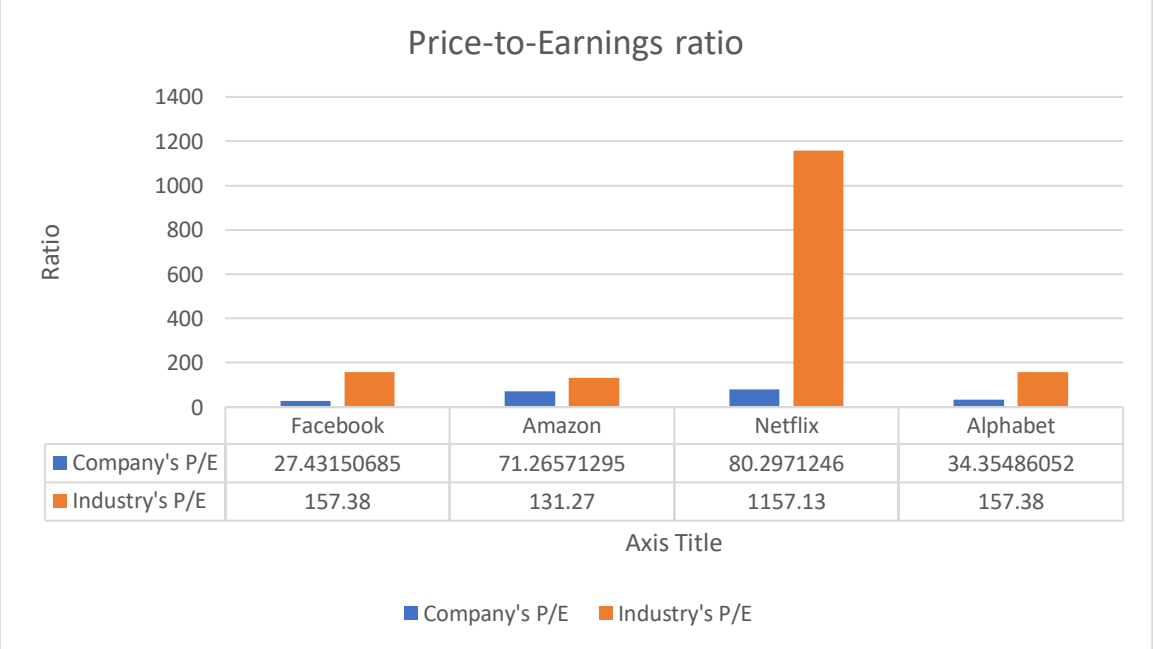
This part is devoted to applying of relative valuation methods on selected stocks: P/E, P/B, P/S and P/CF multiples, which were previously described in literature review. Each ratio is compared to subindustry's average, collected by A. Damodaran, except P/CF indicator since subsector's value was not provided.

Firstly, it is required to identify subsectors of FANG companies. According to Damodaran's findings (2021), they are classified as follows:

- Facebook – software (entertainment)
- Amazon – retail (online)
- Netflix – entertainment
- Google (Alphabet) - software (entertainment)

The companies can be collated only when operating in the same industry hence Facebook and Alphabet can be compared to each other. The first ratio that is aimed to examine is earnings multiplier. Price of stock is determined as of 26th of March, 2021, Earnings per Share are extracted from income statements of 2020, industries' averages are ensured by Damodaran's sheet. Summary of P/E results is shown in the Figure 14:

