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Navn: Jon Medved

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Name:
Jon Medved

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Summary

This paper researches if Value Investing is an efficient approach as an investment management framework. The focus is on the large market capitalization stock market in the United States. The tested period is from the beginning of 2007 until the beginning of 2019. 6 portfolios based on the fundamental analysis were created and tested with the holding period of 5 years. The theory is based on the Efficient Market Hypothesis (EMH), Modern Portfolio Theory (MPT), and on the Value Investing Theory, which is one of the fundamental analysis techniques. According to the findings, it is impossible to accept the EMH, and the findings steer towards the Value Investing as being an approach with a potential to deliver positive Alpha. Furthermore, a distinction between Value Stocks and Value Investing is made, as often those two terms are used interchangeably. The performance analysis of Berkshire Hathaway steers towards the finding that it is much harder to deliver superior results based on the Value Investing approach when the investing is done on a very large scale, as in the 1980 class A stock price was less than 300 USD, in 1990 roughly 7.000 USD and in the beginning of 2019 311.000 USD (the numbers are comparable, since the class A stock was never split). Furthermore, the market capitalization in 2018 it exceeded 500 billion dollars. Economically and statistically significant diminishing Jensen’s Alpha suggests that the superior returns could be inversely related to the market size.

1. Introduction to the research question and Problem Formulation

In the industry of investment management, the majority of the asset managers have one common goal. Since most managers pursue a relative based strategy and are also compensated according to the appropriate benchmark, the goal is to outperform the average, risk-adjusted benchmark return over a long period of time. Alternatively said, in practice, they want to achieve a positive and economically significant Jensen's Alpha or want to do better than the appropriate benchmark compared to an alternative measure of risk. Furthermore, this goal has to be achieved over a long period of time, at least several years (three or more, preferably five). In the short run, any asset can outperform another asset. Investors try to outperform the market using different methods that have essentially the same goal and that is to buy securities when they are undervalued, and later sell them when they are overvalued when they take a long position in them, or short sell them when they are overvalued and buy them back when the price falls and are undervalued. The main distinction among the different investing approaches (how to determine whether a security is undervalued or overvalued) is between the technical analysis and the fundamental analysis.

However, since the introduction of the Efficient Market Hypothesis by Eugene Fama there has been a question whether there is a systematic way to consistently outperform the financial markets, or if it makes sense to invest your money actively. There are many different approaches that managers use to tackle the challenge of active asset management.

Technical analysts (often referred to as "chartists") use different techniques that look mainly at the past price movements, their patterns or volumes traded and based on that try to outperform the market. Technical analysis is an estimating system to decide the future value developments in sight of the previously recorded information (Pushpe, Sumithra, & Madhuri, 2007, p. 24).

Fundamental analysts do not look at the price movements and patterns, but rather analyse the basic characteristics of the underlying security. For example, they look at some fundamental ratios and/or incorporate their additional "views" and then compare that to the stock market price to see whether the stock is undervalued or overvalued. The fundamental analysis, therefore, examines the company's stock price movements by their historical financial and accounting data, their earnings expenses, management, and other balance sheet items (Shakeel & Gohar, 2018, p. 84).

Stock picking is a technique where an analyst analyses an individual stock and the performance of the stock, while with market timing investors try to determine where the market is going to move. Investment decision based on market timing can either be achieved with technical analysis (again looking at some charts or statistical analysis of the price movements themselves) or fundamental analysis (e.g. looking at some reported macroeconomic data).

Value Investors are fundamental analysts that rely on stock picking and occasionally on the one-off opportunities where they time the market. The second option is less common, as it is believed that it is much more complicated to perform successful market timing. The key to a successful investment from the Value Investing standpoint is to find the intrinsic value of the business. This essentially means trying to predict all the future cash flows discounted with an applicable discount rate to today and then comparing that present value with the market capitalization of the business.

Another important thing that value investing tries to define is the difference between the investment and speculation approach. There is not a single distinctive factor when we are considering speculation versus investment, but from the Value Investing perspective, speculation is defined as looking at the price and the price movements of a security. An investment approach is on the other hand considered when we look at the fundamental indicators of the business itself and try to identify whether it has a better earnings potential measured as a present value of the expected future earnings. The concept was introduced by Graham (2003, pp. 18-25). It is important to note that some investors could consider the investment as something completely different, for example looking at the trends using statistical analysis, looking at patterns of price movements, looking at the macroeconomic trends and trying to figure out the performance of a certain company, an industry, stock market as a whole, etc. Therefore, we can see that an investment definition differs regarding the aspect we are looking from and our objectives. For some buying art is considered an investment and for others pure speculation, as the value of it is based only on how much a counterparty is prepared to pay for it at a point in time in the future - in other words, how much more popular it is going to get.

The research question is not to try and distinguish the fundamental and technical analysis, but rather to find out how relevant Value Investing today is. There is a trend of going from active to passive investment management as the Efficient Market Hypothesis has gained popularity. According to it, nobody should be able to consistently outperform the market over a long period of time. However, it is relevant to question whether the markets with increased passive investments have become more inefficient if there are fewer investors (measured as a percentage of the total assets invested) that monitor their assets. Another possibility is that active investors also became more sophisticated with the growth of financial markets and can analyse the financial markets better, so the efficiency could even be improved. The shift to passive investing is especially evident in the U.S., which is considered as the most developed financial market. The main tools for passive investments are Exchange Traded Funds (ETFs) and passively managed mutual funds. In December 2017 the passive part of the Mutual Funds and ETF-s was 37%, compared to 14% in 2005 and as low as 3% in 1995. Out of 37 % of the passive funds, they make as much as 45% of the assets under management in the equity funds and 26% of the bond funds are passively managed (Anadu K. , Kruttli, McCabe, Osambela, & Hee Shin, 2018, pp. 1-2). The shift from active to a passive investment strategy is also presented in a graph (see Appendix 1), extracted from the same study by the Federal Reserve Bank of Boston (Anadu et al., 2018, p.2), sourced from Morningstar (2018). There is a clear paradox present where it is possible that in the future, on average, ceteris paribus, the markets could become less efficient with the additional shift and accepting the efficiency, and consequently generate more opportunity for active investors. Grossman and Stiglitz (1980, p. 405) argued that obtaining information is costly. Therefore, if we assume the market efficiency, nobody would be willing to obtain that information if there was no compensation for obtaining costly information, so there is a fundamental discrepancy between the efficiency and the incentives to obtain information. Furthermore, it is important to note that changes in the efficiency (either towards more efficiency or less efficiency) in the financial markets can also be caused due to other reasons, such as due to the shift from "traditional" to the algorithmic trading, integration of capital markets (e.g. in the European Union compared to separated countries) and on the other hand the disintegration of the markets (e.g. planned exit of the United Kingdom from the European Union), the amount of different information that comes in in a certain period of time, number of participants in the market, the sophistication of the market participants, etc.

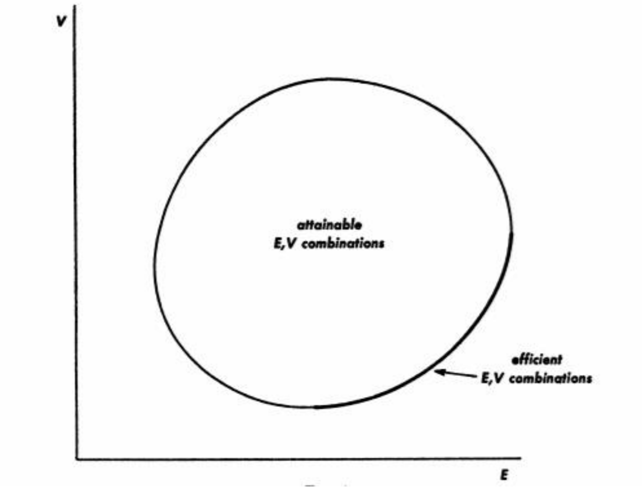
2. Literature review

2.1 Efficiency of the financial markets and Modern Portfolio Theory

Eugene Fama in 1970 posted an article about the Efficiency of Capital Markets and stated: "A market in which prices always "fully reflect" available information is called "efficient"." (Fama E. , 1970, p. 383). From this statement, the conclusion is that any sale or purchase of an asset, in research case of this paper those assets are stocks or a group of stocks cannot add any value to the investors compared to the market. Alternatively said all the activities of trading stocks are neither negative, nor positive, but 0 Net Present Value activities. The market price of the stock already prices in all the future cash flows that the shareholders will get, discounted to the present value with the appropriate discount rate that appropriately reflects risks. That said, the logic might tell us that it, therefore, does not matter which securities we buy in an efficient market, as all of them already have appropriate pricing. In reality, the picture is more complex. With picking individual stocks investors also get with them individual or idiosyncratic risk of the stocks. However, in an efficient market, investors are appropriately compensated only for the non-diversifiable risk. As soon as an investor decides to invest actively, with his or her different composition of the portfolio compared to the conditions in the financial markets, under the assumption that markets are efficient, the investor takes on also diversifiable risk. Therefore, for the same expected return, an investor is exposed to more risk or alternatively for the same amount of risk investor gets a lower expected return. In the long run that leads to the risk-adjusted underperformance in the financial markets. Ben-Horim and Levy (1980, pp. 289-297) conclude that the conventional way of decomposing risk (see Appendix 2 for the components of risk) might be wrong for the securities with negative beta. Furthermore, systematic and non-systematic variability are two complementary components in the standard deviation in the returns of a security (Levy & Ben-Horim, 1980, pp. 289-297).

In 1952 Harry Markowitz posted an article titled Portfolio Selection. The goal of every investor, in a predicted two-dimensional world where we measure return usually on yearly basis and risk with the variance or with the square root of the variance standard deviation, is to achieve the best trade-off between the risk and return. The optimal portfolio should be well-diversified, despite the fact that the variance is still considerable, since the asset prices, especially stock prices are on average positively correlated. In the model, Markowitz assumes that expected return is a desirable thing and variance of return an undesirable thing (Markowitz, 1952, pp. 77-91). The fist mean-variance framework was developed 12 years earlier, by an Italian mathematician Bruno De Finetti. In the 1940 paper “il problema dei pieni”, which translates to “The Problem of Retention Levels in Proportional Reinsurance”. As noted by the Barone (2006, pp. 1-22), de Finetti already designed the portfolio selection (efficient frontier), which was called “the problem of relative full-risk insurances” and the utility maximization (the optimal portfolio), which he called “the problem of absolute full-risk insurances”.

Picture 1: Visualization of the attainable combinations for different portfolios in the expected return – variance framework as proposed by Markowitz in 1952.



Source: Markowitz (1952, p. 82)

The efficient combination of different assets in the portfolio is only one where the portfolio is the tangent one. The group of tangent portfolios is called efficient set and the exact tangent portfolio also depends on the risk-free rate. Therefore, the only decisions that investors make according to that theory are between the risk-free rate and the weighting in the portfolio. If an investor wants a higher expected return than the expected return of the market portfolio the solution according to this theory is not in individual stock picks, but rather in using leverage to come to the higher point on the Capital Market Line (CML). CML connects the risk-free rate with the market (tangent) portfolio. Again, the main benefit of the portfolio comes from diversification. The expected return is calculated as the sum of the weight of an asset in the portfolio multiplied by the expected return of the asset. On the other hand, portfolio variance takes into account also the correlation coefficient between all of the assets. For the n-asset portfolio the equation looks like:

Portfolio expected return:

$$E(R_p) = \sum_{i=1}^{n} w_i \, E(r_i)$$

Where w_i represents the weight of an asset i in the portfolio and $E(r_i)$ represents the expected return of an asset in the portfolio.

Portfolio variance:

$$\sigma_p^2 = \sum_{i=1}^{n} w_i^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{j=1, i \neq j}^{n} w_i \, w_j \, Cov(r_i, r_j)$$

Where w_i represents the weight of i-th asset, σ_i represents the standard deviation or alternatively σ_i^2 the variance of the i-th asset. Cov (r_i,r_j) represents the covariance between the i-th and j-th asset.

The improved risk-return profile comes from the correlation between the assets, which takes values between -1 and 1. Perfectly correlated assets have a correlation coefficient of 1 and thus do not bring any diversification benefit to the portfolio of securities. However, the correlation coefficient is in practice between the assets almost always below one and therefore the diversification effect helps us mitigate the risk that the selected portfolio is taking. Furthermore, if a perfect market-capitalization weighted all-asset portfolio is created, the only risk in the portfolio that remains is the systematic or non-diversifiable risk. This portfolio, according to the theory started by Markowitz in 1952, would be the portfolio that has the most favorable risk-return relationship. Therefore, the decision that an investor has to make is only between the risk-free rate and that portfolio.

For the Modern Portfolio Theory to work, the financial markets need to be efficient. As mentioned previously, a market to be considered efficient it always has to fully reflect all the available information (Fama E. , 1970, p. 383). There are three different forms of efficiency: weak, semi-strong and strong.

As the name suggests, with the weak form efficiency the financial markets are the least efficient according to that classification measures. The stock price reflects all the past information, such as past price movements and volume. Therefore, technical analysts should not be able to generate alpha in the financial market that is weak form efficient. Semi-strong form efficiency suggests that all the past and current publicly available data are priced in (Dupernex, 2007, p. 169). Therefore, neither technical analysts nor fundamental analysts are able to generate alpha on the financial markets. Buffett (1984, pp. 3-15) claims that the outperformance of fundamental value investors is not random, which implies that semi-strong form efficiency does not hold. He claims that it is supposed to be impossible (not random) that so many investors that outperformed the market came from the same investing strategy. This is happening due to the discrepancy between price and value in the financial markets (Buffett, 1984, pp. 3-15). Strong form efficiency suggests that no information, public and/or inside information can help and is already priced in and therefore even those participants with inside information in the financial markets cannot achieve risk-adjusted excess returns in the long run. This one is harder to test, as using insider information is illegal anyhow, so the data is hard to obtain. However, there is a good reason for that being illegal, and that is the possibility of the exploitation of the data for private gain.

2.2 Value investing

In the financial markets, there are many groups of investors that do not believe in market efficiency. The easiest grouping of those market participants is that essentially all active investor in the financial markets do not fully believe at the efficiency of the financial markets and in the modern portfolio theory, as they try to incorporate their own views in the investment decision making. Despite the fact that there has recently been a shift from active to passive management, as mentioned in the introduction, the active management is still the dominant type of investing. That means that either the theory of efficient markets is wrong or that investors that invest actively are not rational. It is important to note again that in 1995 the passive investments represented 3% of the assets under management (AUM) in the mutual funds and in the exchange-traded funds (ETFs). in 2005 the share was up to 14% and in December 2017 the share was already 37% (Anadu et al., 2018, pp. 1-2).

