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Consistent Outperformance of the Value Investing Paradigm. The Performance of Superinvestors and Pragmatic Investors

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Abstract

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Value investing is a popular strategy among superinvestors such as Warren Buffett. This approach goes far beyond the strategy of investing in undervalued assets. Primarily, it takes into consideration companies' fundamentals and looks for assets that are sold less than their intrinsic value. Therefore, the full name of this value strategy according to its broad definition is "intrinsic value business investing". This broad definition is implied by the value investing strategy for the purpose of the master's thesis. Despite the abundance of papers on evaluating the portfolio performance, including value assets portfolios, the portfolio performance evaluation of the most successful value investors in terms of the returns of their holdings is a rather innovative approach to studying this issue. The performance of twenty selected superinvestors was evaluated to verify that following a value investing strategy allows portfolio managers to outperform the benchmarks. The portfolio performance evaluation was performed with the Jensen's alpha, Fama-French 3-factor model, Carhart's 4-factor model, Fama-French 5-factor model, and GARCH(1,1) model with non-normal Student-t distribution. The regressions' results supported by the Sharpe ratio values convincingly demonstrated that the superinvestors following the value investing paradigm in its broad definition had the superior ability to outperform the S&P500 Composite, S&P500 Value, Russell 2000, and Russell 2000 Value benchmarks. The hands-on algorithm to build a pragmatic portfolio under the value investing strategy was presented as well. The pragmatic portfolio composed of the superinvestors, which are the objects of the research in this thesis, was built to use it as another benchmark and to test how to implement the proposed algorithm in practice. Analysis of beta coefficients of multi-factor models revealed that the underlying value investing strategy of superinvestors did not exclude investing in growth stock or other investing styles. It was found that superinvestors' portfolios were influenced by certain factors, such as size (SMB), value (HML) and momentum factors (MOM). The industry preferences of superinvestors were examined with the multivariate analysis of industry factors. The finance sector at the top of the preferences confirms the assumption that superinvestors prefer to invest in well-known industries.

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List of Abbreviations

CAPM	The financial asset valuation model (Capital Asset Pricing Model)
CMA	The investment factor (Conservative minus Aggressive) used in the Fama-French five-factor model
D/E	Debt-to-equity ratio
EMH	Efficient-market hypothesis
EPS	Earnings per share
ETF	Exchange traded fund
EVA	Economic value added
GARCH	Generalized autoregressive conditional heteroscedasticity statistical model
HML	The value factor (High minus Low) used in the Fama-French three- and five-factor models
MOM	The momentum factor (Monthly Momentum) used in the Carhart four-factor model
MPT	Modern Portfolio Theory
P/B	Price-to-Book ratio
P/E	Price-to Equity ratio
RMW	The profitability factor (Robust minus Weak) used in the Fama-French five-factor model
ROA	Return on assets
ROE	Return on equity
SMB	The company size factor (Small minus Big) used in the Fama-French three- and five-factor models
UMD	The proxy variable (Up minus Down) of the momentum factor

1. INTRODUCTION

This master's thesis presents the results of the research aimed at examining whether the intrinsic value business investing strategy provides advantages for fund managers to systematically outperform the market. Portfolio performance evaluation was conducted based on the analysis of monthly returns of twenty superinvestors' portfolios, which had the highest value and longest available historical data at the end of 2018 in the database of the Dataroma.com website from where these data were obtained. The performance of superinvestors was compared with the performance of the S&P500 Composite, S&P500 Value, Russell 2000, and Russell 2000 Value indices. For good measure, the same superinvestors were taken to build a pragmatic portfolio under the business value investing philosophy and added to the analysis of the portfolio performance against the benchmarks.

1.1 Background

Superinvestors can be regarded as value investors (Dataroma.com, 2019), in other words, investors who act in value investing paradigm and following this paradigm buy high-quality undervalued assets, which market values are trading lower than their book values per share, for the long run. Value investing philosophy was firstly presented by Benjamin Graham and David Dodd in 1928 and has firm support from the famous and wealthiest superinvestor – Warren Buffett. In 1984, he issued the survey on the performance of value investors which proved that value investing is, on average, successful in the long term, what is consistent with many academic researches on value investing strategies (Buffett, 1984).

The theoretical background regarding investment portfolio performance analysis is well developed, starting with the pioneering works of Treynor (Treynor,1965), Sharpe (Sharpe, 1966) and Jensen (Jensen, 1968) on the relationship between risk and return of mutual fund portfolios. Many techniques have been represented since then, which enable comparison between different investment portfolios from a perspective of risk and return, both among themselves and with benchmark values. In their work, Cogneau and Hübner (2009) identified 101 performance measures for portfolios proposed by the academic community at the time of their work. Despite such an abundance of approaches to portfolio evaluation, it

is difficult to find information about the portfolio performance of the most successful value investors. On the one hand, most portfolio evaluation approaches consider different mutual and investment funds. On the other hand, even some resources, as GuruFocus.com, provide a different kind of information about value investors' portfolios, performance evaluation indicators are quite restricted there so it is hard to compare and conclude. Also, additional difficulties stem from the fact that value investing is an integral concept on which there is no consolidated shared vision.

The traditional (academic) view considers value investing as a purchase of assets with a low price-to-earnings ratio (P/E) or a price-to-book ratio (P/B) relative to the market (Hanson & Fraser, 2013). Graham and Dodd's value investing philosophy inherited by Warren Buffett primarily takes into account companies' fundamentals when seeking for assets that are sold on the market less than their intrinsic value. This value investing approach would be more correct to call "intrinsic value business investing" or "business value investing", as the business is the investment asset, but not the stock itself (Hanson & Fraser, 2013). In this research, the term "value investing" is used in the meaning of "intrinsic value business investing" because of its brevity and widespread use.

Therefore, it was challenging to concentrate on the topic of the master's thesis and evaluate portfolio performance of the certain number of superinvestors to reveal whether their portfolios beat the benchmarks if it is assumed that superinvestors act in value investing paradigm. The most recent studies on the portfolio evaluation comprise multi-factor models extended from the capital asset pricing model (CAPM), as Fama and French's three- and five-factor models and Carhart's four-factor model (Cogneau & Hübner, 2009). These models were applied for the research to evaluate portfolio performance of superinvestors, as well as the traditional CAPM model. Since CAPM and its extended models provide reliable results under the assumption of the normal distribution of data, which rarely occurs among economic and business time series, most of which are non-stationary by nature (Brooks, 2011), the GARCH(1,1) (general autoregressive conditional heteroscedasticity) model with non-normal Student-t distribution was additionally applied to evaluate portfolio performance.

1.2 Research questions and objectives

The holistic goal of the master's thesis is to explore the phenomenon of the value investing which is widely used by superinvestors, examine how sound this investment strategy is and whether it endues the managers of superinvestors' funds with the ability to outperform the benchmarks systematically. The following research questions were brought about these issues:

Q1: Does following the value investing strategy allow superinvestors to outperform the benchmarks?

The main objective of the study is to evaluate portfolio performance of superinvestors and answer this research question using the Sharpe ratio, Jensen's alpha measure, the 3-factor and 5-factor Fama and French models, the 4-factor Carhart model, and the GARCH(1,1) model. Comparison of the performance of superinvestors' portfolios with the performance of the S&P500 Composite, S&P500 Value, Russell 2000, and Russell 2000 Value indices provides insight into whether the philosophy of value investing gives advantages to superinvestors to beat the benchmarks. The analysis was based on the monthly historical returns of the portfolios' holdings of superinvestors for the period from October 2006 to December 2018.

Q2: How can the pragmatic investment approach, based on the value investing philosophy, be used to create a portfolio from the existing superinvestors' portfolios?

The pragmatic investment approach primarily grounds on time-tested value investing strategies used by superinvestors such as Benjamin Graham, Walter Schloss, and Warren Buffett (Pragmatic Investor, 2020). To answer this question, the value investing phenomenon and the pragmatic investment strategy were examined in detail. The pragmatic approach was also considered at a practical level based on the experience of investment market professionals. Relied on these studies, an algorithm for constructing a portfolio within the framework of the pragmatic investment strategy was proposed. This algorithm presents the actions that need to be taken if an investor wants to build a portfolio under the pragmatic approach. A pragmatic portfolio was formed from a panel of superinvestors

chosen to evaluate portfolio performance in this thesi. This pragmatic portfolio was created to test how to work with the proposed algorithm, primarily on the stage of screening companies and determining which assets are good for portfolio selection, as well as for asset allocation and rebalancing.

Q3: Can the pragmatic approach allow building a portfolio that will beat the benchmark indices in its turn?

Since the pragmatic portfolio was built within the value investing strategy from a panel of the same superinvestors that are considered in this thesis, it was advisable to test the performance of the pragmatic portfolio against the same benchmark indices with the same techniques that were applied to evaluate portfolio performance of superinvestors.

Q4: Which industries are the most popular among superinvestors for allocation of their funds?

There is the popular Warren Buffett's investment advice: "Never invest in a business you cannot understand", which many value investors understand as a guide to invest in familiar industries (Tunweer, 2009). The purpose of this research question is to verify the assumption that superinvestors prefer to invest in companies from industries that are well known for them. The multivariate analysis of industry factors was applied to discover industry preferences of superinvestors.

The motivation to study the performance of superinvestors' portfolios was originated from the desire to find out whether their success is not random and this is not a luck or birth factor under the lucky star of the investment firmament. There was an incentive to study what investment strategies and approaches superinvestors use to build their portfolios, and whether these strategies allow them to achieve systematically better results than the average market results presented by various stock market indices.

1.3 Research methodology

To study the value investing phenomenon and to investigate whether this strategy gives investors the opportunity to build portfolios that can consistently exceed the market, both qualitative and quantitative research methods were employed. The overview of the various methods that were applied in the master's thesis is presented in **Table 1**.

Table 1. *Applied research methods. (Author)*

Method	Type	Purpose
Sharpe ratio	Quantitative	To obtain widely-used portfolio performance indicators of superinvestors' portfolios, a pragmatic portfolio and market indices.
Jensen's Alpha	Quantitative	To get a measure of unsystematic risk that reflects the contribution of a portfolio manager to expected return of a portfolio.
Fama-French 3- and 5-factor and Carhart 4-factor models	Quantitative	To have better tools for portfolio performance evaluation as they adjust for the outperforming tendency of small-cap companies, value stocks, companies with higher operating profitability and conservative investment policy, as well as the momentum impact of past returns on future returns. To study investment styles of superinvestors.
GARCH (1,1) model with non-normal Student-t distribution	Quantitative	To apply a portfolio performance evaluation model that allows to eliminate non-stationarity, handle volatility and non-normality of the portfolio return time series.
Multivariate analysis of industry factors	Quantitative	To explore the preferences of superinvestors toward particular industries.
Analysis of scientific articles and publications about value investing philosophy and pragmatic investment approach	Qualitative	To research the phenomenon of value investing and the pragmatic approach of the portfolio building. To create an algorithm for building a pragmatic portfolio.
Analysis of the real-world cases of professional pragmatic investors	Qualitative	To identify the general basic principles of the pragmatic investment approach. To create an algorithm for building a pragmatic portfolio.
Scorecard for the multi-criteria analysis of company's fundamentals and key financial ratios	Quantitative	To perform screening of companies and funds and make a decision which assets are good to be selected for the pragmatic portfolio.

The analysis of scientific articles and publications was performed to explore the phenomenon of value investing and the pragmatic approach of the portfolio building. Also, qualitative research was conducted regarding the real-world cases of professional pragmatic investors from different countries, such as Switzerland, Belgium, South Africa, the UK, and the USA, to highlight the general basic principles of the pragmatic investment approach. An algorithm for building a pragmatic portfolio was presented based on the results of the qualitative research. This algorithm comprises five stages which are: investor's risk profile identification, selection of assets, diversification, asset allocation and rebalancing. The scorecards for the multi-criteria analysis of the company's and mutual fund's fundamentals, financial indicators and key financial ratios were developed to help pragmatic investors in selecting good assets for their portfolios.

The pragmatic portfolio was built from the same panel of superinvestors whose portfolios were selected to conduct portfolio performance evaluation. The multi-criteria analysis with the scorecards was performed concerning superinvestors' companies and funds to ensure that selected assets meet the criteria that are demanded by pragmatic investors on their holdings. The inclusion of various assets: investment holding companies and mutual funds, which themselves are sufficiently diversified by investing in many assets, ensured diversification of the pragmatic portfolio in question. Asset allocation in the pragmatic portfolio was performed with the portfolio optimizer tool introduced on the Portfolio Visualizer online software platform. The robust optimization was performed based on the historical returns of assets with Sharpe ratio maximization goal and the Monte Carlo method to resample efficient frontier inputs. The portfolio was annually rebalanced with the calendar rebalancing method.

To test the hypothesis that superinvestors following the value investing strategy can outperform benchmark indices, 20 superinvestors whose portfolios currently have the highest value of more than $1.9 billion were taken for the portfolio performance evaluation. The portfolio performance evaluation was based on the analysis of monthly historical risk and return of the portfolios' holdings for the period from October 2006 to December 2018, 147 periods in total. The historical returns of the portfolios were calculated with the consideration of the historical prices and the actual weights of the 20 largest stocks in the portfolios. The total number of unique stocks is 827. The historical prices of stocks were

derived mainly from Thomson Reuters Datastream for the period that covers 148 months from September 2006 to December 2018. For some stocks, the data were checked and updated from the databases of the following websites: Yahoo!Finance, investing.com and advfn.com. The actual weights of stocks in each portfolio in each period were taken as these weights are reported on Dataroma.com. An average superinvestor portfolio was formed from the returns of 20 portfolios of superinvestors based on the returns of their holdings. The returns of the pragmatic portfolio were obtained from Portfolio Visualizer online software platform. The pragmatic portfolio's returns were produced as a result of the asset allocation and annual rebalancing with the Sharpe ratio maximization goal with the Monte Carlo method to resample efficient frontier inputs and based on the historical returns of assets prior to rebalancing periods.

The portfolio performance evaluation was conducted with the following traditional portfolio performance evaluation techniques: Sharpe ratio, Jensen's alpha technique, Fama-French 3-factor model, Carhart 4-factor model, Fama-French 5-factor model. Matlab and Excel were used to perform necessary calculations and build regression models. Positive and statistically significant alpha coefficients (constants) returned by the regressions are the indicators that the portfolio managers can outperform the benchmark indices. The same can be said about the values of the Sharpe ratio for the portfolios if these values are more than the Sharpe ratio values of the benchmark indices. Since the above methods are based on the traditional CAPM, they have the important underlying assumption about the normal distribution. If error terms (residuals) of these models are not normally distributed, then the standard errors of ordinary least squares (the most common method used to estimate the unknown parameters in a linear regression model) estimates will not be reliable. The Jarque–Bera test was performed to check whether the data match the normal distribution.

Operating under the fundamental assumption of constant variance, conventional time series models were found to be not very accurate in estimating stock return movements. To eliminate non-stationarity, handle volatility and non-normality the general autoregressive conditional heteroscedasticity (GARCH) (1,1) model with non-normal Student-t distribution was applied additionally after testing data series on the heteroscedasticity of residuals with the Engle's ARCH test for residual heteroscedasticity. Even though autoregressive models are predominantly used to forecast volatility, there are some studies where they were used

to evaluate past performance of the portfolios. For example, the study of Kaur and Kaushik (2019) proposes to evaluate the performance of mutual funds applying multivariate GARCH (1,1) model with non-normal Student-t distribution because mutual fund returns exhibit facts of non-normality, negative skewness, excess kurtosis and autocorrelation (Kaur & Kaushik, 2019). They chose the Student-t distribution GARCH(1,1) model as this model captures volatility better than alternatives according to the information criteria.

Navigated by the survey of Kaur and Kaushnik (2019), this thesis estimates portfolio performance of superinvestors with the GARCH (1,1) model with the assumption of Student-t non-normal distribution to see how much the results provided by this model differ from the results returned by the common CAPM and extended CAPM models. The GARCH(1,1) model regresses the portfolios' returns against exogenous variables which are returns of benchmark indices and various market factors of multi-factor models. The alpha coefficients of the return equation of the GARCH model indicate the performance of the portfolio managers in cases of various benchmark indices and market factors.

To examine the exposure of portfolios to various industry factors, the multivariate analysis of industry factors was conducted for the superinvestors' portfolios. The industry factors are presented by the monthly returns of 30 industry portfolios derived from Kenneth R. French database for the period from October 2006 to December 2018. Preliminary analysis of the industry classification of stocks as this classification was assigned and returned by Thomson Reuters Datastream revealed that the stock universe of superinvestors' portfolios covers 21 industry groups for the period in question. Since the set of 30 industry portfolios in the Kenneth R. French database is the closest in number to include 21 industry groups, this set of 30 industry portfolios was selected for the analysis.

1.4 Research structure

This thesis consists of six sections. The first is an introductory section that presents the topic of the thesis, the background of the research, research questions and objectives, briefly describes the methodology and provides the structure of the paper.

Section 2 lays the theoretical foundation of the thesis. It begins with a review of the value investing phenomenon. Then it goes in detailed consideration of the pragmatic investment strategy since this strategy is in the focus of the thesis. The pragmatic approach is also considered on a practical level by reviewing and analyzing the experience of investment market professionals. Chapter 2.4 discusses investment funds and especially focuses on the mutual and exchange-traded funds because these types of funds are the most preferred among value and pragmatic investors (Rajan, 2015). Besides that, most superinvestors who were included in the pragmatic portfolio are mutual stock funds. Chapter 2.5 provides the literature review of the current state of research on the portfolio performance of value investors. It reveals discrepant results of various studies in this field justifying the relevance and viability of the selected topic for the master's thesis.

Section 3 examines portfolio construction algorithm within the pragmatic investment framework. It presents the actions that need to be taken if an investor wants to build a portfolio according to the pragmatic approach. Section 4 includes methodology and data and explains research methods which were applied to evaluate portfolio performance and conduct the multivariate analysis of industry factors. It describes which data were used to conduct the research and where and how the data were obtained.

Section 5 presents the results of the research, namely, the multi-criteria analysis of the pragmatic portfolio holdings, the results of various regression models that were used to evaluate portfolio performance relative to benchmarks, and the results of the multivariate analysis of industry factors. Section 6 finalizes the thesis by presenting the main findings of the conducted research, conclusions, challenging ideas, limitations and possible directions for further research.

2. THEORETICAL FRAMEWORK

2.1 Value investing paradigm

To successfully invest in the stock market and to ensure from losing time and money, professional and private investors have developed various approaches for deciding which

assets to buy, in which markets, at what point in time, in what quantity and at what price. These decision-making approaches for investing are based on factors such as investor preferences and inclinations, including their attitude to risk, experience, the goals they pursue, the desired return, and planning horizons. Investors may adhere to one strategy, which they prefer, but in most cases, they come to use several different strategies or a combination of them (Barclays Investment Solutions Ltd., 2020). The most popular investment strategies that are used by investment market professionals and private investors are depicted in **Figure 1.**

Figure 1. *Investment strategies. (Author. Adapted from WallStreetMojo, 2020)*

The value investing strategy stands on consideration of the intrinsic value of a company. Value investors, the most famous of which is Warren Buffett, are looking for stocks that they think are undervalued by the stock market and are traded at a discount to their real value. The idea behind value investing is that stocks often cost little for an acceptable reason, and the fact that the stock price is low does not mean that a stock is cheap. Ultimately, the market will adjust prices, and prices of such undervalued stocks will increase, providing value investors with high returns (Barclays Smart Investor, 2020).

The traditional (academic) view on the value investing that it is a largely statistical approach for building a portfolio of securities with a low price-to-earnings ratio (P/E) or a price-to-book ratio (P/B) relative to the market (Hanson & Fraser, 2013). However, such a narrow definition as investing in undervalued securities hardly reflects the essence of value investing (Damodaran, 2012). As time passed, the term "value investing" has become quite general and is often used to name any strategies that are opposed to "growth investing" (Eyland, 2020). As a result, the widespread use of the term "value investing" indicates an inability to distinguish between the "value effect" on stock returns, which is the issue of the academic finance, and the role of fundamental analysis in generating higher than market returns, which

underlies the investing philosophy of Graham and Dodd. The academic approach to value investing based on the P/E and P/B ratio analysis is limited by deliberate neglect of the company's fundamentals, such as balance sheet quality, as these ratios do not provide any information about the risks and the costs of financial distress (Hanson & Fraser, 2013).

To distinguish Graham and Dodd's value investing philosophy from the classical academic approach, their approach would be more correctly called "intrinsic value business investing" or "business value investing" since business value investors esteem that they primarily invest in the business, not stocks (Hanson & Fraser, 2013). However, for the purposes of this paper, the term "value investing" will be used further because of its brevity and widespread use, but it will mean exactly "intrinsic value business investing".

The approach of Graham and Dodd described in their books "Security Analysis" and "The Intelligent Investors" focuses solely on investing in listed stocks from the perspective of external minority shareholders (Eyland, 2020). They developed a research methodology that allows identifying and buying securities whose prices are much lower than their true values, thereby providing a rational basis for investment decisions. This methodology is based on the following key concepts (Eyland, 2020):

- Intrinsic value. Intrinsic value of a security is its value that is based solely on the internal company's factors: asset value, profit, dividends, future outcomes.
- Margin of Safety. It is the difference between the intrinsic value of a security and its market price. An investor will buy a security only when its market price is significantly lower than its calculated intrinsic value.
- Diversification. In order to manage risks, an investor should invest in different companies, preferably from different sectors, as well as in stocks that have a low correlation between each other.

To give a broad definition of value investing, which will help to understand its essence, one must proceed from the assumption that the value of a company is determined by two sources presented on the left side of **Figure 2**: the investments that a company has already made (assets in place) and the expected future investments (growth opportunities). Value investors seek to buy stocks at a price lower than their assets in place and try to avoid the large premiums paid by markets for growth opportunities (Damodaran, 2012).

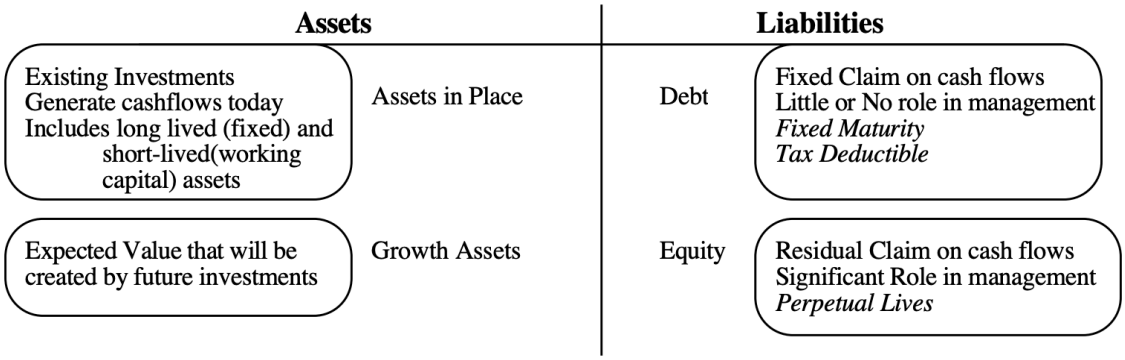

Figure 2. *Sources of the company value. (Damodaran, 2012)*

This broad definition of value investing includes three distinct investing approaches: passive screening, contrarian value investing and activist value investing.

Passive screening

Passive screening is probably the simplest value investing approach, and its followers are direct descendants of Graham's investing school. Passive screeners run companies through the series of investment screens (filters), such as low P/E ratio, assets that are easily marketed, high-quality management, low risk, and other filters that help to classify stocks potentially good for investing in them. Passive screeners look for stocks that pass the screens and are traded with low multiples of book value, earnings or revenue, and claim that these stocks can outperform other stocks and generate excess returns in the long run (Damodaran, 2012).

Contrarian value investing

The second approach is contrarian value investing. This strategy implies the acquisition of securities from which other investors have refused because of their poor past results, risk of default, the poor reputation of a management team, or grave news about them. Contrarian value investors believe that such firms are too punished by markets. If given a chance, they will exceed market expectations far more than firms that are already considered successful. There are several strategies within this strategy. The native one is buying the biggest losers of the previous period. The more complicated is predatory and distressed security investing when contrarian value investors use complex quantitative methods to spot securities issued by troubled undervalued companies (Damodaran, 2012).

Activist value investing

The third approach to value investing is presented by activist value investors who purchase a large portion of stocks in an undervalued or poorly managed company, occupy a leadership position in business with the ability to make managerial decisions to moderate changes that will increase the company's value. Activist value investors make changes in those areas of the business that, in their opinion, primarily affect the undervaluation of a company. However, there is a big risk that if an investor acquires a significant share in the company, she will not be able to change management and make the necessary changes. Thus, investments will be made in vain. (Damodaran, 2012).

Alternatively, an investor, especially not very experienced, who wants to adhere to the value investing strategy and at the same time not spend time analyzing the financial statements of companies and searching for stocks undervalued by the market, can invest in exchange-traded funds (ETFs), or actively managed funds that hold value stocks, or index funds that track indices computed from the prices of the value stocks (Thune, 2019).

The common ground of all these approaches is that they focus on investing in securities of companies that the market is not enthusiastic about, either because of their performance or because of troubles in sectors in which they are located or the market as a whole. Value investors presume the problems temporary and consider investments in such securities as promising, which can provide them with a higher return than current market favorites.

2.2 Pragmatic investment strategy

The investment universe is populated by players with specific features and characteristics that determine their behavior in the capital market. In the report of Rajan (2015) about investors preferences toward equities, four main groups of investors according to their approaches to asset allocation are identified as follows (Rajan, 2015):

1) Defined Benefit (DB) investors who strive to achieve many goals through a combination of quality and low-variance equities, real assets, sovereign bonds and alternative loans.

2) Defined Contribution (DC) investors prefer an approach based on implemented advice to utilize herd instinct earlier than others.
3) Retail investors (RI) tend to distribute capital in benchmark funds focused on a regular income.
4) High net worth (HNW) investors prefer to invest in such a way that it generates uncorrelated absolute returns through the main and alternative asset classes.

According to Rajan, it is Defined Benefit investors who adhere to pragmatism in their actions and care more about "time in the market" than "timing" the market. (Rajan, 2015). It is equally important for them to minimize their regrets as well as minimize risks. Therefore, they will use different classes of assets to achieve specific goals: high-quality global stocks for market growth; low variance stocks for low volatility; real assets for capital growth and regular income; sovereign bonds to protect against falling if global growth disappoints; and an alternative loan for high returns. (see **Figure 3**):

% of respondents

DB investors	
Traditional passive bonds/equity funds	70%
Global equities	69%
Real estate (debt and equity)	68%
Infrastructure	65%
Low-variance equities	62%
Developed market government bonds	58%
Alternative credit	56%

Figure 3. *Asset classes which investors likely to use for asset allocation over the next three years. (Rajan, 2015)*

As can be seen from **Figure 3**, pragmatism, first of all, implies diversification of assets' classes to minimize losses during the market disruption. The next occurrence of investment pragmatism involves holding assets for a relatively long time to compensate for possible losses from the market downwards when the market stabilizes again. Longer retention periods can also help to increase the overall profit by adding dividends. (Rajan, 2017).

