Protective Hypothetical Investment Portfolios during the COVID-19 Recession: Comparison with Superinvestors

Fedor ŠIMKO – Peter PŠENÁK***

Abstract

By examining the portfolios of renowned Superinvestors with different investment strategies, BRK-B of Warren Buffett and ARKK of Cathie Wood, we aimed to design hypothetical resilient portfolios that protect against the damaging effects of recessions. The presented analysis indicates that ARKK significantly outperformed BRK-B during the stability period. However, in the face of the Covid-19 pandemic-induced recession, BRK-B displayed a higher degree of resilience and stability compared to ARKK. All three of our hypothetical portfolios delivered positive returns during both periods of stability and recession. Importantly, our Tangency Portfolio demonstrated the strongest performance of all the investigated portfolios during the recession. Moreover, our Tangency Portfolio showed relatively high performance along with high stability. It is concluded that an investment approach based solely on diversification, can achieve superior returns, and even surpass the broader stock market with an acceptable level of risk.

Keywords: *Capital Asset Pricing Model, economic recession, resilient portfolio, Super-investors, diversification*

JEL Classification: G01, G11

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Introduction

The stability of financial markets is a prerequisite for reliable investment returns and progressive economic growth, since these markets represent the source of financing for government and individual activities (Wright and Quadrini, 2009). However, economic growth is not continuous but rather characterized by fluctuations in general economic activity in the form of business cycles. Times of long-term positive economic development are interrupted by periods of economic instability, manifested as economic recessions. A financial recession is a state of the economy with attenuation in most areas of economic activity, such as spending, employment, productivity, and overall output (Zafiu and Saracu, 2013). During an economic recession, there is frequently an increased degree of unpredictability in financial markets, and investors, as well as other market participants, become frightened.

Crises are often caused by unexpected and impactful situations, such as bank bankruptcy, a stock market crash, accidental events such as pandemics, natural catastrophes, or a cluster of repeated and not yet fully understood negative economic events. Markets have faced several economic recessions over the past decades with different causes. In the 21st century, three major financial crises have occurred.

The first one started at the beginning of the year 2000 with the burst of the Dotcom Bubble. During this time, a bubble formed around technological and Internet-based companies. Investors became too optimistic about their valuations and ignored any fundamental data regarding profitability and liquidity. This led to speculation supported by cheap interest rates and overconfidence about the future success of the Internet. Eventually, following the typical lifecycle of a speculative bubble, big corporations started to sell the overvalued stocks, and the market collapsed (Rapp, 2014).

In the year 2008, another financial crisis transpired, known as the Great Recession. It started in the USA when a speculative bubble began to form around the housing market. Several factors jointly created an environment that possessed the conditions that ultimately led to the crisis. To mention some of these, there was a time of low-interest rates, which reduced the cost of borrowing money. In addition, a growing optimism formed among homeowners and investors alike, who hoped that real estate prices would continue to increase. A severe issue was that there were no sufficient regulatory measures. Banks took advantage of this and began to create complex financial products called mortgage-backed securities. The demand for real estate was pushed to the extremes even more than before when all these factors became effective together. The cheap cost of borrowing

encouraged countless individuals to take out sizeable loans and purchase houses even though they could not repay the banks for the debts they incurred. But after a while, the enthusiasm subsided. Numerous borrowers began to understand that they could not repay the obligations they had accepted. As more and more individuals ultimately did this, a surge of mortgage defaults eventually happened. As lenders failed to recoup their debts, many organizations lost money, and consumers lost faith in the financial system (Rapp, 2014). The bubble popped, and a crisis followed. Due to the international character of global financial markets, the crisis spread quickly from the United States to other nations. During the first quarter of 2008, the crisis started to negatively affect European countries. The Gross Domestic Product (GDP) of the Eurozone decreased by 2.5%.