One prominent group of investors that do not believe in the semi-strong form of the efficiency of the markets are Value Investors. In the 1984 article Superinvestors of Graham and Doddsville, Warren Buffet presented the case of not believing in the efficiency of financial markets at that time. The case that is presented is a coin flipping contest, where he presents a competition in coin flipping of 225 million Americans, where if they flip on the right side they win a dollar, otherwise, they lose it. In the next day, the previous stakes are on the line and in 10 days random winners would have 1024 dollars. In an additional 10 days, there would be 215 people with 20 successful flips in a row and they would have 1.05 million dollars. However, if the people would be just randomly be chosen, the results would be the same. 225 million are lost and 225 million are made in that time. Buffett claims that the distribution of such games would be random. Furthermore, as he claims the distribution of the winners in his analysed period is skewed towards the selected group of students of Benjamin Graham that were investing based on the Value Investing principles, so they have called their "flips" in very different ways, as taught by Ben Graham (Buffett, 1984, pp. 3-15).

Table 1: Returns of selected investors as presented in the Superinvestors of Graham and Doddsville

MAIN INVESTOR	PERIOD	BENCHMARK	return	FIRM	Ltd partners	Firm overall
Walter J. Schloss	1956-84	S&P 500	8.4%	WJS Partnership	16.1%	21.3%
Tom Knapp, Ed Anderson	1968-83	S&P 500	7.0%	Twedee, Browne Inc.	16.0%	20.0%
Warren Buffett	1957-69	Dow Jones	7.1%	Buffett Partnership Ltd	23.8%	29.5%
Bill Ruane	1970-84	S&P 500	10.0%	Sequoia Fund	fund	18.2%
Charles Munger	1962-75	Dow Jones	5.0%	Munger Partnership	13.7%	19.8%
Rick Guerin	1965-83	S&P 500	7.8%	Pacific Parteners	23.6%	32.9%
Stan Perlmeter	1965-83	Dow Jones	7.0%	Perlmetr Investments	19.0%	23.0%

*all returns in the table stated as annual compound rate

Source: Buffett (1984, pp. 6-14).

As it can be observed in the table the investors were significantly outperforming the relevant benchmark, but neither holdings of equities were disclosed, nor the risk that they were undertaking, which would be especially relevant for the analysis. Therefore, the question is how much the outperformance was on a risk-adjusted basis. It is mentioned that there was practically no duplication of portfolios, and therefore the assumption is that the decisions were made independently but from the same intellectual base. The selections were made very differently, but the focus was on the difference between value and price, rather than calendar or movement of the stocks in the next week (Buffett, 1984, pp. 3-15).

Graham is the most important contributor to the theory of the Value Investing and is credited as the "father" of Value Investing. The first important terms that he distinguishes, as mentioned in the introduction, the difference between the investment and speculative approach. Investor, in his view, is not simply someone that invests in the capital markets. It is also not a question of whether one action is legal or not, since both actions are legal and moral, as long as investor's own money is on the line. It is about the companies that investor chooses, time horizon and financial and psychological ability of an investor to endure the irrationality of the financial markets (Graham, 2003, pp. 18-25).

The rules that Graham defines for a defensive investor are that there should be no excessive diversification, 10-30 stocks, picks in companies should be large, prominent and conservatively financed and each of them should have a long record of dividend payments. Obviously, the last criteria is the price, as none of the securities is worth an infinite price. If the price that is paid for security is too high, even the best stock that exceeds expectations might still be a bad investment. The author also distances himself from "growth stocks", since they trade at much higher multiples, it is especially mentioned through the price in relation to the current earnings. Graham defines growth stocks as those that are expected to double their earnings within the new ten years, or alternatively stated to increase the per-share earnings at a compound annual rate of 7.1%. This fact might have a considerable weight in the speculative element (Graham, 2003b, pp. 114-115).

In the Security Analysis Graham defines the stock market as a voting machine especially in the short term, where both individuals and investment professionals express their opinion with purchases and sales of stocks. Choices are in Grahams' opinion the product of partly reason and partly emotions. Market factors, which are only speculative are technical, manipulative and psychological. On the other side, Intrinsic value factors, which are supposed to base the reasoning for an investment approach are earnings, dividends, assets, capital structure and terms to the issue. In-between investments and speculation there are future value factors, which are management and reputation, competitive condition and prospects and possible changes in the volume, price, and costs. All those factors together structure the reasoning towards the issue and are the essential factors for the supply and demand on the financial markets. All factors combined create the market price (Dodd & Graham, 2008, pp. 71-72).

Klarman (1991) defines value investing as a strategy of investing in securities trading at an appreciable discount compared to its underlying value. As he states, it is highly unlikely that the value of the US industry declined by 23% in one day, October 19 in 1987 (Klarman, 1991, p. XVIII). Looking back from now, it seems irrational to think that value has declined so much in one day, as that really is almost impossible. However, the possible observation here is that financial markets might sometimes be very wrong in recognizing the intrinsic value of the stocks. The process of value investing is defined in the Margin of Safety book as very simple. An investor has to focus primarily on risk, estimate the intrinsic value of a business and then buy it at a significant discount from that value. What an investor ought to neglect is short term fluctuations and keep the discipline to buy only when the prices are attractive and sell when they are not (Klarman, 1991, p. XVIII).

Graham (2003c, pp. 290-295) lists and explains the factors that are affecting the Capitalization Rate. The first factor is the general Long-Term Prospects, which are reflected as the difference in the earnings yield in the stock market. Management of the company is the second important consideration, as Graham states, the past management performance needs to be analysed to do an estimate of the next 5 years. Financial Strength and Capital Structure are the next factors. Here Graham does not propose any magic formula or optimal capital structure but rather suggests that the company with large bank loans or bonds issued is less preferred than similar stock with e.g. surplus cash. High leverage is undesired, and earnings earned with the help of high leverage are according to Graham speculative. He tends to neglect the theory of optimal capital structure, where the optimal level of debt is the increasing function of the assets liquidation value, corporate tax rate, and firm size as proposed by Scott (1976, pp. 33-54). However, it is also true that the first edition of the intelligent investor was published in 1949. Furthermore, even what is considered a very important theory about the capital structure, the Modigliani-Miller Theorem (1958, pp. 261-297) was published in the 1950-s. Even though the theory regarding the capital structure was not yet developed before the initial research, there is an assumption that Graham would not change that theory even today. The fourth emphasized part is the dividend record of the company, where 20 years of continuously paid dividends are, as Graham stated a plus factor in the company rating. The fifth and final consideration is the Current Dividend Yield (Graham, 2003d, pp. 198-200). There is also a proposition for a formula for the capitalization rates for growth stocks, which is sometimes cited as the "Graham formula" that is supposed to produce figures "fairly" close to those resulting from the more refined calculations. Unfortunately, the source of those formulas is not presented. The value formula (Graham, 2003c, p. 295) goes as follows:

$$V = EPS \times (8.5 + 2g).$$

Where V represents Value, EPS present earnings per share, or alternatively, the Current (Normal) Earnings. It is important to analyse the earnings and collect the data also from the previous years, as one-year earnings can be hiding a lot of things, for example, they could be correlated with a different external factor or even creative accounting practices that an investor has to be careful about. Furthermore, the dilution of the earnings is also important to consider, as, for example, convertible bonds into common stocks need to be recognized by the investor, as that might be the real reason for lower valuation on the market, rather than the discrepancy between the value and price. Number 8.5 is set to present the P/E ratio for the no-growth company, g presents the expected annual growth rate over the next seven to ten years. An important notice is that the higher the growth rate of the company is, the higher the margin of safety should be for an investor to make. The relative difference of value versus price needs to be higher for companies with high growth rates compared to the companies with low growth rates and potential earnings that are more easily predictable. Furthermore, another important consideration has to be the anticipated interest rates, as they affect the valuation significantly, especially if they rise very soon, the valuation of the company as the discount rates have to be higher (Graham, 2003c, pp. 294-297).

3. Hypothesis

Hypothesis 1: *The Value Investing approach is an efficient approach for generating risk-adjusted excess returns in developed financial markets. Therefore, it makes financial sense to participate actively in the markets with the proposed strategy.*

With the first hypothesis, the goal is to test whether investments based on Value approach can really generate the excess return in the long run, as described in the methodology. With the long run, I mean in the period of over several years, as in that time or preferably sooner the dollar bill that investors are trying to buy for sixty cents should appreciate in the value at least close to the (true) dollar value, on average, assuming our views are correct. The time horizon that makes Value investing sensible is at least three to five years. Furthermore, after a certain period, the stocks are expected to reflect their true value and therefore an appropriate exit strategy is also relevant.

With the active participation, I mean not taking the passive approach with investing. Therefore, there has to be financial sense and the difference/gain with the active approach should be economically significant enough, net of fees and other costs associated with the investment strategy (such as the research costs and/or time devoted over the passive investing approach). Again, as mentioned, this ought to hold in the long run, as in the short run any asset can outperform another asset. Therefore, outperformance in the short run, which is in Value Investing terms considered a few weeks or few months is unreliable and therefore should not be a base for an investment decision.

Hypothesis 2: *Management ability and not only valuations play an important role in the successful generation of excess returns*.

With the second hypothesis, the goal is to test whether we can attribute a large part of investing success not only to some theoretical or mathematical rules but also to the investment manager's ability to recognize the stocks that are really undervalued. As Buffett (CNBC, 2018) stated not only intelligence and mathematical abilities make great investors, but also his or her character and especially emotional stability. This part is important especially in the last part of the business cycle (in the second half of expansion) and then during the bull market, which is often followed by a recession, as we consider the stock market as a leading indicator of the economy. In that time the average investor often gets either too optimistic when the market prices are going up or too pessimistic when the market prices are falling.

Furthermore, it is important to compare whether pure calculations are sufficient for a successful investment, or if a large part of the investing success could be attributed to the management ability of the investor. It is important to notice that with management ability I mean both the ability to think rationally during the boom and bust era and the ability to recognize individual stocks that are really undervalued because of market biases and not because either the company or the industry does not have the same prospects anymore. Later, during the investment process, there are also differences in how different investors pick stocks. Some prefer the original »Value« way, and others prefer different investing principles, such as the Black-Litterman investment approach. Furthermore, under the assumption that Modern Portfolio Theory holds both Hypothesis 1 and 2 should be rejected and active investments are expected to generate negative Alpha.

4. Data

For the empirical analysis, several large sets of data were collected. The focus was on the time-series data used for the further portfolio creation, evaluation and the analysis of investing style in the period from 2007 until the period between 2017 and 2019. The main data source for the analysis was Bloomberg Terminal, where countless functions and tools were used for the data gathering process. Furthermore, Yahoo Finance data were also used for the creation of the portfolios. For the main part of the analysis, portfolio creation based on value principles the data that was gathered was for the S&P 500 index where each individual participant in the index was analyzed. The main collected data “started” in January 2007 with the data for all the members of the selected index. Fundamental data was gathered, alongside with the ticker, name of the company, price of a share, Global Industry Classification Standard (GICS) Sector, GICS Industry, Net Debt per Share, Total Debt per Share, Market Capitalisation, 12-month Dividend Yield, and Current Dividend Yield. Furthermore, Book Value per Share, Price to Book Ratio, Total Debt of the company, Net Debt to Equity, Earnings Before Interest, Taxes Depreciation and Amortization (EBITDA), Earnings Per Share for

Trailing Twelve Months (TTM), Diluted Earnings Per Share, Current Ratio, Debt to Tangible Book Value, Price Earnings ratio average for the last five years, Earnings Yield and the Last Price Earnings Ratio, which is the inverse of the Earnings Yield (E/P). In total for the first part of the analysis over 110000 parts were gathered. Those datasets were the basis for the later stock picks in the portfolios. For the later analysis of the selected stocks, the data about their price movements and consequently returns were gathered on a monthly basis. Furthermore, additional time series for the periods from early 2007 until early 2012, from the beginning of 2009 until early 2014, from early 2011 until early 2016, from early 2013 until early 2018, from early 2015 until early 2019 and from 2017 until early 2019 were gathered. On that basis, six different portfolios were created with six different combinations of stock picks in them for further comparison against the relevant benchmark.

Table 2: Summary statistics on the portfolios at the inception date ((shortened version), the full version can be found in Appendix 3). Figures presented in the short version are mean figures at the inception date.

	Market Cap	P/B	Div yield	Curr ratio	D/TBV	P/E 5 yr	P/E
Portfolio 1	30,701,668	2.05	1.48	1.94	0.45	9.28	8.17
Portfolio 2	6,326,288	1.20	1.81	2.55	0.39	13.03	5.04
Portfolio 3	13,260,921	2.69	1.72	1.69	-1.78	11.76	7.96
Portfolio 4	27,048,914	1.83	1.93	1.90	-1.07	9.23	8.63
Portfolio 5	25,169,792	2.47	1.99	2.05	-1.56	15.39	12.52
Portfolio 6	16,873,600	4.35	1.97	2.70	-2.42	12.36	10.77

Where Market cap stands for the Market Capitalisation on the inception date (x1000, in USD), P/B stands for Price to Book ratio, Div yield for the Dividend yield, Curr ratio for the Current Ratio, D/TBV for Debt to Tangible Book Value, P/E 5yr for the average Price to Earnings ratio in the last 5 years and P/E for Price/Earnings ratio.

For the test of the Berkshire Hathaway portfolio, the source of the data has been their Annual Report where a large part of their marketable securities is disclosed. Furthermore, similar data is gathered and posted also in the SEC 13-F filings as that are the securities that are also required to be published by the SEC. The stocks used for the Analysis were those with a market value of over in the first years 500 million and later 1 billion USD, as they represent the majority of Berkshire portfolio of marketable securities. The data was gathered on an annual basis. Stock prices were gathered using Yahoo Finance and the Bloomberg Terminal. Prices were both for comparability and manipulation reasons gathered on a monthly basis. Later, the monthly data of Berkshire Portfolio return was substituted with the data from Bloomberg due to the assumption of the ability of more accurate rebalancing, quarterly rebalancing and inclusion of all reported stocks. A general limitation with that kind of filings, as described also later in the methodology, for the companies headquartered in the USA is that they are not obliged by the SEC rules to report any foreign holdings and therefore a part of the portfolio remains unknown. Data were also collected for the performance of the Berkshire Hathaway stock, and the risk-free rates were collected from the Federal Reserve Economic Data (FRED) database.