Pragmatic investors are likely to base their actions on asset allocation approaches, such as factor investing across asset classes, buy-and-hold investment strategy, bottom-up investments, smart beta, and absolute return on investment, and investment instruments, such as multi-asset class funds, ETFs, real assets, thematic funds, and alternative investments

(Rajan, 2017). As for the asset class selection, two sets of asset classes will be prioritized under the pragmatic approach: high-quality stocks that can provide high total return and alternative investments that can hedge against inflation and rising rates. Contrariwise, fixed-income assets are likely to be less in demand as central banks begin to tighten quantitatively by raising interest rates (Rajan, 2017).

Barbara McKenzie from Principal Global Investors confirms the conclusions of the Rajan's survey that investors today tend to the pragmatic investment approach. They are much less passionate about traditional asset allocation strategies and prefer equities that have a bond like performance. They do not choose bonds due to their incredibly low yield for the moment, but more and more they are attracted to risky assets, particularly stocks, in search of yield. However, they are so conscious of the risk that they often choose stocks that look like bonds. For example, emitters of the good quality that pay higher dividends and have strong fundamentals (Delevingne, Ugolik, & Northern Trust, 2017).

2.3 Pragmatic approach on a practical level

As a matter of actual practice, pragmatism is widely accepted by many portfolio managers, investment and pension funds, advisory firms, and other professional investors. It is worth to review how they understand pragmatism and implement it in their investment strategies in real world in order to spot the general basic principles of the pragmatic investment approach.

The Swiss asset and investment advisory firm (Independent Capital Group AG, 2020) adheres to the pragmatic approach in managing the capital of its clients by maximizing long-term return taking into account different risks. Advisors of this firm do not base investment decisions on ideology, for example, exclusion of sectors solely for ideological reasons, but they make rational decisions based on the analysis of reliable research data from third parties. The pragmatism is the key issue of the strategic asset allocation policy of Suez-Tractebel pension fund from Brussels. Its specialists invest only when they have a clear understanding of the risk profile of a target company and that the management approach is the best possible. They also eliminate all non-remunerated risks, such as currency risks, by fully hedged them (IPE, 2004).

Mario Fisher, portfolio manager at Prescient Investment Management, the multinational financial services provider headquartered in South Africa, explains the group's pragmatic approach to complex emerging markets where forecasts and intuition can drive into the trap due to an unpredictably changing economic situation. The approach grounds on risk control and portfolio building based on the assessment of current market prices without using forecasting. Risks are directly integrated into portfolio management (Prescient, 2015).

Since active management is complex, expensive and often frustrating, the Henderson Rowe, a UK-based investment manager, takes a pragmatic and realistic investment approach. Stock returns are highly volatile in the short term, and the best returns can be obtained in the medium and long term. To get the maximum return on investment, a client must have a minimum investment period of five years. Following this investment philosophy, a client's portfolio is divided into two parts to be managed passively and actively. To design a portfolio about half of the assets are passive investments and the rest is invested into securities directly. This proportion is not established once and for all and it can be changed depending on the market situation. The goal is to obtain market returns on a diversified basket of indices and then to increase these returns from direct equity investments. (Henderson Rowe, 2020).

The pragmatic investment strategy primarily grounds on the value investing approaches. The passive strategy inspired by Benjamin Graham focuses on avoiding serious mistakes, losses, making decisions often, and exert some annoying efforts (Moore, 2010). The passive part of the portfolio is invested in various stock and bond indices around the world using ETFs, asset-backed ETFs predominantly. The decision to choose an ETF for a passive investment strategy is made taking into account various factors, such as tax consequences for investors, liquidity, which depends on the size of ETFs, and the level of costs. Small ETFs are more likely to cease to exist. Even though ETFs' returns are not monitored in real-time, it should provide a certain return relative to the underlying index. In order to be able to effectively track whether the ETFs follow the underlying index, the ETFs should have existed in the market for some time by the time they are purchased. For capital allocation, new ETFs that are cheaper are always welcome. (Moore, 2010).

The passive investment strategy can be implemented by buying ETFs that track indices. According to the hedge fund manager and the value investor Joel Greenblatt, the value-weighted indices are the most appealing as they consist of low priced and high-quality stocks. He claims that value-weighted indices can overperform active managers, equal-weighted indices and fundamentally weighted indices (Carinci, 2011). Buying an ETF means investing in a sort of value-weighted portfolio if the corresponding index is value-weighted. The example of such value-weighted ETF is MSCI USA Value Weighted Index and ETFs tracking this index iShares Edge MSCI USA Value Factor ETF.

As for the active investment strategy, at present, the stock market is more preferable because the value is better there than in the bond markets (Moore, 2010). Direct investment in stocks is carried out using quantitative and qualitative approaches. First, the stocks comprised by any index are ranged in accordance with four factors: value, growth, sentiment and quality. The resulting list of stocks is reduced further by conducting an in-depth analysis of the financial performance of various companies, and the discounted cash flow model is utilized to determine a price goal. When the stocks reach the price goal, the funds are re-evaluated and relocated or a new higher price goal is defined if it is seemed achievable. This approach follows value investing paradigm and Graham's understanding of the "active investor" as an investor who wishes to devote time and care to choose securities that are both reliable and more attractive than average (Graham & Buffett, 1973).

Having analyzed these real-world cases, it is possible to distinguish the following common basic principles of the pragmatic investment approach:

- the long-term yield orientation with the minimum investment period of five years;
- the impartial analysis of the unbiased reliable data (market and in-house) before making a decision;
- the strict control of the different risks by assessing them, integrating into portfolio management and if the risks are non-remunerated eliminating them with hedging instruments.

Thus, if investors follow these basics, we can say that they act in a pragmatic investment paradigm.

2.4 Investment funds

An investment fund is an institution that carries out collective investments. Its essence is to accumulate the savings of private and legal entities for joint investing (including portfolio investing) through the purchase of securities, rather than real production assets. An investment fund does not entitle the individual investors to decide how to invest the fund's assets. Alternatively, they choose a fund according to its past investment performance, risk profile, size of fees, investment goals, such as the focus on certain geographical regions (for example, emerging markets), certain industries (for example, high-tech companies), investment styles (for example, investing in value stocks), market indices (for example, S&P 500), and other preferences. Since the purchase of securities is carried out by a professional market participant, the risks of private investors are minimized. (Chen, 2020).

Investment funds can be public, such as mutual funds or exchange-traded funds, or they can be privately owned, such as hedge funds or private equity funds. Most of the public investment funds are open-end investment funds which are equally divided into shares. New shares are issued every time investors invest in a fund. There is no supply or demand for shares of a fund, and they sustain a direct relation to underlying assets. Open-end funds are usually priced once at the end of the trading day (Chen, 2020). The opposite type of investment funds is closed-end funds. These funds collect money by issuing a limited number of shares through an initial public offering (IPO) or by private placement. Publicly traded funds are traded on a stock exchange based on supply and demand of investors. Thus, the share price of a closed-end fund can significantly differ from the value of its net asset value, either higher or lower, in other words, with a "premium", when the price is higher than its net asset value, or with a "discount" when the price is lower than the net asset value, which happens most often. As closed-end funds can be traded throughout the trading day, their prices may change during the day (Investment U Research Team, 2020).

Next, a closer look will be taken on such popular types of investment funds among pragmatic investors as mutual funds and exchange-traded funds (Moore, 2010). The main similarities and differences of the mutual funds and ETFs are presented in **Figure 4**.

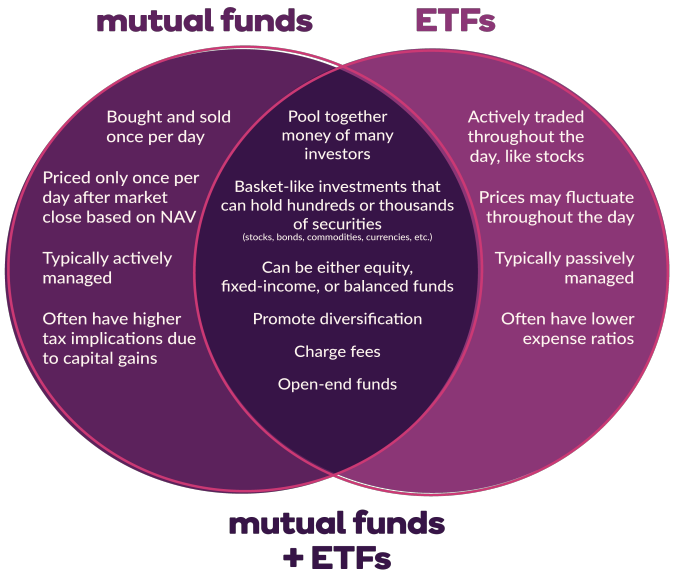

Figure 4. *Mutual funds and ETFs. (Ally Financial Inc., 2019)*

Although mutual funds and ETFs are different types of investment funds, they both provide an opportunity for investors to purchase shares and other securities of companies that they could not buy directly. For example, one share of Berkshire Hathaway is currently quoted at around $275 000. Rare private investors can afford to include the assets of similar value in their portfolios. Instead, they can buy shares of a mutual fund or an ETF that owns shares of Berkshire Hathaway, and this way make an indirect investment in it (Ally Financial Inc., 2019). For example, Sequoia Fund, which is included in the analysis of the superinvestors' portfolio performance in this paper, has Berkshire Hathaway in its portfolio, and the price for the Sequoia Fund currently is around $130 which is quite affordable for most investors. Investing in mutual funds and ETFs also allows investors to diversify their portfolios quite broadly, and at the same time prevent their inflation, because the funds are already sufficiently diversified by professional managers. Finally, professional management makes passive investment possible when investors do not need to monitor the performance of the securities in their portfolios by tracking and acquiring high-performing companies or getting rid of ineffective ones at the right time (Ally Financial Inc., 2019).

2.4.1 Mutual Funds

The oldest type of investment funds is mutual funds, within which, as in other types of investment funds, investors' money is combined to invest in various assets. Mutual fund's

assets are valued and sold to the public daily. Unlike other types of funds, the prices of funds change only once daily, which is their important distinguishing feature. The owners of shares of mutual funds cannot trade them at any time during the day, which is a drawback for active traders but makes them attractive to investors planning long-term investments. Mutual funds are of various types depending on the different bases presented in **Figure 5**.

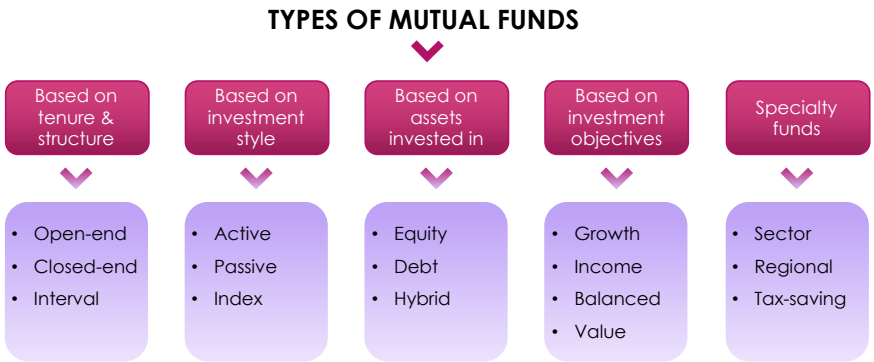

Figure 5. *Classification of mutual funds. (Author. Adapted from Shukla, 2017)*

The main advantage of mutual funds is that they enable investors to buy a diversified portfolio of valuable assets without the need to manage this portfolio and gain access to professionally managed funds at relatively low costs. Mutual funds may be less risky than individual stocks, because the investor's money in the fund is distributed among many different stocks and other securities, and investors can make up their portfolios of several mutual funds. For investors pursuing long-term goals aimed at saving and sustainable return, investments in mutual funds can be a good choice. (Investment U Research Team, 2020). However, mutual funds have serious shortcomings that should be kept in mind. Mutual funds (especially actively managed) often levy fees that can absorb income. The tax inefficiency is another limitation of mutual funds. While money remains invested in a mutual fund, it is usually not taxed. As soon as a fund generates a profit by selling the part of its portfolio, the profit to be distributed among shareholders is taxable. (Investment U Research Team, 2020).

2.4.2 Exchange-Traded Funds (ETFs)

Exchange-traded funds are an alternative to mutual funds and combine the characteristics of both open- and closed-end funds. ETFs give more flexibility for traders. On the one hand, they are structured as open-end investment funds. On the other hand, they are traded on stock

exchanges like closed-end funds during the all trading day. The ETF's trading price is kept abreast of its net asset value, although deviations can occur from time to time. There are different types of ETFs (see **Figure 6**) but most of them track stock or bond indices.

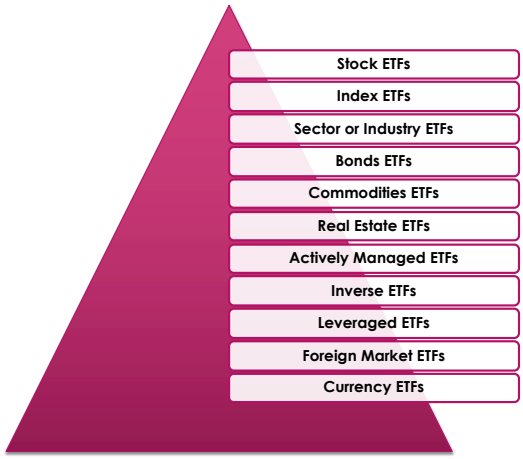

Figure 6. *Types of ETFs. (Autor. Adapted from WallStreetMojo, 2020)*

Two interesting types of ETFs should be noted in **Figure 6**: leveraged ETFs that track multiple of the price of their underlying assets and inverse ETFs that track the opposite of their underlying assets. Investing in these funds allows traders to strengthen or hedge their positions without the use of sophisticated instruments such as options and other derivatives. (Investment U Research Team, 2020).

The advantages of ETFs are their similarity to stocks in the stock market, low costs and tax efficiency compared to mutual funds. ETFs are generally cheaper than mutual funds. Many ETFs are passively managed and spend much less on remuneration to fund managers and other expenses. They do not distribute realized profit from capital gains among shareholders, and due to this, as a rule, they have a lower tax burden. On the other hand, investors are not allowed to reinvest their dividends or have any influence on reinvestment policy (WallStreetMojo, 2020). Another advantage of ETFs is in its property similar to the property of closed-end funds to be traded at any given time during a trading day. During a downtrend, it can be very beneficial to have time to sell before the price collapses at the end of the day. However, this can also provoke investors to act impulsively and make reckless decisions, succumbing to emotions. (Ally Financial Inc., 2019).

2.5 Literature review

Portfolio performance evaluation is a well-researched issue in the modern financial theory since pioneering works of Treynor (1965), Sharpe (1966) and Jensen (1968). Many performance measures for portfolio evaluation have appeared as the theory of finance developed, in particular, Capital Asset Pricing Model (CAPM), as well as new empirical evidence supporting or disproving the proposed assessment methods and the underlying theories. In 1966, Sharpe (1966) issued the paper "Mutual Fund Performance," where he explained the linear relation between the expected return on an efficient portfolio and its associated risk. He examined 34 open-end mutual funds for the period 1954-1963 applying newly presented reward-to-variability ratio (Sharpe ratio), which measures the portfolio's excess return over the risk-free rate with portfolio's standard deviation at the denominator. The linear relationship between the rate of return and the standard deviation was found to be clearly apparent. Shortly after Jensen (1968) contributed to performance evaluation in "The Performance of Mutual Funds in the Period 1945-1964". He extended the CAPM equation by including a constant alpha that reflects the portfolio's excess return over CAPM. A positive alpha shows that the portfolio results are better than the market average. A negative alpha indicates either poor assets selection or the existence of high expenses.

Fama & French introduced the Fama and French's three-factor asset pricing model in their work "The Cross-Section of Expected Stock Returns" (Fama & French, 1992) to explain excess returns in a manager's portfolio. The model expands CAPM by adding to the market factor the size and value factors. They found that small companies' stocks often gain higher returns than those of larger companies, and companies with high book-to-market ratios (value stocks) outperform those with lower book-to-market values (growth stocks). They proceeded to research this issue in later works investigating the common risk factors in the returns on stocks and bonds (Fama & French, 1993) and searching for the international evidence of outperforming value stocks over growth stocks (Fama & French, 1998). Finally, in 2015 they presented enhanced multi-factor model, so-called "Fama-French's five-factor asset pricing model" where they added two new factors: the profitability factor and the investment factor to the existing size and value factors (Fama & French, 2015). Carhart (1997) extended the Fama-French three-factor model by including in it the fourth factor — momentum, which is the tendency for the stock price to rise further if it has been already

rising and go down if it has been declining. Braga (2016) elaborated methodological description of Sharpe's returns-based style analysis and provided some examples how it can be used to identify the asset allocation of a fund and how the assets are divided among different investment categories.

In his article "The Superinvestors of Graham-and-Doddsville", Warren Buffett (1984) based on the study of nine successful investment funds generating long-term returns above the market index stated the idea that following the same value investing strategy would lead to successful results in the market. He argued that despite the fact that investors had portfolios consisting of vastly different stocks, all of them significantly outperformed the market in the long run (Eyland, 2020) what is demonstrated in **Figure 7**.

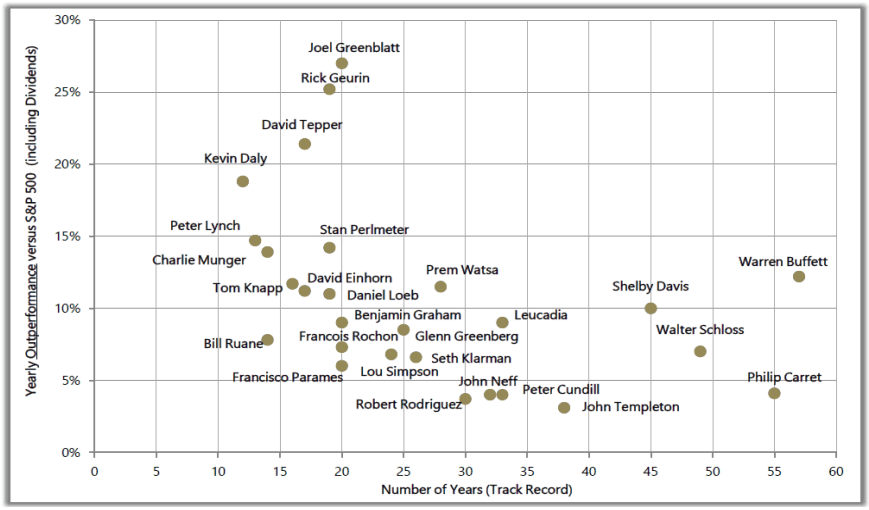

Figure 7. *Outperformance of Value Investors versus S&P500. (Estably, 2020. Based on: The Superinvestors of Graham and Doddsville)*

Noulas, Papanastasiou, & Lazaridis (2005) evaluated the performance of Greek equity funds during the period 1997-2000 with the Treynor, Sharpe and Jensen techniques and discovered that there are big differences among the equity mutual funds with respect to risk and return. An investor needs to know the long-term behavior of mutual funds in order to make the right investment decision because different techniques provide different results about best performing funds, and based on the Jensen (CAPM) measure only three funds out of 23 have statistically significant alphas. Consistent with it, Anderson and Schnusenberg (2019) in their article, reviewed the most frequently cited research on the effectiveness of mutual funds and found that fund managers are usually not able to outrun the market.

Rao and Gupta (2019) from the MSCI examined the question of whether the value strategy is still at the zenith of fame or the days of its glory have been passing away. They compared the returns of the MSCI USA Enhanced Value and Momentum indices, as well as the returns of value mutual funds. As shown in **Figure 8**, the unsatisfactory results of the value investing in comparison with the broad U.S. market have affected both index-based and active investment strategies over the past decade.

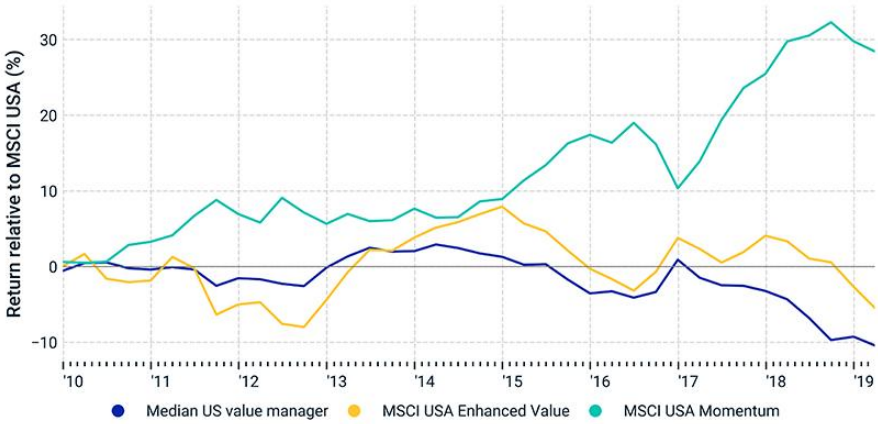

Figure 8. *Returns for the MSCI USA Enhanced Value and Momentum indexes, and returns for U.S. value managers sourced from eVestment. (Rao & Gupta, 2019)*

Even though the underperformance of value investing seems obvious, the authors considered it necessary to note that the results vary greatly depending on sectors and regions. Outside the US, their research did not reveal such a sad picture for value investing. They claimed that it is also necessary to take into account historical cyclicity (Rao & Gupta, 2019).

Piotroski (2000) studied value stocks in terms of whether the fundamental analysis of historical data on the economic performance of companies can further increase the return on investment in companies with high book-to-market values. He motivated his research by the fact that although a high book-to-market investment strategy on average gives a positive abnormal return, only 44% of portfolio holdings generate positive returns. Thus, value investors must tolerate normal or poor returns on a significant portion of the holdings in their portfolios. Although an asymmetric distribution of returns is not unique to value stocks, an investment strategy that identifies potentially strong value stocks is key to determining how value investing works in order to produce superior market results (Piotroski, 2000).

The review of the existing research about this issue revealed rather controversial findings. Since the time of Buffett's research on superinvestors' performance (Buffett, 1984) most of the studies were concentrated on the analysis of returns of value stock funds or value index funds as the study of Rao and Gupta (2019) but not the returns of their portfolios. Furthermore, these funds are formed predominantly on the narrow academic value investing approach that orients on low price-to-earning or price-to-book ratios and neglects company's fundamentals, competitive advantages, intrinsic value and other concepts which are in the core of the value investing philosophy of Graham, Buffett and other superinvestors (Hanson & Fraser, 2013). Thus, the question of whether superinvestors who adhere to the value investing strategy have outstanding competence to manage fund assets and generate above the market returns is still open for research.

3. PORTFOLIO CONSTRUCTION ALGORITHM UNDER THE PRAGMATIC APPROACH

The pragmatic investment strategy is based primarily on time-tested value investing strategies used by superinvestors such as Benjamin Graham, Walter Schloss, and Warren Buffett. Buying undervalued stocks with strong fundamentals and the highest margin of safety and managing portfolio volatility through diversification, assets allocation and rebalancing technics, developed by Harry Markowitz, William Sharp, Philippe Fisher and other titans of the investment realm, allows consistently overperform the market in the long run that no other investment strategy can match (Pragmatic Investor, 2020).

Pragmatic investment algorithm to build a portfolio implies the following main stages: 1) investors' risk profile identification; 2) stocks picking; 3) diversification; 4) asset allocation; 5) rebalancing. The graphical representation of the algorithm to build a pragmatic portfolio within the value investment framework is presented in **Figure 9**.

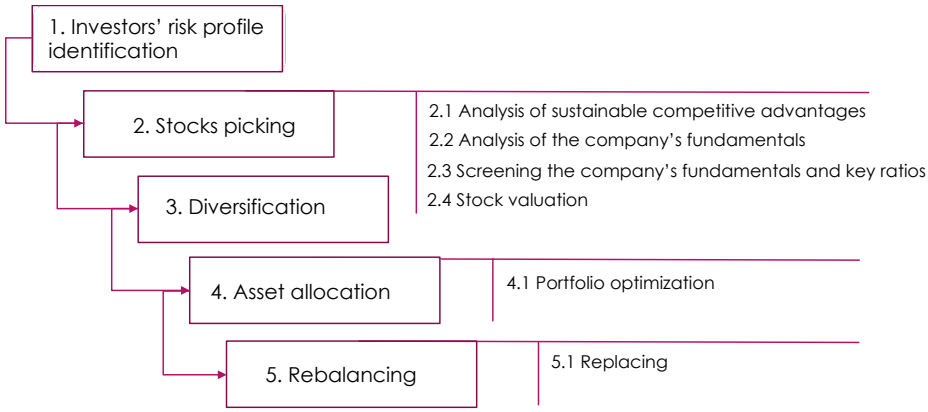

Figure 9. *Algorithm of pragmatic portfolio building. (Author)*

3.1 Investors' risk profile identification

The starting point of the portfolio construction is the determination of the basic characteristics, inclinations and needs of investors, as investors are primarily humans with their characters, temperaments, life circumstances, personal experience and desires. All these features determine their risk appetite. For some, the safety and security of their personal assets are the most important, others are more edge-walking and can afford to take more risks. The investment portfolio should be built in accordance with the acceptable level of risk of an investor. This allows to form a portfolio in the most optimal way for a given level of comfortable risk and manage it in the future (Hing, 2015).

To ensure that an investment portfolio does not cause concern and corresponds to risk tolerance, various tests and questionnaires have been devised that professional investors offer their clients to fill out before starting work on building a portfolio. These questionnaires include questions about personal characteristics, financial situation, investment goals, risk tolerance, investment knowledge and experience. Depending on the results of the questionnaires, investors are divided into three major categories according to their risk profile: Conservative, Moderate (Rational), Aggressive, and their intermediate combinations. The main need of Conservative investors is to preserve income and capital. Moderate (Rational) investors aspire long-term capital growth and are aware of volatility. Aggressive investors strive to maximize returns and may tolerate higher volatility (CI Investments Inc., 2005). The graph in **Figure 10** plots the types of investors depending on the level of risk in comparison with the return on investment.