The most recent economic crisis happened in 2020. The COVID-19 recession was not caused by the burst of a market bubble. Instead, it was triggered by the emergence of a contagious virus in China. Its rapid transmission led to a global pandemic. To prevent the spread of the disease, many countries started implementing precautionary measures. The lockdowns restricted human contact, travel, but also overall consumption. Because of the decline in consumer activity, businesses had to lay off workers to save costs. This unusual situation led to high unemployment rates, low productivity, and eventually a stock market crash (Felsenthal, 2020; Markovič, et al., 2022). During this time, shares of many companies plummeted by 20% or more (Vishnoi and Mookerjee, 2020). The recession was however short-lived, as the lockdowns, protective measures, and vaccination became effective. The number of infected people decreased, and businesses started to expand production and hire workers again. The stock market recovered quickly and by the end of 2020, the share prices for some businesses returned to pre-pandemic levels. However, the recovery was far from even. Stock prices of companies in the travel, energy, and banking sectors, remained significantly lower than their pre-pandemic peaks (Bradley and Stumpner, 2021).

1. Theoretical Background and Hypotheses

Since recessions have a significant negative impact on economic development and living standards around the world, there is a constant effort to find means to prevent or minimize the adverse effects of economic recessions. Investing during a bear market brings both challenges and opportunities. However, it is generally accepted that a depressed market represents a higher level of risk and volatility and may not be acceptable to all investors (Schultz, 2002). Accordingly, several strategies can be adopted to reduce investment risk during a recession, such as hedging, diversification, and mimicking “Superinvestors”.

A common way to preserve the value of a portfolio and reduce volatility is a technique called hedging. A hedge is achieved by taking a position in an investment that offsets the changes in the value of an underlying asset (Hillier, Grinblatt and Titman, 2011). To achieve an effective hedge, two assets must interact in a particular way. An investor must purchase an asset that can balance out the price movements of another so that the whole portfolio is protected from unfavorable price variations. This requires that the investments have a strong, inverse relationship with each other. When the price of one security rises, the price of the other should fall, and vice versa. This helps to balance the portfolio and reduce overall risk. The goal is for the portfolio's overall value to stay reasonably steady and independent of market fluctuations. Security investors often use gold to hedge and protect themselves against probable financial losses. It is frequently seen as a safe haven asset, implying that it retains its value even when other investments decline. For this reason, it is feasible to minimize the overall volatility of a portfolio by investing in gold (Baur and Lucey, 2010).

Another valuable tool that can help to overcome the dangers of a bear market is diversification. In this strategy investors hold various financial assets to reduce the diversifiable risk of their portfolio, which is a kind of risk that results from unpredictability and is unique to a particular business. For example, a company might be sued, or launch a product that does not work out financially. These occurrences can significantly impact a company's success, but this risk can be reduced by spreading investments among numerous businesses. That is because if one company has problems, they might be balanced out by beneficial events happening at another company. Therefore, diversification is an important strategy for investors (Brigham and Ehrhardt, 2013). However, bear markets often spread among sectors and industries and are not specific to one single company. For this reason, hedging alone might not be able to eliminate all dangers that affect the overall economy. This risk is described as market risk arising from factors that systematically affect most firms, such as war, inflation, and economic recession (Brigham and Ehrhardt, 2013).

1.1. Superinvestors

"Superinvestors" are a narrow group of investors who successfully manage large capital over long periods. Due to their extensive experience, they are able to estimate quite reliably the relationship between the rate of return and the rate of risk (Buffett, 1984). They are often followed by smaller investors in times of instability and panic for their ability to time a sale or purchase correctly and maintain the stability of their funds (Siddiquee, 2022). Companies managed by well-known

investors, such as Warren Buffett's Berkshire Hathaway, and Cathie Wood's ARK Invest can serve as prime examples.

Berkshire Hathaway is a multinational holding company. Its shares are traded under the symbols BRK-A and BRK-B. The principal source of capital and the main activity of this company is insurance, while the unretained premium is invested in several subsidiary companies. Warren Buffett and Charlie Munger, vice-chairman (since 1978), both promote the principles of "Value investing". They seek to discover stable companies with strong business models and steadily growing cash flows. As a result, the historical value of the company's shares was very stable and grew significantly faster than the S&P 500 index (Gad, 2009).