The data for the Baupost Group's set of marketable securities was used with the 13-F filings from the Securities and Exchange Commission's Edgar database. However, since their portfolio of marketable securities was especially in the initial years of the analysis much smaller and were also invested in much less analyzed companies. For example, in their filing of holdings for December 2006, their smallest holding is stated with the name of the issuer Dime Bancorp Inc. worth only 112,000 USD. The value is not a problem, but rather the lack of data availability for the research. For each company, there were different options for companies and different classes to choose from. The situation was much different than for blue-chip stocks where Berkshire Hathaway had their investments, and in most cases, they are invested in common stocks with large market capitalization. Therefore, the only way to search for the securities of Baupost group was with the CUISP number. CUISP is a nine-character code, which includes letters and numbers and is set to classify the securities in the USA and Canada. CUISP stands for Committee on Uniform Securities Identification Procedures (SEC, 2019). The number was used for future research, as this was the only way to identify less known securities. However, when the data for the whole portfolio was gathered, even from Bloomberg Terminal, which has one of the most comprehensive databases of securities and corresponding prices, especially if looking for the analysis of recent data (e.g. in the last years) the securities were successfully identified. However, the time series that were missing in the sample. Therefore, the conclusion was that the parts of the missing data are too significant. Furthermore, at the end of March 2019 also the Securities and Exchange Commission was contacted for help with the identification of the securities and advice on the data gathering and possibility of the access to the newer filings. The reply was received in early April from the Securities and Exchange Commission's Chief Counsel's Office, Division of Investment management and they could not provide any data or additional advice, as the maximum amount of data that they can provide is set to be already publicly available in the database.

For the part of the comparison of the different publicly available stocks, exchange-traded products or funds the time-series data was acquired from the Yahoo Finance website. For comparison, also the data for index and alternative growth products were gathered. Furthermore, the fundamentals or fundamental data for those funds were acquired on the Bloomberg Terminal. The data for the High-Quality Market Corporate Bond Spot Rates were collected from the FRED Federal Reserve Economic Data provided by the Federal Reserve Bank of St. Louis. Additionally, the data for 1-year and 10-year Treasury bonds and 3-month T-Bills were gathered from the same database.

4.1 Limitations and challenges

It is important to also discuss the limitations and challenges with the analysis and the methodology. The taxes and transaction costs were not taken into account. The assumption is that the taxes would be relatively similar for the portfolios and for the comparable benchmark. There would be slightly higher transaction costs since portfolios are equally weighted, so some rebalancing would be needed, but the rebalancing could be done relatively infrequently, and the performance would still be the same. On the other hand, there are also some standard costs associated also with the holding benchmark passively, but those costs are very low. The data is also not perfect, as some parts of the data for certain companies returns were not available. Those parts were minimized as much as possible and the data was gathered as comprehensive as possible, from different data providers. Any kind of survivor bias was tried to be minimized. Sometimes, the reasons why there is no market data for e.g. Dell is obvious, since it is a well-known case. In 2013 it went private and therefore no market data are available. Not all companies could be analysed so deeply to get to know the exact dates of mergers, acquisitions, de-listings, etc., and matching of that with the data. Furthermore, since the data are provided from the different providers, different methodologies might be used. Generally, the adjusted close price data were used, to take into account stock splits and dividends automatically. However, some stocks were added in from Bloomberg, and therefore they do not have added dividends in the form of dividend adjusted close price. That means that from the aspect of some smaller parts of the time series data the returns of our portfolios might be better or worse, while from the aspect of dividend (not) adjusted price our portfolios would even do slightly better.

5. Methodology

In the methodology part, the first part explains the data and research-intensive part of the paper, which is the portfolio creation. In this part, the theory was gathered with practical examples to make the case both applied and comprehensive. The second part of the methodology explains the evaluation of the portfolios on a risk-adjusted basis, where the portfolios are evaluated on an unbiased basis, using the risk-adjusted measures. It is very important to use those, as in the investment management pure return does not tell anything without the focus on the risk aspect. If a portfolio achieves a higher return in a period X it might be because of taking higher risk. On the other hand, even if a portfolio achieves lower return over a measured period, but the risk was significantly lower, that can still mean that the portfolio was better than the benchmark on a risk-adjusted basis.

5.1 Portfolio creation methodology

The main research period is from the beginning of 2007 until 2018. The reason for the selected period is to take into account the whole economic cycle and to keep the relevance with the recently available data. It is true that the last economic and especially stock market cycle was not typical in terms of the policies of central banks mainly in developed financial markets, low-interest rate environment through the whole time and quantitative easing. Furthermore, a lot of decomposition of the SP 500, on which the main research is conducted has changed from the previous decades. Whether that is good or not is up for discussion, but facts speak for themselves. Without a doubt, the decomposition from the last decade is more relevant for future research and also for the findings today compared to the original Value Investing framework laid out in 1934 as the decomposition of the industry has changed drastically and therefore some measures might have lost relevance. The important thing is to find out whether "value" can systematically outperform "growth" on a risk-adjusted basis. As mentioned, the major focus is on the US stock market, but certain stocks from other stock markets are also included in the analysis since e.g. Berkshire Hathaway invests also abroad and some of those large investments also have to be disclosed, but that depends on the local (non-US) regulator.

For the portfolio of Berkshire Hathaway, the methodology was to replicate the portfolio for Berkshire's largest holdings as reported in the annual report. For a better representation portfolio was not equally weighted, as analysts often present such portfolios, but rather market value weighted. With market value meant in this context the value of the position of marketable securities that Berkshire holds and from there the weights were derived. There is an important distinction between this type of weighting and market capitalization weighting, where the stocks are weighted according to the market values, without incorporated views of the investors. Portfolio holdings were rebalanced annually, while prices were monthly adjusted over a 10-year period. In the final stage, the data were substituted with similar Blomberg data, where the results were similar but even better since even the smallest holdings were included and rebalancing was quarterly, as mentioned already in the data collection part of the paper. It is important to note, that companies generally do not unless required by the local (outside of the United States) regulator disclose the holdings of their foreign stocks. That usually happens only if the company's holding is over pre-specified percentage ownership of the company, but the rules vary across the countries. Otherwise, they only disclose what is required by the regulator in the US, the Securities and Exchange Commission. That brings a limitation to the research, and the size of the inaccessible portfolio data is not exactly known, as an unknown number of the foreign holdings is not known. The value of the disclosed ownership is over 150 billion USD and comparing it to the market capitalization of over 500 billion USD in April 2019 it is possible to see that a large chunk of the value of the corporation is privately owned. That fact did not affect the methodology, and was neglected, as the goal in one part of the analysis was not to assess the performance of the whole corporation, but rather the publicly traded part disclosed to the investors. That is from one perspective for Berkshire Hathaway not very problematic since their disclosed investments are therefore even more comparable to the US large capitalization stock market. Furthermore, the holdings of Berkshire Hathaway abroad would not have impacted the portfolio performance in an economically significant way since they highly likely hold the vast majority of their holdings in the domestic (US) stocks. The exact figure is not reported and is not known to the outside analysts. The reason for that is, according to Warren Buffett that a lot of people look at the picks of Berkshire and they do not want to provide investment advice for free. Therefore, they do provide only the date required by law (Buffet, 2019). On the other hand, there is a downside to not reporting the foreign stocks, since they might have impacted the portfolio in a significantly positive way, especially from the diversification standpoint and good stock picks or in a negative way with bad stock picks. Again, the problem is not large since the assumption is that the relative importance of those investments is small. Those foreign stocks that were required to be reported by the local regulator are included (e.g. Tesco in the UK) and those stocks were also reported in the annual report.

The methodology for creating the Value portfolio goes as follows. Portfolios were built from scratch, but the concept of building the portfolios is an important part. Benjamin Graham and David Dodd did not write one exact recipe for picking the stocks, but rather just gave advice and therefore the strategy is not very simple to implement. Furthermore, the analysis requires also a good estimation of the future business potential, current positioning and competitive advantage, management, etc. Furthermore, also behavioural factors at a given point in time play an important role. It is true that Value Investing theory is also based on the intangible assessment of the business and for the research purposes in the paper that was not forgotten, but rather put aside when picking the stocks for the portfolio. The reason for it is simple, as intangible factors could affect the stock picks. Besides subjective opinion, which is always present unless the investor believes in the efficient markets (as there is only one right portfolio) there is another problem with the intangible picks. If the portfolio would significantly outperform the market, the one obvious problem with the diligence could be that an outside observer could say that the stocks picked were intentional winners. If the portfolio would underperform due to the intangible evaluation part an outside observer could say that the bad stock picks were intentionally chosen, for example, to prove that the theory is wrong. Therefore, that kind of assessment could only be done today, and the performance could be evaluated after the investing period. The short-term strategy could be tested in that way, but since Value investing is a long-term approach it is not feasible to test it here since it would take years to get results. However, there are also tangible rules that can be taken into account for the portfolio creation. Regarding the intangible factors, if doing an analysis of the stock e.g. in 2014 it is hard to not look at what is going to happen in the next period regarding the business potential, even if the integrity of the stock picker is unquestionable. For example, almost everybody knows what happened to major companies like Apple, Microsoft, Coca Cola, Volkswagen, etc. and therefore an investor might avoid the stocks that went through a scandal on a subliminal level. It is impossible to predict unbiased the future from the "past" perspective (for example from the 2010 perspective in 2019) and the future has already happened. Therefore, a more reliable way is to pick the stocks based on the fundamental factors, without allowing the "intangible" part of the companies or the stock picking process to affect the picks, as the stock picks are much more unbiased in that way and backtesting results must have higher validity compared to the alternative approach of assessing the business based on the intangible factors.

Graham suggests, as covered in the literature review, that the market price of a business is often in a paradoxical situation and that market participants devote much less attention to the issue than they should. The better the prospects of a company, the higher the price is and the less relationship the price will have to the tangible book value (Graham, 2003d, p. 198). Graham suggests that this discrepancy between the current book value and market price creates more difficulty to properly asses the price and affects the valuations based on the "mood" in the stock market. Therefore, according to this theory, a paradoxical situation can be achieved. The better the business prospect, the higher the relative price difference between market and book value and a consequently higher likelihood of bigger fluctuations in the future. The author states, that essentially the better the quality of the stock is, the more speculative is likely to be at the same time. Therefore, the suggestion for the conservative investor is to pay special attention to the portfolio and focus on the stock selling at up to close approximation to their tangible asset value, not more than 1/3 above that figure. However, a stock is not a good pick just because it trades close to the book value. Therefore, the investor should also find stocks that have at the same time satisfactory Price/Earnings ratio, strong financial position and earnings prospects (Graham, 2003d, pp. 198-200). This can be directly transferred into the stock screening procedure and therefore stocks can be ranked according to the Price/Earnings ratio, or the reciprocal of the Earnings/Price ratio, which is earnings yield and is more often quoted by Graham. In the Intelligent Investor. there is also a suggestion of a number of securities to hold between 10 and 30 stocks for defensive investors (Graham, 2003b, p. 114). Stocks are picked based on four fundamental factors. The portfolios are equally weighted and rebalanced. This is reasonable, an alternative approach could be to weight the stocks according to the initial ranking, so those that were ranked better would get bigger weights. In this case equal, weighting was chosen. Market capitalization weighted portfolio seems unreasonable, as the investment style is recognizing the different approach to pick stocks. The returns are calculated on a monthly basis. Risk measures calculations are based on the same corresponding returns.

5.2 Performance evaluation

Return is often the main focus of any new investor. Usually, the demand is to get a stock or portfolio of stocks with high return and low risk. However, in the financial markets, under the assumption of efficiency of the financial markets, there is always a trade-off between the risk and the expected return. With the active portfolio management, investors try to exploit the inefficiencies in the financial markets, to improve that trade-off in their favor. As mentioned previously in the paper, risk-adjusted measures are better measures for performance evaluation. As soon as an investor takes an active position in the market it takes on also a diversifiable risk. Total risk is decomposed of non-diversifiable or systematic risk and diversifiable risk (Levy & Ben-Horim, 1980, pp. 289-297).

A problem is, however, how to most effectively measure the performance of a portfolio. The methodology of performance evaluation goes along in several steps. After the creation of the portfolio, the first task is to calculate the monthly simple returns. After that, the monthly returns for the benchmark ought to be calculated. Then the average return can be calculated, but that number alone does not tell much. Therefore, a common measure for total risk that is used is variance or alternatively standard deviation, which tells how much the total risk that we are taking with a sock or a portfolio is. There are also several developed measures to measure risk-adjusted performance which are based on different risk measures or different combinations of the risk measures. Several of them are also used to evaluate the performance of the created portfolios to estimate their success.

Before an explanation of the measures, it is relevant to expose some problems regarding the risk parameters. First, the “market” index. There is nothing close to the “market”, and therefore since our universe of stocks for the portfolios created is the SP 500, it is reasonable to also use the same index for the benchmark. Furthermore, different time periods of beta measurement give us different estimations of the beta. For the use of our portfolios, the 5-year beta was chosen. The interval of the returns also affects the beta estimate, for the purpose of the paper monthly prices were used and post-regression beta adjustments were used in a standardized way:

Adjusted Beta= 1.00 (1/3) + Beta estimated in the regression (2/3)

The rationale behind it is that in the long run, betas move towards one, which is the market beta. Furthermore, betas sometimes have high noise or alternatively said high Standard Error (SE). This is important to notice as in the model beta is used as a static figure. Furthermore, an additional factor that is inevitable is that firms change over time, and with the changes, the variability in the market changes also the corresponding beta (Damodaran, 2019).

Capital Asset Pricing Model

Capital Pricing Asset Model (CAPM) is the standardized measurement model and tries to estimate the required return of an asset. It is a single factor model (SFM), where the systemic risk is measured with the beta. Beta is estimated with the regression of a stock or a portfolio on the appropriate benchmark and essentially represents a slope at which the portfolio reacts compared to the benchmark.

$$E(R_i) = R_f + \beta_i \, (E(R_m) - R_f)$$

CAPM can also be rewritten in an alternative form in terms of the expected returns. Note that alpha is added in this second case:

$$E(R_i) - R_f = \alpha_i + \beta_i (E(R_m) - R_f)$$

Where $E(R_i)$ is the expected return of a stock or a portfolio, R_f is a risk-free rate, beta represents the slope of the regression function that measures volatility of an investment compared to the benchmark, $E(R_m)$ represents the expected return on the market, and when the risk free rate is subtracted it represents the market risk premium. Since the beta is in the CAPM assumed to be the only factor that affects the return, we call it a single factor model (SFM). Alpha ought to be zero for CAPM to hold.

Jensen's alpha

Jensen's Alpha is the most often discussed measure of performance and is based on CAPM. It is a risk-adjust measure of performance. As Jensen (1967) explains, the assumptions that all investors are averse to risk, have an identical investing period, make decisions based only based on the expected returns and the standard deviation of corresponding returns, are divisible and there are no taxes. Furthermore, beta is the main measurement of risk. There are different opinions about the model, but the goal of this paper is not to find the optimal performance measurement, but rather to evaluate the performance based on self-created and portfolios or funds with the risk-adjusted measures that are most comprehensive in the financial theory today. It is important to note that none of the measures is perfect and each has its own pitfalls and advantages. Jensen's alpha presupposes that CAPM for the model and risk in relation to the market is captured with the beta.

$$J\alpha_p = E(R_p) – \beta_p (E(R_m) – R_f)$$

Where $J\alpha_p$ stands for Jensen's alpha of the portfolio (often used interchangeably simply as $\alpha_{p,}$ alpha of the portfolio), $E(R_p)$ stands for the expected return of the portfolio, β_p for the beta of the portfolio, $(E(R_m) – R_f)$ stands for the market risk premium and is the expected return of the market or benchmark portfolio from which the risk free rate is subtracted.