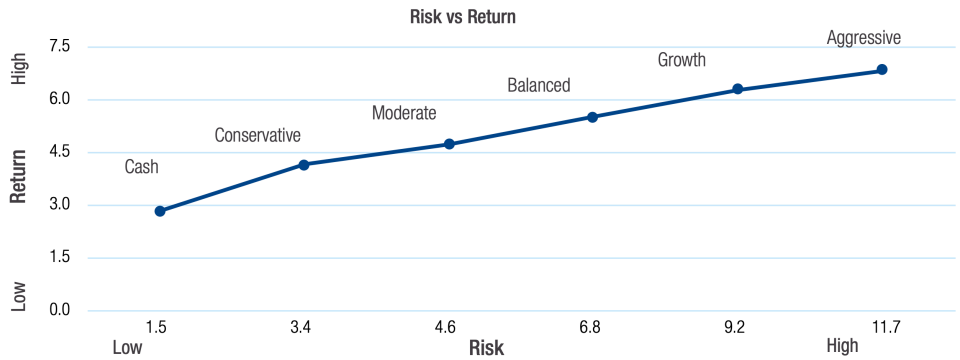

Figure 10. *Investors' risk tolerance profile. (Morgans Financial Limited, 2017)*

3.2 Stocks picking

The first step in the search and selection of stocks for an investment portfolio begins with a study of key performance indicators of a company, its fundamentals. A detailed analysis of the financial statements will help to determine the current state of a company, its future viability, sustainability and existing risks of competition, — all the competitive advantages which Warren Buffett calls "moat strength" of a company (Chapman, 2019). Systematic detection of companies with a wide moat eliminates guesswork and prejudice when making investment decisions. Combining it with the analysis of other fundamental factors may be an effective way in which investors can avoid the negative consequences of overpaying for stocks (Carbonneau, 2019).

The next important step is to determine the real value of stocks and the possibility of subsequent purchase with a sufficient discount to ensure an acceptable margin of safety (Pragmatic Investor, 2020). When a target company is identified to be strong and good enough for investing in, the positive decision should be made only when this company is undervalued. An undervalued company has a positive difference between its intrinsic value and its current market value. This difference is at the bottom of the "margin of safety" concept, popularized by Benjamin Graham (Hopkins, 2018). The universal rule is that it is much better to buy shares of a company at a price lower than its intrinsic value, and then wait until the price roars back, than buy a company more expensive than it costs, and wait until its intrinsic value bounces back with the market (Hing, 2014).

3.2.1 Analysis of sustainable competitive advantages

Warren Buffett's concept of "moat strength" originated from his figurative view of buying a business as buying a castle surrounded by a moat. This economic moat must be deep and broad to withstand any competition. Over the years, Buffett has accentuated that he is looking for companies with sustainable competitive advantages. Sustainable competitive advantages are assets, characteristics or abilities of a company that are difficult to replicate or surpass, and which create a superior or favorable long-term position compared to competitors (Faulkenberry, 2020).

A systematic approach to determining the structure of the size of a company's moat is based on an analysis of three major groups of sources of sustainable competitive advantages: production advantages, consumer advantages and external advantages (Mauboussin, Callahan, and Majd, 2016). These three groups can be decomposed to look on the sources more in details as, for example, it is represented in **Figure 11**. The more stable competitive advantages a company has, the greater its "moat strength" is and the more likely it is that the investment in this company will be successful.

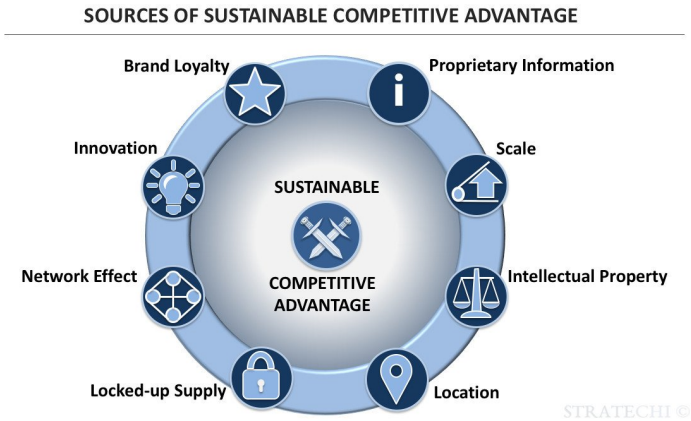

Figure 11. *Sources of sustainable competitive advantage. (Newsum, 2020)*

Evaluation of sustainable competitive advantages can begin with answers to the following questions (Faulkenberry, 2020):

1) Can the company increase prices, easily adjust them to inflation and not lose the market share? If so, the company has ***pricing power*** and may gain a dominant position in the market.

2) Does the company have a unique product or service that completely covers the needs of customers for this product or service? ***Product differentiation*** increases customer loyalty and is less likely to lead to a loss of market share than a cost-based advantage.
3) Will the company's products be used by customers over the next 10 years? ***Adapting product line*** allows launching improved or complementary products that make customers come back for a product in a "new" or improved edition.
4) Does the company have a strong, reliable and recognizable brand that has a certain consumer monopoly in its region or around the world? Is it strong enough to beat its competitors over long periods of time? ***Powerful brands*** make customers give preference to a brand over competitors.
5) Can the company protect itself from the competition and retain customers? ***Barriers to entry*** are, for example, the cost advantages, high investment costs, intellectual property rights, government regulations, valuable strategic assets.
6) Does the company have a strong team of talented managers who make the right decisions, especially in difficult times, motivate and get the best out of their employees? ***Outstanding management*** is a strong competitive advantage that is hard to quantify but difficult to overestimate.
7) Does the company have reserves for investments in expanding and responding to the sudden arrival of a strong competitor with a large supply of funds to fight for customers? ***A strong balance sheet, low debt and cash reserves*** support liquidity and solvency, make it possible to make timely investments and, if necessary, provide access to working capital.
8) Can a company be a low-cost supplier and provide low prices through economies of scale? ***Scaling*** helps to lower costs and prices, leveraging along with procurement, mass production, marketing, fixed costs, and partners (Newsum, 2020). Being a low-cost provider consistently can be a significant barrier to entry for competitors.

If the company that is potentially considered for purchasing of its shares can provide intelligible answers to the questions above, then most likely this company has a "moat strength" and investments in this company are most likely to be profitable. Conversely, if most of the questions will cause difficulties, it is most likely worth refraining from investing in this company. In investments, especially for the long term, it is especially important to quantify as much as possible the parameters that will allow picking the strong companies

(Carbonneau, 2019). To objectively assess if a company has sustainable competitive advantages and whether it is worth investing in it, it is necessary to appeal to a quantitative analysis of the financial and key indicators of the company, which is discussed onward.

3.2.2 Analysis of the company's fundamentals

Before making investment decisions, it is necessary to conduct comprehensive due diligence of the financial statements of a company. In particular, investors should carefully study the Income Statement (Statement of Earnings), the Balance Sheet (Statement of Financial Condition) and the Cash Flow Statement. To assess whether the value of the company will increase or decrease in the future, investors are advised to conduct a fundamental analysis based on an assessment of the retrospective financial condition of a company. One way to analyze the fundamentals of a company is to calculate some key financial ratios that will give an idea of how a company has worked. These ratios should not be considered on their own, but appropriately, for example, comparing them with the results of previous years and with the results of other companies from the same industry. The key financial ratios can be combined into the following groups: 1) Liquidity ratios, 2) Financial leverage ratios, 3) Profitability ratios, 4) Earnings quality (Sloan) ratio, and 5) Market value ratios. (Young, 2019).

1) Liquidity ratios

Liquidity ratios measure a company's ability to repay its liabilities and reflect the occurrence of cash and other assets to cover the short-term debt, accounts payables, and other obligations (Inc, 2019). The most commonly used liquidity indicators are the following:

- Current Ratio:

$$\text{Current Ratio} = \text{Current Assets} / \text{Current Liabilities} \quad (1)$$

The current ratio measures the ability of a business to repay short-term liabilities with current assets. A value above one indicates that a company is able to cover its current liabilities, but it may also show that a company is not using its cash effectively. Investors usually prefer a

not too high current ratio, as this reflects that the company uses its assets for business growth (Young, 2019).

- Quick Ratio:

$$\text{Quick Ratio} = (\text{Current Assets} - \text{Inventory}) / \text{Current Liabilities} \quad (2)$$

Also known as the "acid test" ratio, the quick ratio gives a better idea of the short-term liquidity than the current ratio since it subtracts inventories from the equation, the least liquid components of the current assets. Thus, the most liquid current assets (cash, marketable securities and current receivables) remain in the equation. The optimal ratio should be equal to one. The larger value testifies an overabundance of cash or problems with the collection of accounts receivables. A value below one indicates that the company relies too much on inventories to cover liabilities (Inc, 2019).

- Cash Ratio:

$$\text{Cash Ratio} = (\text{Cash} + \text{Cash Equivalents}) / \text{Current Liabilities} \quad (3)$$

The cash ratio is another indicator of the ability to pay off short-term liabilities with the amount of actual cash and cash equivalent such as marketable securities (stocks and bonds). If the ratio is more than 1 it means that a company will be able to repay its current liabilities in cash and cash equivalents and still have the remaining funds. Although there is no perfect value for the cash ratio, its preferred values range from 0.5 to 1. This ratio provides the most conservative view of the company's liquidity since only cash and cash equivalents are taken into account. Even a high ratio may indicate some degree of security, excessive amount of cash may also indicate its inefficient usage when cash is simply on the balance sheet and does not generate income. (Inc, 2019).

2) Financial leverage ratios

The financial leverage ratios are the next important group of ratios, which is carefully studied by investors, as they measure the dependence of a company on borrowing to finance its activities. A company will need funds to pay off the remaining principal balance at some point in the future, and the funds used for this will not be available for other purposes. Moreover, a company may have difficulty obtaining additional financing if it already has

too much debt. Not all debts are bad, but a significant debt should turn on the alarm button in order to prompt more careful study about the sources of debt and the purposes a company has taken it (Hing, 2014). Some major leverage ratios include:

- Debt Ratio:

$$\text{Debt Ratio} = \text{Total Liabilities} / \text{Total Assets} \quad (4)$$

Debt ratio shows the relative amount of company's assets that are financed by borrowed funds. A debt ratio of larger than one means that a company has negative net worth and, in fact, is technically bankrupt (Inc, 2019).

- Long-term Debt to Capitalization Ratio:

$$= \text{Long-term Debt} / (\text{Long-term Debt} + \text{Shareholders' Equity}) \quad (5)$$

This ratio shows the amount of financial resources of a company. If the ratio exceeds 1, this indicates that debt is the main source of financing, and this is a warning signal of financial weakness. Any further debt beyond this point will increase the risk and reduce the financial flexibility of a company. On the other hand, a high ratio can also report an increase in shareholders' return on equity since interest payments are tax deductible. (Carlson, 2019).

- Debt to Equity Ratio (D/E):

$$\text{Debt to Equity Ratio} = \text{Total Liabilities} / \text{Total Shareholders' Equity} \quad (6)$$

The D/E ratio (financial leverage) represents the capital structure of a company. A leveraged company has a ratio coefficient of more than 1 (Accountingverse, 2020). A company with a higher portion of the capital provided by owners has a low debt-to-equity ratio and is generally considered being safer. If the ratio is too low, it could be the evidence of unreasonable cautiousness. Investors usually prefer companies with a lower debt-to-equity ratio. As a rule, debt should reach from 50 to 80 percent of equity. (Inc, 2019).

3) Profitability ratios

The profitability ratios assess how well a company uses its assets to generate profit and create value for shareholders. Higher values of the profitability ratios are aimed by a company, as it may indicate that its current business is in a good state and can generate

sufficient cash flows, revenue, and profit (Corporate Financial Institute, 2020). Net Profit Margin, Return on Assets (ROA) and Return on Equity (ROE) are three profitability ratios the most useful for investors (DiLallo, 2015). ROA and ROE are the return-based profitability ratios which investors should know as they both measure how well a company manages its assets to create wealth for shareholders.

- Net Profit Margin:

$$\text{Net Profit Margin} = \text{Net Earnings} / \text{Sales} \tag{7}$$

The net profit margin is the most important indicator of profitability, which gives a final picture of how profitable a company is after all expenses, including interest and taxes. It is believed that the higher this value the better, but there is no universal standard. A good net profit margin in one sector will be terrible for another. That is why it should be compared with the indicators of companies from similar industries besides analyzing the historical trend of this indicator. (DiLallo, 2015).

- Return on Assets (ROA):

$$\text{ROA} = (\text{Net Income} + \text{After-tax Interest Expense}) / (\text{Average Total Assets}) \tag{8}$$

The ROA specifically reveals how effectively a company deploys its assets to create more assets. Investors would prefer the higher values of ROA. A low value of ROA may indicate inefficient management. At the same time, it highly depends on the industry, as low values of ROA are quite normal for the asset-intensive businesses where large investments in buying expensive machinery and equipment to generate income are something common, for example, in car manufacturing or telecommunication. On the contrary, software and consulting sectors are much less asset-intensive (Corporate Financial Institute, 2020).

- Return on Equity (ROE):

$$\text{ROE} = \text{Net Profit} / \text{Shareholders' Equity} \tag{9}$$

Investors and stock analysts are particularly concerned about the return on equity ratio. ROE measures a company's ability to covert a shareholders' equity into profit. The better the company's work in optimizing the investments made by shareholders in the business, the

higher the value of ROE. Companies with high ROE, as a rule, are more capable to generate a profit using their funds, and, as a result, they are less dependent on debt financing. A sufficiently high ROE can be a positive signal to buy the company's shares (Corporate Financial Institute, 2020).

4) Earnings quality (Sloan) ratio

Richard Sloan was the first who argued that not all types of earnings have the same quality (TRV Stock Analyzer, 2017). Earnings are not yet to be real money, and one unit in earnings is not equal to one unit in cash that can be distributed by a company. The cash component is at the top of the quality pyramid. Non-cash earnings are of the lower quality. Non-cash earnings are called "accruals" and include the earnings which a company has been recorded as earnings under the accrual accounting method, but has not yet arrived at a real exchange for cash at the bank. (Sloan, 1996). The accrual ratio is also called the "Sloan ratio" after Richard Sloan and measures the degree of accruals of a company:

$$\text{Accruals Ratio} = (\text{Net Income} - \text{Cash Flow from Continuing Operations} - \text{Investing Cash Flow}) / \text{Total Assets} \quad (10)$$

Investors uses the Sloan ratio to analyze if the reported net income closely matches cash flows, which may evidence about the sustainability of earnings and how accurately net income presents a company's results. The lower the value of the accruals ratio, the better is the quality of earnings (Breaking Down Finance, 2020). The results of the Sloan ratio calculation can be interpreted as following (TRV Stock Analyzer, 2017):

- A Sloan ratio between -10% and 10% — a company has minimum accruals and is in a safe zone.
- A Sloan ratio from -25% to -10% or 10% to 25% — a company begins to have more accruals which put it in the warnings zone.
- A Sloan ratio less than -25% or greater than 25% — earning most likely consist of accruals and a company is the danger zone.

5) Market Value Ratios

Market value ratios are used to estimate a company's stock price. Commonly used market value ratios include the following (Taulli, 2006):

- Earnings per Share (EPS):

$$\text{Earnings per Share} = (\text{Net Earnings} - \text{Preferred Dividends}) / \text{Total Shares Outstanding} \quad (11)$$

Earnings per share (EPS) is one of the key indicators used to compare the investment attractiveness and performance of companies operating in the stock market. The higher the value of EPS, the more valuable a company is because investors will be willing to pay more for a company with higher profitability per share.

- Price-to-Earnings ratio (P/E):

$$\text{Price-to-Earnings ratio} = \text{Share Price} / \text{Earnings per Share} \quad (12)$$

Price-to-Earnings ratio is one of the main indicators used for a comparative assessment of the investment attractiveness of joint stock companies. The general rule of thumb is that small values of the coefficient indicate undervaluation of the company in question, and larger ones indicate overvaluation. There are two approaches to the calculation: with the historical data and with the forecasted data. As the second approach is just guesswork, it should be based on the consensus estimates from experts. For investors, it is most appropriate to use the second approach, since investing is something that relates to the future, and not to the past (Taulli, 2006).

- Earning Yield ratio:

$$\text{Earning Yield ratio} = 1 / (P/E) = \text{Earnings per Share} / \text{Share price} \quad (13)$$

Earning yield ratio is the reciprocal of the Price-to-Earnings ratio. It is indicated as a percentage, which makes it easy to compare with current bond yields. If bonds offer better yields investors may want to shift part of their portfolios into bonds (Taulli, 2006).

- Dividend Yield ratio:

$$\text{Dividend Yield ratio} = \text{Annual Dividend per Share} / \text{Share Price} \quad (14)$$

Dividend yield ratio shows the percentage of payout compared to the current stock price. If a company focuses on paying dividends, it may enhance the return on investment (Chen,

2019). However, higher dividend yield is not always attractive. Dividend yield can grow simply due to falling stock prices and may look unusually high for stocks that are falling rapidly, or vice versa unusually low for stocks that are growing in price. Many companies do not pay dividends, especially in the US stock market, while in some sectors they pay dividends above the average. Also, mature companies tend to pay higher dividend yield than small new fast-growing companies in similar sectors (Chen, 2019).

3.2.3 Screening the company's fundamentals and key ratios

When used correctly, the fundamentals and key ratios can help investors interpret data on the financial and economic performance of a company and make informed investment decisions. Heuristic rules based on years of experience have been developed to determine what the ratio value is "good" and what is "bad". Benjamin Graham and David Dodd (Graham & Dodd, 2009), Pat Dorsey (Dorsey, 2004) and Warren Buffett (Hing, 2014) were the persons who arrived at a set of criteria for the company's fundamentals and key financial ratios. They called these filters "value screens" (Graham & Dodd, 2009). Based on the analysis of these screens and the information about financial ratios that important to pragmatic investors, **Table 2** compiles the main ratios and other fundamentals and codifies them by assigning the ratings: "Excellent", "Good", "Marginal" or "Bad".

The presented in **Table 2** ratings are the average generalized assessments without taking into account industry specifics and other important parameters that could have a significant impact on the definition of "good" and "bad" stocks. An exception was made for the ROA indicator, since its normative values for asset-intensive and asset-light businesses vary significantly, which cannot be ignored and/or averaged in some way.

Once investors have succeeded to calculate financial ratios and fundamentals listed in **Table 2**, they should rate them according to the proposed scale and assign a score to each rating as follows: "Excellent" = 3, "Good" = 2, "Marginal" = 1 and "Bad" = 0. The final result, which is the average score of all criteria, will lead to an integral assessment of a stock in the interval from 0 to 3, which corresponds to the non-numeric rates from "Bad" to "Excellent". A pragmatic investor should generally consider stocks that are rated as "Good" and "Excellent".

Table 2. *Criteria for a good value stock. (Author)*

		Key financial ratios	Criteria for a good value stock	
Liquidity ratios	1	Current Ratio	(3) Excellent: between 1,5 and 2 (2) Good: 1 – 1,5 and 2 – 3 (1) Marginal: 0,5 – 1 and 3-5 (0) Bad: < 0,5 and > 5	
	2	Quick (Acid test) Ratio	(3) Excellent: between 1 and 3 (2) Good: 0,9 – 1 and 3 – 5 (1) Marginal: 0,7 – 0,9 and 5-10 (0) Bad: < 0,7 and > 10	
	3	Cash Ratio	(3) Excellent: between 0,8 and 1,3 (2) Good: 0,5 – 0,8 and 1,3 – 1,5 (1) Marginal: 0,2 – 0,5 and 1,5-2 (0) Bad: < 0,2 and > 2	
Financial leverage ratios	4	Debt Ratio	(3) Excellent: between 0,4 and 0,6 (2) Good: 0,2 – 0,4 and 0,6 – 0,7 (1) Marginal: 0,1- 0,2 and 0,7 – 0,9 (0) Bad: < 0,1 and > 0,9	
	5	Long-term Debt to Capitalization Ratio	(3) Excellent: between 0,4 and 0,6 (2) Good: 0,2 – 0,4 and 0,6 – 0,7 (1) Marginal: 0,1- 0,2 and 0,7– 0,9 (0) Bad: < 0,1 and > 0,9	
	6	Debt to Equity Ratio (D/E)	(3) Excellent: between 0,5 and 1 (2) Good: 0,3 – 0,5 and 1 – 2 (1) Marginal: 0,2- 0,3 and 2 – 3 (0) Bad: < 0,2 and > 3	
Profitability ratios	7	Net Profit Margin	(3) Excellent: > 20% (2) Good: between 10% and 20% (1) Marginal: between 5 and 10% (0) Bad: < 5%	
	8	Return on Assets (ROA)	*For the asset-intensive businesses:* *(3) Excellent: > 6%* *(2) Good: 4% — 6%* *(0) Bad: < 4%*	*For the asset-light businesses:* *(3)* Excellent: more than 20% *(2)* Good: 15% —20% *(0)* Bad: less than 15%
	9	Return on Equity (ROE)	(3) Excellent: > 30% (2) Good: between 15% and 30% (1) Marginal: b/w 12% and 15% (0) Bad: < 15%	
Earnings quality ratio	10	Accruals (Sloan) Ratio	(3) Excellent: b/w -10% and 10% (2) Good: from -20% to -10% and 10% to 20% (0) Bad: < -20% or > 20%	
Market value ratios	11	Earnings per Share (EPS)	(3) Excellent: if EPS / Long-term AAA Bond Yield < the stock's current share price (0) Bad: otherwise	
	12	Price-to-Earnings ratio (P/E)	(3) Excellent: <= 9% (2) Good: between 9% and 15% (0) Bad: > 15%	
	13	Earning Yield ratio	(3) Excellent: more than twice of the AAA bond yield (0) Bad: otherwise	

	14	Price-to-book (P/B)	(3) Excellent: <=0,9 (1) Marginal: between 0,9 and 1,1 (0) Bad: > 1,1
	15	Dividend Yield ratio	Excellent: more than 2/3 the AAA bond yield Bad: otherwise
		Other company's fundamentals	**Criteria for a good value stock**
	16	Net Income growth in the past 5 years	Excellent: has grown more than 3 times Good: has grown 2-3 times Marginal: has grown 1-2 time Bad: has not grown at all
	17	Cash Flow growth in the past 5 years	Excellent: has grown more than 3 times Good: has grown 2-3 times Marginal: has grown 1-2 time Bad: has not grown at all
	18	Free Cash Flow / Sales in each of the past 5 years	Excellent: more than 5% Bad: otherwise
	19	Depreciation / Gross Profit	Excellent: 8% or less Good: between 8% and 18% Bad: more than 18%
		Moat Strength	**Criteria for a good value stock**
	20	Moat Strength	Excellent: Wide Marginal: Narrow Bad: None

If the results of the analysis of fundamental and key financial ratios are satisfactory, there is the final step to analyze the company's "moat strength". To perform this, an investor may use the Morningstar's Economic Moat rating available to the premium service subscribers. According to the Morningstar's rating, companies are assigned one of three values of the economic moat: "Wide" — for companies with the strongest sustainable competitive advantage; "Narrow" — for companies with some competitive advantage, and "None" — for companies with no competitive advantage (Morningstar, 2020).

Alternatively, if coming back to the questions regarding the sustainable competitive advantages summarized in **Figure 12**, these questions can also be quantified using the same rating scale proposed by Morningstar. To perform this estimation, an investor must be diligent and collect the most complete information about a company from competent sources.

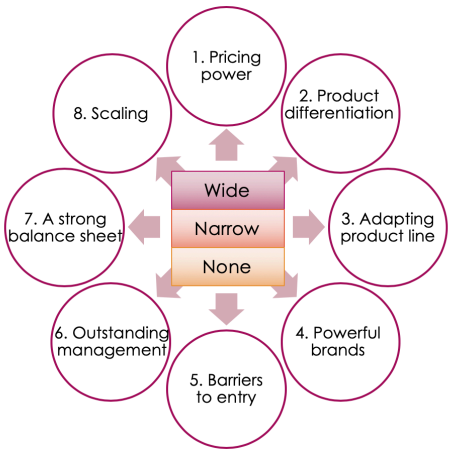

Figure 12. *Sustainable competitive advantages. (Author)*

By attributing "Wide", "Narrow" and "None" to the digital values 3, 1 and 0 respectively, an investor can also calculate the average integral estimate of the "moat strength" of a company. If a result strives for the number 3, then it can be concluded that a company has the wide moat and its sustainable competitive advantages are strong.

3.2.4 Stock valuation

The fact that the company is fundamentally strong does not mean that investors have to rush and immediately buy its shares. Before, they need to answer two very important questions: 1) Is the current price of shares undervalued? 2) What price is it worth paying? (Hing, 2014). There are a number of methods for determining an intrinsic value of a company, for example, Discounted Cash Flow models, Dividend Discount models, Graham's formulas, Economic Value Added (EVA), Compound annualized growth rate and other valuation models. Intrinsic value is not an exact figure, but a range of values that it can take depending on investment goals and the approach used by an investor. It is advisable to use several assessment methods to determine the range of values, and on their basis determine the average or focus on the upper or lower boundary (Elementary Value, 2019).

The method which is used the most by one of the pragmatic investment experts is based on Earnings per Share (EPS) and the estimation of the EPS growth in the future — usually for at least the next 5 years (Hing, 2014). This approach requires information about the company's current EPS, annual dividend payment (if any) and the estimated EPS Growth.

These data can be found, for example, at Yahoo Finance or Morningstar. The future value of EPS is calculated using the following formula:

$$EPS_{Future} = EPS_{Current} * (1+g)^{Y} + d * \frac{(1+r)^{(Y+1)} - (1+r)}{g}, \qquad (15)$$

where:

g — estimated EPS growth;

d — 1/2 of the dividend rate;

Y — years to hold.

The longer the period of ownership, the better for a pragmatic investor, but the problem of the less accurate estimates of EPS growth rates arises here. Anyway, it is recommended to use a 5-year period for calculation as the estimated EPS growth for the next 5 years is available at Yahoo Finance for all investors. The formula (15) uses the half of the dividend rate, not the entire amount, to build a very conservative estimate of the Future EPS value, because the dividends are not guaranteed, and quite often they can be reduced or eliminated at any time.

The next step is the calculation of the estimated future stock price by using the lowest value of the average P/E ratio over the past 5 years to be as conservative as possible.

$$Estimated\ Future\ Price = Future\ EPS_{Future} * Lowest\ average\ P/E_{for\ the\ past\ 5\ years} \qquad (16)$$

The estimated future price should be discounted back to the present day using the formula:

$$Price = \frac{Estimated\ Future\ Price}{(1+r)^{Y}}, \qquad (17)$$

where:

r — discount rate;

Y — years to hold.

The discount rate is calculated as follows:

$$Discount\ Rate = \frac{Worst\ Case\ Return}{1 - Margin\ of\ Safety}, \quad (18)$$

To calculate the accurate discount rate, the worst-case return and the margin of safety should be determined properly. Recalling Graham's concept of the margin of safety, the difference between the intrinsic value of a stock and its market price should be sufficient enough to be a buffer that can protect from the wrong investment decisions. For a pragmatic investor, the recommended value for the margin of safety is 50% and for the worst-case return is 12%, which means that if a stock falls by 50% of the expected price the annual return will be 12%. Although this does not exclude the choice of other values, the reason to choose the worst-case return of 12% is that this is the average annual return of the S&P 500 over long periods (Hing, 2014). Experienced investors should embed a much better return on individual stocks than the S&P 500 returns (at least twice as much). If they cannot afford it, then they should invest in index funds. Having determined all the values, an investor will receive the maximum price that she is willing to pay for the required margin of safety and the return in the worst case. If the current stock price is less than or equal to this maximum purchase price, an investor may make a positive decision to buy this stock, otherwise refuse to buy, since the price is too high.