ARK Investment Management LLC is an American investment management company founded by Cathie Wood in 2014. The shares of its most popular Innovation ETF are traded under the symbol ARKK. This fund focuses on investments in disruptive technologies and macroeconomic trends. It has major holdings in businesses like Tesla and other revolutionary companies focusing on artificial intelligence, gene editing, electric vehicles, robotics, and cryptocurrencies (ARK Invest, 2023). They are characterized by tremendous potential for growth in the future but often lack positive cash flows and do not generate profits yet.

1.2. Aim and Contribution

The objective of this paper was to consider the specific characteristics of financial markets during economic recessions and develop hypothetical portfolios that might be effective in reducing the impact of these harmful economic periods, and to examine whether disciplined portfolio construction based on formal asset allocation methods can offer a viable alternative to the imitation of well-known investors. Additionally, the paper blends these two approaches by introducing combined Superinvestor portfolios as a middle ground between pure emulation and technical optimization. The rationale for this process was that the investment strategies of retail investors are often influenced by the investment moves of famous and successful professionals. Because Buffett and Wood represent rather antagonistic investment philosophies and attract different risk/return preferences, combining and optimizing their portfolios can offer investors a balanced alternative while still gaining exposure to assets associated with proven managers that they seek to emulate. By evaluating performance separately during economic stability and the COVID-19 crisis within a rolling-window rebalancing framework, the study improves the realism of the comparison and highlights how the relative attractiveness of investment strategies changes across market conditions.

To achieve this aim, we explored the potential implications of financial market behavior during recessions for investors by considering Mean-Variance Analysis

and Capital Asset Pricing Model (Markowitz, 1952). To construct the portfolios, we utilized Exchange Traded Funds (ETFs), cryptocurrency, and commodities, such as gold. Moreover, we considered the strategies of Superinvestors, who presumably have found measures to successfully overcome the challenges that emerge during stock market crises (Buffett, 1984). To gain insight on how and why these individuals earn money, while most investors do not, we analyzed their performance during the period before, and during most recent stock market crash of 2020 at the start of the global COVID-19 pandemic. Subsequently, we explored the basic strategies investors can use to protect themselves against the adverse effects of these events. Next, we used these formal concepts to select and distribute the assets for hypothetical portfolios designed to endure a market crash. More specifically, we constructed three hypothetical portfolios and compared their performance with that of the recognized Superinvestors – Warren Buffett (BRK-B) and Cathie Wood (ARKK). Additionally, we combined the portfolios of these two investors in two mean-variance optimized portfolios, and one equally weighted portfolio. We then compared all the portfolios with a benchmark, which was used to reflect the performance of the broader market. Besides using statistical analysis to obtain the variance, standard deviation, mean, median, and covariance to get deeper insights into the characteristics of individual portfolios, we also utilized more sophisticated tools like Beta and the Sharpe Ratio. We tested the performance of all portfolios during the market periods of economic stability and of economic crisis, and aimed to disclose, whether our theoretical portfolios could match or even outperform the portfolios of Warren Buffett, Cathie Wood, and their combinations. In line with this consideration, we created three hypotheses to be tested:

Hypothesis 1: During the specified study periods, the Superinvestor portfolios yield a higher total return than our Minimum Variance Portfolio.

Hypothesis 2: During the specified study periods, the Superinvestor portfolios yield a higher total return than our Tangency Portfolio.

Hypothesis 3: During the specified study periods, the Superinvestor portfolios yield a higher total return than our Equally weighted portfolio.

2. Materials and Methodologies

2.1. Characteristics of Examined Object

To create our hypothetical investment portfolios, we used historical data on five different assets' daily adjusted closing prices, covering two distinct periods. Numbers represent the information on the historical prices and can be therefore

classified as quantitative data. The observations are quantitative and are collected at a daily frequency in order to maximize the number of observations and improve the precision of the estimated inputs. To determine the percentage change in the prices from one day to the next, we computed the daily changes in the price for each asset. In our testing, the period from January 1, 2017, to December 31, 2019, represented a time of economic stability. The time frame from January 2020 to December 31, 2022, is used to depict an economic recession. However, for the purpose of optimization, we extended the first estimation sample by 6 months, starting from June 1, 2016. This step was necessary to estimate the covariance matrix and expected returns for the out of sample optimization starting at 2017.