Sharpe Ratio

Sharpe ratio, R/V ratio or Reward to Volatility ratio is the ratio introduced by William F. Sharpe. As Sharpe stated: "the ratio indicates the historic average differential return per unit of historic variability of the differential return." (Sharpe, 2019). Sharpe ratio recognizes risk in the standard deviation of the returns and therefore captures the total risk of the portfolio. It is a very popular risk-adjusted measure of performance and it is very simple to understand.

$$\text{Sharpe Ratio (SR)} = \frac{E(Rp)-Rf}{\sigma p}$$

Where the $E(R_p)$ is again the expected return of the portfolio, R_f the risk-free rate, and σ_p is the standard deviation of the portfolio or asset that is evaluated.

Treynor ratio

Treynor ratio is related to Alpha, as it measures the excess return to the relation to the non-diversifiable risk. The difference to the Sharpe ratio is that as the proxy for the risk it uses the slope of the regression line with respect to the corresponding benchmark, instead of using the total risk as a unit of measurement. The formula for the Traynor ratio; Traynor (1966), cited in Hubner (2003, p. 5) goes as follows:

$$\text{Treynor ratio} = (E(R_p) - R_f) / \beta_p$$

Where the $E(R_p)$ denotes the expected return of the portfolio, R_f the risk-free rate, and β_p the beta of our portfolio. Here it is important to notice that the ratio is connected to both Jensen's alpha and the Sharpe Ratio. Jensen's alpha is similar in the way that it uses similar inputs, but it is rather a relative measure, similarly as Sharpe Ratio. The difference to the Sharpe Ratio is that it uses the portfolio's beta instead of the portfolio's standard deviation as a measure of risk.

Modigliani-Modigliani M^2 measure

The Modigliani-Modigliani, M^2 or simply M2 is a risk-adjusted measure developed by Franco Modigliani and Leah Modigliani. It essentially tells how much the excess return of the actively managed portfolio is if the risk is adjusted so that the market portfolio is equally risky. Essentially what is done looking from the practical perspective would be adding leverage or negative leverage (lending) to match the risks. That makes the performance between the two funds or assets comparable and that could actually be achieved. It is important to note that alternative versions of the measure are used, either with using standard deviation as a measure of total risk or using the beta as a proxy for the systemic risk. In the last one, there might be some diversifiable risk left, but it makes sense to calculate it if we are adding the asset or an additional portfolio to an already well-diversified portfolio. In the model the standard Modigliani Modigliani (1997) version is used, explained in Simons (1998, p. 39):

$$M^2 = (E(R_p)\text{-}R_f)\ (\sigma_m / \sigma_p) - (E(R_m)\text{-}R_f)$$

Where M^2 denotes the Modigliani-Modigliani measure, $E(R_p)$ the expected return of the analyzed portfolio, R_f the risk-free rate, σ_m the standard deviation of the benchmark, σ_p the standard deviation of returns of the analyzed portfolio, and $E(R_m)$ the expected return of the market portfolio.

Information Ratio is another commonly used risk-adjusted performance measure. One of the ways to measure the Information Ratio (IR) is to divide alpha by the standard deviation of diversifiable risk. Furthermore, it could also be defined as the mean active return divided by active risk (CFAInstitute, 2016).

Fama-French Three Factor Model

The benefit of the Fama-French Three Factor Model, which is an extension to the CAPM described above is that it includes the “size” and “value” premium, as created by Fama and French (1992, pp. 427-465) and (1993, pp. 3-56). What is especially important in our context is that value firms tend to outperform the market. Furthermore, the size factor takes into account that small capitalization firms tend to outperform large capitalization firms.

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1 (R_{Mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_{it}$$

Where R_{it} denotes the return of a portfolio in time t, R_{ft} the risk-free rate in time t, R_{Mt} the return of the benchmark in the time period t, from which the risk free rate is subtracted to get the market risk premium, SMB or Small Minus Big represents the spread of the size effect, HML of High Minus Low represents the spread of high book-to-market stocks compared to low book-to-market stocks.

There are many criticisms of the model, as it might be such by construction, but what is important to see if the returns are explained by these factors and what happens with alpha when the value and size factors are added.

Furthermore, Fama and French also updated the model with the two additional factors the Five Factor Model:

$$R_{it} – R_{ft} = \alpha_{it} + \beta_1 (R_{Mt} – R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + \varepsilon_{it}$$

Where the additional two factors denote RMW Robust Minus Weak is the return spread of most profitable firms minus the least profitable and CMA Conservative Minus Aggressive is the difference in returns of the firms that invest conservatively minus those that invest aggressively (French, 2019).

Some of the formulas used in the paper are standardized in financial theory (e.g. for CAPM). Formulas are also available in Bode, Kane, Marcus (2011).

Another thing also tested and is considered under the performance evaluation part is the consideration of the Berkshire Hathaway performance over time. For that analysis, a time series was gathered, from 1980 onward and the close prices on a monthly basis were gathered. For the data on risk-free measures, the Federal Reserve Economic Data FRED database was used. The goal was to measure the changes of alpha of Berkshire Hathaway portfolio over years and whether there is the statistical or economical difference in their outperformance and/or underperformance over the years with respect to the “market”, for which S&P 500 is used once again.

6. Portfolio evaluation and commentary

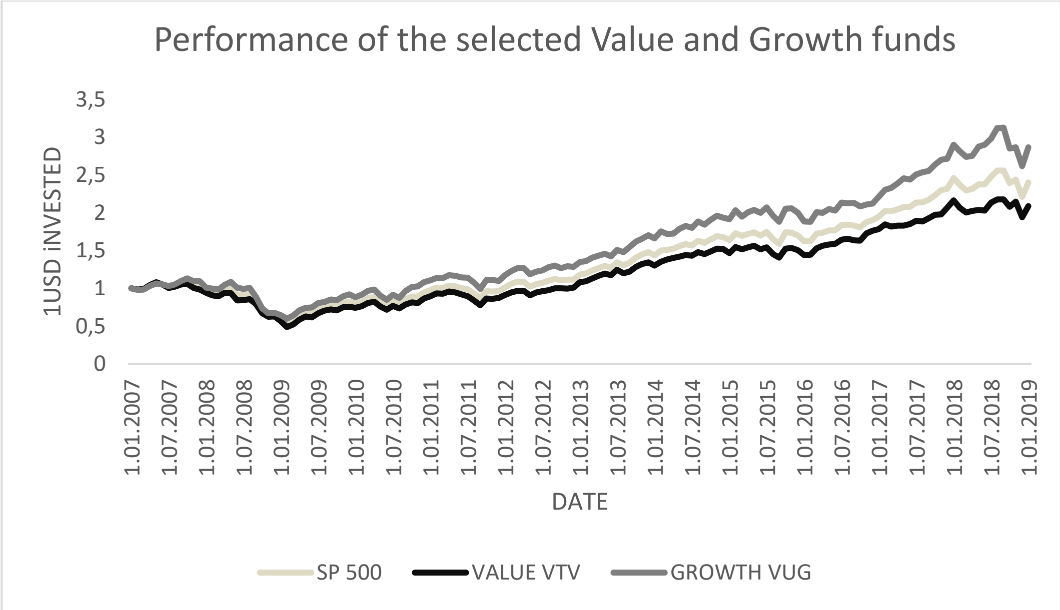
The first part of the evaluation is started with the evaluation of the “value” versus the benchmark versus the “growth” fund. Furthermore, other existing funds were evaluated. For the comparison reasons (as there are also costs for holding the benchmark, even though the costs are very low) SPY Exchange Traded Fund (ETF) is used as a proxy for the SP 500 index. The focus of the first part is to see how the conventional products offered to the investors performed in the last decade. The conventional finance theory mentioned previously tells that “value” should outperform “growth”. As it can be observed from the graph the “growth” fund outperformed the value fund in the selected 12-year period from January 2007 until January 2019. The initial expectation was that value would slightly underperform in the periods of expansion and outperform in the market "bust" year(s). Therefore, the whole cycle was taken int the account. However, as mentioned, just looking at the performance is not sufficient and therefore the risk-adjusted measures of performance were used. Further fund performance can be observed in Appendix 4.

Table 3: Performance measure on monthly basis for "value" and "growth" compared to the benchmark in the period from 2007 until the end of 2018.

	Sharpe ratio	Jensen's Alpha	Treynor ratio	M2	Information Ratio
Value VTV	0.087	-0.087%	0.382%	-0.097%	-8.73%
Growth VUG	0.133	0.122%	0.590%	0.102%	10.83%
Benchmark	0.109		0.469%		

As it can be observed from the table and from the picture below, where the value fund (black) underperforms both compared to the benchmark (light grey) and even more compared to the growth fund (dark grey). The value fund achieves the highest Sharpe ratio, meaning that in the period it had the best reward to the total risk trade-off. However, what is even more important is the positive Alpha that is achieved by the growth fund and stands at 0,122% on a monthly basis. The Traynor ratio and M2 measure of performance follow the pattern, where the best performer is the growth fund, while the value fund is the worst performer. Information Ratio suggests a similar conclusion. Overall, the conclusion is that in the analysed period the value fund performed economically significantly worse than both the benchmark and the growth fund. Here, a distinction in the classification needs to be made, as the terms are sometimes used interchangeably. Value stocks and Value Investing have two different meanings, as Value Investing is both broader term and does not cover all the conventional "value" stocks. Furthermore, a Value investor can often recognize certain "value" stocks as a very speculative purchase. There is some overlap, as for stocks trading at lower multiples sometimes a smaller margin of safety is required and Graham often emphasizes the importance of low multiples, as described in the literature review.

Picture 2: Performance of the selected Value and growth funds



6.1 Performance of the Value Investing Backtested Strategy

As mentioned in the methodology part, 6 different portfolios with a 5-year investing period were created. This assumption regarding the holding period was made as it is expected that within three to five years the stocks would appreciate toward the fair value. Here can an important observation by the investing strategy be made. Value Investors do not believe in the Semi-Strong Efficient Market Hypothesis in the short run, as there is a belief that an investor could capture and "exploit" the information from the fundamental data of the companies. Another important fact is that the strategy is not based on some superior amount of data or better connections compared to other market participants. The point of the strategy is that it competes in the free market, where essentially all the data can be captured for the marginal cost of close to zero for an average individual that has internet access. However, the stocks that show a discrepancy between the value and price in the short run ought to appreciate towards a fair value in a relatively reasonable amount of time, over several years. That indicates that there is a belief that markets, or alternatively said that the consensus for the price in the financial markets eventually will recognize the full value of the selected stocks. That is an important point that might initially not be so obvious. It is true that the same can be said for example for short term trades, investors with a time horizon of several weeks or months and use the same logic to capture the difference between the value and price. However, from the value investing standpoint, such trades are considered speculative purchases as in the short term (e.g. one year) any asset can outperform another asset, even on the risk-adjusted basis. The only important thing here would be to find the right month.

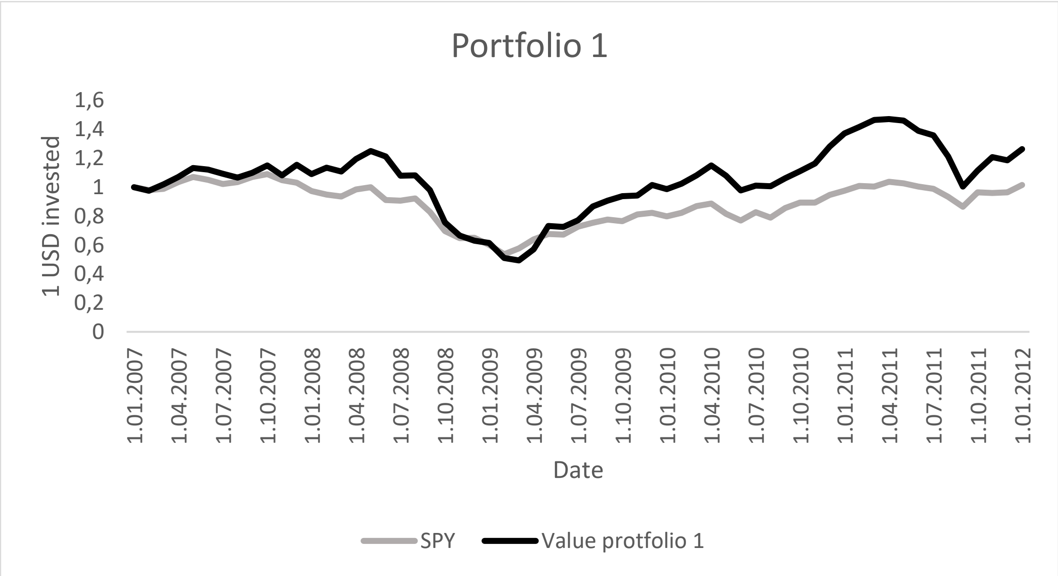
A certain limitation is the analysis of the fundamental business ratios behind the numbers. For example, current assets might not show the whole picture without the story behind them. Furthermore, there can be many reasons behind the high earnings yield. Are that expected bad future results, is the industry declining, potential lawsuits, etc? In the Value Investing such speculations, for example with lawsuits where the negative outcome could be devastating for the return do not satisfy the investment criteria and are regarded as speculation. Therefore, such companies that might have ended up in one or several of the presented portfolios would be excluded. Furthermore, there is a high possibility that a Value Investor would not even be fully invested in the high valuation environment, meaning that stocks are selling at the estimates that are too high or alternatively said that in the limited universe of stocks, especially when dealing with large sums of money, good opportunities might not be able to find. Furthermore, it is very risky to assume that for example, past returns of the last decade are going to be repeated in the next decade. In the past, the returns have often proved to be a very noisy measure that predicts the future moves in the stock market.

To summarize, six different portfolios were created. One portfolio, the shortest one that spans only over the last two years delivered economically significantly negative alpha. Furthermore, it achieves significantly lower Sharpe ratio compared to the benchmarks, which is for all cases the SP 500. The style analysis could be done for different portfolio, with an approach of minimizing the tracking errors and set up weights between the different passive benchmarks. For the purpose of this paper, this technique is irrelevant, as it would be less comprehensive to compare portfolios with different passive benchmarks. The other five portfolios delivered positive alpha, and two of those delivered also higher Sharpe ratio. The results are not in accordance with our expectations, as the expectation was a significant underperformance of the portfolios. The results are therefore both important and surprising.

Table 4: Performance measure on a monthly basis for the Portfolios 1-6 compared to the benchmark in the period from 2007 until the end of 2018.