It should be noted that the higher the accepted margin of safety and the worst-case return, the fewer stocks on the market will meet these criteria. Usually, there is not a very large number of high-quality stocks trading at a discount with a sufficient margin of safety at any given time. However, a disciplined and patient investor, following the pragmatic approach, can succeed in finding such stocks, while other investors skip or refuse from them pursuing short-term goals.

3.3 Diversification

Diversification of the investment portfolio is the key to achieving its best return and reducing risk. Just incorporating a large number of stocks does not make the portfolio diversified. If they behave the same way, it may be fatal for an investor. A properly diversified portfolio contains stocks that behave differently, in other words, have a low correlation among themselves (Pragmatic Investor, 2020).

Harry Markowitz made a great contribution to this issue in the 1950s in his article "Portfolio Selection" where he stated that risk does not work in the same way as returns. While the total portfolio return is simply the weighted average of the individual returns of each component in that portfolio, the risk is a combination of the individual risk of each component and also a correlation function between each component (Markowitz, 1952). He was a pioneer of the Modern Portfolio Theory (MPT), an important understanding of which is that the risk of an individual stock is not very important. What is of paramount importance is its contribution to the risk of the portfolio as a whole. That is why the MPT uses diversification as its primary mechanism (Kolm & Gupta, 2008). The MPT divides the risk of stock returns into two types: systematic risk (market risk) and unsystematic risk (specific to an individual stock risk). There is no way to minimize market risk with diversification, but it can moderate a specific risk. Diversifying a portfolio by including stocks with a low or negative correlation between them will help to reduce exposure to risk since such stocks tend to counteract each other: when some fall, others grow. This can reduce the volatility of their combined returns, and since volatility is a standard way of measuring risk, it reduces the overall risk of the portfolio. That is why diversification is so important.

Portfolio optimization

After deciding which stocks to include in the portfolio, it is necessary to decide how to make this portfolio optimal, in other words, minimize the level of risk to achieve the expected return, or maximize income at a given level of risk. The most famous tool to achieve this is the Markowitz's MPT. This methodology to build an investment portfolio is aimed at the optimal choice of assets, based on the required return/risk ratio. As the technique is based on the analysis of expected average returns and variations of random variables, it is also called "mean-variance analysis" (Fabozzi, Markowitz & Gupta, 2008).

Portfolio optimization work consists of taking all the stocks in the portfolio and creating a set of efficient portfolios: portfolios that contain the lowest risk for a given return or the highest return for a given risk level. Markowitz proposed a set of assets, a vector of their average expected returns and a covariance matrix to build the space of possible portfolios with various combinations of the risk and return. Plotted on the chart where the x-axis is

standard deviation as a measure of risk and the y-axis is an average rate of return, they form the "efficient frontier" (see **Figure 13**).

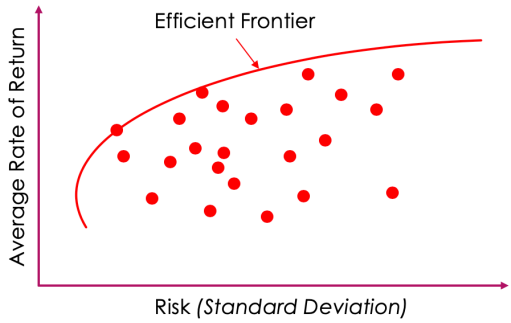

***Figure 13**. The graphical representation of the Efficient Frontier. (Author)*

All portfolios that lie on the efficient frontier are called efficient portfolios. Any portfolio that does not lie on the curve of the efficient frontier is not optimal since it is either too risky in relation to its return, or insufficiently profitable in relation to its risk. Portfolios below the effective boundary curve are ineffective because from the existing set of assets it is not possible to make the best portfolio with a higher expected return for the same risk level or lower risk level for the same expected return. Portfolios above the effective border curve cannot be formed for this set of stocks. At least one portfolio that has the expected risk and return can be built on the effective frontier from available assets (Guided Choice, 2020). Thus, MPT quantifies risk relative to expected returns and provides a mathematical model that helps to determine the best portfolio for a given level of risk or return, and an efficient frontier demonstrates the benefits of diversification. This allows investors to diversify their portfolio based on historically proven, time-tested risk management methods.

3.4 Asset allocation

Once the portfolio is sufficiently diversified, the next step will be a reasonable allocation of funds among diversified assets in the portfolio. Some strategies are implemented to allocate assets. The easiest way, which many investors practice, is to equally distribute funds between diversified assets, and then periodically rebalance a portfolio. This strategy is better than nothing, but it lacks any real ability to exploit the synergies that may be in the portfolio. Just

investing an equal amount in each asset can work, but in most cases, it is better to allocate funds based on the returns and risk characteristics of individual stocks (Hing, 2014).

The better method used by pragmatic investors as the main mechanism for the portfolio optimization and effective asset allocation is to use the Sharpe ratio. (Pragmatic Investor, 2020). The Sharpe ratio is a measure of risk reward: the higher the value, the better the investment (in terms of return/risk). The Sharpe ratio is calculated with the following equation:

$$S_x = \frac{R_x - R_f}{\sigma_x}, \tag{19}$$

where:

S_x — Sharpe's performance measure;

R_x — the average annual rate of return of the asset;

R_f — the average risk-free return (usually the interest rate of US Treasury bonds);

σ_x — standard deviations of the assets' returns.

Graphically, the Sharpe Ratio is presented in **Figure 14**, where the Sharpe ratio of the asset x is the slope of the straight line that is tangent to the efficient frontier and starts from the point on the y-axis corresponding to the risk-free rate.

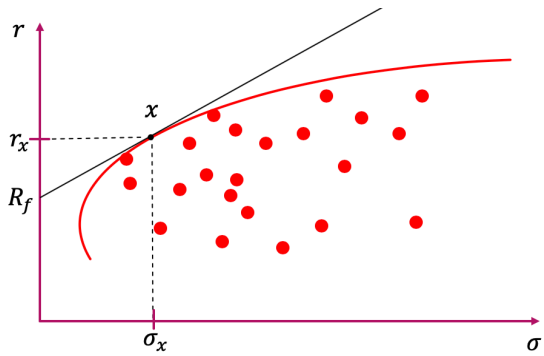

Figure 14. *The graphical representation of the Sharpe ratio. (Author)*

To allocate assets using the Sharpe ratio, an investor should perform the following steps:

1) calculate the Sharpe ratio for each stock in the portfolio;
2) sum all the Sharpe ratio estimates;
3) divide the Sharpe ratio of each stock by the sum of the Sharpe ratios.

The result will be a percentage allocation for each stock in the portfolio. The advantage of this strategy is that the stocks with better risk-return combination will receive a larger share in the portfolio which is much more logical than the simple equal allocation strategy described above. However, the strategy does not consider the possible interactions between assets in the portfolio, while these interactions can be significant and affect the entire risk of the portfolio (Hing, 2014). The reason investors use the Sharpe ratio to allocate assets despite the shortcomings is that it is quite effective in most cases, for example, when investing in individual stocks (Hing, 2014).

Regarding how many different assets should be contained in the portfolio of a pragmatic investor, the answer to this question was given by Edwin J. Elton and Martin Gruber in the book "Modern Portfolio Theory and Investment Analysis". They stated that 20 stocks with a low correlation between them provided the same risk protection as 500 or more stocks in a portfolio. A further reduction in the number of stocks to 8 with a low correlation between them provided 81% protection against risk. Thus, it makes no sense to inflate a portfolio with a lot of different assets, because a properly diversified portfolio will not receive any additional protection when the number of assets exceeds 20. It is enough to opt for a careful selection of high-quality fundamentally sustainable stocks in amounts of 8 to 20, and even go along with a smaller quantity using index funds or industry ETFs, which are already more or less diversified (Elton et al., 2017).

3.5 Rebalancing

Many investors build a portfolio and then leave it in its original state, without touching it, until they need cash for something. Unfortunately, this classic buy and hold strategy is a not a good strategy, even if initially a portfolio was well diversified and the assets in it were allocated properly. Thus, rebalancing remains one of the most underused or even never used methods of risk minimization (Hing, 2014). The basic concept of portfolio rebalancing is to redistribute investments in the portfolio in such a way as to correspond generally to the initially selected weights. The initial portfolio risk-reward profile should be maintained after the portfolio rebalancing (Frankel, 2019).

There are several reasons for rebalancing. First, it helps to reduce the risk that may arise due to the disproportionate impact of one asset on the portfolio. Stock prices often change at different rates and at different times. Therefore, a more efficient stock begins to dominate the portfolio, and if it goes down at some point in time, it will drag down the entire portfolio. By periodically redistributing the risk across several assets, an investor isolates the portfolio from the risks associated with the behavior of only one stock. (Bernstein, 2001). Another advantage is that it automatically forces to buy cheap and sell expensive, while most investors tend to do the opposite: due to greed they buy expensive shares that go up, and sell cheaply falling shares because of fear (Frankel, 2019). This is called "chasing performance", and this is probably the main reason why many investors do not succeed in the long run (Bernstein, 2001). Rebalancing allows to eliminate this irrational behavior and cope with emotions if an investor follows a pre-planned strategy and takes appropriate actions depending on what is happening with stock prices in the portfolio. (Hing, 2014). Since it does not make sense to rebalance constantly, because it costs a certain amount of personal time and money for commission fees and taxes, there are several rebalancing strategies that are stated further.

Calendar rebalancing

The first most common strategy is a calendar or time-based rebalancing. According to this approach, the investor determines the frequency of rebalancing, for example, annually, once every six months, or quarterly. Since the studies have not established which rebalancing period is better, most investors prefer an annual period, often associated with a financial event, such as a tax refund. The advantage of this approach is its simplicity and obviousness. The disadvantage is that most of the year a portfolio will be unbalanced and the benefits of reducing risk and increasing return will not be used effectively. However, calendar rebalancing is better than not rebalancing at all what most investors practice in reality (Zilbering, Jaconetti and Kinniry, 2015).

Threshold rebalancing

The next more effective rebalancing strategy is threshold rebalancing. An investor adhering to this strategy rebalances only when the allocations of target assets deviate by a predetermined percentage, absolute or relative, for example, by 5%, 10%, 25%, or other percentages. Since the threshold rebalancing is price-based, it provides more rebalancing

options than using calendar rebalancing. However, if the portfolio contains a sufficiently large number of assets, the problem arises related to extra time spent on too frequent rebalancing due to small and constant movements in asset prices. However, for a pragmatic investor who should strive to create a portfolio from the most carefully selected high-quality 8-10 stocks, threshold rebalancing is a very effective and useful strategy. Investors now have enough available software for this purpose. (McNamee, Paradise and Bruno, 2019).

Opportunistic rebalancing

The superior rebalancing strategy according to many investment practitioners is called Opportunistic Rebalancing and emerged from a study of Gobind Daryanani (Daryanani, 2008). This strategy is also known as "recurring tolerance band rebalancing", which means that instead of rebalancing based on the time interval, it is based on how far an asset can deviate from the target frequence band before turning it back. (Starnes, 2019). It has more advantages over other strategies and it not only controls risk really well but also provides better returns by seizing more buy-low and sell-high opportunities than other rebalancing strategies (Pragmatic Investor, 2020). The idea of Opportunistic Rebalancing is not to predict when to rebalance, but to look regularly at the behavior of the stock prices and rebalance only when prices move in such a way that it is profitable (Hing, 2014). This strategy is similar to the threshold rebalancing, but it introduces a new parameter called the tolerance band (see **Figure 15**).

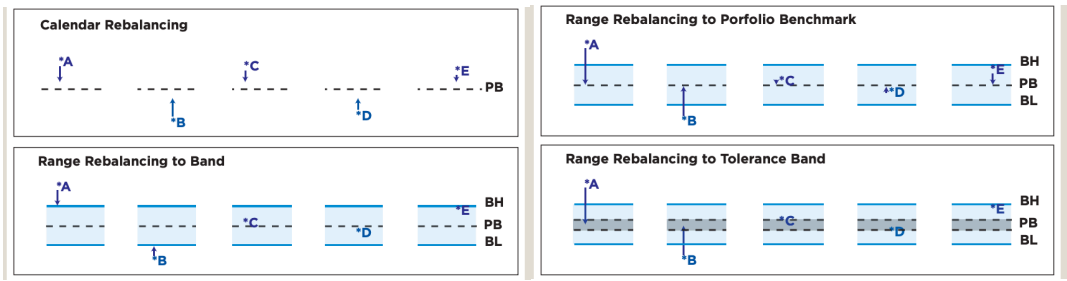

Figure 15. *Rebalancing approaches. (Daryanani, 2008)*

As with threshold rebalancing, if a stock goes beyond the threshold, it should be rebalanced. However, the stock is only rebalanced within the tolerance band, and not to its initial allocation. Moreover, only stocks outside their tolerance bands are rebalanced. This means that not all stocks will need to be rebalanced, so it narrows the number of transactions needed for rebalancing. (Starnes, 2019). Daryanani established that Opportunistic Rebalancing is

more effective than a simple time-based rebalancing, it reduces trading costs, significantly increases returns, minimizes risk, and controls portfolio drift. However, no matter what rebalancing strategy investors choose, their efforts will be rewarded in any case.

Replacing

In addition to portfolio rebalancing, there is another mechanism for adjusting an existing portfolio — replacing. Each investment in stocks is periodically subjected to fundamental analysis. If the results have deteriorated, it may be the time to replace this holding with stocks of another company. Ideally, the replacement should have a similar correlation value and be in a similar industry or sector in order not to erode the allocation balance. However, an investor may choose a stock in a completely different sector and/or with a different correlation. In this case, an investor must restart the allocation process and then rebalance in accordance with the new policy. This ensures that a portfolio will always be the most optimal and positioned in order to take advantage of future market movements (Hing, 2014).

4. DATA AND METODOLOGY

The research was based on the portfolio returns of twenty superinvestors, whose portfolios had the highest value of more than $1,9 Billion at the end of 2018 for the period from October 2006 to December 2018. The pragmatic portfolio was built within the pragmatic investing framework. The following techniques were applied to the portfolio performance evaluation: Jensen's alpha model, multi-factor Fama and French's 3- and 5- factor models, Carhart's four-factor model, and GARCH(1,1) model with non-normal Student-t distribution. The multivariate analysis was conducted to examine the exposure of superinvestors' portfolios to various industry factors.

4.1 Data

The empirical study was based on the following data for the period from September 2006 to December 2018 for the price series (148 months in total) and from October 2006 to December 2018 for return series (147 months in total):

- Portfolios of 20 largest superinvestors for the period from the last quarter 2006 (the oldest data available) till the end of 2018 (see **Appendix 1**). The source: Dataroma.com

Each portfolio consists of up to 20 largest stocks in each period. The portfolios' structures are reported quarterly and represent the actual holdings for the respective quarter and do not have a forward-looking bias (Dataroma.com, 2019).

- Monthly stock prices of the all stocks included in the portfolios of superinvestors (827 unique stocks in total). The sources: Thomson Reuters Datastream, Yahoo!Finance (finance.yahoo.com), Investing.com, and ADVFN.com.

Adjusted monthly prices of stocks were retrieved from Thomson Reuters Datastream for the period that covers 148 months from September 2006 to December 2018. The total number of unique stocks is 827. Almost all stocks are traded in the US (NYSE or NASDAQ) except 7 stocks: two stocks are listed in Eurozone, two in the London Stock Exchange, two in Korea, two in Japan, and one in Hong Kong. Missing stock quotes that were not returned by Thomson Reuters Datastream were found manually at Yahoo!Finance, investing.com and advfn.com for the historical prices before splitting, bankruptcy and other events which led to discontinuing of using tickers and elimination of historical quotes from the current databases, including Thomson Reuters Datastream. The stock prices were transformed into returns series in order to obtain portfolio returns for each superinvestor.

- The actual percentage (weights) of each stock in each portfolio in each period from the last quarter of 2006 till the end of 2018. The source: Dataroma.com

- The values of the benchmark indices S&P500 Composite, S&P500 Value, Russell 2000, and Russell 2000 Value. The source: Thomson Reuters Datastream.

The values of the benchmark indices were transformed into the return series for the portfolio performance evaluation with the applied models.

- 3 Month Treasury Bill Rate as a risk-free proxy. The source: Thomson Reuters Datastream.

3 Month Treasury Bill Rate was converted from annual to monthly yield rates with the following formula where r_m and r_a are monthly and annual yield rates:

$$r_m=(r_a+1)^{(1/12)}-1 \quad (20)$$

- Historical values of the factors of the Fama-French 3-, 5-factor and Carhart 4-factor models: SMB, HML, MOM, RMW, CMA. The source: Kenneth R. French Database (mba.tuck.dartmouth.edu)

- Historical returns of 30 industry portfolios. The source: Kenneth R. French Database (mba.tuck.dartmouth.edu)

- Financial indicators, fundamentals and ratios of companies and mutual stock funds included in the pragmatic portfolio. The sources: Yahoo!Finance (finance.yahoo.com), Morningstar (www.morningstar.com), The Wall Street Journal (www.wsj.com), Investing.com, and GuruFocus.com.

Fundamentals, indicators and coefficients already calculated and available in open sources were derived directly. Other financial indicators and ratios were calculated based on data taken from the financial statements of companies which were found on the websites listed above.

- Monthly returns of the pragmatic portfolio from October 2006 to December 2018. The source: Portfolio Visualizer software platform.

The pragmatic portfolio consists of 7 superinvestors out of 20 in question listed on the stock exchange and passed the screening procedure with the scorecards for the multi-criteria analysis. The returns of the pragmatic portfolio were obtained as a result of asset allocation and yearly rebalancing with the goal of Sharpe ration maximization based on the returns of the year prior to the year of rebalancing. This way the pragmatic portfolio returns do not

have a look-ahead bias as for the asset allocation. The pragmatic portfolio still has a look-ahead bias with regard to the portfolio composition since the screening procedure was made based on the financial statements for 2019.

4.2 Methodology

4.2.1 Superinvestors' portfolios selection

The superinvestors' portfolios were selected from the Dataroma.com online source that monitors the portfolios of value-oriented investors ("superinvestors") by extracting data from their publicly available financial documents. Portfolio holdings represented there reflect only stock and do not include bonds, cash and other types of assets. The top 20 largest portfolios were chosen for the research according to their values at the end of 2018 and with the maximum availability of the historical data. The top 20 superinvestors' portfolios that were selected for the research, their values, number of stocks, their 20 largest holdings at the end of 2018, and the availability of historical data are presented in **Appendix 1**.

Monthly quotes from September 2006 to December 2018 were retrieved for all stocks ever included in each portfolio. The actual percentage of each stock in each portfolio in each period in question were extracted from the Dataroma website from the fourth quarter of 2006 to the last quarter of 2018. The portfolio returns were calculated for each superinvestor's portfolio based on actual weights of stocks in the portfolios as these weights are presented on Dataroma website. The average superinvestor portfolio was constructed based on the averaged returns of all superinvestors' portfolios.

Additionally, the returns of equally-weighted portfolios and an equally-weighted average superinvestor portfolio were calculated, as if all holding in the portfolios had the same percentage sharing. The hypothetical equally-weighted portfolios were built for the only purpose to build an equally-weighted average superinvestor portfolio and compare its cumulative returns with the cumulative returns of actual portfolios of superinvestors and indices. The equally-weighted portfolios were not utilized for the portfolio performance evaluation. The previous study on this issue performed by the author revealed that the

portfolio performance evaluation conducted with the assumption of equally-weighted asset allocation does not provide reliable and unambiguous results.

4.2.2 The Sharpe technique

The performance measure proposed by William Sharpe is an investment portfolio performance indicator, which is calculated as the ratio of the average risk premium to the average portfolio deviation. The Sharpe method uses the total risk of a portfolio and indicates how well the return of an asset compensates an investor for taking the risk. Experts in the investment world use this ratio quite widely to evaluate portfolio performance (Amenc and Le Sourd, 2003). The Sharpe measure is given by the following equation:

$$S_p = \frac{R_p - R_f}{\sigma_p}, \tag{21}$$

where:

S_p — Sharpe's portfolio performance measure;

σ_p —standard deviation of the portfolio p over the evaluation period;

R_p —average rate of return for portfolio p over the evaluation period;

R_f —average risk-free return over the evaluation period.

If the Sharpe ratio is calculated on a monthly basis, it should be annualized by multiplying the monthly Sharpe Ratio by the square root of 12. (Sharpe Ratio, 2020).

The higher the Sharpe ratio is, the better the return is for the same risk or, equivalently, the lower the risk is for the same return. Although the Sharpe ratio is widely used for risk-adjustment evaluation of investment performance, it can only be accurate with a normal distribution of data (Vaidya, 2018).

4.2.3 The Jensen (CAPM) technique

The Jensen technique is based on the Capital Asset Pricing Model (CAPM). Jensen's alpha coefficient derived from the regression under this model is a measure of unsystematic risk

and reflects the quality of portfolio management or contribution of a portfolio manager to the premium actually received (Amenc and Le Sourd, 2003). The econometric model based on the historical data takes the form:

$$R_{jt} - R_{ft} = \alpha_j + \beta_j(R_{mt} - R_{ft}) + e_{jt}\ , \qquad (22)$$

where:

R_{jt}—return of the portfolio;

$(R_{jt} - R_{ft})$ —risk premium of the portfolio;

α_j — portfolio performance indicator;

β_j — systematic risk of portfolio j;

R_{mt} — return of the market;

R_{ft} — risk-free rate;

e_{jt} — random error term.

If the alpha coefficient returned by the regression is statistically significant and positive, then it can be argued in the framework of the CAPM hypothesis that the portfolio results are better than the market average. If the alpha coefficient in the regression is statistically significant and negative, then analysts conclude that the portfolio results are worse than the market average. If alpha is not statistically different from zero, then the portfolio had actual returns that were consistent with those expected based on the market model, and there was no extra profit compared to market returns (Noulas, Papanastasiou, & Lazaridis, 2005).

4.2.4 Fama-French 3-factor model

The 3-factor model of Fama and French (1993) states that for the estimation of the expected return on an asset it is not enough to take into account only the return of the market portfolio, but other factors should be considered as well. These factors are company size factor SMB (Small Minus Big) and value factor HML (High Minus Low). SMB is the difference between the returns of weighted average portfolios of small and large capitalization companies, or "premium for the size of the company". HML is the difference between the returns of weighted average stock portfolios with high book-to-price ratio (value stocks) and low book-

to-price ratio (growth stocks), or "premium for a company's growth potential" (Fama & French, 1993). The regression of the Fama and French 3-factor model is:

$$R_{jt} - R_{ft} = \alpha_j + \beta_{1j}*M + \beta_{2j}*SMB + \beta_{3j}*HML + e_{jt}, \quad (23)$$

where:

R_{jt}—return of the portfolio;

R_{ft} —risk-free rate;

M —market risk factor ($R_{mt} - R_{ft}$);

α_j — portfolio performance indicator;

β_{1j} , β_{2j} , β_{3j} —factor coefficients;

SMB —size premium factor;

HML —value premium factor;

e_{jt} —random error term.

This model is supposed to be a better tool for portfolio performance evaluation in comparison with the basic CAPM model because it adjusts for the outperforming tendency of the small-cap companies and value stocks.

4.2.5 Carhart 4-factor model

Carhart supplemented the 3-factor model of Fama-French with the fourth factor — momentum (MOM, monthly momentum). The momentum effect implies the presence of the inertia in the stock market, that is to say, the impact of historical stock returns on their future returns. For the proxy variable of the momentum factor, Carhart took the profitability of the UMD portfolio (Up minus Down, or winners minus losers). The variable is calculated as the difference between the monthly returns of a portfolio consisting of winning stocks and a portfolio that includes only losers. Portfolios formed on the basis of the results of past activities show excess returns relative to a given benchmark. Momentum investors take significant risks and, consequently, high returns are compensated for this risk (Carhart, 1997). The regression equation for the Carhart 4-factor model looks as follows:

$$R_{jt} - R_{ft} = \alpha_j + \beta_{1j}*M + \beta_{2j}*SMB + \beta_{3j}*HML + \beta_{4j}*MOM + e_{jt}, \quad (24)$$

where:

R_{jt}— return of the portfolio;

R_{ft} — risk-free rate;

M — market risk factor ($R_{mt} - R_{ft}$);

α_j — portfolio performance indicator;

β_{1j} , β_{2j} , β_{3j} , β_{4j} — factor coefficients;

SMB — size premium factor;

HML — value premium factor;

MOM — momentum factor;

e_{jt} — random error term.

The Carhart's model adjusts for the outperforming tendency not only of the small-cap companies and value stocks but also of the momentum impact of past returns on future returns.

4.2.6 Fama-French 5-factor model

Subsequently, the 3-factor model of Fama and French was transformed into a 5-factor model. The profitability factor RMW (Robust Minus Weak) and the investment factor CMA (Conservative Minus Aggressive) were added to already existing factors of the extended CAPM model. The RMW factor is the average return on equity (ROE) of the two robust operating profitability portfolios (most profitable portfolios) minus the average return on equity of the two weak operating profitability portfolios (less profitable portfolios). Companies with higher profitability factor show higher investment returns than companies with lower profitability factor. (Fama & French, 2015). The investment factor CMA is the difference between the average return of the two conservative investment portfolios (low investment firms) and the average return of the two aggressive investment portfolios (high investment firms). It measures the excess returns of firms investing less over those investing more (Fama & French, 2015). The CMA factor is expressed as the growth of assets over the past year and shows whether a company is increasing its investments now. Studies have shown that companies that do not increase the company's assets here and now are more attractive for investment, for example, because their debt load decreases. The

higher investment factor CMA is associated with lower average returns. The regression equation for the Fama-French 5-factor model looks as follows:

$$R_{jt} - R_{ft} = \alpha_j + \beta_{1j}*M + \beta_{2j}*SMB + \beta_{3j}*HML + \beta_{4j}*RMW + \beta_{5j}*CMA + e_{jt}, \quad (25)$$

where:

R_{jt} — return of the portfolio;

R_{ft} — risk-free rate;

M — market risk factor ($R_{mt} - R_{ft}$);

α_j — portfolio performance indicator;

β_{1j} , β_{2j} , β_{3j} , β_{4j} , β_{5j} — factor coefficients;

SMB — size premium factor;

HML — value premium factor;

RMW — profitability factor;

CMA — investment factor;

e_{jt} — random error term.

The Fama-French 5-factor model adjusts for the outperforming tendency of the companies with higher operating profitability and conservative investment policy in addition to the small-cap companies and value stocks.

4.2.7 Jarque–Bera test for normality

The Jensen's alpha and Sharpe measure approaches to the portfolio performance evaluation ground on the CAPM model and provide reliable estimation results under the assumption about the normal distribution of returns. The normality assumption is required to conduct hypothesis tests about the model parameters. If error terms of the model are not normally distributed, the confidence intervals will be too wide or narrow and the standard errors of ordinary least squares estimates will not be reliable. (Brooks and Tsolacos, 2014). One of the most commonly applied tests to check whether the data match the normal distribution is the Jarque–Bera test which is specified as:

$$\mathrm{JB} = \frac{n}{6}\left(S^2 - \frac{1}{4}(K-3)^2\right), \quad (26)$$

where:

S — sample skewness;

K— sample kurtosis;

n — sample size.