The assets used to assemble the hypothetical portfolios are Bitcoin (GBTC), Gold (GLD), Vanguard Information Technology ETF (VGT), Vanguard Real Estate ETF (VNQ), and Vanguard Total Stock Market ETF (VTI). From them, we create three hypothetical portfolios. Based on the Markowitz mean-variance framework, we created for both time frames a Minimum Variance Portfolio and a Tangency Portfolio. Additionally, we constructed an Equally weighted portfolio of all five assets to demonstrate the simplest way to allocate resources.

The framework for the portfolio optimization is based on the Modern Portfolio Theory (MPT), created by the Nobel Prize-winner Harry Markowitz based on the core assumption that investors are risk averse. Therefore, their objective should be to minimize risk. The main objective is to obtain the highest possible return for their given level of risk tolerance. Therefore, the performance of an individual investment is not as important as its impact on a portfolio that consists of multiple assets (Guerard, 2017).

A core tool in MPT is the Capital Asset Pricing Model (CAPM), which is used to estimate the expected returns of an asset based on its risk, as measured by its Beta, and the expected returns of the market as a whole (Hillier et al., 2011). This provides the basis for mean-variance analysis used to identify the so-called efficient frontier (Mlynarovič, 2006). An efficient frontier is a set of portfolios that offer the highest expected return for a given level of risk, under the assumption that investors care only about these two properties and there are no transaction costs (Hillier, Grinblatt and Titman, 2011).

An investor seeking to maximize his risk-adjusted return will opt for the Tangency portfolio. Extremely risk-averse investor will minimize volatility and assemble a Minimum Variance Portfolio (MVP). To identify the MVP, an investor must find the weights that make the covariance between each asset and the constructed portfolio equal to a constant number and rescale the weights, to sum up to 1. The return of this portfolio will have the same covariance as the return of every security it is composed of (Hillier, Grinblatt and Titman, 2011).

The weights of the Minimum Variance Portfolio and Tangency Portfolio were estimated using a rolling-window procedure and then applied out of sample. Specifically, at the end of each month, we rebalanced the portfolio weights using information from the preceding six months of daily returns, and these weights were then used for trading during the next month. The hypothetical portfolios were therefore rebalanced monthly, which in contrast to a single in-sample optimization eliminates look-ahead bias and ensured that the portfolios were evaluated under a realistic decision-making process.

The portfolios of Superinvestors are represented by the stock of their respective company. For Warren Buffett, it is Berkshire Hathaway (BRK-B); for Cathie Wood, it is ARK Investment Management (ARKK). In addition to evaluating these two assets individually, we also constructed combined Superinvestor portfolios with equal weightage of BRK-B and ARKK (Super-EWP), as well as mean-variance optimized (Super-MVP, Super-TP), by the same rolling-window optimization approach.

To create a benchmark that covers a wide range of industries and asset classes, we combined five different ETFs into an equally weighted index. The benchmark was composed of Vanguard Health Care ETF (VHT), Vanguard Information Technology ETF, Vanguard Financials ETF (VFH), Vanguard Energy ETF (VDE), and Invesco Dynamic Leisure & Entertainment ETF (PEJ). Benchmark returns are computed at the daily frequency and compounded to monthly returns for period-by-period comparisons with the monthly portfolio return series.

We evaluated the performance of each portfolio based on risk and return. Besides variance and standard deviation, we also evaluated the Beta coefficient. Beta measures the sensitivity of a security's returns to changes in the overall market returns and reflects the amount of risk that the stock imparts to the market portfolio (Brigham and Ehrhardt, 2013). The Beta of a broader market represented by a benchmark is always one. For measuring the performance, we used the average annual return. Finally, we computed the Sharpe Ratio. Investors use the Sharpe Ratio to find an investment with the highest expected return per unit of risk. When the Sharpe Ratio is maximized, a portfolio should offer the best possible risk-adjusted return. In other words, a high Sharpe Ratio indicates that an investment has generated high returns relative to the volatility it has exposed investors to. Similarly, a low Sharpe Ratio indicates that an equity does not provide sufficient returns when we consider how much risk it bears. The ratio is calculated as the average return minus the risk-free rate, divided by the standard deviation of the return (Sharpe, 1994).