Figure 14: P/E ratio

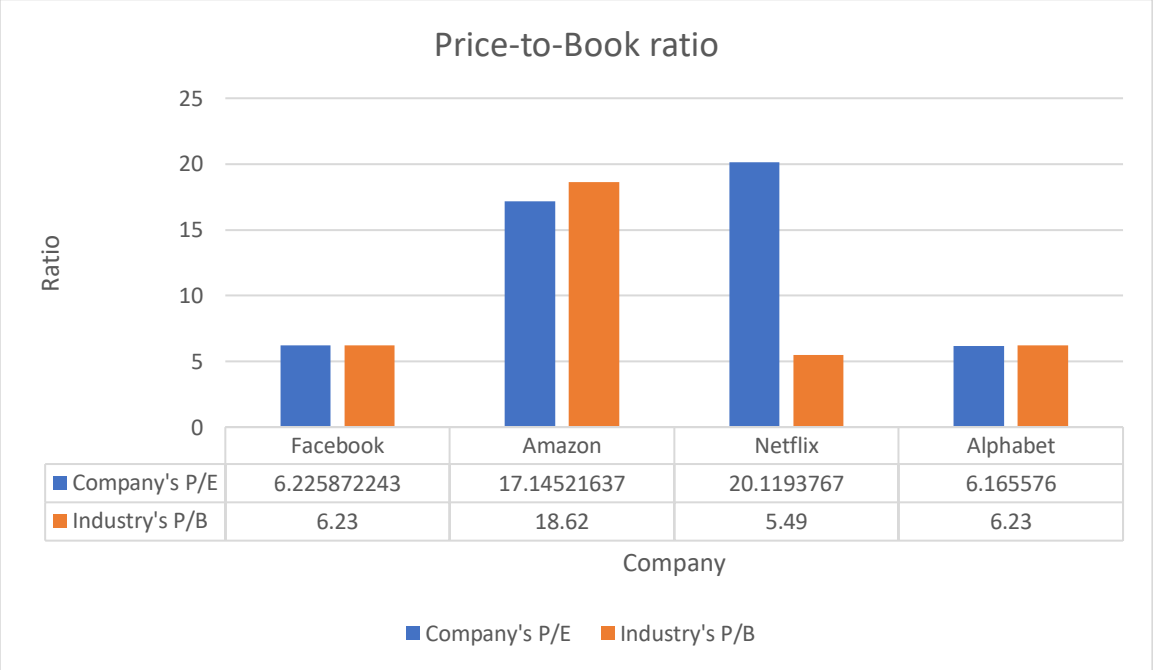


Own elaboration based on data from Yahoo!! Finance, Morningstar (see Appendix)

Netflix has the highest P/E ratio (80,297) among FANG members, which explains that investors have higher expectations in future growth of income. However, compared to industry, the outcome for Netflix is much lower than group's average hence I suggest to buy/hold the stock. As for Amazon, P/E indicator is above 70, but approximately 2 times lower than sector's ratio thus it is also recommended to buy or hold shares. The lowest value was obtained for Facebook, meaning that potential investor pays 27,43 USD for every dollar that company earns. The ratio is also almost 6 times lower than sector's average so the stock can be purchased or hold in the case of possession. Operating in the same industry, Alphabet's P/E value is slightly higher than Facebook's thus these stocks can also be bought.

Another multiplier, which is Price-to-Book ratio is calculated by dividing current market value of share by Book value (difference between assets and liabilities) per stock. The outcome of calculation is shown in the following figure:

Figure 15: P/B ratio



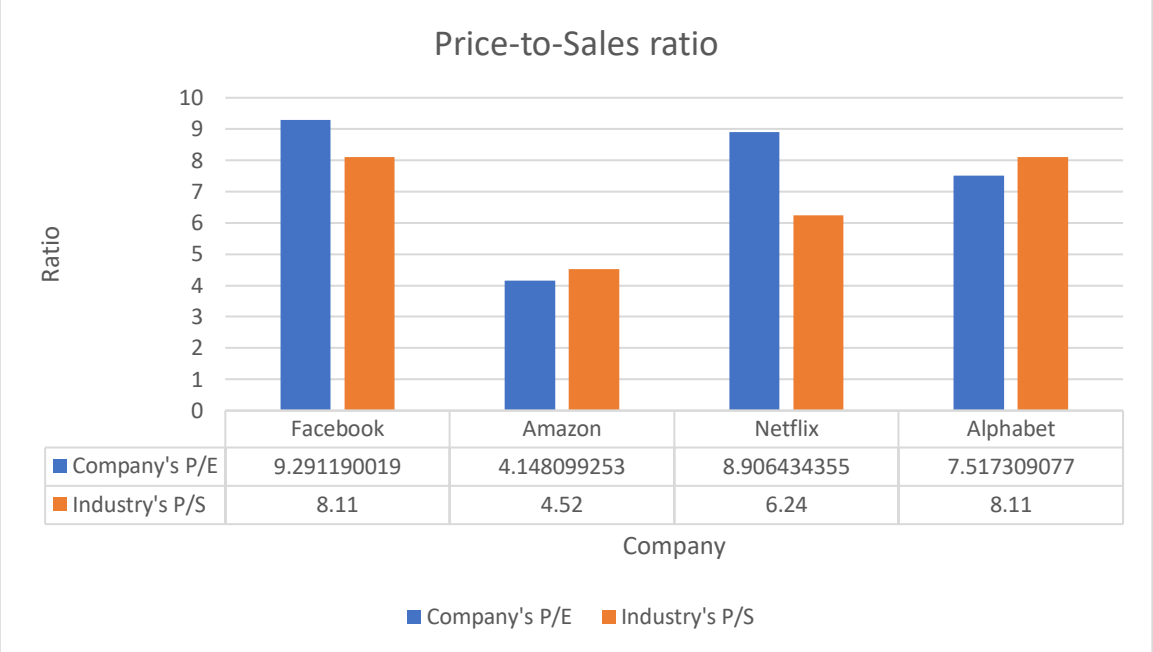
Own elaboration based on data from Morningstar (see Appendix)