The Jarque–Bera test appeals to the fact that the entire distribution of a random variable is characterized by the first two moments: the mean and the variance. Skewness and kurtosis are the standardized third and fourth moments of the distribution. Skewness expresses how strongly the distribution is asymmetric with respect to its mean value, and kurtosis measures the extent to which the tails of the distribution are fat. The graph of the normally distributed data is not skewed and mesokurtic with the coefficient of kurtosis of 3. The Jarque–Bera test checks whether the coefficient of skewness (S) and the coefficient of excess kurtosis (K-3) are jointly equal zero. The null hypothesis of this test is that the residuals from the model are normally distributed, and it would be rejected if they are skewed and leptokurtic or platykurtic or both. (Brooks, 2011).

The Jarque–Bera test was performed for the residuals of the regression models in Matlab with the function "jbtest" at the 5% significance level. The test returns the results in logical values: "1" indicates the rejection of the null hypothesis at the 5% significance level that residuals follow the normal distribution, while "0" supports the null hypothesis of normality. (MathWorks, 2020). The results of the Jarque–Bera test are presented in **Appendix 4.**

4.2.8 Engle's ARCH test for residual heteroscedasticity

Time series, including non-correlated ones, can be sequentially dependent because of a dynamic conditional variance process. If the time series demonstrate conditional heteroscedasticity or squared residuals' autocorrelation, they are supposed to have an autoregressive conditional heteroscedastic (ARCH) effect. The Engle's test was applied to check whether the time series of the portfolio returns exhibit the ARCH effect. The Lagrange Multiplier test proposed by Engle (1982) evaluates the significance of ARCH effect. To perform the test a linear regression model is fitted for the squared error terms and then checked for the significance of the fitted model. The null hypothesis is of the homoscedasticity, which means that the squared residuals are the white noise (Engle, 1982).

The Engle's ARCH test was performed for the residuals of the regression models in Matlab with the function "archtest", one lag and at the 5% significance level. The test returns the results in logical values: "1" indicates the presence of significant ARCH effects in the residuals of the return series, while "0" evidences about the failure to reject the null hypothesis of no ARCH effect (MathWorks, 2020). The results of the Engle's ARCH test are presented in **Appendix 4.**

4.2.9 GARCH(1,1) model

Traditional time series models of the portfolio performance evaluation, such as CAPM, may not give reliable results as they operate under the main assumption of constant variance. Therefore, it made sense to apply additionally the generalized autoregressive conditional heteroscedasticity (GARCH) (1,1) model with non-normal Student-t distribution in order to eliminate non-stationarity, handle volatility and non-normality of the portfolio return time series.

One of the most important properties of the autoregressive conditional heteroscedasticity models is their ability to capture the tendency for volatility clustering in financial data (Arowolo, W.B, 2013), what justifies the usage of this model. Operating under the main assumption of constant variance, traditional time series models were found to be not very accurate in estimating stock return movements. That is why Engle (1982) proposed to use the autoregressive conditional heteroscedasticity (ARCH) models, which assumes that the conditional variance depends on the squares of past values of the time series. The generalized autoregressive conditional heteroscedasticity (GARCH) model, proposed by Bollerslev (1986), suggests that conditional variance also depends on past values of conditional variance itself, in other words, has an additional autoregressive structure within itself. The GARCH(1,1) model with a single "moving average" lag (p), a single autoregressive lag (q), exogenous variables R_i, which represent different market factors of the multi-factor models and excessed returns of the market indices, is given by the following set of equations (Kaur & Kaushik, 2019):

$$R_{p,t} = \alpha + \sum_{i=1}^{m} \beta_i R_{i,t} + \varepsilon_t,\ \varepsilon_t|\varphi_{t-1} \sim Student - t(v, \sigma^2)\ , \tag{27}$$

$$\sigma_t^2 = \omega + d\varepsilon_{t-1}^2 + g\sigma_{t-1}^2\ , \tag{28}$$

where:

Equation (27) — return equation;

$R_{p,t}$ — excessed return of the portfolio at time *t*;

$R_{i,t}$ —excessed returns of the market indices or market factors at time *t*;

α — risk-adjusted performance as intercept of regression models;

β — risk exposure or factor loading on each factor $R_{i,t}$;

ε_t — error terms, conditional heteroskedastic on the information set φ_{t-1} at time t-1;

Equation (28) — variance equation;

σ_t^2 — conditional variance;

$\omega > 0$; $d, g \geq 0$ — parameters of the model of the variance equation (28);

ω — weighted function of long-term average value;

ε_{t-1}^2 — information about volatility of the previous period;

σ_{t-1}^2 — fitted variance of the previous period;

$d + g < 1$ — necessary condition, otherwise the time series will become unstable and have non-stationarity in variance.

The non-normal Student-t distribution specification was introduced to the model because the normality test showed the violation of the assumption about a normal distribution of the error terms of the regression models in many cases. (See **Appendix 4**).

The GARCH(1,1) model was built in the Matlab software with the function "arima('variance',garch(1,1))". The specification "variance" means that the GARCH model is stored in the variance property of the ARIMA model. The non-normal Student-t distribution specification of the mean model was added by the function "Mdl.Distribution='t'"

The statistically significant and positive alpha coefficients of the return equation (27) will indicate that the portfolio managers have the superior ability to outperform the benchmarks.

4.2.10 Multivariate analysis of industry factors

The multivariate analysis of industry factors was performed to explore the preferences of the superinvestors toward different industries. The industry factors are presented by the monthly returns of 30 industry portfolios derived from Kenneth R. French database for the period from October 2006 to December 2018. The preliminary industry classification of stocks was performed based on the information returned by Thomson Reuters Datastream. This classification revealed that the stock universe of superinvestors' portfolios covers 21 industry groups for the period in question (see **Appendix 10).** Since the set of 30 industry portfolios in the Kenneth R. French database is the closest in number to include 21 industry groups, this set of 30 industry portfolios was selected for the analysis. The multivariate analysis of industry factors was performed with the following regression equation:

$$\mathrm{R_p} = \alpha + \sum_{n=1}^{30} b_n \, \mathrm{R_n} + e_p \, , \qquad (29)$$

where:

R_p— return of the portfolio;

n — number of factors;

a, b_n — regression coefficients;

R_n — return of the industry portfolios;

e_p — random error term.

The statistically significant regression coefficients b_n indicate the portfolio exposure to the corresponding industry portfolios.

5. RESULTS

5.1 Descriptive statistics

Figure 16 plots the cumulative returns of the average superinvestor portfolio, the hypothetic equally-weighted average superinvestor portfolio, the pragmatic portfolio, and the benchmark indices.

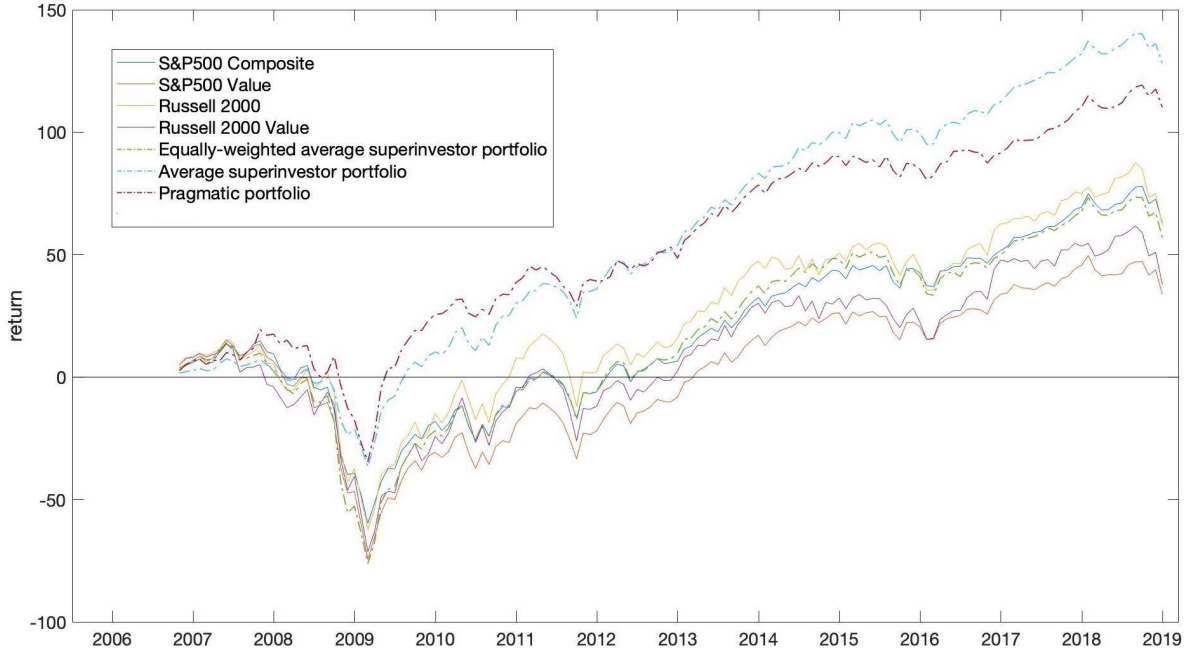

Figure 16. *Cumulative returns. Benchmark indices, average superinvestors' portfolios and pragmatic portfolio. (Author)*

It can be seen that the portfolios' cumulative returns followed the fluctuations and trends of the cumulative returns of the benchmark indices having the peaks and dips at the same periods. It can also be noticed that the cumulative returns of the average superinvestor portfolio and the pragmatic portfolio steadily exceeded the cumulative returns of the benchmark indices. At the end of the period under review, they still had the highest value despite the downward trend. The cumulative return of the equally-weighted average superinvestor portfolio could not demonstrate such superiority and almost completely copied the behavior of the market indices, especially S&P500 Composite.

Figure 17 compares the cumulative returns of each individual superinvestor's portfolio and the cumulative return of the pragmatic portfolio. The portfolio built by the author within the pragmatic investing framework showed pretty confident results against the cumulative returns of the individual superinvestors' portfolios.

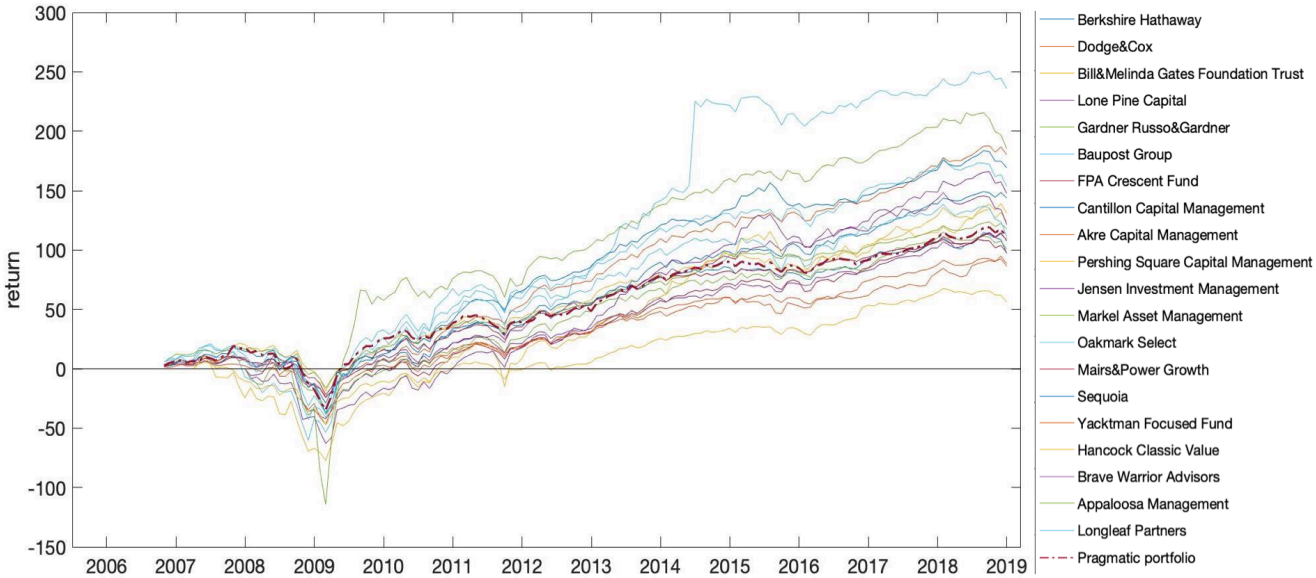

Figure 17. *Cumulative returns. Superinvestors' portfolios and pragmatic portfolio (Author)*

The descriptive statistics of monthly return series of the superinvestors' portfolios, the average superinvestor portfolio, the pragmatic portfolio, the hypothetic equally-weighted superinvestor portfolio, and the benchmark indices are combined in **Table 3** below.

Even some portfolios' returns deviate in their means from the benchmark values, the average superinvestor portfolio corresponds to values which show benchmark indices, especially in the median. Historical volatilities of the portfolios are about the same level as the benchmark indices' volatilities, with the rare exceptions. The most volatile portfolios are Appaloosa Management with the standard deviation of 10.07 and Baupost Group with the standard deviation of 8.73, and the least volatile is Dodge & Cox Team with the standard deviation of 2.62. The average superinvestor portfolio and the pragmatic portfolio are less volatile than all the benchmarks, assuming that superinvestors on average carried less risk than the market in case of the various indices. The Sharpe ratios of all portfolios are higher than the Sharpe ratios of any of the benchmark indices claiming the better return for the same risk, except the hypothetic equally-weighted superinvestor portfolio. The highest Sharpe ratio of 1.34 has Akre Capital Management, and the lowest belongs to Hancock Classic Value.

Table 3. *Descriptive statistics. (Author)*

Fund	Manager	Max	Min	Mean	Median	Std	Sharpe	Coverage %	Obs
S&P 500 Comp	-	10,23	-18,56	0,43	1,06	4,26	0,35	-	147
S&P 500 Value	-	10,55	-19,03	0,23	1,05	4,60	0,14	-	147
Russell 2000	-	14,26	-23,45	0,42	1,44	5,62	0,24	-	147
Russell 2000 Value	-	14,55	-22,48	0,26	0,99	5,64	0,13	-	147
Berkshire Hathaway	Warren Buffett	16,43	-13,07	0,66	0,77	4,06	0,53	92,2	147
Dodge & Cox	Dodge & Cox Team	6,89	-8,27	0,59	0,87	2,62	0,73	55,6	147
Bill & Melinda Gates Foundation T	Michael Larson	9,88	-11,71	0,93	1,46	3,80	0,82	100,0	147
Lone Pine Capital	Stephen Mandel	10,38	-17,28	1,12	1,36	4,28	0,88	97,7	147
Gardner Russo & Gardner	Thomas Russo	10,98	-13,80	0,82	1,19	4,01	0,68	98,0	147
Baupost Group	Seth Klarman	70,60	-16,28	1,61	0,65	8,73	0,62	93,7	147
FPA Crescent Fund	Steven Romick	8,49	-8,24	0,90	1,31	3,02	1,00	65,0	147
Cantillon Capital Management	William Von Mueffling	11,25	-8,32	1,30	1,26	3,56	1,03	76,3	147
Akre Capital Management	Chuck Akre	10,44	-6,35	1,62	2,01	3,44	1,34	99,6	147
Pershing Square Capital Managem	Bill Ackman	19,84	-20,57	0,88	1,40	6,30	0,46	100,0	147
Jensen Investment Management	Robert Zagunis	8,17	-12,31	0,76	0,99	3,24	0,78	85,0	147
Markel Asset Management	Thomas Gayner	8,30	-12,50	0,80	1,08	3,05	0,87	60,8	147
Oakmark Select	Bill Nygren	15,97	-20,12	1,04	1,64	5,38	0,65	97,1	147
Mairs & Power Growth	Mairs & Power	12,51	-11,29	0,73	0,92	3,11	0,78	67,1	147
Sequoia	Ruane, Cunniff & Goldfa	16,49	-16,67	1,15	1,34	4,24	0,91	89,8	147
Yacktman Focused Fund	Donald Yacktman	13,72	-23,10	0,60	1,02	4,21	0,46	97,9	147
Hancock Classic Value	Richard Pzena	11,39	-11,67	0,40	0,77	3,31	0,38	61,8	147
Brave Warrior Advisors	Glenn Greenberg	23,26	-19,51	0,92	1,78	5,50	0,56	100,0	147
Appaloosa Management	David Tepper	54,35	-51,42	1,40	1,20	10,07	0,47	100,0	147
Longleaf Partners	Mason Hawkins	20,44	-27,05	0,76	1,43	5,86	0,43	100,0	147
Average Superinvestor Portfolio	-	13,32	-12,66	0,87	1,20	3,64	0,79	87,0	147
Equally-weighted Average SI Portf	-	16,68	-24,76	0,39	1,04	4,92	0,25	87,0	147
Pragmatic Portfolio	-	18,70	-12,05	0,75	1,13	4,01	0,61	100,0	147

Table contains descriptive statistics of monthly return series for the period between October 2006 and December 2018. It includes maximum, minimum, mean and median values, as well as standard deviation and annualized Sharpe ratio. Coverage (%) is an indicator of how much of the portfolio is made up by the selected 20 largest holdings at the end of 2018. Number of observation — 147 periods in total.

On average, the 20 largest stocks in the portfolios cover 87% of all stocks' universe at the end of 2018. For six portfolios, it is even the full coverage, while in others the top 20 positions contribute at least 55% to the overall portfolio in terms of weight.

5.2 Pragmatic portfolio construction

The pragmatic portfolio was built based on the approach developed and presented in this thesis in section 3. The holdings for this portfolio were selected from the same pool of superinvestors which portfolios were chosen for the portfolio performance evaluation. The reasons were the following:

- The companies and funds of superinvestors have features that meet the conditions of value investing: most stock funds themselves are value funds in accordance with their classification (see **Appendix 2**) and holding companies have low P/E indicators that are quite attractive for value investors (see **Appendix 6**).

- This choice provides a quite high level of diversification for the pragmatic portfolio since superinvestors have a lot of various holdings in their portfolios.
- The portfolio built from the existing superinvestors allowed to have one more benchmark for the portfolio performance evaluation to answer the research question of whether superinvestors following the value investing strategy can outperform benchmark indices.

Since nine superinvestors are private funds they were rejected before the screening stage of the pragmatic portfolio construction due to the lack of the publicly available information about their performance and because it is almost impossible for an outside investor to become a co-owner of a private fund. Nine stock funds and two corporations which are listed on the stock market were subjected to the screening procedure (see **Appendix 2).** Two different scorecards were utilized to perform multi-criteria analysis for the pragmatic portfolio's holdings: for corporations and mutual funds separately. It was done because fundamentals and financial indicators of their performance and criteria for the good choice are quite different. The criteria and their threshold values were used to perform multi-criteria analysis of the superinvestors that are corporations as these criteria are listed in **Table 2**. For analyzing how justified was the choice of portfolio holdings in case of the mutual stock funds, the criteria and their threshold values were applied for the multi-criteria analysis as these criteria are presented in **Appendix 5.** The holdings in the pragmatic portfolio were subjected to the multi-criteria analysis with the scorecards built in Excel to select good portfolio holdings from the point of pragmatic investing (see **Appendix 6-9**). The information for the scorecards was taken from the financial statements for 2019 from Yahoo!Finance, Morningstar, The Wall Street Journal, Investing.com, and GuruFocus.com. The sources of data are listed in the scorecard tables in **Appendix 5-7.** The results for the corporations are presented in **Appendix 6.** The results of the multi-criteria analysis for the mutual stock funds are in **Appendix 8.**

The multi-criteria analysis allowed to build a pragmatic portfolio only from the superinvestors which companies and funds satisfied the criteria of the good assets for the pragmatic portfolio. Seven superinvestors' funds and holding companies were selected for the pragmatic portfolio. Four mutual stock funds did not pass the screening procedure because of their insufficient risk/return profiles. They are Oakmark Select Investor

(OAKLX), Sequoia (SEQUX), JHancock Classic Value I (JCVIX) and Longleaf Partners (LLPFX). The pragmatic portfolio composition after the screening is presented in **Table 4**.

Table 4. *Pragmatic portfolio holdings. (Author)*

	Name	Manager	Ticker	Type	Category	Fund Status
1	Berkshire Hathaway Inc.	Warren Buffett	BRK.A	Corporation	–	–
2	Markel Corporation	Thomas Gayner	MKL	Corporation	–	–
3	Dodge&Cox Stock	Dodge & Cox Team	DODGX	Stock Fund	Large-Cap Value	Open
4	FPA Crescent	Steven Romick	FPACX	Stock Fund	Large-Cap Value	Open
5	Jensen Quality Growth J	Robert Zagunis	JENSX	Stock Fund	Large-Cap Core	Open
6	Mairs&Power Growth Inv	Mairs & Power	MPGFX	Stock Fund	Multi-Cap Core	Open
7	AMG Yacktman Focused N	Donald Yacktman	YAFFX	Stock Fund	Large-Cap Value	Open

The screening was made based on the data from the financial statements for 2019 since this data was relevant at the time of writing the thesis and was most accessible. In such a way, the pragmatic portfolio constructed from the existing superinvestors had a look-ahead bias for picking stocks and was back-tested for the portfolio performance evaluation.

Asset allocation in the pragmatic portfolio with selected superinvestors that passed the screening procedure was performed with the portfolio optimizer tool introduced on the Portfolio Visualizer online software platform (portfoliovisualizer.com). The robust optimization was performed based on Sharpe ratio maximization with the Monte Carlo method to resample efficient frontier inputs. Portfolio optimization based on traditional Sharpe ratios with a limited number of historical returns ignores the uncertainty and, as a result, is not robust (Deng *et al.*, 2013). The Monte Carlo simulation allows creating alternative optimization input data that corresponds to the uncertainty and how this data may be observed in reality (Kim, Kim and Fabozzi, 2016).

The minimum weight of 5% was set for all assets so they were all represented in the portfolio in each period, and this way to ensure sufficient portfolio diversification. The portfolio was annually rebalanced with the calendar rebalancing method. The asset allocation for the current year was determined at the beginning of each year on the basis of the return on portfolio assets for the previous year as if an investor had been at the beginning of the year and possessed information only about past returns. Then, the obtained asset allocation for the current year was taken to obtain portfolio returns for that year. In such a way, a look-ahead bias for asset allocation was avoided because asset allocation relied on data that was already available at the moment of rebalancing. Portfolio Visualizer provided optimization

results in terms of assets allocation for each period of rebalancing as well as monthly returns of the optimized portfolio (see **Appendix 2).** These returns were used for the analysis of the pragmatic portfolio performance.

5.3 Portfolio performance evaluation

Table 5 summarizes the results of the CAPM regressions and the GARCH(1,1) model of the monthly portfolios' returns against the benchmark indices. As it can be seen from **Table 5,** the average superinvestor portfolio and the pragmatic portfolio have positive Jensen's alphas with a strong significance at 1% and 5% level, as well as the most individual superinvestors' portfolios in case of all indices when the common CAPM regression was applied.

Table 5. *Regressions results of the CAPM and GARCH(1,1) models with the benchmark indices. (Author)*

Fund	Manager	S&P500 Composite				S&P500 Value		Russell 2000		Russell 2000 Value	
		CAPM			GARCH(1,1)	CAPM		CAPM		CAPM	
		Alpha		Adj.R sq.		Alpha	Adj.R sq.	Alpha	Adj.R sq.	Alpha	Adj.R sq.
Berkshire Hathaway	Warren Buffett	3,59	*	0,76	1,48	5,67 ***	0,79	4,88 *	0,60	5,96 **	0,64
Dodge & Cox	Dodge & Cox Team	3,94	***	0,85	3,00 *	5,37 ***	0,88	4,75 ***	0,74	5,54 ***	0,74
Bill & Melinda Gates Foundation	Michael Larson	7,04	***	0,62	3,72 *	8,78 ***	0,63	8,16 ***	0,47	9,06 ***	0,47
Lone Pine Capital	Stephen Mandel	7,78	***	0,73	9,42 **	10,02 ***	0,60	9,02 ***	0,50	10,25 ***	0,50
Gardner Russo & Gardner	Thomas Russo	4,39	**	0,70	3,94	6,27 ***	0,67	5,53 **	0,54	6,51 ***	0,54
Baupost Group	Seth Klarman	13,40	*	0,31	3,09	16,38 **	0,31	14,45 **	0,34	16,44 **	0,34
FPA Crescent Fund	Steven Romick	5,58	***	0,45	4,91 **	6,68 ***	0,40	6,17 ***	0,36	6,78 ***	0,36
Cantillon Capital Management	William Von Mueffling	8,97	***	0,44	6,71	10,33 ***	0,36	9,68 ***	0,34	10,42 ***	0,34
Akre Capital Management	Chuck Akre	12,03	***	0,43	11,53	13,34 ***	0,36	12,68 ***	0,34	13,42 ***	0,34
Pershing Square Capital Manager	Bill Ackman	4,48		0,58	9,50	7,33 *	0,57	5,88	0,53	7,56 *	0,53
Jensen	Robert Zagunis	5,08	***	0,87	3,66 **	6,90 ***	0,81	6,13 ***	0,67	7,11 ***	0,67
Markel Asset Management	Thomas Gayner	6,25	***	0,74	3,99 **	7,81 ***	0,78	7,08 ***	0,71	7,95 ***	0,71
Oakmark Select	Bill Nygren	6,58	***	0,87	3,67	9,60 ***	0,86	8,10 ***	0,80	9,85 ***	0,80
Mairs & Power Growth	Mairs & Power	5,24	***	0,83	3,34 **	6,93 ***	0,84	6,09 ***	0,79	7,06 ***	0,79
Sequoia	Ruane, Cunniff & Goldfar	9,62	***	0,64	10,23 **	11,67 ***	0,64	10,60 ***	0,60	11,82 ***	0,60
Yacktman Focused Fund	Donald Yacktman	2,76		0,75	1,84	4,93 **	0,76	4,13 *	0,58	5,26 *	0,58
Hancock Classic Value	Richard Pzena	0,97		0,79	0,18	2,63 **	0,85	1,82	0,79	2,79 *	0,79
Brave Warrior Advisors	Glenn Greenberg	4,96	*	0,61	3,85	7,44 **	0,60	6,17 *	0,54	7,66 **	0,54
Appaloosa Management	David Tepper	7,60		0,45	5,35 *	11,35 *	0,48	9,71	0,41	11,82 *	0,41
Longleaf Partners	Mason Hawkins	2,95		0,78	0,41	6,13 **	0,74	4,50 *	0,70	6,37 **	0,70
Average Superinvestor Portfolio	-	6,16	***	0,92		8,28 ***	0,90	7,28 ***	0,81	8,48 ***	0,81
Pragmatic Portfolio	-	4,80	**	0,68		6,87 ***	0,69	6,02 **	0,58	7,11 ***	0,58
Average Superinvestor Portfolio (GARCH(1,1))					4,74 ***	8,03 *		7,33		8,60	
Pragmatic Portfolio (GARCH(1,1))					2,43 *	4,72 **		6,24 *		7,64	

*The table contains Jensen's alphas — the annualized alpha values from the CAPM regressions of the portfolios against the benchmark indices S&P 500 Composite, S&P 500 Value, Russell 2000 and Russell 2000 Value. It also contains the alpha (constant) coefficients of the GARCH(1,1) regression model with exogenous variables that represent market indices for the individual portfolios in case of S&P500 Composite index only, and for the average superinvestor and pragmatic portfolios in case of all indices. Highlighted alpha values reflect the normal distribution of error terms according to the results of the Jarque-Bera normality test. Adjusted R-squared columns show the explanatory power of CAPM regression models. *** — indicates 1% level of significance, ** — 5% level of significance, * — 10% level of significance.*

Since the CAPM model works under the assumption of the normal distribution of data the Jarque-Bera normality test was performed and the results evidence that most of the time series are not normally distributed (see **Appendix 4**). At the same time, the Engle's test for heteroscedasticity revealed the presence of the ARCH effect among data, so the GARCH(1,1) with non-normal Student-t distribution model was additionally applied to get the resulting alpha coefficients. The individual portfolios of superinvestors were regressed with the GARCH(1,1) model only in case of S&P500 Composite index because linear CAPM regression in case of this index returned the most modest results of the portfolios' performances in comparison with other indices. As for the average superinvestor portfolio and the pragmatic portfolio, they were regressed with the GARCH(1,1) model against all four indices in question. Having accommodated non-normal distribution of residuals and heteroscedasticity the GARCH(1,1) model with Student-t distribution returned more conservative results (see **Table 5)**. Only half of the superinvestors' portfolios demonstrate statistically significant positive alphas. The average superinvestor portfolio also has statistically significant positive alphas only in cases of the S&P500 Composite and S&P500 Value indices, but not in cases of the Russell 2000 and Russell 2000 Value indices. Whereas the pragmatic portfolio shows statistically significant outperformance over the market in cases of all indices except Russell 2000 Value.