2.2. Benchmark

In the field of finance, a benchmark represents a standard used as a reference point for comparison. Professional and retail investors use market indices to assess whether they outperformed or underperformed in the broader stock market and if their investment strategies are effective (Brigham and Ehrhardt, 2013). Investors often choose the S&P 500 index as a benchmark, but a benchmark can be a market index, individual stock, commodity, or even a combination of multiple asset classes.

For our analysis, we created a benchmark equally weighted between five different industries, substantially influenced by the two most recent market crises. To accurately represent each market sector, we selected an ETF specifically designed to monitor changes within that sector. For example, because the healthcare system was susceptible to the impacts of the COVID-19 virus, we used the Vanguard Health Care ETF (VHT) to represent this part of the economy in the benchmark. Another industry that was significantly affected by the global pandemic was travel and tourism. Therefore, our benchmark includes the Invesco Dynamic Leisure & Entertainment ETF (PEJ).

Additionally, the military tensions, which started at the beginning of 2022, strongly impacted companies in the energy and financial industries. Therefore, we used the Vanguard Energy ETF (VDE) and the Vanguard Financials ETF (VFH) to symbolize these sectors. Finally, we used the Vanguard Information Technology ETF (VGT) as the last component for our benchmark. The rationale for this was that technology companies are more volatile than others and tend to respond quickly and intensively to changes in market sentiment. Therefore, the benchmark should represent the overall economy well, emphasizing the mentioned sectors.

2.3. Bitcoin

Bitcoin is the most well-known and prominent cryptocurrency when measured by market capitalization. In contrast to traditional currencies, it is not controlled by a centralized authority such as the government and works only through digital media (Davis, 2011). Because of its excellent past growth, we included it in our portfolios as a trust (GBTC). Nonetheless, Bitcoin remains highly volatile, with its price fluctuating by several percentage points per day.

2.4. Gold

Gold is a commodity that is used for better diversification and stabilization of a portfolio. It is special for investors because it reacts differently to economic trends than shares. While stocks respond positively to economic expansion and negatively to economic contraction, gold often tends to move the other way

around. During times of economic prosperity, companies tend to expand and earn more profits. When the economic climate reverses, however, businesses suffer, and investors fear volatility and the fact that they can lose their wealth invested in stocks. For this reason, they choose to buy gold instead, which is considered a stable and safe investment. This is the reason why the prices of gold increase when the economy crumbles (Baur and Lucey, 2010). Investors who understand this unique feature can use the precious metal as a so-called hedge and offset the losses during an economic recession. In our hypothetical portfolios gold is represented by an ETF (GLD).

3. Results

3.1. Period of Economic Stability (2017 – 2019)

The period of 2017 – 2019, represented a time of economic stability and low market volatility. In this section we present the results for this period and explain how the hypothetical portfolios behave compared to the portfolios of Superinvestors and the broader market, represented by the benchmark.

During the years 2017 – 2019, the Minimum Variance Portfolio exhibited the lowest variance of 0.005 and standard deviation of 7.37%, which makes it most stable among all the alternatives. MVP also yields an annual return of 10.90%, and the highest Sharpe Ratio of 0.39, despite not being optimized for this goal. The Beta coefficient is by far the lowest, only 0.28.

Tangency Portfolio

The Tangency Portfolio performed underwhelmingly during the period of economic stability. Its variance and standard deviation were among the lowest, but still significantly larger than that of the MVP, at 0.019 and 14.01% respectively. The annual return was only 12.91%, only slightly above the MVP and the benchmark. The Sharpe Ratio of the Tangency Portfolio was 0.24, which is also the lowest value in our portfolio sample. Finally, the Beta coefficient of 0.53 was the highest.