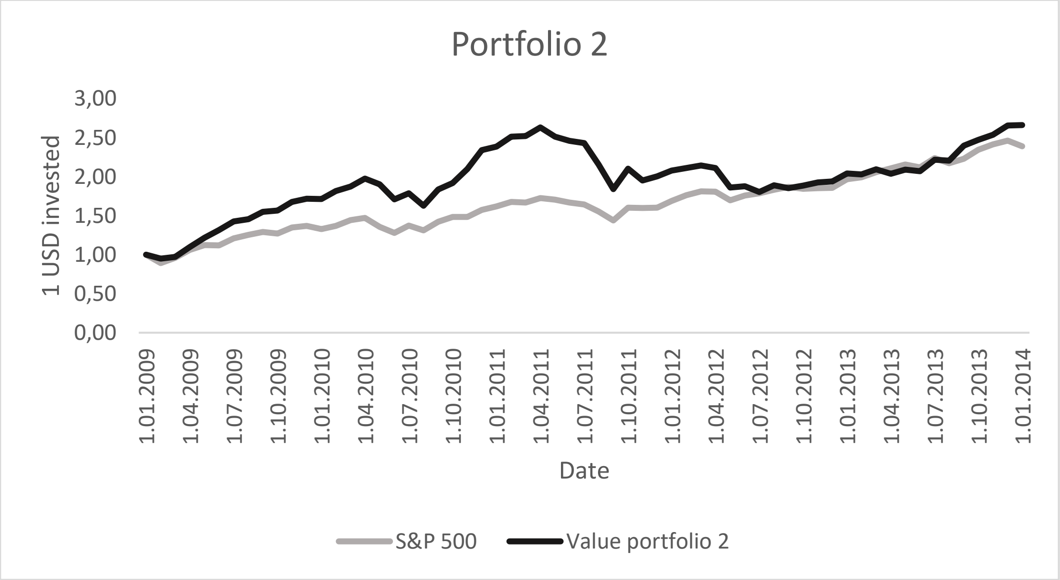
	Sharpe ratio	Jensen's Alpha	Treynor ratio	M2	Information Ratio
P1	0.066	0.552%	0.494%	0.369%	21.80%
Benchmark	-0.001		-0.004%		
P2	0.272	0.198%	1.570%	-0.159%	19.67%
Benchmark	0.307		1.381%		
P3	0.255	0.339%	1.092%	0.177%	15.15%
Benchmark	0.206		0.739%		
P4	0.331	0.133%	1.217%	-0.145%	5.52%
Benchmark	0.382		1.089%		
P5	0.095	0.033%	0.539%	-0.191%	0.46%
Benchmark	0.150		0.518%		
P6	0.024	-0.710%	0.122%	-0.674%	-18.62%
Benchmark	0.206		0.764%		

Picture 3: Portfolio 1 performance in the period from the beginning of 2007 for 5 years, until the beginning of 2012.



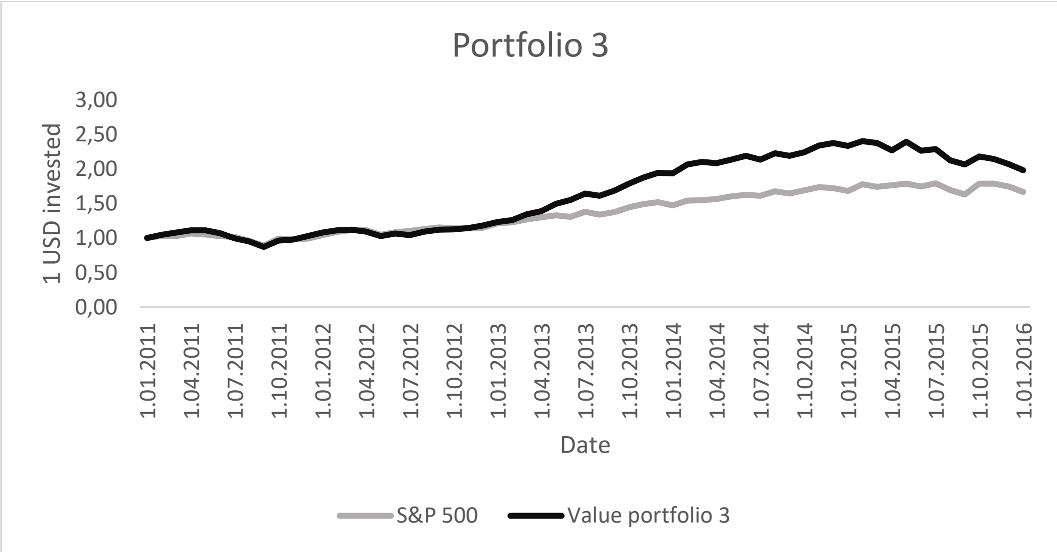
Portfolio 1 is invested also during the stock market crash in 2008. What is surprising is that the portfolio, looking from April 2007 until March 2009 falls more than the benchmark. However, it is important to note that it outperforms the benchmark in 2007 and after March 2009. The portfolio is more volatile, but the outperformance compared to the S&P 500 is economically significant (economic significance is explained at the end of chapter 6.1), the monthly Sharpe Ratio of Portfolio 1 is 0,066 compared to -0,001 of the benchmark. Monthly Sharpe Ratios are generally annualized by multiplying monthly estimates by the square root of 12. However, Lo (2003, pp. 36-37) states that: “the correct multiplier depends on the correlation of portfolio’s returns and can yield considerably different Sharpe Ratios, considerably smaller in case of positive serial correlation or larger in the case of negative serial correlation.” The initial intuition behind the value stocks is that they should outperform during the stock market crash and do similarly or slightly worse during the expansion. On the risk-adjusted performance measures, the portfolio achieves, as mentioned a higher Sharpe Ratio and alpha of 0,55% on a monthly basis. Furthermore, the M2 measure is positive and stands at 0,369%.

Picture 4: Portfolio 2 performance in the period from the beginning of 2009 for 5 years, until the beginning of 2014.



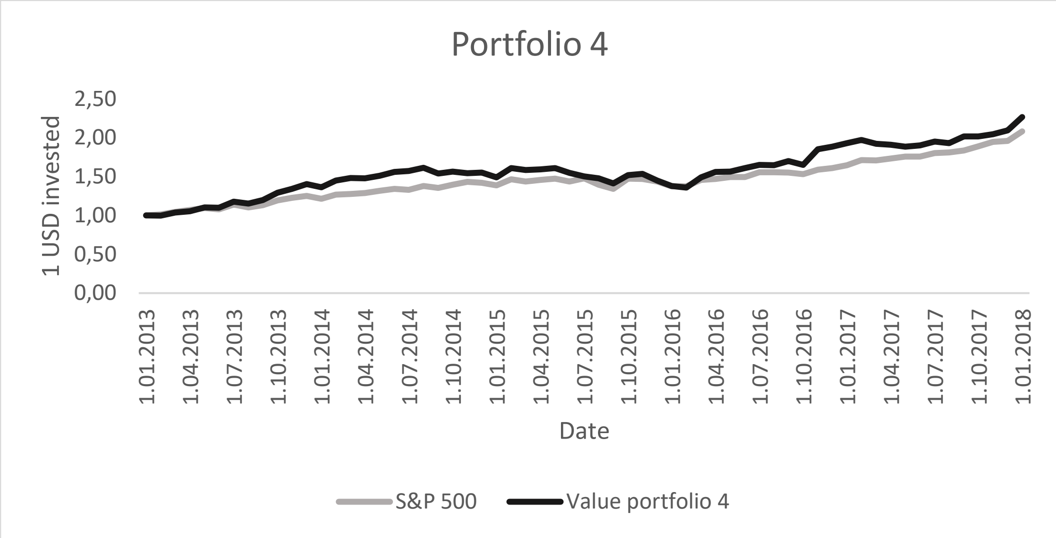
What is important to note is that three years with the Portfolio 1 (first three) and three years with the portfolio 3 (last three) overlap, so the performance ought to be the same. But the subtle point is that the stock picks in the Portfolio 2 are different than in Portfolio 1 and in Portfolio 3, and therefore the performance is different. From the graph we can observe that in the first half of the invested period the outperformance is significant, then the portfolio performs worse, and in the end, the portfolio again outperforms the benchmark. The portfolio is “better” than the benchmark essentially the whole period, but it is also more volatile. It delivers positive monthly Alpha at 0,198%, while the monthly Sharpe Ratio is lower at 0,272 compared to the 0,307 of the benchmark. Treynor ratio is at 1.57% by 0,19 percentage point higher compared to the benchmark.

Picture 5: Portfolio 3 performance in the period from the beginning of 2011 for 5 years, until the beginning of 2016.



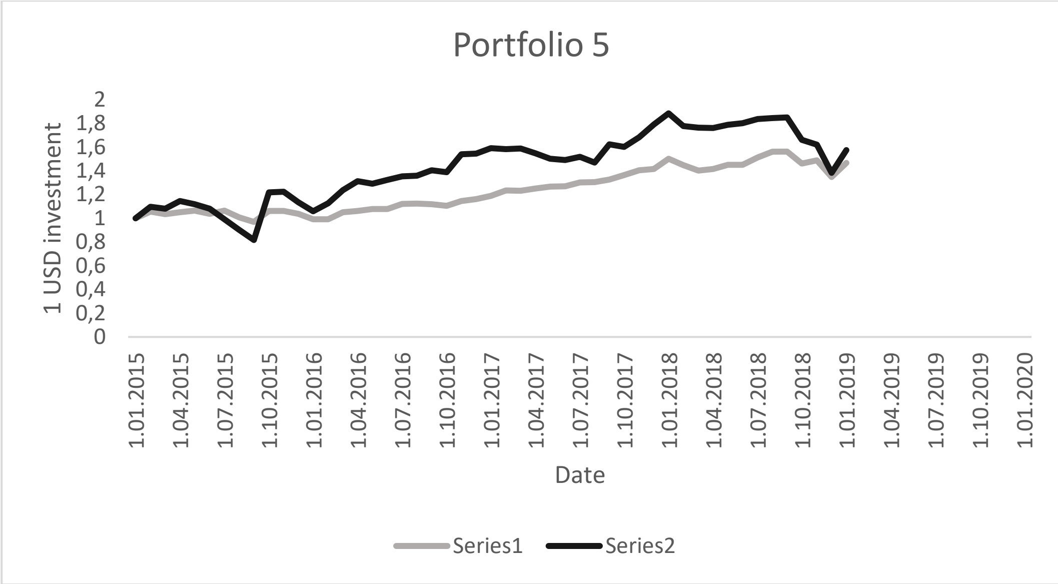
In Portfolio 3, the overlap in the period in the first three years is with Portfolio 2 and in the last three years with Portfolio 4. As it can also be observed in the graph the portfolio in the first 2,5 years tracks the benchmark, but in the second part of the investment life economically significantly outperformed the benchmark and delivered solid results with relatively low volatility. Furthermore, the adjusted beta was 0,96. Monthly Alpha is at 0,339% positive and economically significant. Furthermore, all other risk-adjusted measures are favorable compared to the benchmark. M2 stands at 0,177% and Information Ratio at 15,15% and tells that the portfolio did well compared to how much diversifiable risk was taken. Treynor Ratio, which measures excess return per unit of systemic risk was also higher, at 1,092%, compared to the 0,739% of the Traynor Ratio of the benchmark.

Picture 6: Portfolio 4 performance in the period from the beginning of 2013 for 5 years, until the beginning of 2018.



Portfolio 4 moves relatively similar to the benchmark. The volatility is higher than the volatility of benchmark, with an annualized standard deviation of 13.22% compared to the 9.88% of the benchmark. The portfolio has positive monthly Alpha at 0,133%, while the Sharpe Ratio is lower at 0,331 compared to the 0,382 of the benchmark. The M2 measure of performance is also negative, which is expected since the version of M2 with the standard deviation as a measure of total risk, rather than beta as a measure of systematic risk is used. Information Ratio stands at 5,52% and is lower than the first three portfolios, and higher than the last two.

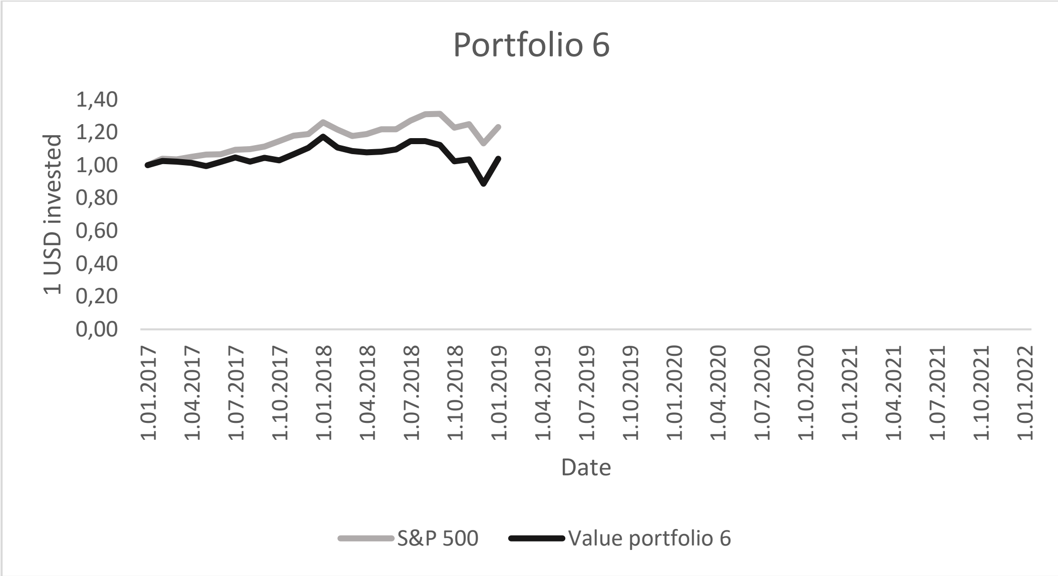
Picture 7: Portfolio 5 performance in the period from the beginning of 2015 for 4 years, until the beginning of 2019.



The first thing important observation is that that the portfolio lines length end intentionally at the beginning of 2019, while the Portfolio is according to the strategy described in the methodology planned to exit after 5 years, so 1. January 2020. Therefore, for the comparability in the visualization with the other portfolios, the last year is still blank. The same analogy is applied to portfolio 6, which is invested for two out of five years.

As it can be observed on the upper graph the portfolio in the initial nine months fell by almost 20% from the starting value, but later solidly performed compared to the benchmark. However, in the last 6 months before the sale portfolio fell more than the benchmark, but in the end, also bounced back and ended up the holding period above the benchmark. The portfolio delivers economically insignificant alpha, while the monthly Sharpe Ratio is significantly lower at 0,095 compared to the 0,150 of the benchmark. Furthermore, the M2 measure of performance is also negative at -0.191% per month. Portfolio also has a relatively high adjusted beta at 1,59, meaning that it has high exposure to the general moves of the benchmark.

Picture 8: Portfolio 6 performance in the period from the beginning of 2017 for 2 years, until the beginning of 2019.