Netflix's P/B ratio implies that stocks are overvalued compared to industrial average as market value of shares is almost 4 times more expensive than assets of the company Indicator of Amazon also shows high results in P/B (17,14), however it is still lower than sector's average (18,62). As for other stocks such as Alphabet and Facebook, their P/Bs indicate values (6,22 that are very close to industry's average with lowest ratios in the FANG

group, however Alphabet seems to be preferable, operating in the same sector due to lower P/B value.

Price-to-Sales indicates how market price of stock in relation to sales generated per share. This ratio can be calculated with our any accounting adjustments as variable are directly taken from income statements. In the Figure 16, P/S ratio is shown:

Figure 16: P/S ratio



Own elaboration based on data from Morningstar (see Appendix)

P/S multipliers of Facebook and Netflix exceed ratio of the sectoral averages. Moreover, their values are the highest among FANG remember thus it recommended selling or not buying these stocks. As for Amazon and Alphabet, P/S ratios of these firms are lower than average in the industry thus stocks are recommended to be purchased.

Last but not least, P/CF ratio is examined, which represents the among of cash generated by a certain company in relation to market value of share. As it has been already mentioned, data for industry P/CF I not available hence companies' values are compared among each other. The outcome of P/CF calculations is shown in the Table 23:

Table 23: P/CF ratio

	Facebook	**Amazon**	**Netflix**	**Alphabet**
P/CF ratio	20,61365138	24,24061198	15,67084857	21,0692199

Own elaboration based on data from Morningstar (see Appendix)

6. Results and discussion of valuation

In FCFF valuation, value of firm was obtained for each company of FANG group. Intrinsic value of Facebook's share is 287,28 USD, which is higher by 2,47%, meaning that this stock is worth than its market price thus it is recommended to buy or hold it. Fair price of Amazon stocks was established as 3073,32 USD per share. Considering that it was traded as of 26.03.2021 at 3038,77 USD, the real value is slightly higher by 1,1%, investor are advised to purchase these shares. Netflix's true price was identified as 492,80 USD per stock, while recent market value was 502,66 thus this security is overvalued by and investors should sell it or give up on buying it. According to firm valuation method, Alphabet's (Google) stocks are undervalued by approximately 3 times, accounting for 5961,32 USD of intrinsic price per share. Such significant difference can be explained by higher net income gained in the base year (2020), compared to net earnings generated by other FANG members (Alphabet's value exceeds 40 billion USD, while other's is less than 30 billion USD) and relatively small number of common stocks issued.

FCFE procedure was similar to previous approach, however when calculating values, debt repayments were subtracted additionally. True value of Facebook was calculated as 274,37 USD, which is lower by 2% than market price. It explains that the stock should be sold or not purchased. Amazon's share was valued at 1479,83 USD, which is twice as lower as current market value. The results are also different compared to FCFF approach with double decrease in value as Amazon had high debt repayment in previous years (e.g., 10,695 billion in 2020). The underlying price of Netflix was also estimated lower at 293,29 USD, which is more than 40$ lower than current value, at which it is traded. As well as in the case of Amazon, streaming service company had high repayment for lease obligations. The intrinsic value of Alphabet obtained from FCFF and FCFE was similar as there were lack of debt repayments for this company.

In relative valuation, various multiples were examined. Based on P/E ratio, stocks of all FANG firms are recommended to be purchased as their ratios are below the sectorial average. Moreover, while operating in the same industry, Facebook stocks are more preferred than Alphabet's. However, by contrast, considering P/B indicator, Google's securities look more attractive to investors rather than Facebook's shares. Another multiplier P/S showed that Amazon and Alphabet's stocks are recommended for buying as their values are below average in the sectors, while Facebook and Netflix' share are assumed to be overvalued thus investor should sell them or give up on purchasing. Last but not least

indicator that was examined is P/CF ratio. Since the sectorial average were not provided, it is challenging to make conclusions of undervaluing or overvaluing of stock.