Equally Weighted Portfolio

The Equally weighted portfolio consists of 20% of each asset. It had the highest volatility of 0.089 and standard deviation 29.76%, but it also delivered by far the highest average annual returns at 36.17%. Its Sharpe Ratio of 0.34 was the second-highest, and its Beta was 0.48.

T a b l e 1

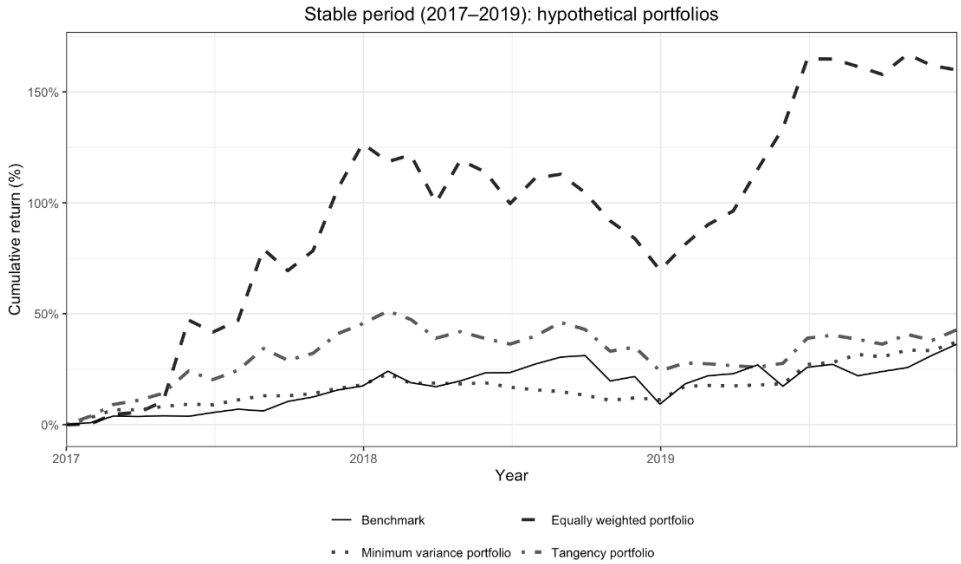
Hypothetical Portfolio Performance (2017 – 2019)

Metric	Minimum Variance Portfolio	Tangency Portfolio	Equally Weighted Portfolio	Benchmark
Variance	0.005	0.019	0.089	0.018
Standard deviation	7.37%	14.01%	29.76%	13.54%
Average annual return	10.90%	12.91%	36.17%	11.31%
Sharpe Ratio	0.39	0.24	0.34	0.22
Beta	0.28	0.53	0.48	1.00

Source: Own calculations.

F i g u r e 1

Hypothetical Portfolio Returns during the Period 2017 – 2019



Source: Own calculations.

Superinvestor Portfolios

The portfolio of Cathie Wood delivered among Superinvestors the highest annual returns of 36.04%. However, it seems to lack stability, as its variance 0.073 and standard deviation 27.08%, were the highest among all Superinvestor portfolios. The Sharpe Ratio of ARKK was 0.37 and the Beta coefficient was the highest, at 1.48. Berkshire Hathaway stock performed relatively worse between the years 2017 and 2019. Its annual return 11.98% was only slightly above the benchmark. The variance 0.020 and standard deviation 14.09% were low, but higher than in the benchmark, or the MVP and the Tangency Portfolio. The value for the Sharpe Ratio was one of the lowest at only 0.23.