In Portfolio 6, the first important observation is that the portfolio, for now, spans only for two years. The second important observation is that until now it economically significantly underperformed (black line) against the benchmark S&P 500 (light grey line). Furthermore, Portfolio 6 it is also slightly more volatile than the S&P 500 with the annualized standard deviation of 15.53% versus 14.86% of the benchmark. Therefore the return to volatility ratio, assuming obviously the same risk-free rate is worse from both sides of the equation, but the important difference is in the returns. The portfolio in the first 24 months economically significantly underperforms the benchmark and delivers a negative alpha of -0,710% per month. Furthermore, all other risk-adjusted measures steer toward worse performance. Monthly Sharpe Ratio is significantly lower with 0,024 compared to the 0,206 of the benchmark.

Similarly, as with portfolio 5, the line chart is intentionally shorter for easier visualization compared to the other portfolios. The portfolio has 60% of the time to go further on and the stocks in it are supposed to be sold on 1. January 2022. Despite the fact that it underperforms compared to the benchmark, it is obviously unknown where the portfolio will end up by 2022. However, current prospects do not look good. There are now two future possibilities, either continuing to underperform or the so-called mean reversion.

The overall performance of Portfolios 1-6 was on average expected to be significantly worse than it actually was. Positions with only 15 to 20 stocks in the same "group" according to the analysed fundamental factors were expected to be highly correlated among themselves and that was expected to result in high risk. As soon as we have highly correlated assets the effect of diversification diminishes. Theoretically, if the correlation coefficient among the securities is 1, then there is no effect of diversification and no benefit of holding multiple assets if they have the same expected return.

From the results that can be observed that the Portfolios in five out of six portfolios deliver positive Alpha. One of those Alphas is economically not significant. One portfolio delivers economically significant negative Alpha (Portfolio 6). Furthermore, the Sharpe Ratio is lower in four portfolios out of six portfolios compared to the benchmark. However, in Portfolio 2 the difference is not economically significant. In two portfolios the Sharpe Ratio is higher. Since the Sharpe Ratio uses as a measure of risk the total risk (Standard Deviation), it is highly relevant if the portfolio is the only portfolio that we are invested in. However, if the Portfolio is added to an already well-diversified portfolio the Jensen's Alpha is a more comprehensive measure, as the diversifiable risk that we are taking on that is taken into account in the variance/standard deviation is less relevant. Therefore, on average, ceteris paribus adding the portfolios according to the obtained results in a well-diversified portfolio is a feasible strategy. The results are surprising in a positive sense for the Value Investing Strategy and Important from the perspective of the possibilities for investing and future research.

Table 5: Fama-French Three Factor Model results

Fama French Three Factors Model results. The regression model is

$R_{it} – R_{ft} = \alpha_{it} + \beta_1 (R_{Mt} – R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_{it}$

Where R_{it} is the return of a portfolio in time t, R_{ft} the risk-free rate in time t, R_{Mt} the return of the benchmark in the time period t, from which the risk free rate is subtracted to get the market risk premium, SMB or Small Minus Big represents the spread of the size effect, HML of High Minus Low represents the spread of high book-to-market stocks compared to low book-to-market stocks. The factors are downloaded from Ken French's Web site. The coefficients are estimated using OLS. The numbers in the parenthesis are t-statistics. The columns labeled R^2 adj contain the adjusted R-squared. The column labeled T contains the sample size used in the regression. ***, ** and * indicate if the coefficient is significant at 1%, 5% or 10% level.

PORTFOLIO	Intercept	Mkt-RF	SMB	HML	T	R^2 adj
Value VTV	-0.03	0.97***	-0.24***	0.27***	144	0.96

	(-0.36)	(53.77)	(-7.22)	(9.31)		
Growth VUG	0.00	1.06***	-0.08**	-0.29***	144	0.97
	(0.05)	(61.05)	(-2.38)	(-10.60)		
Portfolio 1	0.49	1.15***	-0.11	-0.04	60	0.56
	(0.68)	(7.60)	(-0.32)	(-0.16)		
Portfolio 2	-0.08	1.01***	0.74***	-0.25	60	0.71
	(-0.18)	(8.41)	(3.36)	(-1.26)		
Portfolio 3	0.47	0.93***	0.19	0.17	60	0.74
	(1.65)	(11.49)	(1.44)	(1.11)		
Portfolio 4	0.13	1.07***	0.18*	0.51	60	0.80
	(0.53)	(13.42)	(1.83)	(5.18)		
Portfolio 5	-0.14	1.89***	-0.08	0.81	48	0.52
	(-0.15)	(6.98)	(-0.21)	(2.10)		
Portfolio 6	-0.98	-0.21	-0.58	-0.89	24	0.17
	-1.06)	(-0.88)	(-1.66)	(-1.95)		

As it can be observed in the table for the Fama French Three Factor Model essentially all the variability of the “value” and “growth” fund can be explained with the three factors, since the adjusted R^2 stands at 0,96 and 0,97. None of the Alphas is statistically significantly different from zero. All except the last regression, which has a very low sample size, have the market risk factor significant at p=0,01. HML positive factor and a statistically significant factor in the first regression indicates that it is a value fund, and negative at the second regression suggests that it is a growth fund. Value and Portfolio 2 at 1%, Growth at 5% significance level and Portfolio 4 at 10% significance level indicate that the fund is primarily composed of large capitalization stocks. The Market loading for Portfolio 5 is relatively high at 1,89. Portfolio 6 is added both in the Three and Five Factor Models for completeness, but the sample size is too small for thorough analysis.

Table 6: Fama French Five Factor Model results

Fama French Five Factors Model results. The regression model is

$R_{it} – R_{ft} = \alpha_{it} + \beta_1 (R_{Mt} – R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + \varepsilon_{it}$

Where R_{it} is the return of a portfolio in time t, R_{ft} the risk-free rate in time t, R_{Mt} the return of the benchmark in the time period t, from which the risk free rate is subtracted to get the market risk premium, SMB or Small Minus Big represents the spread of the size effect, HML of High Minus Low represents the spread of high book-to-market stocks compared to low book-to-market stocks. RMW Robust Minus Weak factor represents the return spread of most profitable firms minus the least profitable and CMA Conservative Minus Aggressive is the difference in returns of the firms that invest conservatively minus those that invest aggressively. The factors are downloaded from Ken French's Web site. The coefficients are estimated using OLS. The numbers in the parenthesis are t-statistics. The columns labeled R^2 adj contain the adjusted R-squared. The column labeled T contains the sample size used in the regression. ***, ** and * indicate if the coefficient is significant at 1%, 5% or 10% level.

PORTFOLIO	Intercept	Mkt-RF	SMB	HML	RMW	CMA	T	R2 adj
Value VTV	-0.03	0.99***	0.25***	0.22***	-0.05	0.22***	144	0.96
	(-0.45)	(52.02)	(7.54)	(6.45)	(-0.95)	(3.68)		
Growth VUG	0.00	1.06***	0.07**	0.22***	0.07	0.16***	144	0.97
	(-0.01)	(57.26)	(2.13)	(-6.66)	(1.42)	(-2.69)		
Portfolio 1	0.54	1.13***	0.09	0.04	-0.01	-0.25	60	0.55
	(0.66)	(6.12)	(0.25)	(0.13)	(-0.02)	(-0.44)		
Portfolio 2	-0.05	0.99***	0.64	-0.46*	-0.43	0.11	60	0.70
	(-0.11)	(7.88)	(2.92)	(-1.81)	(-1.38)	(0.28)		
Portfolio 3	0.47*	0.92***	0.19	-0.15	-0.22	0.63**	60	0.76
	(1.69)	(10.88)	(1.27)	(-0.72)	(-0.97)	(2.12)		
Portfolio 4	0.26	1.09***	0.06	0.30**	-0.35**	0.57***	60	0.82
	(1.11)	(14.46)	(0.61)	(2.45)	(-2.16)	(2.84)		
Portfolio 5	-0.05	2.10***	-0.13	0.01	0.03	2.00	48	0.57
	(-0.069)	(7.84)	(0.34)	(0.01)	(0.04)	(2.68)		
Portfolio 6	-0.92	-0.26	0.54	-0.51	0.13	-0.56	24	0.09
	(-0.94)	(-0.98)	(1.25)	(-0.77)	(0.16)	(-0.69)		

In the Five Factor Model, the observations are relatively similar, and two new factors do not add much explanatory power. For portfolios 1-5 the adjusted R^2 is between 0,01 and 0,05 higher. The RMW factor is statistically significant at 5% level only for portfolio 4. The CMA factor is statistically significant at 1% confidence level for value fund, growth fund and portfolio 4, and at 5% confidence level for portfolio 4. Alpha of Portfolio 3 is statistically significant at the 10% significance level. It is positive at 0,47% per month. (As it can be observed, from a practical standpoint there is no significant difference between the significance of Alpha in the Fama French Three versus Fama French Five Factor Model). That indicates that Alpha is positive, statistically significant and economically significant. An important explanation about every time the economic significance is mentioned in the paper goes as follows: when doing empirical analysis and performing statistical analysis two aspects are important, the statistical and economic significance of our findings. Statistical significance is the significance of a coefficient at a prespecified p level in a valid statistical model. On the other hand, the economic significance is a more subtle concept. For example, we can get in the Fama-French model statistically significant alpha of +0,03% per month at 95% confidence level. However, the next question is whether an active approach with such Alpha really was adding value. 0.03%, even if statistically significant, is under this interpretation economically insignificant. The size where a certain number becomes economically significant also depends on the context. For example, is +2.00% an economically significant result? The answer really depends on the context. If 2.00% is, for example, a change in the price of product ABC in a decade that is a small, highly likely insignificant change. However, if a mutual fund manager consistently delivers 2.00% positive annual Alpha that difference might distinguish manager among the top and bottom quartile of investors in developed financial markets. Furthermore, even more important, if, for example, the return of a risk-adjusted benchmark was 5% in year 1, while investor achieved 7% risk-adjusted return, it means that the "outperformance" was two percentage points. These two percentage points mean that the return was 40% higher. Such a difference is in financial markets important and economically significant. Even one percentage point annual difference net of fees and other costs is significant. However, the real difference shows over the decades when the additional effect of compounding is added. If we assume 5% vs 7% annual return (and neglect the standard deviation for this representation), this means that an investor that invests 1.000.000 USD in alternative 1 (5%) versus the alternative 2 for 10 years and reinvests the "profit" has 1.628.895 USD versus 1.967.151 USD after 10 years and after 20 years 2.653.298 USD versus 3.869.684 USD. The present value of the difference can be calculated if we know the proper riskiness and interest rate environment. The future value of the difference is 338.256 USD and 1.216.386 USD. The present value of the discounted difference discounted with the discount rate of 10% is 130.412 USD for the 10-year investment horizon and 180.808 USD for a 20-year investment horizon. This makes the difference economically significant even though the initial outperformance of 2 percentage points seemed subtle. At the end of the example, it is important to note that the same logic works also in the opposite direction with a negative added value of the investor.

6.2 Analysis of the investing style of Berkshire Hathaway

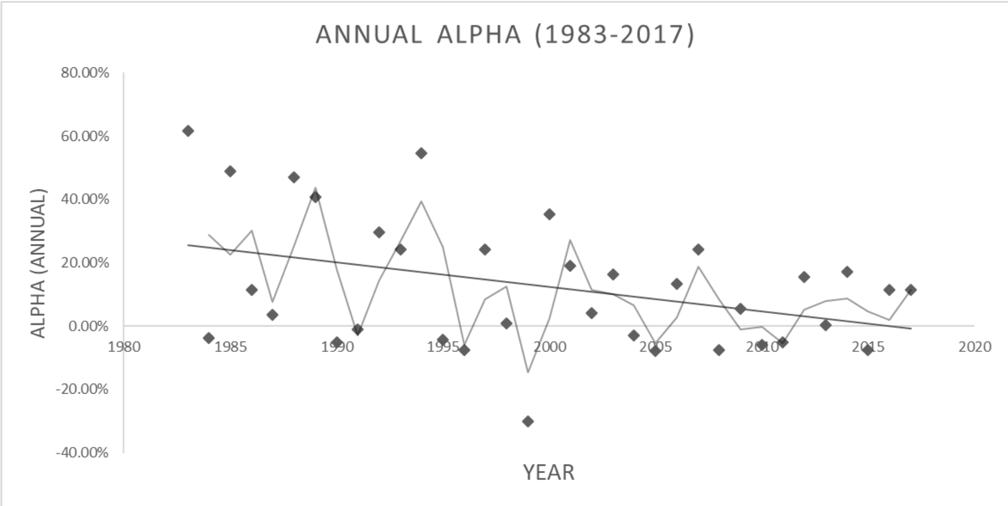
Berkshire Hathaway, with the CEO and chairperson Warren Buffett, is one of the most successful financial firms in the world with one of the most successful investment managers in the world. It is a conglomerate comprised both of many privately owned subsidiaries and investments in common stocks with a market capitalization of over 500 billion USD.

Predicted comments from the Efficient Market Hypothesis attitude is looking at one of the most successful performers in the market is just plain luck and one participant has to be the luckiest. That is one possible explanation for the success of Berkshire Hathaway. An alternative explanation is that Berkshire Hathaway is based on the investing principles, which are possible to generate Alpha in the financial markets and that Warren Buffett and vice-chairman Charles T. Munger are the best Value Investors, according to the historical performance and therefore it makes sense to analyze their investing style to see whether there are some systematic biases in the financial markets that they were able to exploit. The third explanation is just an extraordinary gift for picking stocks and taking over businesses which is not related to the Value Investing, but is only improperly communicated to the broader investing community as Value Investing, just because the “father” of Value Investing Benjamin Graham was one of the professors of Buffett at Columbia University and later also his co-worker and mentor at Graham-Newman Corp.

The first relevant question is since Berkshire Hathaway has evolved over the years, whether the superior past investment performance of Berkshire stock is still relevant. Furthermore, a large part of that return is attributable indirectly to the marketable securities that they hold in their portfolio and obviously, the other large part is attributable to the businesses that they own. Furthermore, the analysis of their performance can also show how much value they have added in total under the assumption that the markets are efficient and that the Alpha generated per year is a comprehensive reflection of the performance.

In the graph below the annual alpha of Berkshire Hathaway is presented. Furthermore, the trendline and the two years moving average line is added.

Picture 9: The annual change in the Berkshire Hathaway alpha (dots), two-year moving average (curved line) and trendline (straight line).



As it can be observed the slope is negative, therefore meaning that the alpha of Berkshire Hathaway is diminishing through the years. The regression was made using the ordinary least squares (OLS). The intercept stands at 0,216 with the corresponding p-value at 0,003, while the slope is at -0,0058 with the corresponding p-value at 0,082. Therefore, the Alpha is deteriorating at a statistically significant level with 90% confidence interval. What is important is the slope of the regression line. If the measured period increases by 1 year, then on average, ceteris paribus, Alpha decreases by 0,58% points at 10% significance level. The result is important as it is both economically significant at 0,58% points per year, which is a large amount for Alpha, and, as mentioned also statistically significant with p-value statistically significant at 0,10 level.