Comparison of the results with Morningstar's estimates

In this part, author's results from stock valuation are compared to fair values that Morningstar proposed according to its estimates. Initially, it is required to examine methods that the agency used for valuation procedure. Therefore, some facts about Morningstar's stock valuation methodology are stated below:[12]

- A foundation for equity assessment lies in projection of expected cash flows hence the main method of absolute valuation is Discounted Cash Flow approach. Free Cash Flow to Firm and Equity models are applied in valuation process, however, which type of DCF is utilized for a certain company is not mentioned. It is only stated that FCFE is used primarily for financial firms.
- Projections of future cash flows are made for the period from 5 to 10 years. Forecasts are performed using data from financial statements, where each indicator of financial performance is predicted individually based on in-depth analysis of factors that cause changes in values of variables.
- Growth rates are established according to three factors: growth for Earnings Before Interest over the selected period, normalized Retention Rate, average of Return on Invested Capital. Moreover, Morningstar's analysts take into consideration the length of projection period when estimating growth potential of business.
- The Weighted Average Cost of Capital is used as discount rate, where all funding are sources are collected, including preferred shares.
- Capital Asset Pricing Model is used to calculate Coast of Equity. For some enterprises, besides basic variables of CAPM, Morningstar includes expectations on level of inflation.
- There fair prices are determined in a specific 5-star range, where 1-star rating assumes that the specified price of stock above this value is considered to be significantly overvalued and the agency recommends to sell or give up on purchasing the stock. By contrast, 5-star rating implies the market value of stock, below which

[12] According to Morningstar Equity Research Methodology (See References).

it is believed to be highly undervalued thus Morningstar encourages investor to buy or hold certain shares.

Consequently, the methods of valuation procedure proposed by Morningstar, some substantial differences between author's valuation techniques must be mentioned. Firstly, it is not clear, what is the projection period for specific companies (there were no information found about forecast horizon), listed in Morningstar valuation so when comparing the results, it must be taken into account. Secondly, author used multiplication of Rate of Investment and Return on Equity as a sustainable growth rate of expected free cash flows compared to more complex methodology of identification for future business potential. The WACC considers preferred stock, while author excludes it, emphasizing on number of common shares outstanding. Moreover, inflation expectations are not considered when calculating required rate of return.

Considering the assumption, mentioned in Morningstar's stock valuation methodology part that FCFE method is applied mainly for financial enterprises, it is assumed that FANG stocks are estimated based on FCFF model as none of these companies operate in financial sector, but tech industry. Therefore, as all crucial distinctions between Morningstar's and author's methodologies were stated previously, the following table provides essential comparison of intrinsic values calculated using FCFF technique:

Table 24: Comparison of author's FCFF valuation with Morningstar's estimates

	FB	**AMZN**	**NFLX**	**GOOGL**
Author's fair value	287, 3 USD	3038,77 USD	492,59 USD	5958,48 USD
Morningstar's fair value	335 USD	3075,73 USD	250 USD	2605 USD
Market price (26.03.2021)	280,35	3038,77	502,66	2032,09
1-Star Price	>519 USD	>6200 USD	>437 USD	>4037 USD
5-Star Price	<201 USD	<2400 USD	<125 USD	<1563 USD
Uncertainty by Morningstar	High	High	Very high	High
Author's valuation date	26.03.2021	26.03.2021	26.03.2021	26.03.2021
Morningstar's valuation date	28.01.2021	03.02.2021	20.01.2021	03.02.2021
Morningstar's recommendation	***Buy***	***Buy***	***Sell***	***Buy***
Author's recommendation	***Buy***	***Buy***	***Sell***	***Buy***

Own elaboration based on author's findings and Morningstar's valuation

7. Conclusion

This diploma thesis was devoted on the application of certain absolute and relative valuation techniques on FANG stocks. It was discovered that tech companies, especially from FANG group tend to not perform dividend payouts hence the Dividend Discount Model was excluded from analysis as it is impractical to use it in non-dividend case. Therefore, it was decided that Free Cash Flow to Firm and Equity models are used as absolute valuation methods and multiples are utilized in relative valuation.

In practical part, three-step fundamental analysis was established. Macroeconomic situation and trends of tech industry were identified. Overall, at the moment the US economy is in recession cycle, however it is expected that the economy will recover as vaccination from COVD-19 will continue. As for tech sector, there is no doubt, it is booming nowadays and current trends of artificial intelligence, cloud computing, cybersecurity etc. might become a profound base for successful firm. In the last stage of top-down approach, profitability analysis was performed by implementing DuPont model, where it was discovered that Netflix had the highest return on equity in 2020. Last but not least, selected stocks were evaluated by methods described in theoretical part.