T a b l e 2

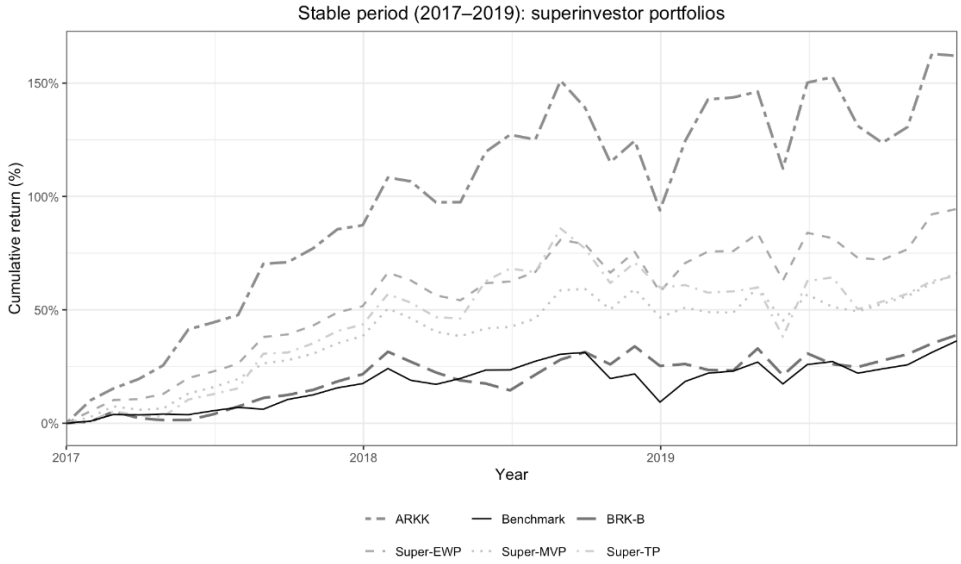
Superinvestor Portfolio Performance (2017 – 2019)

Metric	BRK-B (Warren Buffett)	ARKK (Cathie Wood)	Super – MVP	Super – TP	Super – EWP	Benchmark
Variance	0.020	0.073	0.022	0.047	0.033	0.018
Standard deviation	14.09%	27.08%	14.83%	21.58%	18.29%	13.54%
Average annual return	11.98%	36.04%	18.12%	19.04%	20.40%	11.31%
Sharpe Ratio	0.23	0.37	0.33	0.24	0.36	0.22
Beta	0.73	1.48	0.82	1.03	1.11	1.00

Source: Own calculations.

F i g u r e 2

Superinvestor Portfolio Returns during the Period 2017 – 2019



Source: Own calculations.

All the combined Superinvestor portfolios were able to outperform the benchmark, but all three were also more volatile. Despite not being optimized, the simplest Equally weighted portfolio (Super-EWP), which was weighted equally between BRK-B and ARKK, achieved the second-highest Sharpe Ratio among all the Superinvestor portfolios of 0.36. Nonetheless, this value was still lower than for the hypothetical MVP. This portfolio also offered a high return of 20.40%, which was only exceeded by ARKK and the hypothetical Equally weighted portfolio. Similarly to the hypothetical Tangency Portfolio, the Superinvestor Tangency Portfolio (Super-TP) failed to maximize the Sharpe Ratio, which was among the lowest overall. Unexpectedly, the Superinvestor Minimum Variance Portfolio

(Super-MVP), did much better in this regard, with a SharpeRatio of 0.33. It was however still slightly more volatile than plain BRK-B (0.022 vs 0.020) while offering a higher annual return by 6.14%.

3.2. Period of Economic Crisis (2020 – 2022)

The years from 2020 to 2022, represents a period of economic instability and high market volatility. In this section we present the results for this period and explain how the hypothetical portfolios behave compared to the portfolios of Superinvestors and the broader market, represented by the benchmark.

Minimum Variance Portfolio (MVP)

The MVP is the most stable portfolio even during a period of economic uncertainty. It has the lowest variance 0.02 and the lowest standard deviation 13.87% of all alternatives. It delivers a modest expected return of only 8.23% and its Beta coefficient of 0.29 was the lowest of all portfolios. The Sharpe Ratio 0.15 was substantially lower than during the period of economic stability.

Tangency Portfolio

The Tangency Portfolio performed significantly better during the market crisis than during the period of stability. It offers the highest Sharpe Ratio of 0.24 and variance of 0.04 and standard deviation of 21.18% and Beta 0.52. Its annual return was 18.34%, the highest of all the hypothetical portfolios.