As for the individual superinvestors' portfolios in cases of the CAPM regressions, the majority of them demonstrate confident outperformance over the four market indices having positive alphas with the strong statistical significance. The leader is Seth Klarman's Baupost Group. The second performing superinvestor is Akre Capital Management of Chuck Akre. Their leadership positions were not proved by the GARCH(1,1) model with the S&P500 Composite index. Since in the case of Akre Capital Management against all four indices, the normality test did not reject the hypothesis about the normal distribution of residuals the leadership position of Akre Capital Management may be accepted.

The results of the regressions in cases of the Fama-French 3- and 5-factor and Carhart 4-factor models are presented in **Table 6.** The results in **Table 6** demonstrate positive statistically significant alphas for the average superinvestor portfolio both when the linear regressions and the GARCH(1,1) model were applied. The pragmatic portfolio shows quite satisfactory statistically significant result only in case of the Carhart 4-factor model, but this

result was not supported when GARCH(1,1) model was applied for the corresponding multi-factor models. When the pragmatic portfolio was regressed on the average superinvestor portfolio, two different types of regressions did not prove statistically significant underperformance of the pragmatic portfolio in comparison with the average superinvestor portfolio.

Table 6. *Linear and GARCH(1,1) regressions' results of the Fama-French 3- and 5-factor model, Carhart 4-factor model, and average superinvestor portfolio. (Author)*

		FF3			C4			FF5			SI Portfolio		
Fund	**Manager**	**Alpha**		**Adj.R sq.**	**Alpha**		**Adj.R sq.**	**Alpha**		**Adj.R sq.**	**Alpha**		**Adj.R sq.**
Berkshire Hathaway	Warren Buffett	2,27		0,79	2,55		0,80	1,08		0,81	-2,30		0,77
Dodge & Cox	Dodge & Cox Team	2,64	***	0,89	2,75	***	0,89	3,05	***	0,88	-0,10		0,86
Bill & Melinda Gates Foundation	Michael Larson	5,28	**	0,64	5,33	**	0,64	4,53	*	0,65	2,11		0,63
Lone Pine Capital	Stephen Mandel	4,12	**	0,78	4,28	**	0,78	4,86	**	0,79	2,14		0,71
Gardner Russo & Gardner	Thomas Russo	2,59		0,69	2,70		0,69	1,32		0,70	-0,92		0,74
Baupost Group	Seth Klarman	9,30		0,38	10,29		0,41	12,42	*	0,38	2,84		0,44
FPA Crescent Fund	Steven Romick	3,72	*	0,48	3,50	*	0,50	3,50	*	0,48	2,43		0,50
Cantillon Capital Management	William Von Mueffling	6,31	***	0,51	5,98	***	0,54	5,66	**	0,52	5,33	**	0,47
Akre Capital Management	Chuck Akre	9,52	***	0,50	9,13	***	0,54	8,37	***	0,52	8,48	***	0,47
Pershing Square Capital Manager	Bill Ackman	0,50		0,61	0,98		0,62	2,01		0,60	-4,29		0,67
Jensen	Robert Zagunis	2,56	**	0,87	2,53	**	0,86	2,05	*	0,87	0,43		0,82
Markel Asset Management	Thomas Gayner	5,05	***	0,77	5,02	***	0,77	4,71	***	0,78	1,87		0,75
Oakmark Select	Bill Nygren	3,37	**	0,90	3,63	**	0,91	4,50	**	0,90	-1,82		0,89
Mairs & Power Growth	Mairs & Power	3,69	***	0,86	3,82	***	0,86	2,93	**	0,87	0,46		0,85
Sequoia	Ruane, Cunniff & Goldfar	7,63	***	0,65	7,84	***	0,65	7,65	***	0,66	3,46	*	0,72
Yacktman Focused Fund	Donald Yacktman	0,88		0,74	1,40		0,78	-0,17		0,75	-3,11		0,73
Hancock Classic Value	Richard Pzena	-0,15		0,89	0,09		0,90	0,53		0,88	-4,01	***	0,83
Brave Warrior Advisors	Glenn Greenberg	2,52		0,62	2,97		0,64	3,40		0,63	-2,59		0,70
Appaloosa Management	David Tepper	8,40		0,48	9,75	*	0,54	9,16		0,53	-4,63		0,54
Longleaf Partners	Mason Hawkins	-1,31		0,82	-0,82		0,84	-1,43		0,81	-5,78	**	0,80
Average Superinvestor Portfolio	–	3,94	***	0,94	4,19	***	0,95	4,01	***	0,94	–		
Pragmatic Portfolio	–	3,28		0,69	3,62	*	0,71	3,20		0,70	-0,81		0,72
Average Superinvestor Portfolio (GARCH(1,1))		3,47	**		4,12	**		3,66	**		–		
Pragmatic Portfolio (GARCH(1,1))		0,72			1,65			0,56			-0,56		

*The table contains the annualized alpha values from the regressions of the portfolios against the market factors of the Fama-French 3-factor model (FF3), Carhart 4-factor model (C4), Fama-French 5-factor model (FF5). It also contains the alpha (constant) coefficients of the GARCH(1,1) regression model with exogenous variables that represent market factors of corresponding multi-factor models only in case of the average superinvestor and the pragmatic portfolios. Alphas from the regressions of the portfolios against the average superinvestor portfolio are presented in the last column as well. Highlighted alpha values reflect the normal distribution of error terms according to the results of the Jarque-Bera normality test. Adjusted R-squared columns show the explanatory power of the regression models. *** — indicates 1% level of significance, ** — 5% level of significance, * — 10% level of significance.*

More than half of the individual superinvestors' portfolios demonstrate positive statistically significant alpha coefficients for all three multi-factor models. The leader is Akre Capital Management, as in case of the CAPM regressions with the market indices. The same fund has the highest statistically significant Jensen's alpha when the individual portfolios are

regressed on the average superinvestor portfolio. As for Seth Klarman's Baupost Group, it has the highest statistically significant alpha value only in case of the Fama-French 5-factor model but not in case of other multi-factor models. It can be noticed that all regression models both with the market indices and with the market factors for Baupost Group have the lowest explanatory power, expressed by the adjusted R-squared, among all superinvestors (see **Table 6)**. This can also be explained by a high estimate of the standard error, which is in direct dependence on one of the highest standard deviation value among the portfolios' returns (see **Table 3**).

The application of the multi-factors' models also provided an opportunity to give a look at investment styles of the superinvestors for the period in question. The statistically significant beta coefficients of the corresponding multi-factor regressions, shown in **Table 7**, allow concluding about the commitment of superinvestors to one or another investment style.

Table 7. *Market factors' coefficients of the Fama-French 3-factor, Carhart 4-factor and Fama-French 5-factor models*

Fund	Manager	M (Market Factor)			SMB (Size Factor)			HML (Value Factor)			MOM	RMW	CMA
		FF3	C4	FF5	FF3	C4	FF5	FF3	C4	FF5	C4	FF5	FF5
Berkshire Hathaway	Warren Buffett	9,62 ***	9,24 ***	9,99 ***	-3,47 ***	-3,40 ***	-2,53 ***	4,01 ***	2,89 ***	5,07 ***	-1,37 ***	3,92 ***	-1,16
Dodge & Cox	Dodge & Cox Team	6,62 ***	6,47 ***	6,48 ***	-1,15 ***	-1,12 ***	-1,09 **	2,50 ***	2,05 ***	2,28 ***	-0,54 **	-0,68	0,04
Bill & Melinda Gates Foun	Michael Larson	8,52 ***	8,45 ***	8,85 ***	-4,01 ***	-3,99 ***	-3,37 ***	1,99 **	1,77 *	1,79	-0,26	1,88	1,86
Lone Pine Capital	Stephen Mandel	10,49 ***	10,27 ***	10,10 ***	-0,54	-0,49	-0,78	-4,52 ***	-5,15 ***	-2,75 ***	-0,78	-1,03	-4,27 ***
Gardner Russo & Gardner	Thomas Russo	8,77 ***	8,62 ***	9,23 ***	-2,62 ***	-2,59 ***	-2,14 **	0,34	-0,10	1,22	-0,54	3,05 **	0,11
Baupost Group	Seth Klarman	12,78 ***	11,45 ***	11,35 ***	9,85 ***	10,10 ***	9,26 ***	-0,47	-4,39	-1,52	-4,81 ***	-7,07	-3,80
FPA Crescent Fund	Steven Romick	5,28 ***	5,58 ***	5,48 ***	-0,06	-0,11	-0,10	-0,75	0,13	-1,93 **	1,08 **	0,15	2,69 *
Cantillon Capital Managen	William Von Mueff	6,51 ***	6,95 ***	6,89 ***	0,55	0,47	0,39	-3,14 ***	-1,84 *	-4,31 ***	1,59 ***	0,84	3,21 *
Akre Capital Management	Chuck Akre	6,18 ***	6,69 ***	6,76 ***	1,09	0,99	1,08	-3,08 ***	-1,56	-4,65 ***	1,87 ***	1,70	4,46 **
Pershing Square Capital M	Bill Ackman	13,14 ***	12,49 ***	12,63 ***	2,39	2,51	1,88	0,01	-1,89	-1,58	-2,34 **	-4,00	1,37
Jensen	Robert Zagunis	8,60 ***	8,64 ***	8,85 ***	-1,49 ***	-1,50 ***	-1,16 **	-0,33	-0,21	-0,95	0,14	1,42	1,70 *
Markel Asset Managemen	Thomas Gayner	6,97 ***	7,02 ***	7,16 ***	-0,44	-0,45	-0,24	2,87 ***	3,01 ***	2,00 ***	0,18	0,53	2,21 *
Oakmark Select	Bill Nygren	13,57 ***	13,22 ***	13,09 ***	0,98	1,05	0,94	3,15 ***	2,10 ***	3,06 ***	-1,28 ***	-1,50	-2,20
Mairs & Power Growth	Mairs & Power	7,51 ***	7,34 ***	7,81 ***	0,68	0,71	1,12 **	2,26 ***	1,74 ***	1,41 **	-0,64 **	1,91 **	1,77 *
Sequoia	Ruane, Cunniff & G	9,10 ***	8,82 ***	8,98 ***	1,60	1,65	1,82	0,62	-0,21	0,94	-1,02	-0,26	-0,89
Yacktman Focused Fund	Donald Yacktman	10,29 ***	9,58 ***	10,65 ***	-3,81 ***	-3,68 ***	-3,30 ***	1,28	-0,80	2,52 **	-2,55 ***	2,62 *	-0,52
Hancock Classic Value	Richard Pzena	7,42 ***	7,09 ***	7,13 ***	0,05	0,12	0,27	4,88 ***	3,93 ***	4,39 ***	-1,16 ***	-0,81	-0,55
Brave Warrior Advisors	Glenn Greenberg	11,02 ***	10,41 ***	10,54 ***	2,05	2,17	1,80	-0,24	-2,03	0,61	-2,20 ***	-3,04	-1,96
Appaloosa Management	David Tepper	15,83 ***	14,01 ***	14,91 ***	-0,59	-0,24	-1,64	5,42 **	0,06	15,24 ***	-6,59 ***	-3,50	-16,25 ***
Longleaf Partners	Mason Hawkins	14,35 ***	13,69 ***	14,33 ***	2,09 *	2,21 **	2,90 **	1,58	-0,36	0,28	-2,38 ***	2,30	-0,19
Average Superinvestor Portfolio		9,63 ***	9,30 ***	9,56 ***	0,16	0,22	0,25	0,92 **	-0,04	1,16 ***	-1,18 ***	-0,08	-0,62
Average Superinvestor Portfolio (GARCH(1,1))		9,69 ***	9,36 ***	9,69 ***	-0,12	0,06	-0,22	0,39	-0,02	0,46	-1,06	-0,49	0,08

*The table contains beta coefficients of the Fama-French 3-factor (FF3), Carhart 4-factor (C4), and Fama-French 5-factor (FF5) models' factors: market factor (M), size factor (SMB), value factor (HML), momentum factor (MOM), profitability factor (RMW), investment factor (CMA). Highlighted cells indicate the statistically significant negative values. *** — indicates 1% level of significance, ** — 5% level of significance, * — 10% level of significance.*

The following conclusions about the investment styles of superinvestors can be made:

1) The negative betas of the size factor (SMB) in 6 statistically significant cases out of 8 mean that superinvestors prefer to have more large-cap stocks in their portfolios. Only Baupost Group of Seth Klarman and Longleaf Partners of Mason Hawkins have positive

exposure to the size factor and benefit from the outperformance of the small companies over the large-cap ones. The same can be said about the Mairs & Power Growth but only in case of the Fama-French 5-factor model.

2) Almost half superinvestors have statistically significant exposure to the value factor (HML). While on average, based on the average superinvestor portfolio, superinvestors show adherence to the value strategy, some superinvestors (Stephen Mandel, William Von Mueffling and one of the leaders Chuck Akre) demonstrate statistically significant negative exposure to the value factor. It may prove that value investing approach does not mean that superinvestors follow strictly the academic definition of the value investing strategy, buying only value stocks with low P/E or P/B ratios. For example, the investment style of Chuck Akre is characterized by a mixture of the classical business value approach with the purchase of companies that demonstrate consistent earnings growth or high compound growth rate in book value per share (Gurufocus, 2020).
3) There are 13 negative and only 3 positive statistically significant coefficients of the momentum factor (MOM), which may indicate that superinvestors did not try to chase the performance of stocks. Since momentum investors focus on stock price trends but not on fundamentals, they can be regarded as contrarian to value investors (Fite, 2019). Thus, superinvestors acted as value investors and were not interested in taking advantage of the recent price trends.
4) As for the profitability factor (RMW), some superinvestors prefer to invest in companies with high operating profitability but there are just 4 individual cases and no general conclusions can be made in absence of the statistically significant results for the average superinvestor portfolio. The same is for the investment factor (CMA). On the individual level, some superinvestors prefer companies that invest aggressively and some prefer conservative firms, but nothing can be inferred in general.

Summarizing the results of regressions, most of the superinvestors consistently demonstrate the ability of fund managers receive a better return than the market when different regression models are applied and adjusted to different factors. This conclusion can be supported by the performance evaluation results of the average superinvestor portfolio and the pragmatic portfolio which were built from the same pool of the superinvestors. The analysis of beta coefficients of the multi-factor models made it possible to detect the investment styles that

superinvestors applied in the period under review. In general, they preferred to invest in value stocks and large-capitalization companies and did not chase the recent price movements.

5.4 Industry selection

The tables in **Appendix 3** `contain beta coefficients of 30 industry portfolios and their statistical significance as the results of the multivariate regressions of superinvestors' portfolios with the industry portfolios as regressors. The top 5 industry groups with the maximum positive significant beta coefficients are listed in **Table 8**. The superinvestors on average, based on the average superinvestor portfolio, have the maximum statistically and economically significant positive exposure to the finance and healthcare industries.

Table 8. *Industry preferences of the superinvestors. (Author)*

	Average superinvestor portfolio results:	Beta	
1	Finance: Banking, Insurance, Real Estate, Trading	1,94	***
2	Healthcare, Medical Equipment, Pharmaceutical Products	1,94	***
3	Retail	0,86	**
4	Electrical Equipment	0,78	*
5	Tobacco Products	0,75	***
	Pragmatic portfolio results:	**Beta**	
1	Paper	3,19	**
2	Personal and Business Services	2,64	**
3	Finance: Banking, Insurance, Real Estate, Trading	2,16	**
4	Oil	1,90	***
5	Food	1,30	***

*The table presents the results of the multivariate analysis of industry factors in case of the returns of the average superinvestor portfolio and the pragmatic portfolio as dependent variables and 30 industry portfolios as independent in multivariate regressions: top 5 industry portfolios and their beta coefficients. *** — indicates 1% level of significance, ** — 5% level of significance, * — 10% level of significance*

The multivariate analysis of the pragmatic portfolio against the industry factors also revealed the statistically and economically significant positive exposure to the finance industry among the top 5 results. The analysis of the industry preferences of the superinvestors was also performed based on the industry classification of all stocks included in the superinvestors portfolios as this classification is defined in Thomson Reuters Datastream (see **Appendix 10**).The results of the multivariate analysis of the industry factors are consistent with the results presented in **Appendix 10**. It can prove the assumption that superinvestors prefer to invest in industries familiar to them, namely in finance industry.

6. DISCUSSION AND CONCLUSION

6.1 Main findings and contributions

This master's thesis explored the phenomenon of the value investing which is widely used by superinvestors. The objective of the research was to evaluate portfolio performance of superinvestors using the Sharpe ratio, Jensen's alpha measure, the 3-factor and 5-factor Fama and French models, the 4-factor Carhart model, as well as the GARCH(1,1) model with non-normal Student-t distribution. The Jarque–Bera test was performed to check whether the data meets the condition of the normal distribution of residuals and the Engle's ARCH test was applied for testing data series on the heteroscedasticity of residuals. These models were applied to evaluate how superinvestors performed compared to S&P500 Composite, S&P500 Value, Russell 2000 and Russell 2000 Value benchmark indices. The average superinvestor portfolio was created from the returns of the individual superinvestors' portfolios to see how on average superinvestors performed compared to indices. Also, a pragmatic portfolio was built and added to the analysis of the portfolio performance. To build a pragmatic portfolio, the phenomenon of the value investing and the pragmatic investment approach were studied both from theoretical and practical sides. As a result of this study, the algorithm to build a portfolio under the pragmatic approach was proposed with the scorecards for the multi-criteria analysis of fundamentals and financial ratios for screening companies and funds. This algorithm was tested to build the pragmatic portfolio from the existing superinvestors at the stages of stock picking, asset allocation and rebalancing. Finally, the multivariate analysis of industry factors was applied to reveal the industry preferences of superinvestors.

The following research questions were raised to achieve an objective:
Q1: Does following the value investing strategy allow superinvestors to outperform the benchmarks?
Q2: How can the pragmatic investment approach, based on the value investing philosophy, be used to create a portfolio from the existing superinvestors' portfolios?
Q3: Can the pragmatic approach allow building a portfolio that will beat the benchmark indices in its turn?

Q4: Which industries are the most popular among superinvestors for allocation of their funds?

A variety of different qualitative and quantitative methods were applied to evaluate portfolio performance and answer the research questions. The Sharpe ratio for portfolios and indices were calculated to obtain a widely used portfolio performance indicator. The Jensen's alpha as a result of the CAPM regressions of the portfolios against benchmark indices was taken as a measure of unsystematic risk that reflects the contribution of a portfolio manager to expected return. The Fama-French 3- and 5-factor and Carhart 4-factor models were applied to have better tools for portfolio performance evaluation in comparison with the basic CAPM model because they adjust for the outperforming tendency of small-cap companies, value stocks, companies with higher operating profitability and conservative investment policy, as well as the momentum impact of past returns on future returns. The GARCH(1,1) model with non-normal Student-t distribution was applied additionally as a portfolio performance evaluation model that allows to eliminate non-stationarity, handle the volatility and non-normality of the portfolio return time series, and get the more robust results. The multivariate analysis of industry factors, where historical returns of 30 industry portfolios represent industry factors, was applied to discover industry preferences of superinvestors and to verify the assumption that superinvestors prefer to invest in industries that are well known for them.

For good measure, the superinvestors' portfolios were taken to build a pragmatic portfolio under the business value investing philosophy and added to the analysis of the portfolio performance against the same benchmark indices with the same techniques that were applied to evaluate portfolio performance of superinvestors. To start out building a pragmatic portfolio, the value investing phenomenon and the pragmatic investing strategy were examined in detail based on the analysis of scientific articles and publications about value investing philosophy and pragmatic investing approach. The pragmatic approach was also considered at a practical level based on the experience of investment market professionals. Based on these studies, an algorithm for constructing a portfolio within the framework of the pragmatic investment strategy was proposed. Within this algorithm, the scorecards for the multi-criteria analysis of the company's fundamentals and key financial ratios was designed to perform screening of companies and making a decision which assets are good to be selected for a pragmatic portfolio. The separate scorecard was prepared for the mutual

stock funds as their financial reports and key financial indicators differ from the reports of corporations. A pragmatic portfolio was created in order to test how to work with the proposed algorithm in practice, primarily at the stage of screening companies and determining which assets are good for portfolio selection, as well as for asset allocation and rebalancing.

The sample data for the portfolio performance evaluation are based on the monthly returns of twenty superinvestors' portfolios which had the highest value and longest available historical data at the end of 2018 for the period from October 2006 to December 2018. The returns of superinvestors' portfolios were calculated based on the prices of stocks and real weights of holdings included in the portfolios. The portfolio holdings and their weights in each period were derived from the Dataroma.com, while the prices of the 827 unique stocks ever included in the portfolios during the period in question were taken from Thomson Reuters Datastream mainly. On average, the top 20 largest positions in the portfolios contribute about 87% to the overall portfolio. For 6 portfolios, it is even the full coverage, while in other portfolios the top 20 stocks cover at least 55% of the portfolios in terms of weight. The values of the benchmark indices S&P500 Composite, S&P500 Value, Russell 2000, and Russell 2000 Value extracted from Thomson Reuters Datastream were transformed into the return series for the portfolio performance evaluation with the applied models. The 3 Month Treasury Bill Rate was taken as a risk-free proxy and converted from annual to monthly yield rates. For the multi-factor models the historical values of the market factor (M), the size premium factor (SMB), the value premium factor (HML), the momentum factor (MOM), the profitability factor (RMW), and the investment factor (CMA) were derived from the Kenneth R. French Database. Historical returns of 30 industry portfolios for multivariate analysis of industry factors were extracted from the same source. The superinvestors included in the pragmatic portfolio was screened with the scorecards for the multi-criteria analysis of corporations and mutual funds. This screening was based on financial indicators, fundamentals and ratios that had been already calculated and available in open sources or calculated by the author from data taken from the financial statements of companies. Monthly returns of the pragmatic portfolio composed of the superinvestors' listed on the stock market and passed the screening were issued by Portfolio Visualizer software platform as a result of asset allocation and yearly rebalancing with the Sharpe ratio maximization goal with the Monte Carlo method to resample efficient frontier inputs.

The key research question (Q1) of the master's thesis about whether the superinvestors acting within the value investment paradigm can outperform the market benchmarks were investigated with the Jensen's alpha, Fama and French's 3- and 5-factor models, Carhart's 4-factor model, and the GARCH(1,1) model. The statistically significant positive alpha coefficients of the regressions showed quite convincingly that superinvestors, following the value investment strategy, could steadily outperform the market in the cases of various benchmarks and applied statistical models. These results were supported by the Sharpe ratio. All superinvestors' portfolios, as well as the average superinvestor portfolio, have the higher values of the Sharpe ratio than the benchmark indices. The leader among the superinvestors is Akre Capital Management with the highest statistically significant Jensen's alphas in case of the common CAPM regressions with all four indices and the highest Sharpe ratio as well. The absence of significance in case of GARCH(1,1) model for this portfolio against S&P500 Composite index is compensated by the fact that the normality test did not reveal non-normality in error terms. The second performance portfolio belongs to Sequoia Fund, even the results of the multi-criteria analysis performed within the pragmatic portfolio building and the Morningstar rating are not enthusiastic about its performance at the end of 2019. The Sequoia fund also has the highest statistically significant alpha value in case of GARCH(1,1) model against S&P500 Composite index. The average superinvestor portfolio showed statistically significant positive alphas when GARCH(1,1) model was applied against S&P500 Composite and S&P500 Value indices, but not against Russell 2000 and Russell 2000 Composite. This also can be compensated by the fact that the test for normality did not reject the hypothesis about the normal distribution of error terms. Thus, the question of whether following the value investing strategy allows superinvestors outperform the benchmarks can be answered in the affirmative.

The results of multi-factor models also made it possible to analyze the investment styles of superinvestors, which are characterized by statistically significant values of beta coefficients of the corresponding factors. The results showed that superinvestors' portfolios were influenced by certain factors, such as size (SMB), value (HML) and momentum factors (MOM). The market, value and size factors explain the most variation of the superinvestors' portfolios. High and statistically significant beta values of some factors can partially explain the high alpha values of the corresponding regression coefficients, which did not receive

statistical significance, as, for example, in the case of the Baupost Group, whose maximum but statistically insignificant alpha value can be explained not only by the low explanatory power of the model and the high standard error but also by the high statistically significant value of the SMB factor. Although most superinvestors and the average superinvestor portfolio showed a positive statistically significant exposure to the value factor, it emerged that some superinvestors preferred investing in growth stocks. The analysis of investment styles also showed that most portfolios have negative and statistically significant exposure to the momentum factor, meaning that the superinvestors did not follow recent changes in the prices of underlying assets, but adhered to their main value strategy. Nevertheless, some superinvestors, as one of the leaders Chuck Akre, have statistically significant positive betas which means that they could have chased the stock prices and benefited from the latest price trends. Consequently, the value investing strategy of superinvestors is not totally equivalent to the academic value investing of acquiring shares with a low P/B or P/E ratios and does not exclude investing in growth stock or other investing styles.