In the first part of valuation part, application of absolute methods using Discounted Cash Flow models. For estimating intrinsic value from Free Cash Flow to Firm and Equity procedures, crucial input determinants were calculated. Firstly, two-stage growth model was selected with 5-year of forecast horizon (from 2021 to 2025) in the first stage. Growth rate of expected Free Cash Flow for projection period of first stage was established based on average 10-year ROE and RR indicators. As for terminal period, the growth value was calculated based on US real GDP growth predictions adjusted by factors, highlighted in previously performed analysis of profitability (perpetual growth rate for Amazon and Alphabet was set on 6% level, while Facebook and Netflix's values are accounted for 4%). Discount rate are identified through Cost of Equity and Weighted Average Cost of Capital calculations, needed for analyzing fair values of share using FCFE and FCFF methods, respectively. Considering input determinant of DCF models, we can answer on the main questions of this work:

- *How different are the results received from various valuation approaches of selected companies used in this work?*

Compared to Firm's value, equity value of a company tends to be lower due to deduction of debt repayments. Facebook's intrinsic value using firm and equity valuation differs by 4,7%. The outcome of FCFE fair value for Amazon is decreased by more than 2 times in relation to FCFF as repayments for lease financial were significant in the previous years that affected projections of future Free Cash Flows. Netflix's entity and equity values are distinct between each other by approximately 40%. Alphabet's fair prices from two different DCF approaches are similar as there was lack of repayments hence it was only affected by changes in discounting rate.

Moreover, emphasizing on multiples valuation, Alphabet and Amazon's selected ratios were above industry's average thus these securities are recommended to be purchased, considering any of multiple ratios. It is recommended to sell Netflix and Facebook's stocks, if P/S ratio is used as valuation metrics.

- *Does any company show relatively good results among others to be an object of successful investment?*

When it comes to valuing stocks of the company, none of the models used in this work can serve as the most accurate since there are many unknown factors that should be studied. However, based on the outcome that was obtained during the analysis, some conclusions can be stated. Firstly, applying FCFF and FCFE approaches, it was seen that Alphabet's stocks are almost 3 times undervalued compared to current market price hence investors have good opportunity to buy the stock as the amount of future cash flows are expected to increase with high growth. Moreover, the firm has the highest Earnings per Share ratio with 59,15 of value among FANG members and quite low Debt-to-Equity ratio with 0,436 value. However, its ROE indicator is slightly lower than others' from the group, but more stable with low volatility in previous decade. Focusing on cloud computing and entertainment (e.g., YouTube), author believes that Alphabet corporation have profound prerequisites for company's growth of business.

Author suggests to provide a diversification of investor's portfolio rather than focusing on one certain stock only thus another company that might attract investors, based on author's estimates is Facebook as it is a low-debt firm (in 2020, there were no long-term debt booked) with substantial indicator of ROE in the previous and sufficient earnings per share ratio. However, as most of income Facebook generates comes from online advertising it is uncertain how the situation will be after the global pandemic. Furthermore, Facebook

attracted the attention of the authorities by recent personal data scandal so investors should assume that legal fees might significantly influence profits of the company in the future.

Amazon's stocks can also be considered as a good investment opportunity as it has high Earnings per Share with 42,64 of value and similar to Facebook, ROE level in 2020. One of the drawbacks of these securities, that investors must take into accounts, is high debt repayments, which are increasing every year. The company has good potential to growth as during COVID-19 era online retailers gain more than offline. However, the situation might be turned around quicky as the lockdowns will be over and offline retailers begin their normal business activity.

The author's outcome and Morningstar's estimates were also examined. According to the results, despite some distinction in values of stocks, the recommendations are matching each other.

To sum up, the chosen topic has a lot of potential to be developed as in-depth analysis can be performed for each FANG company. Thus, this work does not reflect full potential of top-down approach of fundamental analysis due to thesis requirements in volume limitations of work, but it just shows a profound step to broad stock valuation procedure. It would be interesting to provide the results of such comprehensive in-depth analysis of FANG stocks and compare them with author's findings.

8. References

Books:

BARKER R., *Determining values: Valuation models and financial statements*, 1st edition, Addison-Wesley Longman Ltd, 2001, ISBN-13: 978-0273639794

BLACKWELL, L, D. W., GRIFFITHS, M. D., WINTERS, D. B. *Modern Financial Markets: Pri ces, Yields and Risk Analysis*.1. issue. Phoenix: John Wiley & Sons, Inc., 2007, ISBN 978-0-470-00010-6

BREALEY R. A., MYERS S.C., ALLEN F., *Principles of corporate finance,* 9th edition McGraw-Hill, 2008, ISBN-13: 978-0071266758

CUNNINGHAM L.A., *The essays of Warren Buffett: lessons for corporate America*, 4th edition, The Cunningham Group & Carolina Academic Press, 2015, ISBN-13: 978-1611637588