The factors that might have affected Berkshire Hathaway's diminishing Alpha:

The first reason that might have affected the Alpha of the Berkshire Hathaway is the investing style of the investors. In the initial days, the investment style was to invest in classic Value Investing type of stocks that trade at preferably low multiples and still offer a decent margin of safety compared to the market price. Berkshire Hathaway itself was one of those investments, where the company was bought for a very low price but did not generate high returns and it was also operating in the textile industry, which was determined to go bust in the

1970-s. The money could be made, but it was very hard, as there were layoffs and asset stripping was required. But the investing style has evolved towards "better" companies or companies with better companies selling at a reasonable price. Furthermore, the investing style was streamed towards the companies that are low in capital intensiveness. Buying very good companies that require low investments and distribute cash for further investments. A classic example of that type of company would be See's Candies, a company from California which was bought in 1972. The point of such a company that produces candies is in the high Return On Invested Capital (ROIC). Another benefit of such company is that it has a "moat" around the business model, which essentially means that the brand has a strong reputation and potentially even subconsciously affects the purchasing decision of the customer. In See's Candies in California, where the association was especially strong for Christmas and Valentine's day. A company that has such "moat" almost all around the world is also one of the investments is Coca Cola. Berkshire Hathaway acquired a large stake in late 1980-s. Even today, Berkshire Hathaway is the largest Institutional Holder of Coca Cola, owning 400 million shares (Nasdaq, 2019). One important part of the advantage in the Berkshire portfolio is also the Insurance business, where float from the collected premiums is collected and invested further. GEICO is a classic example of a company that was important to start the insurance operations. However, in recent years, the investments were also streamed towards the third investing style, which is capital intensive companies, that also have a moat around. An example is the BNSF Railway company. The moat is obvious, as it is very hard to replicate a railway and furthermore it is a very efficient way to move goods on land. The last sector of investments that Berkshire engaged in recently was investments in the technology companies, both in Amazon and especially in Apple, which was on the 31.12.2018 also the largest investment of Berkshire Hathaway in marketable securities worth 40 271 million USD (Buffett, 2019b, p. 12).

The second reason, rather the investing style might be the size of the investments that Berkshire Hathaway makes. From investing several million dollars, to also a thousand times larger amounts makes an investment decision harder. Even if an investment has the same characteristics investing on a small scale has one massive advantage. There are thousands and thousands of different opportunities to invest small sums and therefore more opportunities to find better Value Investments. When dealing with e.g. 100 billion in the investable amount the picture is different. There are only a few opportunities that fit into the Value Investing criteria and are understandable to the management of Berkshire Hathaway. Therefore, the first point about the evolution of the businesses might rather be a consequence and not an intention to invest in, for example, capital intensive companies. That might also be the reason why the Alpha went from great to satisfactory and if the trend continues the performance of the whole company might soon, on average, ceteris paribus, over several years be roughly around the index.

The third reason that affects the Alpha of the investigated company is the market timing ability. Despite the fact that managers are often advocates of the passive investing they hold large amounts of cash, over 100 billion dollars. However, market timing ability is harder to assess. One thing that is important to note is that the market timing and stock picking are connected and again the possibilities are much broader with the small amount of money in relative terms. In absolute terms, the scale has an obvious advantage over a small amount. Furthermore, factors such as higher efficiency of the financial markets through time and the diminishing ability of the investment managers were considered for the statistical analysis but are essentially impossible to add in the model, as there was no reliable data available. Furthermore, the goal was to find if the Alpha is changing through time. The primary focus of the analysis is presented below and is focused on the performance of Berkshire marketable securities.

Table 7: Performance of four Portfolios compared to the benchmark in the period from the beginning of 2000 until the end of 2018 (monthly).

Portfolio	Sharpe Ratio	Jensen's Alpha	Treynor Ratio	M2	Information Ratio
P 2000-j5	0.040	0.356%	0.265%	0.450%	11.099%
Benchmark	-0.057		-0.265%		
P2005-j10	0.034	0.281%	0.174%	0.273%	12.681%
Benchmark	-0.025		-0.117%		
P2010-j15	0.263	-0.012%	1.023%	-0.047%	-1.459%
Benchmark	0.276		1.037%		
P2015-j19	0.056	-0.360%	0.214%	-0.389%	-23.334%
Benchmark	0.169		0.584%		

As mentioned previously, this is the performance measured for the part of Berkshire portfolio traded and in the financial markets and reported to the SEC. Performance measures are on a monthly basis. Portfolios are measured from the beginning of the year until (e.g. 2000), for the period of 60 months, with the exception of the last portfolio, which spans over 48 months and are found in the Appendix 5. The portfolio achieves economically significant positive Alpha in the first two portfolios, with values of 4.27% annually for the first portfolio and 3.37% annually for the second portfolio and economically significant negative Alpha in the last portfolio -4.32% per year. In the third portfolio, the Alpha (-0.144% annually) is not economically significant (the same explanation for the economic significance applies here as explained at the end of chapter 6.1). Treynor's measure provides the same conclusion, that portfolios 1 and 2 performed significantly better, portfolio 3 insignificantly worse and portfolio 4 significantly worse. The finding is not surprising since the Beta was used again as a measure of risk, just the scaling is different as it is measured as excess return per unit of systemic risk that we are taking with the portfolio. An important observation can be made regarding the Sharpe Ratio. The conclusion for the Sharpe Ratio is that also Sharpe Ratio corresponds in the same way as Alpha and Treynor Ratio. This finding is more surprising since the measure of risk is the Standard Deviation, so the total risk of the portfolio. This means that this portfolio(s) are not exposed to a lot of diversifiable risk. The finding is important if the portfolio is the only portfolio that we have. Furthermore, for comparison in the created portfolios 1-6 from the previous part of the analysis, the diversifiable risk was higher and consequently, Sharpe Ratios were less favorable. M2 and Information Ratio both draw the same conclusion regarding portfolio 1 and 2 outperforming and 4 significantly underperforming. As it can be observed from the Fama-French Three Factor Model, an important observation can be made in Portfolio 2 (P 2005-j10). In the portfolio, all three factors are statistically significant at 1% level, and Alpha is statistically not significant. The adjusted R2 stands at 0,85, which tells that 85% of the variability is explained by the three factors in the model. A negative loading on the SMB factor tells that the fund is primarily composed of large capitalization stocks, which is not surprising, as the invested amount in the portfolio is so large that large capitalization stocks are the only feasible choice. Furthermore, the HML factor of 0,50 indicated that it is a value fund. Therefore, the outperformance measured previously with the standard risk-adjusted performance measures can be attributed to the exposure to the large value stocks in the selected period. Factor-Based Analysis for the portfolio steers towards the efficiency of the market, rather than the management ability in the case of Portfolio 2.

Table 8: Fama-French Three Factor Model results for Berkshire Portfolios

Fama French Three Factors Model results. The regression model is

$R_{it} – R_{ft} = \alpha_{it} + \beta_1 (R_{Mt} – R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_{it}$

Where R_{it} is the return of a portfolio in time t, R_{ft} the risk-free rate in time t, R_{Mt} the return of the benchmark in the time period t, from which the risk free rate is subtracted to get the market risk premium, SMB or Small Minus Big represents the spread of the size effect, HML of High Minus Low represents the spread of high book-to-market stocks compared to low book-to-market stocks. The factors are downloaded from Ken French's Web site. The coefficients are estimated using OLS. The numbers in the parenthesis are t-statistics. The columns labeled R^2 adj contain the adjusted R-squared. The column labeled T contains the sample size used in the regression. ***, ** and * indicate if the coefficient is significant at 1%, 5% or 10% level.

PORTFOLIO	Intercept	Mkt-RF	SMB	HML	T	R2 adj
P 2000-j5	0.05	0.56***	-0.19	0.37**	60	0.35
	(0.09)	(5.14)	(-1.64)	(2.43)		
P 2005-j10	0.17	0.87***	-0.43***	0.50***	60	0.85
	(0.67)	(14.14)	(-3.75)	(5.73)		
P2010-j15	0.20	0.77***	-0.22**	0.11	60	0.79
	(0.96)	(13.04)	(-2.07)	(1.07)		
P2015-j19	-0.34	0.97***	-0.16	0.18*	49	0.82
	(-1.48)	(14.58)	(-1.67)	(1.88)		

7. Possibilities for the future research

First, there are many possibilities to expend the analysis of Value Investing in the emerging financial markets, especially if they are under-analysed or have other restrictions e.g. capital restrictions and therefore might be less efficient compared to the developed financial markets, especially the US stock market. This might also lead to indirectly test the efficiency of those financial markets. An important limitation here is the data collection, which might get exponentially more costly with the less developed markets. Another general challenge in those markets are often the legal limitations and standards as those markets might be significantly riskier from those aspects compared to the developed financial markets. Furthermore, it is important that standardized criteria of the analysts are applied across sections since the assumption is that also the knowledge of the market and therefore also the intangible component of investments is likely to be limited in the more distant markets.

The hardest part of the future research might be expanding even more in the Value Investing field itself since there is no one strict rule of investing and is also heavily dependent on either researcher or investment manager. Therefore, unless one standardized formula or set of formulas for testing is provided, the results won't be completely comparable. Furthermore, the data of recognized Value Investors is very limited, as they try to protect the data, and only selected companies are obliged to publicly share the investments. As mentioned, in the US the regulation requires for those that must report their holdings in the SEC filings only to report their domestic stock holdings. Furthermore, above selected/known few, it is hard to determine who really is investing according to those principles and how much might other techniques affected them and their investing style (either in a positive or negative way), since there is no one universal Value Investing formula.

Furthermore, small stocks, for example, the lowest quarter by absolute size need further analysis. There were in the quarter 4 of 2018, according to the World Federation of Exchanges 51.582 listed companies in three main regions, in Americas 10.075, in Asia Pacific region 27.347 and in EMEA region 14160. The total market cap was 74.432.136 million USD in the last quarter of 2018 with the largest share having the Americas region with 34.206.092 million USD market capitalization, Asia Pacific with 23.859.721 million USD followed by the EMEA region with 16.366.323 million USD (WFE, 2019). World market capitalization in 2018 was 65,661,000 million USD and in the World Bank also claim that market capitalization in the US in 2018 was 33.027.245 million dollars (TheWorldBank, 2019). It is important to note that data between the sources vary a bit, but it is also a question in which period of the year did in the World Bank measure the data. The market capitalization of the SP 500 index, which has 500-505 constituents

that were collectively worth 25.747.000 million USD on April 30 2019 (S&P, 2019), Therefore if we assume relatively constant market capitalization, that means 500 largest companies represented roughly 78% of the total US stock market, with 22% left for the other 95% of the listed companies. That leaves enormous space for the future research and potential to test and expand the Value Investing techniques, especially if the amount invested is not very big, meaning that the researcher could use the whole universe of the stocks. However, it is important to notice that the assumption is that data collection with smaller companies will get more expensive and potentially also less reliable.
Further research and expansion in the field would be a very good addition since the research of Value Investing techniques and the application of them is surprisingly limited.

Conclusion

The paper presents the relevance of Value Investing with the main focus in the developed, especially the US stock market. The results of the performed tests and measurements in the previous sections show that Value Investing with the application of specific rules has a reasonable base to outperform the relevant benchmark. The average annual Alpha of the back-tested strategy was +2.23% per annum.

The principle or an intellectual framework of looking at Value is still relevant, and it should not be neglected. What value is not is just looking at the stock price or do e.g. stock splits from class A to class B, use of excessive leverage to make a decent, risk non-adjusted return, invest based on some political news or to have (the main) focus just on the timing of the market. As Charles Munger stated "All intelligent investing is value investing – acquiring more than you are paying for. You must value the business in order to value the stock." We can say somewhat say that the classic Graham type of investing in large US equities might provide us an advantage in certain periods over the benchmark. The finding is, that on average, it made sense in the previous decade to add "Value Investing" portfolio to an already well-diversified portfolio of stocks.

However, there are also different ways to look for value. There are all kinds of small cap stock where the investing strategy might work differently and there are also different markets to look at, and therefore a lot of the possibilities for the future research with the application of the same principles are still opened.

The findings are consistent with the first Hypothesis, which states that The Value Investing approach is an efficient approach for generating risk-adjusted excess returns in developed financial markets. Therefore, it makes financial sense to participate actively in the markets with the proposed strategy. The second Hypothesis, which states that the management ability and not only valuations play an important role in the successful generation of excess returns from our analysis of the most famous Value Investing company cannot be confirmed for the last decade. While the Alpha of the stock, to which the investments in the financial markets of the company are highly correlated to was high in the 1980-s, it diminished through the decades. Furthermore, the analysis of the disclosed marketable securities failed to deliver evidence of systemic, risk-adjusted outperformance in the last decade, on which the analysis was focused on. Additionally, between 2005 and 2010 period, the Alpha compared to the benchmark can be explained by the 3 factors in the Fama French 3 factor model. In the period of the last 9 years, the average Alpha of the portfolio of marketable securities was -2.00% per annum, while in a decade before it was +3.88% per annum. Based on that results, investors that want to invest in Berkshire Hathaway, company based on Value Investing principles should not expect a large risk-adjusted outperformance compared to the relevant passive benchmark in the long run. However, the company today is well-diversified and is composed also of outstanding private businesses (not traded on the stock exchange). Therefore, the future performance will heavily depend also on the approach of the management towards private investments, managing public investments, dividend payout and share buyback policy.

To conclude, Value Investing provides a solid base for investing and for the understanding of the businesses. It also provides some valuable concepts, like the margin of safety, for investing in any business, and in the end, it also has the potential to add value in the developed financial markets.

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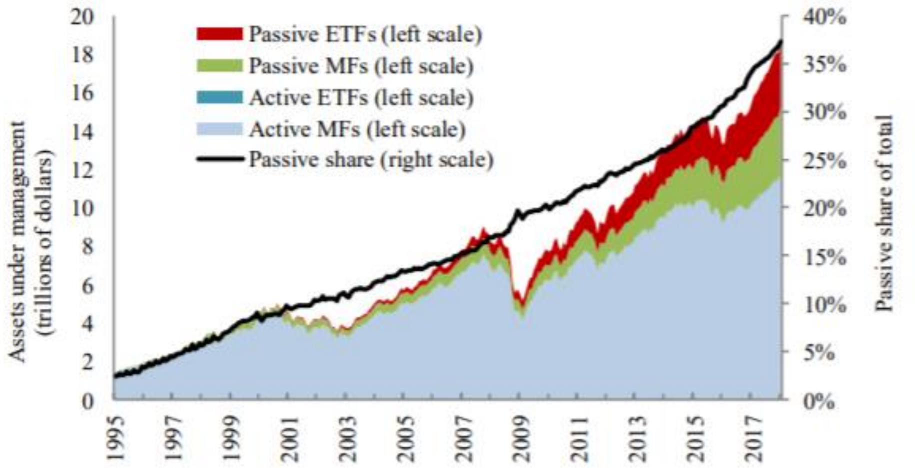
Appendix

Appendix 1: Total assets in active and passive Mutual Funds and Exchange Traded Funds and the passive share of total.