The algorithm to build a pragmatic portfolio was presented in this thesis to answer the research question Q2 about how the pragmatic investment approach based on the value investing philosophy can be used to create a portfolio from the existing superinvestors' portfolios. The scorecards for multi-criteria analysis of fundamentals, key financial ratios and indicators were specially developed based on criteria applicable to them within a value investing and pragmatic approach for companies and mutual funds. These scorecards are aimed to support the decision-making process at the stage of choosing assets for the portfolio. Within this algorithm, it was also described in details how to perform stock valuation, assets allocation and rebalancing. To test how to work with the proposed algorithm, the pragmatic portfolio was built from the pool of existing superinvestors. The holding companies and stock funds which represent existing superinvestors were taken for the screening procedure. First, only 11 superinvestors out of 20 remained because the 9 funds are private and not traded on the stock exchange which makes them difficult for the investment purpose and for the analysis of their fundamentals and financial indicators. The remaining 11 superinvestors are 9 stock funds and 2 holding companies. According to the results of the multi-criteria analysis of holding companies and stock funds, 4 stock funds were not included in the pragmatic portfolios because of their marginal rating. Thus, only 7 superinvestors (2 holding companies and 5 stock funds) composed the pragmatic portfolio.

The screening was made based on the data from the financial statements for 2019 since this data was relevant at the time of writing the thesis and most accessible. In such a way, the pragmatic portfolio constructed from the existing superinvestors has a look-ahead bias for picking stocks and was back-tested for the portfolio performance evaluation.

Asset allocation and rebalancing of the pragmatic portfolio were performed annually based on the historical returns for each year separately with the portfolio optimizer tool introduced on the Portfolio Visualizer online software platform. The portfolio optimization goal was the Sharpe ratio maximization with the Monte Carlo method to resample efficient frontier inputs. The asset allocation for the current year was determined at the beginning of each year on the basis of the return on portfolio assets for the previous year, as if an investor had been at the beginning of the year and possessed information only about past returns. Then, the received asset allocation for the current year was taken to obtain portfolio returns for that year. In such a way, a look-ahead bias for asset allocation was avoided because asset allocation relied on data that was already available at the moment of rebalancing.

Since the pragmatic portfolio has a deficiency at the stage of the stock picking, this portfolio should be regarded as theoretical. It was constructed for the purpose of this master's thesis to have it as one more benchmark for the portfolio performance evaluation of the superinvestors' portfolios. Despite the fact that the constructed pragmatic portfolio is theoretical, the algorithm itself seems to be a hands-on instrument for individual investors who want to invest like Graham, Buffett and other famous value investors. The proposed algorithm describes a straightforward procedure that must be completed in order to build a pragmatic portfolio. The scorecards for multi-criteria analysis of fundamentals and key ratios are useful to screen assets and determine which ones are worth being included in the portfolio of a pragmatic investor. It is further proposed to determine how much the price of an asset is underestimated by the market and what the price really should be paid for this asset. If an asset is underestimated and its price is currently adequate to ensure a sufficient margin of safety to protect from a poor investment decision, then it is recommended to purchase this asset. Taking into account the personal risk/return profile an investor can determine the goal for the portfolio: minimizing risk in relation to a certain level of return, maximizing return in relation to a certain level of risk, maximizing Sharpe ratio, and other goals. Having defined goals, the asset allocation is carried out from a set of assets that have passed the screening

procedure with a positive rating and determined to have a sufficient margin of safety. Further, the algorithm encourages investors not to forget about such an important stage of portfolio management as rebalancing using at least the simplest calendar method. For more advanced investors, it is proposed to use more complex and effective methods, such as threshold and opportunistic rebalancing.

The results of the research also proved the importance of the assets allocation and rebalancing mechanisms of the portfolio construction as the cumulative return of the average superinvestor portfolio calculated with the actual weights of stocks in each portfolio in each period surpasses significantly the cumulative return of the average superinvestor portfolio calculated with the assumption of the equal weights of all stocks in all period under consideration.

To answer the research question Q3 the pragmatic portfolio was built from the existing superinvestors according to the algorithm proposed in this thesis in section 3. The pragmatic portfolio was added to the analysis of the portfolio performance against the benchmarks. It has positive Jensen's alphas with a strong significance at 1% and 5% level in case of all indices when the common CAPM regressions were applied. The application of the Carhart-4 factor model also provided quite satisfactory statistically significant results for the pragmatic portfolio. The GARCH(1,1) model with Student-t distribution returned statistically significant outperformance of the pragmatic portfolio over the market in cases of all indices except Russell 2000 Value and not for the multi-factor models. Thus, eight of fourteen applied models proved the outperformance of the constructed pragmatic portfolio over the benchmarks quite evidently.

The study of the industry preferences of superinvestors (Q4) with the multivariate analysis of industry factors revealed that superinvestors prefer to invest the most in the finance, healthcare, retail, electronic equipment, and tobacco sectors. This panel was supported in case of the finance, healthcare and electronic equipment sectors by the classification of stocks included in the superinvestors' portfolios as this classification was returned by the Thomson Reuter Datastream. The results proved the assumption that superinvestors prefer to invest in industries familiar to them, namely in the finance industry.

To summarize, the undertaken study managed to answer the posed research questions and demonstrate that following value investing strategy enables investors to steadily outperform the market indices, both in the case of superinvestors and in the case of the pragmatic portfolio. The hands-on algorithm was proposed that may be useful to investors to build a pragmatic portfolio under the value investing paradigm that could outperform the market. The investment preference of superinvestors toward the financial industry has also been proven. The analysis of the investment styles of superinvestors revealed that their portfolios were influenced by certain market factors, such as size (SMB), value (HML) and momentum factors (MOM).

The contribution of this thesis to research on the soundness of the value investing primarily lies in the fact that it was based on the analysis of historical risk and return of holdings of the superinvestors' portfolios — 20 private value investors whose portfolios currently have the highest value of more than $1.9 billion. While most studies looked at the portfolio performance of value investors through the prism of fund returns as they are traded on the stock markets and returns of index funds calculated based on asset-average returns, what creates a bias in portfolio returns due to the prevailing influence of assets with a higher market value (Vanguard, 2020). The historical returns of the portfolios in this master's thesis were calculated with the consideration of the historical prices and the actual weights of the 20 largest stocks in the portfolios in each period.

6.2 Limitations and future research

To perform the research and answer the research questions the Jensen's alpha, CAPM and multi-factor models, as well as the GARCH(1,1) econometrical model with non-normal Student-t distribution, were applied to evaluate portfolio performance and find support for the hypothesis that superinvestors have a superior ability to outperform the market and their portfolios can beat the benchmarks. The assumption about the normal distribution of time series is the main limitation of the CAPM models. Even statistical models were tested for the normality, the results were not uniform for all time series. The same can be said about the effect of autoregressive conditional heteroscedasticity. Although the test results showed the presence of ARCH effect in many time series, nevertheless, the sufficient number of time

series did not pass the test. However, the GARCH(1,1) model was applied to all time series, regardless of the presence or absence of the ARCH effect in them. To obtain more reliable results and further develop the study of the value investment strategy, it is recommended to conduct more statistical tests and find more suitable specifications of statistical models for each time series separately where some bias appears. The econometrical models used in the research can also be improved by considering a longer historical period with a larger number of superinvestor portfolios. Also, other mathematical and statistical approaches can be used to evaluate portfolio performance to analyze and compare results.

The main limitation of the constructed pragmatic portfolio is that the screening procedure with the multi-criteria analysis was performed based on the financial statements for 2019. In such a way the composition of the pragmatic portfolio has a look-ahead bias which makes this portfolio theoretical and designed only for the purpose of this master's thesis. To evaluate the efficiency of the pragmatic approach it would be proper to build a pragmatic portfolio based on the information available only at the start of the evaluation period. The assets for the portfolio should be chosen after screening procedure on the basis of the sufficient margin of safety by estimating the future price of an asset. The procedure should start from the identification of the risk profile of an investor to set the goal of the portfolio optimization. It is also recommended to apply more sophisticated methods of rebalancing than just a simple calendar rebalancing. Since all these actions are rather time consuming and comprise a lot of data mining and calculation they were not applied on a full scale in this research. Moreover, this was not the primary goal of the study. Nevertheless, it seems quite interesting to devote time to build a pragmatic portfolio properly and then apply portfolio evaluation methods to compare its performance again the market benchmarks.

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Appendix 1. Top 20 Superinvestors' Portfolios and their Holdings 2018 Q4

	Portfolio Manager - Firm	Portfolio value 2018	N of stocks 2018	Portfolio from	20 Largest Holdings 2018 (1-10)									
					1	2	3	4	5	6	7	8	9	10
1	Warren Buffett - Berkshire Hathaway	$183,1 B	48	2006 Q4	AAPL	BAC	WFC	KO	AXP	KHC	USB	JPM	BK	MCO
2	Dodge & Cox Team - Dodge & Cox	$60,5 B	71	2006 Q4	CMCSA	WFC	CHTR	SCHW	MSFT	GOOG	SNY	COF	BAC	NVS
3	Michael Larson - Bill & Melinda Gates Foundation Trust	$21,9 B	19	2007 Q2	BRK.B	WM	MSFT	CAT	CNI	WMT	ECL	CCI	FDX	UPS
4	Stephen Mandel - Lone Pine Capital	$14,8 B	25	2008 Q1	ADBE	AMZN	MSFT	IQV	UNH	FB	BABA	STZ	ATVI	CP
5	Thomas Russo - Gardner Russo & Gardner	$12 B	83	2008 Q4	MA	BRK.A	NSRGY	PDRDF	HKHHF	UN	CFRHF	PM	WFC	BUD
6	Seth Klarman - Baupost Group	$11,1 B	35	2006 Q4	FOXA	LNG	FOX	VSAT	QRVO	AGN	LBTYK	PXD	EBAY	PCG
7	Steven Romick - FPA Crescent Fund	$9,52 B	47	2010 Q1	AIG	AVGO	ARNC	UTX	CIT	ADI	CMCSA	BIDU	NPSNY	JEF
8	William Von Mueffling - Cantillon Capital Management	$8,29 B	34	2009 Q4	SPGI	ADI	FIS	WLTW	GOOGL	CME	V	ICE	AMT	ECL
9	Chuck Akre - Akre Capital Management	$7,9 B	25	2009 Q4	AMT	MA	MCO	ORLY	V	MKL	DLTR	ROP	SBAC	KMX
10	Bill Ackman - Pershing Square Capital Management	$5,96 B	9	2007 Q2	QSR	LOW	CMG	HLT	SBUX	UTX	ADP	ESI	HHC	
11	Robert Zagunis - Jensen	$5,95 B	27	2007 Q2	BDX	PEP	MSFT	UNH	LNAGF	ECL	SYK	UTX	ORCL	JNJ
12	Thomas Gayner - Markel Asset Management	$5,23 B	131	2006 Q4	BRK.A	BRK.B	KMX	BAM	DIS	DEO	MAR	DE	HD	UNH
13	Bill Nygren - Oakmark Select	$4,15 B	22	2006 Q4	GOOG	CBRE	TEL	C	ALLY	FCAU	BAC	GE	QRTEA	REGN
14	Mairs & Power - Mairs & Power Growth	$3,88 B	56	2007 Q2	ECL	USB	GOOG	MMM	MDT	JNJ	HRL	DIS	DCI	ABT
15	Ruane, Cunniff & Goldfarb - Sequoia	$3.31 B	27	2006 Q4	KMX	GOOG	BRK.A	MA	CNSWF	CACC	GOOGL	RYCEF	FWONK	AMZN
16	Donald Yacktman - Yacktman Focused Fund	$2.24 B	23	2006 Q4	FOX	PG	PEP	ORCL	JNJ	KO	MSFT	BOIVF	CSCO	SYY
17	Richard Pzena - Hancock Classic Value	$2.04 B	42	2007 Q2	COF	AIG	C	ORCL	MRK	MET	F	GE	CTSH	MS
18	Glenn Greenberg - Brave Warrior Advisors	$1.97 B	22	2008 Q1	GOOGL	ADS	SCHW	JPM	RJF	LEN	PRI	LBTYK	FB	AR
19	David Tepper - Appaloosa Management	$1.93 B	21	2008 Q1	MU	FB	AGN	PCG	GOOG	AABA	ET	CZR	TMUS	UNH
20	Mason Hawkins - Longleaf Partners	$1.93 B	18	2006 Q4	CTL	CKHUY	GE	CNX	HCMLF	FDX	MAT	AMG	GOOG	CNHI

	Portfolio Manager - Firm	Portfolio value 2018	N of stocks 2018	Portfolio from	20 Largest Holdings 2018 (11-20)									
					11	12	13	14	15	16	17	18	19	20
1	Warren Buffett - Berkshire Hathaway	$183,1 B	48	2006 Q4	DAL	GS	LUV	GM	CHTR	DVA	VRSN	UAL	USG	AAL
2	Dodge & Cox Team - Dodge & Cox	$60,5 B	71	2006 Q4	JPM	FDX	AXP	CI	BK	BMY	RHHBY	JCI	MET	AZN
3	Michael Larson - Bill & Melinda Gates Foundation Trust	$21,9 B	19	2007 Q2	KOF	WBA	TV	LBTYK	AN	LBTYA	ARCO	LILAK	LILA	
4	Stephen Mandel - Lone Pine Capital	$14,8 B	25	2008 Q1	BKNG	CSX	WYNN	TRU	MA	TIF	TDG	ADSK	PYPL	NOW
5	Thomas Russo - Gardner Russo & Gardner	$12 B	83	2008 Q4	BRK.B	D:URH*	MLM	DEO	MO	CMCSA	JCDXF	BF.A	BF.B	GOOG
6	Seth Klarman - Baupost Group	$11,1 B	35	2006 Q4	SYF	AR	TBPH	CLNY	ATRA	MCK	UNVR	ABC	AKBA	CBS
7	Steven Romick - FPA Crescent Fund	$9,52 B	47	2010 Q1	BAC	C	AABA	TEL	GOOGL	GOOG	GBLBF	HCMLF	MSFT	CHTR
8	William Von Mueffling - Cantillon Capital Management	$8,29 B	34	2009 Q4	ZTS	CBRE	A	BDX	AVGO	VRSN	TMO	EFX	GOOG	ST
9	Chuck Akre - Akre Capital Management	$7,9 B	25	2009 Q4	VRSK	UBNT	KKR	DHR	AMTD	ESGR	FOCS	BRK.B	PRMW	ALRM
10	Bill Ackman - Pershing Square Capital Management	$5,96 B	9	2007 Q2										
11	Robert Zagunis - Jensen	$5,95 B	27	2007 Q2	MMM	ACN	PG	GOOGL	PFE	AAPL	INTU	WAT	OMC	MA
12	Thomas Gayner - Markel Asset Management	$5,23 B	131	2006 Q4	WBA	AMZN	GOOGL	V	RLI	UN	JNJ	BLK	ADP	GD
13	Bill Nygren - Oakmark Select	$4,15 B	22	2006 Q4	COF	AAL	CHTR	AIG	NFLX	APA	MGM	MA	APC	LEA
14	Mairs & Power - Mairs & Power Growth	$3,88 B	56	2007 Q2	GGG	HON	RHHBY	MSFT	TECH	FISV	TTC	FAST	CHRW	BMS
15	Ruane, Cunniff & Goldfarb - Sequoia	$3.31 B	27	2006 Q4	SCHW	JEC	NPSNY	BRK.B	BKNG	FB	VIVEF	EA	LBRDK	HCXLF
16	Donald Yacktman - Yacktman Focused Fund	$2.24 B	23	2006 Q4	KO:KTB	KO:HHS	HEGIF	COP	STT	USB	XOM	BK	INFY	ARGKF
17	Richard Pzena - Hancock Classic Value	$2.04 B	42	2007 Q2	WFC	IPG	LEA	BAC	HPE	EIX	AXS	AXS	RDS.A	JPM
18	Glenn Greenberg - Brave Warrior Advisors	$1.97 B	22	2008 Q1	C	NLSN	DHI	LBTYA	RRC	GOOG	FTDR	CMCSA	AMGP	MCO
19	David Tepper - Appaloosa Management	$1.93 B	21	2008 Q1	AY	VST	ALL	COOP	LNG	TERP	NRG	WFC	KMT	ESI
20	Mason Hawkins - Longleaf Partners	$1.93 B	18	2006 Q4	C:FFH	AGN	CHKGF	UTX	WYNN	PK	CMCSA	DWDP		

Appendix 2. Pragmatic Portfolio. List of superinvestors for the multi-criteria analysis, asset allocation and monthly returns

The list of superinvestors holding companies and stock funds subjected to the multi-criteria analysis

	Name	Manager	Ticker	Type	Category	Fund Status
1	Berkshire Hathaway Inc.	Warren Buffett	BRK.A	Corporation	–	–
2	Markel Corporation	Thomas Gayner	MKL	Corporation	–	–
3	Dodge&Cox Stock	Dodge & Cox Team	DODGX	Stock Fund	Large-Cap Value	Open
4	FPA Crescent	Steven Romick	FPACX	Stock Fund	Large-Cap Value	Open
5	Jensen Quality Growth J	Robert Zagunis	JENSX	Stock Fund	Large-Cap Core	Open
6	Oakmark Select Investor	Bill Nygren	OAKLX	Stock Fund	Multi-Cap Value	Open
7	Mairs&Power Growth Inv	Mairs & Power	MPGFX	Stock Fund	Multi-Cap Core	Open
8	Sequoia	Ruane, Cunniff & Goldfarb	SEQUX	Stock Fund	Multi-Cap Growth	Open
9	AMG Yacktman Focused N	Donald Yacktman	YAFFX	Stock Fund	Large-Cap Value	Open
10	JHancock Classic Value I	Richard Pzena	JCVIX	Stock Fund	Multi-Cap Value	Open
11	Longleaf Partners	Mason Hawkins	LLPFX	Stock Fund	Multi-Cap Value	Open

Pragmatic portfolio assets allocation

Ticker	Name	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BRK.A	Berkshire Hathaway Inc.	7,28%	32,36%	68,04%	5,00%	5,00%	38,60%	5,65%	28,68%	7,15%	63,17%	5,00%	35,61%	8,73%
DODGX	Dodge&Cox Stock	16,70%	15,38%	5,00%	5,00%	5,00%	5,58%	5,00%	14,05%	57,63%	5,00%	5,00%	13,59%	11,70%
FPACX	FPA Crescent	54,39%	5,19%	5,98%	9,23%	66,59%	8,76%	5,33%	6,20%	8,86%	5,00%	5,00%	5,00%	12,22%
JENSX	Jensen Quality Growth J	5,00%	6,11%	5,00%	5,00%	5,08%	5,41%	5,00%	5,00%	5,00%	5,00%	5,00%	9,35%	36,22%
MKL	Markel Corporation	5,00%	30,73%	5,98%	5,00%	6,44%	7,41%	54,07%	8,09%	8,52%	11,83%	70,00%	5,10%	6,44%
MPGFX	Mairs&Power Growth Inv	6,63%	5,00%	5,00%	5,00%	5,00%	27,55%	5,32%	32,98%	5,00%	5,00%	5,00%	8,70%	5,02%
YAFFX	AMG Yacktman Focused N	5,00%	5,23%	5,00%	65,77%	6,89%	6,69%	19,63%	5,00%	7,84%	5,00%	5,00%	22,65%	19,67%
	Total:	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%

Monthly returns of the pragmatic portfolio

31/10/2006	2,49%										
30/11/2006	2,69%										
31/12/2006	1,21%										
31/01/2007	0,97%	**31/01/2009**	-9,47%	**31/01/2011**	1,93%	**31/01/2013**	7,28%	**31/01/2015**	-3,72%	**31/01/2017**	2,11%
28/02/2007	-2,17%	28/02/2009	-7,68%	28/02/2011	4,69%	28/02/2013	2,25%	28/02/2015	3,87%	28/02/2017	3,29%
31/03/2007	1,60%	31/03/2009	11,75%	31/03/2011	-1,52%	31/03/2013	3,23%	31/03/2015	-1,05%	31/03/2017	-0,38%
30/04/2007	-0,22%	30/04/2009	18,70%	30/04/2011	1,55%	30/04/2013	1,69%	30/04/2015	-1,52%	30/04/2017	0,17%
31/05/2007	3,50%	31/05/2009	7,55%	31/05/2011	-2,35%	31/05/2013	3,82%	31/05/2015	1,13%	31/05/2017	0,19%
30/06/2007	-1,05%	30/06/2009	0,55%	30/06/2011	-1,91%	30/06/2013	-1,04%	30/06/2015	-2,98%	30/06/2017	1,58%
31/07/2007	-2,15%	31/07/2009	7,10%	31/07/2011	-3,90%	31/07/2013	4,58%	31/07/2015	4,35%	31/07/2017	2,58%
31/08/2007	3,30%	31/08/2009	4,11%	31/08/2011	-2,67%	31/08/2013	-3,26%	31/08/2015	-5,67%	31/08/2017	0,59%
30/09/2007	1,51%	30/09/2009	3,83%	30/09/2011	-5,45%	30/09/2013	3,19%	30/09/2015	-3,08%	30/09/2017	1,47%
31/10/2007	7,81%	31/10/2009	-0,03%	31/10/2011	9,43%	31/10/2013	3,44%	31/10/2015	5,92%	31/10/2017	1,94%
30/11/2007	-2,45%	30/11/2009	4,16%	30/11/2011	1,44%	30/11/2013	2,48%	30/11/2015	-0,52%	30/11/2017	3,41%
31/12/2007	0,54%	31/12/2009	2,45%	31/12/2011	-0,67%	31/12/2013	2,35%	31/12/2015	-1,88%	31/12/2017	1,82%
31/01/2008	-4,13%	**31/01/2010**	0,24%	**31/01/2012**	0,23%	**31/01/2014**	-3,62%	**31/01/2016**	-4,39%	**31/01/2018**	4,70%
29/02/2008	1,64%	28/02/2010	1,91%	29/02/2012	1,64%	28/02/2014	4,22%	29/02/2016	1,67%	28/02/2018	-3,27%
31/03/2008	-3,70%	31/03/2010	3,72%	31/03/2012	6,63%	31/03/2014	1,88%	31/03/2016	4,79%	31/03/2018	-1,73%
30/04/2008	1,09%	30/04/2010	0,35%	30/04/2012	-1,49%	30/04/2014	0,38%	30/04/2016	1,00%	30/04/2018	-0,27%
31/05/2008	0,35%	31/05/2010	-5,86%	31/05/2012	-2,14%	31/05/2014	1,82%	31/05/2016	4,26%	31/05/2018	0,72%
30/06/2008	-9,59%	30/06/2010	-1,42%	30/06/2012	2,29%	30/06/2014	2,11%	30/06/2016	0,10%	30/06/2018	1,59%
31/07/2008	-3,25%	31/07/2010	3,13%	31/07/2012	-0,97%	31/07/2014	-1,35%	31/07/2016	0,48%	31/07/2018	4,03%
31/08/2008	2,05%	31/08/2010	-2,09%	31/08/2012	1,29%	31/08/2014	3,51%	31/08/2016	-0,87%	31/08/2018	2,41%
30/09/2008	6,42%	30/09/2010	6,37%	30/09/2012	4,06%	30/09/2014	-1,33%	30/09/2016	-0,42%	30/09/2018	0,78%
31/10/2008	-12,05%	31/10/2010	1,84%	31/10/2012	0,85%	31/10/2014	1,32%	31/10/2016	-4,16%	31/10/2018	-4,61%
30/11/2008	-9,14%	30/11/2010	-0,16%	30/11/2012	1,51%	30/11/2014	2,77%	30/11/2016	3,21%	30/11/2018	3,05%
31/12/2008	-4,67%	31/12/2010	4,93%	31/12/2012	-4,59%	31/12/2014	-0,15%	31/12/2016	0,94%	31/12/2018	-7,52%

Appendix 3. Resulting beta coefficients of multivariate analysis of industry factors with 30 Industry Portfolios

Fund	Manager	Food	Beer	Smoke	Games	Books	Hshld	Clths	Hlth	Chems	Txtls
Berkshire Hathaway	Warren Buffett	1,10	0,72	0,72	0,21	0,18	0,89	-0,48 ***	-0,70	-0,48	0,10
Dodge & Cox	Dodge & Cox Team	0,84	-0,59	0,17	0,03	-0,10	0,40	-0,33 ***	1,27 ***	-0,37	0,00
Bill & Melinda Gates Foundation Trus	Michael Larson	2,65 *	-0,09	0,49	-1,49 **	-0,45	-0,76	-0,17 ***	1,28	-0,76	0,80 *
Lone Pine Capital	Stephen Mandel	0,26	0,45	0,51	0,96 *	0,36	-0,26	0,63 ***	0,87	1,34	-0,33
Gardner Russo & Gardner	Thomas Russo	0,12	1,04	2,72 ***	0,59	0,17	0,96	-0,07 ***	1,63 *	0,13	0,53
Baupost Group	Seth Klarman	2,59	-0,39	0,81	1,98	5,60 **	-10,57 ***	1,50 ***	12,16 ***	-9,90 ***	2,13
FPA Crescent Fund	Steven Romick	0,43	-0,03	0,92 *	-0,81 *	0,11	-0,52	-0,80 ***	1,96 **	0,89	-0,91 **
Cantillon Capital Management	William Von Mueffling	-0,62	-0,42	1,00	-0,63	0,54	1,04	-1,17 ***	2,94 ***	0,98	-0,92 **
Akre Capital Management	Chuck Akre	0,01	-0,36	0,72	0,32	0,19	-0,57	-0,46 ***	3,62 ***	0,03	-1,21 ***
Pershing Square Capital Management	Bill Ackman	-1,03	-1,89	1,68	0,18	-1,96	-3,58 *	0,94 ***	3,86 **	0,09	0,95
Jensen	Robert Zagunis	1,37 **	0,58	-0,16	-0,44	0,12	1,14 **	0,15 ***	0,54	-0,30	-0,63 ***
Markel Asset Management	Thomas Gayner	-0,41	-0,79	0,78 *	-0,40	0,11	-0,57	1,26 ***	0,93	-0,70	0,19
Oakmark Select	Bill Nygren	0,08	0,02	0,41	0,36	0,06	-0,52	0,31 ***	1,49 *	-0,30	0,40
Mairs & Power Growth	Mairs & Power	0,98	-0,56	0,23	-0,03	-0,15	0,84 *	0,03 ***	0,62	-0,20	0,01
Sequoia	Ruane, Cunniff & Goldfar	-0,72	-1,69	1,31 **	0,58	-1,13	-1,61	-0,20 ***	1,79 *	-2,17 **	1,65 ***
Yacktman Focused Fund	Donald Yacktman	1,27	2,17 **	-0,12	0,46	-0,15	2,48 **	0,15 ***	-0,91	0,70	0,25
Hancock Classic Value	Richard Pzena	-0,45	-0,44	0,51	0,01	-0,22	-1,21 **	0,05 ***	0,16	-0,99 *	0,32
Brave Warrior Advisors	Glenn Greenberg	-0,87	-0,50	0,63	1,06	1,04	-0,43	0,15 ***	2,95 *	-2,00	-0,29
Appaloosa Management	David Tepper	-2,78	-0,23	0,67	1,52	0,70	-0,98	1,06 ***	1,74	4,16	3,95 ***
Longleaf Partners	Mason Hawkins	-0,50	-0,60	1,00	1,41 **	0,48	0,69	-1,18 ***	0,56	0,52	0,52
Superinvestor Portfolio	-	0,22	-0,18	0,75 ***	0,29	0,28	-0,66	0,07 ***	1,94 ***	-0,47	0,38 **
Pragmatic Portfolio	-	0,78	1,15	0,56	0,15	-0,03	-0,34	0,18 ***	-0,29	0,02	1,30 ***