DAMODARAN A. *The Dark side of valuation: Valuing young, distressed, and complex businesses,* 2nd edition, Pearson India, 2017, ISBN-13: 978-9386873255

DAMODARAN A. *Investment valuation: Tools and techniques for determining the value of any asset,* 3rd edition, John Wiley & Sons, Inc., 2012, ISBN-13: 978-1118011522

DUNHAM L. M., SINGAL V., *Equity securities*, Chapter 10, 3rd edition, CFA Institute Investment Foundations, 2018, ISBN 13: 978-1946442741

ELTON E. J., GRUBER M. J., BROWN S. J., GOETZMANN W. N. *Modern portfolio theory and investment analysis*, 9th edition, John Wiley & Sons, Inc.,2014, ISBN 978-1-118-46994-1

FISHER P.A., *Common stocks and uncommon profits and other writings*, John Wiley & Sons, Inc., 2003, ISBN 0-471-44550-9

FRANCIS J.C., KIM D., Modern Portfolio Theory: Foundation, Analysis and New Developments, John Wiley & Sons, Inc., 2013, ISBN 978-1-118-37052-0

GRAHAM B., TODD D.L., *Security analysis: Principles and technique*, 6th edition, The McGraw-Hill Companies, Inc., 2009, ISBN 0-07-159253-9

JONES C.P., Investments: Analysis and management, 12th edition, John Wiley & Sons, Inc., 2013, ISBN 978-1-118-36329-4

KOLLER T., GOEDHART M., WESSELS D. *Valuation: Measuring and managing the value of companies*, 6th edition, John Wiley & Sons, Inc., 2015, ISBN 978-1-118-87370-0

MELICHER R.W., NORTON E.A., Introduction to finance, 15th edition, John Wiley & Sons, Inc., 2014, ISBN 978-1—118-49267-3

PALAT R., *Fundamental analysis for investors*, 1st edition, Vision Books Pvt. Ltd., 2016, ISBN 13: 978-81-7094-942-8

PIKE R., NEALE B., *Corporate finance and investment: Decisions and strategies*, 6th edition, Pearson Education Limited, 2009, ISBN 978-0-273-71550-4

REILLY, F. BROWN, K. *Investment analysis and portfolio management*. 7th edition, South-Western, 2002

ROSENBAUM J., PEARL J., *Investment Banking: Valuation, leveraged buyouts, and mergers and acquisitions*, 2nd edition, John Wiley & Sons, Inc., 2013, ISBN-13: 978-1118656211

STOWE J.D., ROBINSON T.R., PINTO J.E., MCLEAVEY D.W., *Equity asset valuation*, John Wiley & Sons, Inc., 2007, ISBN-13 978-0-470-05282-2

THOMSETT M.C., Getting started in fundamental analysis, John Wiley & Sons, Inc., 2006, ISBN-13: 978-0-471-75446-6

VIEBEG J., PODDIG T., VARMAZ A., *Equity Valuation: Models from leading investment banks*, 1st Edition, John Wiley & Sons, Inc., 2008, ISBN-13: 978-0470031490

Journals and articles:

DUKES W. P., PENG Z., PHILIP C. *How do Practitioners Value Common Stock?*, The Journal of Investing, 2006

PENMAN S. H., *Return to Fundamentals*, Journal of Accounting, Auditing & Finance, 1992

Internet sources:

BUREAU OF ECONOMIC ANALYSIS [Online]: *Gross Domestic Product, Fourth Quarter and Year 2020 (Second Estimate)* [Accessed on 16th March 2021]. Available at: https://www.bea.gov/news/2021/gross-domestic-product-fourth-quarter-and-year-2020-second-estimate

CONGRESSIONAL BUDGET OFFICE [Online]: *An Overview of Economic Outlook: 2021 to 2031* [Accessed on 16th March 2021]. Available at: https://www.cbo.gov/system/files/2021-02/56965-Economic-Outlook.pdf

CONGRESSIONAL RESEARCH SERVICE [Online]: *Fiscal Policy and Recovery from the COVID-19 Recession* [Accessed on 29th March 2021]. Available at: https://crsreports.congress.gov/product/pdf/R/R46460

CONGRESSIONAL RESEARCH SERVICE [Online]: *The Federal Reserve's Response to COVID-19: Policy Issues* [Accessed on 29th March 2021]. Available at: https://crsreports.congress.gov/product/pdf/R/R46411

DAMODARAN A. [Online]: *Alphabet Soup: Google is Alpha, but where are the Bets?*, [Accessed on 5th September 2020]. Available at: http://aswathdamodaran.blogspot.com/2018/04/alphabet-soup-google-is-alpha-but-where.html