Source: Monrningstar, Inc. (2018), presented in Anadu, Kruttli, McCabe, Osambela, & Hee Shin, (2018, p.2).

Appendix 2: Visualization of the different components of risk.

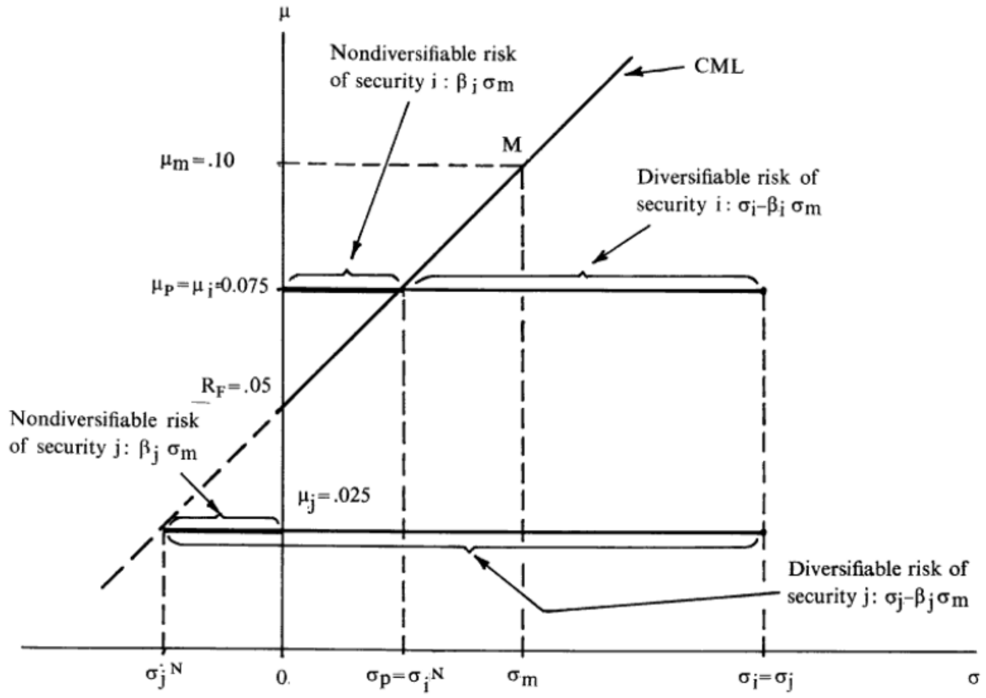


Figure 1

Source: Levy & Ben-Horim (1980).

Appendix 3: Summary statistics for the portfolios 1-6 at the inception date.

Portfolio 1	Market Cap	P/B	Div yield	Curr ratio	D/TBV	P/E 5 yr	P/E
min	3,870,412	1.28	0.00	0.68	0.14	6.39	5.87
max	160,294,126	3.77	6.08	9.18	0.96	15.07	10.50
std deviation	40,156,854	0.70	1.42	1.99	0.24	2.23	1.35
median	19,754,906	1.75	1.07	1.32	0.39	9.05	8.26
mean	30,701,668	2.05	1.48	1.94	0.45	9.28	8.17
Portfolio 2	**Market Cap**	**P/B**	**Div yield**	**Curr ratio**	**D/TBV**	**P/E 5 yr**	**P/E**
min	1,043,990	0.58	0.00	1.73	0.00	5.86	1.93
max	16,248,462	2.19	7.42	5.34	0.91	20.97	7.27
std deviation	4,705,330	0.54	1.92	0.95	0.30	3.81	1.57
median	4,175,543	1.02	1.70	2.22	0.31	12.63	5.30
mean	6,326,288	1.20	1.81	2.55	0.39	13.03	5.04
Portfolio 3	**Market Cap**	**P/B**	**Div yield**	**Curr ratio**	**D/TBV**	**P/E 5 yr**	**P/E**
min	1,610,494	0.97	0.00	0.79	-26.21	5.60	5.52
max	47,873,462	10.75	5.59	4.35	0.94	52.69	9.43
std deviation	13,228,976	2.34	1.98	0.83	5.90	10.70	1.26
median	7,884,356	1.73	1.05	1.39	0.11	10.00	7.93
mean	13,260,921	2.69	1.72	1.69	-1.78	11.76	7.96
Portfolio 4	**Market Cap**	**P/B**	**Div yield**	**Curr ratio**	**D/TBV**	**P/E 5 yr**	**P/E**
min	4,121,788	0.72	0.00	1.04	-9.15	6.02	4.96
max	211,649,577	7.10	4.15	4.79	0.87	24.84	9.94
std deviation	48,251,604	1.35	1.33	0.95	2.30	3.95	1.33
median	13,197,511	1.62	2.08	1.64	0.05	8.52	8.85
mean	27,048,914	1.83	1.93	1.90	-1.07	9.23	8.63
Portfolio 5	**Market Cap**	**P/B**	**Div yield**	**Curr ratio**	**D/TBV**	**P/E 5 yr**	**P/E**
min	3,756,919	0.64	0.00	1.36	-19.11	11.78	9.23
max	123,581,129	6.25	5.35	3.73	0.99	21.90	15.26
std deviation	25,905,882	1.40	1.32	0.53	4.59	2.82	2.22
median	19,953,323	2.12	1.94	2.02	0.17	14.48	12.91
mean	25,169,792	2.47	1.99	2.05	-1.56	15.39	12.52
Portfolio 6	**Market Cap**	**P/B**	**Div yield**	**Curr ratio**	**D/TBV**	**P/E 5 yr**	**P/E**
min	2,821,674	0.56	0.00	1.12	-12.36	8.69	6.14
max	157,832,348	21.70	6.18	18.16	0.78	20.81	12.86
std deviation	34,552,857	4.93	1.77	3.85	3.81	2.93	1.61
median	8,850,268	2.48	1.81	1.44	-1.41	11.99	10.96
mean	16,873,600	4.35	1.97	2.70	-2.42	12.36	10.77

Where Market cap stands for the Market Capitalisation on the inception date (x1000, in USD), P/B stands for Price to Book ratio, Div yield for the Dividend yield, Curr ratio for the Current Ratio, D/TBV for Debt to Tangible Book Value, P/E 5yr for the average Price to Earnings ratio in the last 5 years and P/E for Price/Earnings ratio

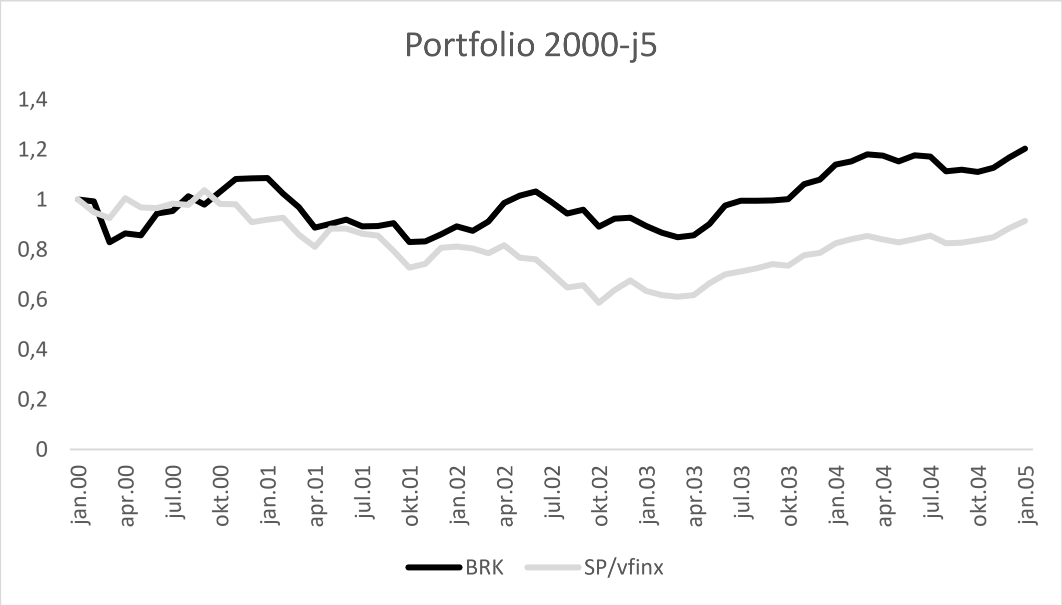
Appendix 4: Returns and evaluation of the selected funds (monthly).

	SPY	VUG	VTV	IWD	EFV	XLU	IWF
simple ret	0.0072	0.0087	0.0062	0.0056	0.0020	0.0071	0.0088
simp ret yearly	0.0868	0.1041	0.0749	0.0670	0.0244	0.0852	0.1058
stdev mon	0.0430	0.0450	0.0440	0.0441	0.0570	0.0395	0.0438
stdev year	0.1490	0.1559	0.1526	0.1528	0.1976	0.1369	0.1517
skewness	0.6247	-0.6772	-0.6359	-0.7021	-0.2102	-0.8288	-0.7276
kurtosis	1.4486	1.6259	1.4874	1.7386	0.9407	1.0908	1.8350
beta	1.0000	1.0174	0.9975	0.9988	1.1515	0.4422	0.9931
adjusted beta	1.0000	1.0015	0.9883	0.9892	1.0900	0.6218	0.9854
Sharpe	0.5823	0.6680	0.4910	0.4382	0.1237	0.6218	0.6973
Treynor	0.0868	0.1023	0.0751	0.0670	0.0212	0.1926	0.1065
Jensen's alpha	0.0000	0.0158	-0.0116	-0.0197	-0.0755	0.0468	0.0196
Modigliani M2	0.0000	0.0128	-0.0136	-0.0215	-0.0683	0.0059	0.0171

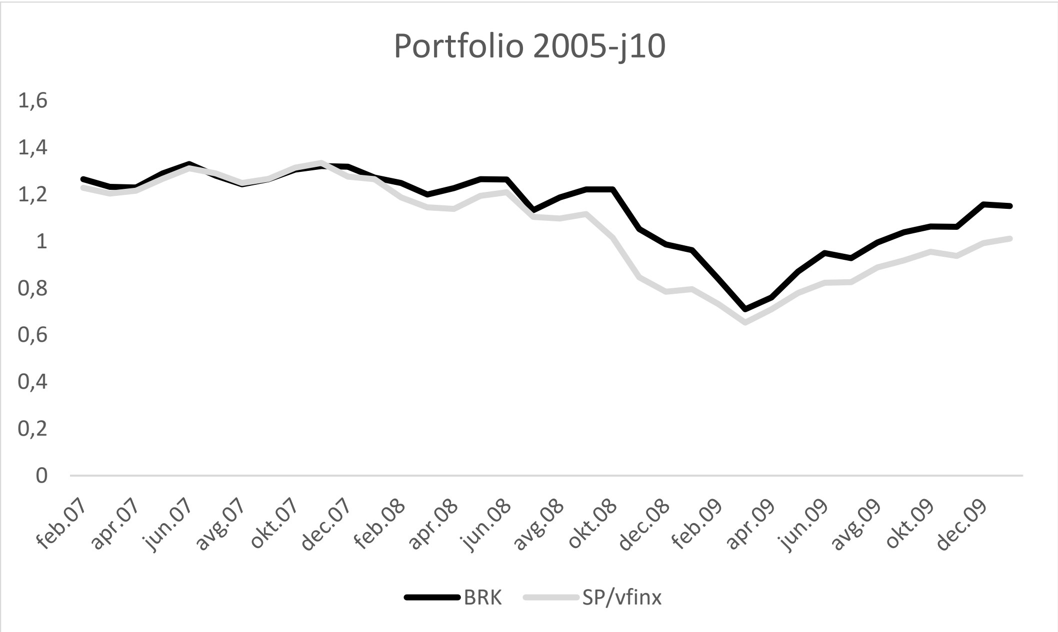
Where SPY tracks S&P 500, VTV is Vanguard value ETF, IWD is iShares Russel 1000 Value ETF, EFV is iShares EAFE Value ETF, XLU tracks Utilities companies in the SP 500, IWF iShares Russel 1000 Growth ETF, VUG is Vanguard Growth ETF.

Appendix 5: Performance of the Berkshire Hathaway portfolios.

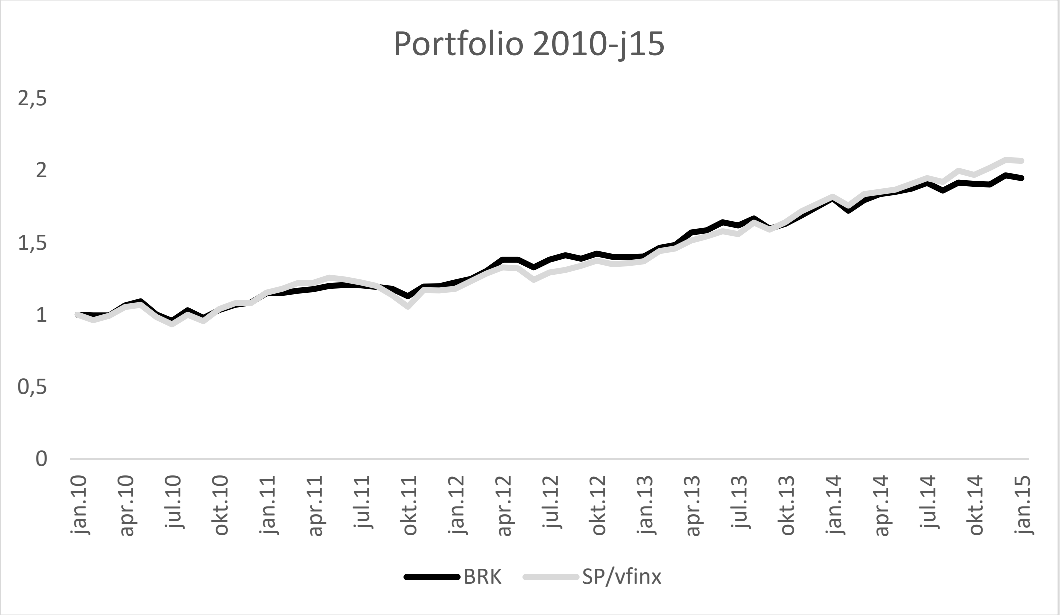
Portfolio 2000-j5 invested from the beginning of 2000 until the beginning of 2005.



Portfolio 2005-j10 invested from the beginning of 2005 until the beginning of 2010.



Portfolio 2010-j15 invested from the beginning of 2010 until the beginning of 2015.



Portfolio 2015-j19 invested from the beginning of 2015 until the beginning of 2019.