Fund	Manager	Cnstr	Steel	FabPr	ElcEq	Autos	Carry	Mines	Coal	Oil	Util
Berkshire Hathaway	Warren Buffett	-0,96	-0,65	-2,49 **	1,28	0,79 *	0,00	0,16	0,46 **	1,07 **	0,21
Dodge & Cox	Dodge & Cox Team	-0,77 **	0,06	0,64	0,34	0,01	-0,13	-0,04	0,07	0,43 *	-0,53
Bill & Melinda Gates Foundation Trus	Michael Larson	-1,61 *	-0,77	0,28	2,13 *	0,37	-0,19	0,50	0,23	1,43 **	0,20
Lone Pine Capital	Stephen Mandel	0,22	0,27	3,36 ***	-0,74	-0,93	0,83	0,14	-0,11	-1,24 **	0,82
Gardner Russo & Gardner	Thomas Russo	0,44	0,22	1,54	-1,38	0,52	-0,20	0,20	-0,25	1,06 *	-0,26
Baupost Group	Seth Klarman	-5,24 *	-1,63	7,69 *	1,87	4,22 **	-5,53 **	2,01	0,22	1,59	0,13
FPA Crescent Fund	Steven Romick	1,09	-0,03	0,67	0,11	0,07	0,35	-0,15	-0,14	1,36 **	-2,54 ***
Cantillon Capital Management	William Von Mueffling	0,30	-0,50	1,18	-0,51	0,63	-0,17	-0,32	0,07	0,98	-2,11 **
Akre Capital Management	Chuck Akre	1,20	-0,53	1,53	-0,72	0,07	-0,09	-0,61	0,14	0,89	-1,66 *
Pershing Square Capital Management	Bill Ackman	0,93	-1,95 *	-0,38	0,43	2,27 **	-0,55	0,30	0,89 **	-0,71	0,64
Jensen	Robert Zagunis	-0,29	0,12	0,32	0,77	0,13	0,32	-0,24	0,01	0,08	0,02
Markel Asset Management	Thomas Gayner	-0,99	-0,49	-0,76	0,98	0,40	-0,62	0,85 **	-0,23	0,67	1,50 **
Oakmark Select	Bill Nygren	0,10	-0,29	-0,38	0,79	-0,03	0,01	0,22	0,07	0,99 *	-1,00
Mairs & Power Growth	Mairs & Power	0,28	-0,12	0,46	1,32 ***	0,43	0,13	-0,23	-0,05	0,39	-0,14
Sequoia	Ruane, Cunniff & Goldfar	0,32	-1,21 *	0,18	2,49 **	0,93	-0,26	-0,48	0,67 ***	-0,43	-0,01
Yacktman Focused Fund	Donald Yacktman	0,94	0,26	-1,37	-0,85	0,42	0,24	1,01 **	-0,02	-0,43	-0,11
Hancock Classic Value	Richard Pzena	-1,02 **	-0,05	0,29	-0,01	0,41	0,32	0,02	0,02	0,75 **	-0,10
Brave Warrior Advisors	Glenn Greenberg	1,69	-0,07	-1,13	3,69 **	1,54 *	-0,63	-0,60	0,48	1,06	-1,68
Appaloosa Management	David Tepper	0,98	2,23	-5,38	2,93	-2,29	-0,68	1,91	-0,17	-0,79	5,35 **
Longleaf Partners	Mason Hawkins	0,07	1,69 **	-0,99	0,75	0,71	-0,28	0,37	0,11	1,47 **	-0,72
Superinvestor Portfolio	-	-0,12	-0,17	0,26	0,78 *	0,53 **	-0,36	0,25	0,12	0,53 **	-0,10
Pragmatic Portfolio	-	-1,20	-0,16	-3,11 ***	1,15	0,49	-1,38 *	-0,05	0,31	1,90 ***	-0,47

Fund	Manager	Telcm	Servs	BusEq	Paper	Trans	Whlsl	Retail	Meals	Fin	Other	Adj. R sq.
Berkshire Hathaway	Warren Buffett	-0,85	-0,15	0,99	0,99	0,89	-1,47	0,95	0,85	4,11 ***	2,12 ***	0,85
Dodge & Cox	Dodge & Cox Tea	1,24 ***	0,63	-0,21	-0,20	0,52	-0,10	-0,21	-0,08	3,08 ***	0,25	0,91
Bill & Melinda Gates Foundation	Michael Larson	-2,88 ***	1,27	-0,98	1,54	0,61	-1,41	1,63	1,26	1,24	3,27 ***	0,68
Lone Pine Capital	Stephen Mandel	0,36	2,37 **	1,44 *	-1,05	-1,05	-0,91	2,55 **	-1,62 *	-0,07	-0,64	0,78
Gardner Russo & Gardner	Thomas Russo	-1,35	0,57	-0,61	0,76	-0,38	-1,81	1,60 *	-0,78	0,18	1,17	0,76
Baupost Group	Seth Klarman	-0,28	-0,75	1,02	-4,67	1,96	-1,55	-4,81	4,81	1,80	1,36	0,42
FPA Crescent Fund	Steven Romick	-0,83	1,48	-0,19	1,09	0,52	-0,89	2,18 **	-0,42	0,30	-0,59	0,60
Cantillon Capital Management	William Von Mu	0,00	3,14 **	0,07	0,94	0,99	-1,56	2,39 **	0,42	-0,82	-1,08	0,55
Akre Capital Management	Chuck Akre	1,03	0,59	0,25	1,72	1,47	-1,95	2,75 **	1,00	-1,31	-1,22	0,53
Pershing Square Capital Manager	Bill Ackman	1,66	-0,06	-0,66	1,90	0,30	2,64	2,52	2,07	2,70 *	-2,10	0,67
Jensen	Robert Zagunis	-0,53	2,46 ***	0,25	1,99 ***	0,02	-0,71	1,29 ***	0,24	0,24	0,80 **	0,92
Markel Asset Management	Thomas Gayner	-1,04	0,88	-0,83	1,82 **	0,09	0,29	1,25 *	0,37	2,13 ***	1,41 **	0,81
Oakmark Select	Bill Nygren	1,09	3,01 ***	0,64	-0,44	0,38	1,73	-0,34	0,40	3,49 ***	-0,06	0,90
Mairs & Power Growth	Mairs & Power	-0,15	-0,72	-0,02	1,93 ***	-0,33	-0,23	1,06 **	0,61	0,84 **	0,51	0,92
Sequoia	Ruane, Cunniff &	-0,03	1,93 *	-0,67	0,09	-1,11	0,95	2,36 **	1,06	0,94	2,12 **	0,78
Yacktman Focused Fund	Donald Yacktma	2,36 ***	1,48	-0,93	0,48	-1,35	-0,52	1,21	-0,38	2,11 ***	0,42	0,82
Hancock Classic Value	Richard Pzena	0,35	0,19	-0,20	1,18 *	-0,18	1,38 **	0,28	0,44	4,18 ***	0,59	0,89
Brave Warrior Advisors	Glenn Greenberg	2,13	0,27	0,88	-0,52	-0,31	-1,00	-1,33	-0,84	1,66	0,74	0,66
Appaloosa Management	David Tepper	-2,02	-5,58	6,07 **	-0,59	1,50	#### ***	-1,26	-3,33	11,82 ***	1,36	0,59
Longleaf Partners	Mason Hawkins	1,38	1,16	1,38	-1,77	-0,13	2,56 *	1,07	0,60	0,16	-0,41	0,86
Superinvestor Portfolio	-	0,08	0,71	0,39	0,36	0,22	-0,82 *	0,86 **	0,33	1,94 ***	0,50	0,96
Pragmatic Portfolio	-	-1,83 *	2,64 **	-0,72	3,19 **	-0,44	0,96	0,18	0,09	2,16 **	2,01 **	0,76

*(*** 1% level of significance, ** 5% level of significance , * 10% level of significance)*

Appendix 4. Results of the Normality Jarque-Bera Test and ARCH effect Engle's Test for the CAPM Regressions

Fund	Manager	S&P500 C		S&P500 V		R2000		R2000 V		FF3		C4		FF5		SI Portfolio	
		Norm	ARCH	Norm	ARCH	Norm	ARCH	Norm	ARCH	Norm	ARCH	Norm	ARCH	Norm	ARCH	Norm	ARCH
Berkshire Hathaway	Warren Buffett	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes
Dodge & Cox	Dodge & Cox Team	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	Yes
Bill & Melinda Gates Foundation Trust	Michael Larson	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No
Lone Pine Capital	Stephen Mandel	No	No	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	Yes
Gardner Russo & Gardner	Thomas Russo	No	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Baupost Group	Seth Klarman	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
FPA Crescent Fund	Steven Romick	No	No	Yes	No	Yes	No	Yes	No	No	No	No	No	No	No	No	Yes
Cantillon Capital Management	William Von Mueffling	No	Yes	Yes	No	Yes	No	Yes	No	No	No	No	No	No	Yes	No	Yes
Akre Capital Management	Chuck Akre	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes
Pershing Square Capital Management	Bill Ackman	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	No	Yes
Jensen	Robert Zagunis	No	No	Yes	No	Yes	No	Yes	No	No	No	No	No	No	No	Yes	No
Markel Asset Management	Thomas Gayner	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No
Oakmark Select	Bill Nygren	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	Yes	No
Mairs & Power Growth	Mairs & Power	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	Yes	No
Sequoia	Ruane, Cunniff & Goldfarb	No	Yes	No	Yes	No	Yes	No	Yes	No	No	No	No	No	Yes	No	No
Yacktman Focused Fund	Donald Yacktman	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Hancock Classic Value	Richard Pzena	No	No	No	No	Yes	Yes	Yes	No	Yes	No	Yes	No	No	No	No	No
Brave Warrior Advisors	Glenn Greenberg	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Appaloosa Management	David Tepper	No	Yes	No	Yes	No	Yes	No	Yes	No	No	No	No	No	Yes	No	No
Longleaf Partners	Mason Hawkins	No	Yes	No	Yes	Yes	No	Yes	Yes	No	No	Yes	No	No	Yes	No	Yes
Superinvestor Portfolio	–	No	No	No	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	–	–
Pragmatic Portfolio	–	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No

Appendix 5. Criteria for a good stock fund

	Perfomance indicator	Criteria for a good mutual fund	Sources
1	Expense Ratio	(3) Excellent: <0,65% (2) Good: <0,75% (1) Marginal: <1,5 (0) Bad: >1,5%	https://www.nerdwallet.com/blog/investing/typical-mutual-fund-expense-ratios/ and https://www.investopedia.com/ask/answers/032715/when-expense-ratio-considered-high-and-when-it-considered-low.asp
2	Sales Load (Load)	(3) Excellent: None (0) Bad: Otherwise	Yahoo!Finance
3	TTM Yield	(3) Excellent: >4% (2) Good: >2% (1) Marginal: >0,9% (0) Bad: <1%	Yahoo!Finance. Based on the Fidelity Large and Mid–cap value funds
4	Minimum Initial Investment	(3) Excellent: < 2 500 (2) Good: > 2 500 (0) Bad: > 10 000	Investing.com
5	Morningstar Sustainability Rating	(3) 4 - 5 (2) 3 (1) 2 (0) 1	Yahoo!Finance
6	Morningstar Overall Rating	(3) 4 - 5 (2) 3 (1) 2 (0) 1	Morningstar
7	Morningstar Risk & Return 3 Year Rating: Risk vs. Category	(3) Below Average and Low (2) Average (1) Above Average (0) High	Morningstar
8	Morningstar Risk & Return Rating: Return vs. Category	(3) High (2) Above Average (1) Average (0) Below Average and Low	Morningstar
9	Lipper Leader Scorecard (Lipper Leaders Key: 5 - highest, 1 - lowest):		Reuters
9.1	Total Return	(3) 4 - 5 (2) 3 (1) 2 (0) 1	
9.2	Consistent Return	(3) 4 - 5 (2) 3 (1) 2 (0) 1	
9.3	Preservation	(3) 4 - 5 (2) 3 (1) 2 (0) 1	
9.4	Tax Efficiency	(3) 4 - 5 (2) 3 (1) 2 (0) 1	
9.5	Expense	(3) 4 - 5 (2) 3 (1) 2 (0) 1	

Appendix 6. Results of the multi-criteria analysis for the holding companies

	Key financial ratios	Criteria for a Good value stock	Source	Actual values		Scores	
				BRK.A	MKL	BRK.A	MKL
1	Current Ratio (WSJ: Financials) == Current Assets / Current Liabilities	(3) Excellent: between 1,5 and 2 (2) Good: 1 – 1,5 and 2 – 3 (1) Marginal: 0,5 – 1 and 3-5 (0) Bad: < 0,5 and > 5	Yahoo!Finance: Statistics	3,9	2,99	1	2
2	Quick (Acid test) Ratio = (Current Assets – Inventory) / Current Liabilities	(3) Excellent: between 1 and 3 (2) Good: 0,9 – 1 and 3 – 5 (1) Marginal: 0,7 – 0,9 and 5-10 (0) Bad: < 0,7 and > 10	WSJ: Financials	3,52	2,4	3	3
3	Cash Ratio (WSJ: Financials) = (Cash + Cash Equivalents) / Current Liabilities	(3) Excellent: between 0,8 and 1,3 (2) Good: 0,5 – 0,8 and 1,3 – 1,5 (1) Marginal: 0,2 – 0,5 and 1,5-2 (0) Bad: < 0,2 and > 2	WSJ: Financials	2,48	0,76	0	2
4	Debt Ratio = Total Liabilities / Total Assets	(3) Excellent: between 0,4 and 0,6 (2) Good: 0,2 – 0,4 and 0,6 – 0,7 (1) Marginal: 0,1- 0,2 and 0,7 – 0,9 (0) Bad: < 0,1 and > 0,9	calculation	0,48	0,70	3	1
5	Long-term Debt to Capitalization Ratio	(3) Excellent: between 0,4 and 0,6 (2) Good: 0,2 – 0,4 and 0,6 – 0,7 (1) Marginal: 0,1- 0,2 and 0,7– 0,9 (0) Bad: < 0,1 and > 0,9	WSJ: Financials	0,18	0,25	1	2
6	Debt to Equity Ratio (D/E)	(3) Excellent: between 0,5 and 1 (2) Good: 0,3 – 0,5 and 1 – 2 (1) Marginal: 0,2- 0,3 and 2 – 3 (0) Bad: < 0,2 and > 3	Yahoo!Finance: Statistics	0,255	0,34	1	2
7	Net Profit Margin (%)	(3) Excellent: > 20% (2) Good: between 10% and 20% (1) Marginal: between 5 and 10% (0) Bad: < 5%	Investing.com: Financials: Ratios	32,12	18,89	3	2
8	Return on Assets (ROA) (%)	*For the asset-intensive businesses (Property & Casualty Insurance Industry ROA 2019Q4 — 5%):* (3) Excellent: > 6% (2) Good: between 4% and 6% (0) Bad: < 4%	Investing.com: Financials: Ratios	10,72	5,08	3	2
9	Return on Equity (ROE) (%)	(3) Excellent: > 30% (2) Good: between 15% and 30% (1) Marginal: b/w 12% and 15% (0) Bad: < 15%	Investing.com: Financials: Ratios	21,05	17,78	2	2
10	Accruals (Sloan) Ratio (%)	(3) Excellent: b/w -10% and 10% (2) Good: from -20% to -10% and 10% to 20% (0) Bad: < -20% or > 20%	Gurufocus.com: Valuation Ratio	5,91	2,81	3	3
11	Earnings per Share (EPS) / Long-term AAA Bond Yield*	(3) Excellent: if EPS / Long-term AAA Bond Yield* < the stock's current share price (0) Bad: otherwise	Investing.com: Financials: Ratios	737 107,25	1 911,98	0	0
12	Price-to-Earnings ratio (P/E) (%)	(3) Excellent: <= 9% (2) Good: between 9% and 15% (0) Bad: > 15%	Investing.com: Financials: Ratios	5,53	6,81	3	3
13	Earning Yield ratio = 1/(P/E)	(3) Excellent: more than twice of the AAA bond yield (0) Bad: otherwise	calculation	0,18	0,15	3	3
14	Price-to-book (P/B)	(3) Excellent: <=0,9 (1) Marginal: between 0,9 and 1,1 (0) Bad: > 1,1	Investing.com: Financials: Ratios	1,06	1,1	1	1
15	Dividend Yield ratio	(3) Excellent: more than 2/3 the AAA bond yield (0) Bad: otherwise	Investing.com: Financials: Ratios	__	__	NA	NA
16	Net Income growth in the past 5 years	(3) Excellent: has grown > 3 times (2) Good: has grown 2-3 times (1) Marginal: has grown 1-2 time (0) Bad: has not grown at all	calculation	2,38	2,05	2	2
17	Net Cash Flow growth in the past 5 years (%)	(3) Excellent: has grown > 3 times (2) Good: has grown 2-3 times (1) Marginal: has grown 1-2 time (0) Bad: has not grown at all	calculation	3,74	0,88	3	0
18	Free Cash Flow / Sales in each of the past 5 years	(3) Excellent: more than 5% (0) Bad: otherwise	calculation	3	3	3	0
19	Depreciation / Gross Income (%)	(3) Excellent: <= 8 (2) Good: between 8 and 18 (0) Bad: > 18	calculation	16,76	5,66	2	3
20	"Moat Strength"	(3) Excellent: Wide (1) Marginal: Narrow (0) Bad: None	Morningstar raiting:	Wide	Narrow	3	1
		Total Score:				**2,15**	**1,85**
		Final Equity Raiting:				**Good**	**Good**

Appendix 7. Financials and fundamentals of the holding companies. 2019

Financials	Source	BRK.A	MKL
Total Liabilities	Yahoo!Finance: Balance Sheet	389 166 000	26 395 399
Total Assets	Yahoo!Finance: Balance Sheet	817 729 000	37 473 815
Stocks' Price	Yahoo!Finance: Historical Data	335 996,00	1 172,97
Earnings per Share (EPS)	Investing.com: Ratios	49 828,45	129,25
Net Income 2019	WSJ: Financials: Inc Statement	81 417,00	1 792,00
Net Income 2015	WSJ: Financials: Inc Statement	24 083,00	587,00
Net Cash Flow 2019 (Billion)	Macrotrends: Cash Flow	33,821	1 103,92
Net Cash Flow 2015 (Billion)	Macrotrends: Cash Flow	7,128	587,75
Depreciation	WSJ: Financials: Inc Statement	8 747,00	269 200
Gross Income	WSJ: Financials: Inc Statement	52 196,00	4 756 908
Cash	WSJ:Financials: Balance Sheet	127 997,00	3 500,35
Marketable Securities	WSJ:Financials: Balance Sheet	63 822,00	0,00
Current Liabilities	WSJ:Financials: Balance Sheet	51 543,00	4 578,00
Current Assets	WSJ:Financials: Balance Sheet	201 211,00	10 780,87
Inventory	WSJ:Financials: Balance Sheet	19 852,00	0

BRK.A	Source	2019	2018	2017	2016	2015
Free Cash Flow	WSJ: Financials: Cash Flow	22,708	22,863	34,02	19,581	15,409
Sales	WSJ: Financials: Inc Statement	254,616	247,837	239,933	222,935	209,995
Free Cash Flow / Sales		**9%**	**9%**	**14%**	**9%**	**7%**

MKL	Source	2019	2018	2017	2016	2015
Free Cash Flow	WSJ: Financials: Cash Flow	1 150 744	786 264	783 877	470 949	571 396
Sales	WSJ: Financials: Inc Statement	9 526 191	6 841 285	6 061 659	5 612 026	5 369 983
Free Cash Flow / Sales		**12%**	**11%**	**13%**	**8%**	**11%**

Moody's Seasoned AAA Corporate Bond Yield (Long Term Average)	ycharts.com	6,76%

"Moat strength" Morningstar rating sources:

1) BRK.A: Warren, 2020
2) MKL: Horn, 2020

Appendix 8. Results of the multi-criteria analysis for the stock funds

	Perfomance indicator	Criteria for a good mutual fund	Score								
			DODGX	FPACX	JENSX	OAKLX	MPGFX	SEQUX	YAFFX	JCVIX	LLPFX
1	Expense Ratio	(3) Excellent: < 0,65% (2) Good: < 0,75% (1) Marginal: <1,5 (0) Bad: > 1,5%	3	1	1	1	3	1	1	1	1
2	Sales Load (Load)	(3) Excellent: None (0) Bad: Otherwise	3	3	3	3	3	3	3	3	3
3	TTM Yield	(3) Excellent: > 4% (2) Good: > 2% (1) Marginal: > 0,9% (0) Bad: <1%	2	2	1	1	1	0	1	3	2
4	Minimum Initial Investment	(3) Excellent: < 2 500 (2) Good: > 2 500 (0) Bad: > 10 000	3	3	3	3	3	2	3	0	2
5	Morningstar Sustainability Rating	(3) 4 - 5 (2) 3 (1) 2 (0) 1	0	0	3	0	0	0	0	0	1
6	Morningstar Overall Rating	(3) 4 - 5 (2) 3 (1) 2 (0) 1	2	1	2	0	2	0	3	0	0
7	Morningstar Risk & Return 3 Year Rating: Risk vs. Category	(3) Below Average and Low (2) Average (1) Above Average (0) High	1	0	3	0	3	2	3	0	1
8	Morningstar Risk & Return Rating: Return vs. Category	(3) High (2) Above Average (1) Average (0) Below Average and Low	1	0	1	0	1	0	3	0	0
9	Lipper Leader Scorecard (Lipper Leaders Key: 5 - highest, 1 - lowest):										
9.1	Total Return	(3) 4 - 5 (2) 3 (1) 2 (0) 1	3	2	3	0	3	0	3	0	0
9.2	Consistent Return	(3) 4 - 5 (2) 3 (1) 2 (0) 1	3	2	3	0	3	0	3	0	0
9.3	Preservation	(3) 4 - 5 (2) 3 (1) 2 (0) 1	2	1	3	0	3	3	3	0	0
9.4	Tax Efficiency	(3) 4 - 5 (2) 3 (1) 2 (0) 1	1	2	2	3	1	1	0	3	0
9.5	Expense	(3) 4 - 5 (2) 3 (1) 2 (0) 1	3	3	3	2	3	3	0	1	3
		Total Score:	2,08	1,54	2,38	1,00	2,23	1,15	2,00	0,85	1,00
		Final Equity Raiting:	Good	Good	Excellent	Marginal	Good	Marginal	Good	Marginal	Marginal

Rating scale:

2,25 - 3	Excellent
1,5 - 2,25	Good
0,75 - 1,5	Marginal
0 - 0,75	Bad

Appendix 9. Actual values of indicators for the multi-criteria analysis for the stock funds

Perfomance indicator		Criteria for a good mutual fund	Sources	Actual Values								
				DODGX	FPACX	JENSX	OAKLX	MPGFX	SEQUX	YAFFX	JCVIX	LLPFX
1	Expense Ratio	(3) Excellent: < 0,65% (2) Good: < 0,75% (1) Marginal: <1,5 (0) Bad: > 1,5%	Yahoo!Finance	0,52%	1,14%	0,87%	1,00%	0,64%	1,00%	1,27%	0,92%	0,79%
2	Sales Load (Load)	(3) Excellent: None (0) Bad: Otherwise	Yahoo!Finance	None	None	None	None	None	None	None	None	None
3	TTM Yield	(3) Excellent: > 4% (2) Good: > 2% (1) Marginal: > 0,9% (0) Bad: <1%	Yahoo!Finance. Based on the Fidelity Large and Mid–cap value funds	2,51%	2,89%	1,17%	0,99%	1,42%	0,87%	1,47%	4,31%	2,82%
4	Minimum Initial Investment	(3) Excellent: < 2 500 (2) Good: > 2 500 (0) Bad: > 10 000	Investing.com	2 500	1 500	2 500	1 000	2 500	5 000	2 000	250 000	10 000
5	Morningstar Sustainability Rating	(3) 4 - 5 (2) 3 (1) 2 (0) 1	Yahoo!Finance	1	1	4	1	1	1	1	1	2
6	Morningstar Overall Rating	(3) 4 - 5 (2) 3 (1) 2 (0) 1	Morningstar	3	2	3	1	3	1	5	1	1
7	Morningstar Risk & Return 3 Year Rating: Risk vs. Category	(3) Below Average and Low (2) Average (1) Above Average (0) High	Morningstar	Above Average	High	Low	High	Below Average	Average	Low	High	Above Average
8	Morningstar Risk & Return Rating: Return vs. Category	(3) High (2) Above Average (1) Average (0) Below Average and Low	Morningstar	Average	Below Average	Average	Low	Average	Below Average	High	Low	Low
9	Lipper Leader Scorecard (Lipper Leaders Key:		Reuters									
9.1	Total Return	(3) 4 - 5 (2) 3 (1) 2 (0) 1		4	3	5	1	4	1	5	1	1
9.2	Consistent Return	(3) 4 - 5 (2) 3 (1) 2 (0) 1		4	3	5	1	4	1	5	1	1
9.3	Preservation	(3) 4 - 5 (2) 3 (1) 2 (0) 1		3	2	5	1	4	4	5	1	1
9.4	Tax Efficiency	(3) 4 - 5 (2) 3 (1) 2 (0) 1		2	3	3	5	2	2	1	5	1
9.5	Expense	(3) 4 - 5 (2) 3 (1) 2 (0) 1		5	4	4	3	5	4	1	2	0

Appendix 10. Industry classification of stocks included in the superinvestors' portfolios according to the Thomson Reuters Datastream.

	Industry / Sector	Number	Percent
1	Financial (commercial banks, investment, loan and insurance companies)	125	15,1%
2	Electronics (automatic controls, electronic data processing equipment, instruments, parts & components, radio, t.v. & phonograph manufacturers)	84	10,2%
3	Service organizations	76	9,2%
4	Oil, gas, coal & related services	65	7,9%
5	Drugs, cosmetics & health care	63	7,6%
6	Retailers	55	6,7%
7	Utilities	37	4,5%
8	Chemicals	27	3,3%
9	Transportation	26	3,1%
10	Machinery & equipment	23	2,8%
11	Radio & t.v. broadcasts	21	2,5%
12	Construction	20	2,4%
13	Food	20	2,4%
14	Recreation	20	2,4%
15	Automotive	17	2,1%
16	Land and real estate	17	2,1%
17	Beverages	16	1,9%
18	Wholesalers	16	1,9%
19	Aerospace	9	1,1%
20	Metal producers	8	1,0%
21	Miscellaneous	82	9,9%
	TOTAL:	827	100%