DAMODARAN A. [Online]: *Amazon: Glimpses of Shoeless Joe?*, [Accessed on 5th September 2020]. Available at: http://aswathdamodaran.blogspot.com/2018/04/amazon-glimpses-of-shoeless-joe.html

DAMODARAN A. [Online]: *Come easy, go easy: The Tech Takedown!*, [Accessed on 5th September 2020]. Available at: http://aswathdamodaran.blogspot.com/2018/04/come-easy-go-easy-tech-takedown.html

DAMODARAN A. [Online]: *Netflix: The Future of Entertainment or House of Cards?*, [Accessed on 5th September 2020]. Available at: http://aswathdamodaran.blogspot.com/2018/04/netflix-future-of-entertainment-or.html

DAMODARAN A. [Online]: *PE Ratio by Sector (US)*, 2021 [Accessed on 29th March 2021]. Available at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/pedata.html

DAMODARAN A. [Online]: *Revenue Multiples by Sector (US)*, 2021 [Accessed on 29th March 2021]. Available at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/psdata.html

DAMODARAN A. [Online]: *Price and Value to Book Ratio by Sector (US)*, 2021 [Accessed on 29th March 2021]. Available at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/pbvdata.html

DAMODARAN A. [Online]: *The Facebook Feeding Frenzy: Time for a Pause!*, [Accessed on 5th September 2020]. Available at: http://aswathdamodaran.blogspot.com/2018/04/the-facebook-feeding-frenzy.html

DAMODARAN A. [Online]: *Valuation Approaches and Metrics: A Survey of the Theory and Evidence*, 2006 [Accessed on 5th September 2020]. Available at: http://people.stern.nyu.edu/adamodar/pdfiles/papers/valuesurvey.pdf

DAMODARAN A. [Online]: *Valuing Young, Start-up and Growth Companies: Estimation Issues and Valuation Challenges*, 2009 [Accessed on 5th September 2020]. Available at: http://people.stern.nyu.edu/adamodar/pdfiles/papers/younggrowth.pdf

FRANCK T. [Online]: *Move over 'FANG' stocks, now there's 'FAAANG*, [Accessed on 5th September 2020]. Available at: https://www.cnbc.com/2017/10/02/move-over-fang-stocks-now-theres-faaang.html

MORNINGSTAR PREMIUM [Online]: *Morningstar Equity Research Methodology*. [Accessed on 30th March 2021]. Available at: https://s21.q4cdn.com/198919461/files/doc_downloads/governance_documents/2020/12/MasterEquityResearchMethodology_Dec2020.pdf

MORNINGSTAR PREMIUM [Online]: *Alphabet, Inc.* [Accessed on 28th March 2021]. Available at: https://www.morningstar.com/stocks/xnas/googl/quote

MORNINGSTAR PREMIUM [Online]: *Amazon.com, Inc*. [Accessed on 28th March 2021]. Available at: https://www.morningstar.com/stocks/xnas/amzn/quote

MORNINGSTAR PREMIUM [Online]: *Facebook, Inc*. [Accessed on 28th March 2021]. Available at: https://www.morningstar.com/stocks/xnas/fb/quote

MORNINGSTAR PREMIUM [Online]: *Netflix, Inc*. [Accessed on 28th March 2021]. Available at: https://www.morningstar.com/stocks/xnas/nflx/quote

ORGANISAION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT [Online]: *Economic Outlook*, 2021 [Accessed on 28th March 2021] Available at: http://www.oecd.org/economic-outlook/march-2021/

SMIRNOV Y. [Online]: *Efficient market hypothesis (ENH)*, CFA Institute Investment Foundation [Accessed on 28th March 2021]. Available at: http://financialmanagementpro.com/efficient-market-hypothesis/#:~:text=Fama%20and%20Paul%20A.,higher%20than%20the%20market%20average.

STANDARD & POOR'S GLOBAL [Online]: *S&P 500 GICS Sector Scorecard*, 2021 [Accessed on 28th March 2021]. Available at: https://www.spglobal.com/spdji/en/documents/additional-material/gics-500-scorecard.pdf

STANDARD & POOR'S GLOBAL [Online]: *S&P U.S. Equity Risk Premium Index*, S&P Dow Jones Indices, 2021[Accessed on 28th March 2021]. Available at: https://www.spglobal.com/spdji/en/indices/strategy/sp-us-equity-risk-premium-index/#overview

STANDARD & POOR'S GLOBAL [Online]: *S&P 500 Information Technology*, S&P Dow Jones Indices, 2021 [Accessed on 28th March 2021]. Available at: https://www.spglobal.com/spdji/en/indices/equity/sp-500-information-technology-sector/#overview

THE WORLDBANK [Online]: *GDP growth (annual %)* [Accessed on 29th March 2021]. Available at: https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG

THE WORLDBANK [Online]: *GDP growth (annual %) - United States* [Accessed on 29th March 2021]. Available at: https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=US

THE WORLDBANK [Online]: *Inflation, consumer prices (annual %)* [Accessed on 29th March 2021]. Available at: https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG

THE WORLDBANK [Online]: *Real interest rate (%)* [Accessed on 29th March 2021]. Available at: https://data.worldbank.org/indicator/FR.INR.RINR

UNITED NATIONS [Online]: *World Economic Situation and Prospect*, 2021 [Accessed on 16th March 2021]. Available at: https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2021_FullReport.pdf

UNITED STATES DEPARTMENT OF THE TREASURY [Online]: *Daily Treasury Yield Curve Rates* [Accessed on 29th March 2021]. Available at: https://www.treasury.gov/resource-center/data-chart-center/interest-rates/pages/textview.aspx?data=yield

UNITED STATES SECURITIES AND EXCHANGE COMMISSION [Online]: *Form 10-K: Facebook, Inc.*, 2020 [Accessed on 29th March 2021]. Available at: https://www.sec.gov/Archives/edgar/data/1326801/000132680121000014/fb-20201231.htm#i5d2898d61ccf450cbccb20a5c73005f3_7

UNITED STATES SECURITIES AND EXCHANGE COMMISSION [Online]: *Form 10-K: Alphabet, Inc.*, 2020 [Accessed on 29th March 2021]. Available at: https://www.sec.gov/Archives/edgar/data/1652044/000165204421000010/goog-20201231.htm#id55be7992b374e1a9a2bc48887ddbb3f_106

UNITED STATES SECURITIES AND EXCHANGE COMMISSION [Online]: *Form 10-K: Amazon, Inc.*, 2020 [Accessed on 29th March 2021]. Available at: https://d18rn0p25nwr6d.cloudfront.net/CIK-0001018724/336d8745-ea82-40a5-9acc-1a89df23d0f3.pdf

UNITED STATES SECURITIES AND EXCHANGE COMMISSION [Online]: *Form 10-K: Netflix, Inc.*, 2020 [Accessed on 29th March 2021]. Available at: https://d18rn0p25nwr6d.cloudfront.net/CIK-0001065280/8f311d9b-787d-45db-a6ea-38335ede9d47.pdf

YAHOO! FINANCE [Online]: *Alphabet, Inc.* [Accessed on 29th March 2021]. Available at: https://finance.yahoo.com/quote/GOOGl/

YAHOO! FINANCE [Online]: *Amazon.com, Inc.* [Accessed on 29th March 2021]. Available at: https://finance.yahoo.com/quote/AMZN/

YAHOO! FINANCE [Online]: *Facebook, Inc.* [Accessed on 29th March 2021]. Available at: https://finance.yahoo.com/quote/FB/

YAHOO! FINANCE [Online]: *Netflix, Inc.* [Accessed on 29th March 2021]. Available at: https://finance.yahoo.com/quote/NFLX?p=NFLX

ZANDI M., YAROS M. [Online]: *The Macroeconomic Consequences: Trump vs. Biden*, Moody's Analytics [Accessed on 16th March 2021]. Available at: https://www.moodysanalytics.com/-/media/article/2020/the-macroeconomic-consequences-trump-vs-biden.pdf

9. Appendix

This Diploma Thesis provides assessment of variables, needed for valuation models and some indicators of profitability analysis. The calculations are performed in Microsoft Excel software. The document includes 9 sheets, which are stated below:

- **ROE** – calculation of Return on Equity under DuPont system
- **Debt-to-Equity** – Calculation of Debt-to-Equity ratio
- **WACC** – calculation of Weighted Average Cost of Capital
- **FCFF** – calculation of interest tax shield, projected FCFF, terminal value and intrinsic value of stocks
- **FCFE** - calculation of projected FCFE, terminal value and intrinsic value of stocks
- **Price-to-Earnings** – calculation of P/E ratio for base year (2020) and of projection the indicator in the following 5 years
- **Price-to-Book value** – calculation of P/B ratio for base year (2020) and projection of the indicator in the following 5 years
- **Price-to-Sales** – calculation of P/E ratio for base year (2020) and projection of the indicator in the following 5 years
- **Price-to-Cash Flow** – calculation of P/E ratio for base year (2020) and projection of the indicator in the following 5 years

The supplemented material in the form of Excel file is attached to the work and can be found in “Thesis appendices” section on Final Thesis page in the University Information System (UIS).