Equally Weighted Portfolio

This portfolio offered an annual return of 13.92%. It had the highest volatility, represented by a variance and standard deviation of 0.08 and 27.80%, respectively. It had a Beta of 0.79 and a Sharpe Ratio of 0.13.

T a b l e 3

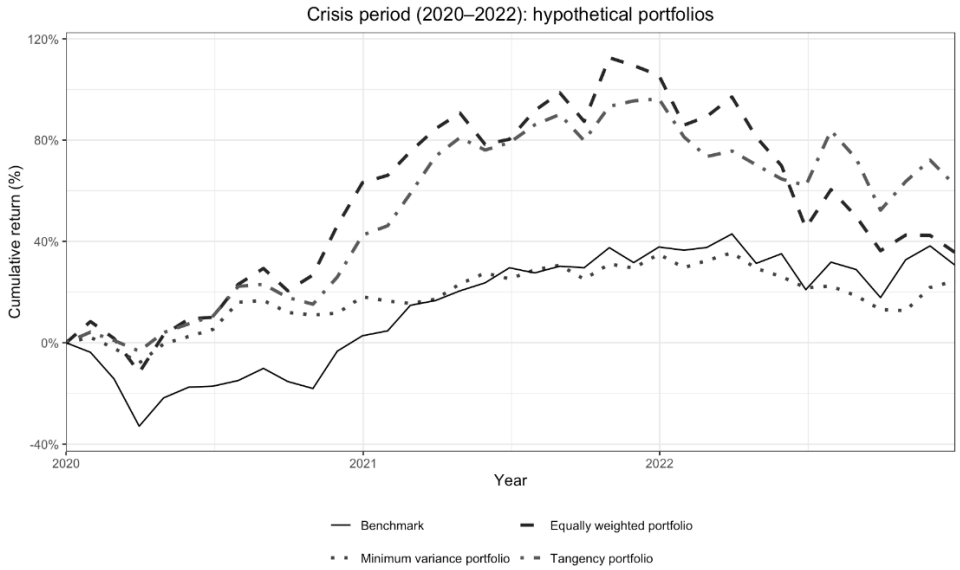
Hypothetical Portfolio Performance and Risk Data (2020 – 2022)

Metric	Minimum Variance Portfolio	Tangency Portfolio	Equally Weighted Portfolio	Benchmark
Variance	0.019	0.045	0.077	0.072
Standard deviation	13.87%	21.18%	27.79%	26.92%
Average annual return	8.23%	18.34%	13.92%	12.50%
Sharpe Ratio	0.15	0.24	0.13	0.12
Beta	0.29	0.52	0.79	1.00

Source: Own calculations.

F i g u r e 3

Hypothetical Portfolio Returns during the Period 2020 – 2022



Source: Own calculations.

Superinvestor Portfolios

The investment fund of C. Wood performed the worst out of all examined investments. ARKK did not only have the highest fluctuation of returns, which is represented by the highest volatility 0.19 and standard deviation 44.09% but also the lowest expected return. In fact, the expected returns for the portfolio are negative (–5.3%). This is also reflected in the lowest Sharpe Ratio, which is also negative (–0.04). Finally, the Beta for ARKK is 1.07, which is the highest value for this coefficient.

The portfolio of W. Buffett performed relatively better during the crisis. It delivered the annual return of 13.14%. The volatility and standard deviation increased to 0.06 and 23.83%, respectively. The portfolio has a Sharpe Ratio of 0.15 and a Beta of 0.68.

Of the combined Superinvestor portfolios the Tangency managed to outperform the benchmark. In fact, at 21.59%, it delivered the highest return among all the portfolios. It also had the second-best overall risk-return payoff, represented by a Sharpe Ratio of 0.18. While the Super-EWP delivered a positive return of 4.77%, it was the second lowest. Combined with the overall highest standard deviation of 29.03%, it now yielded a low Sharpe Ratio of 0.04. The Super-MVP achieved the lowest volatility out of all the Super portfolios at 0.057, while underperforming the benchmark by 2%.

T a b l e 4

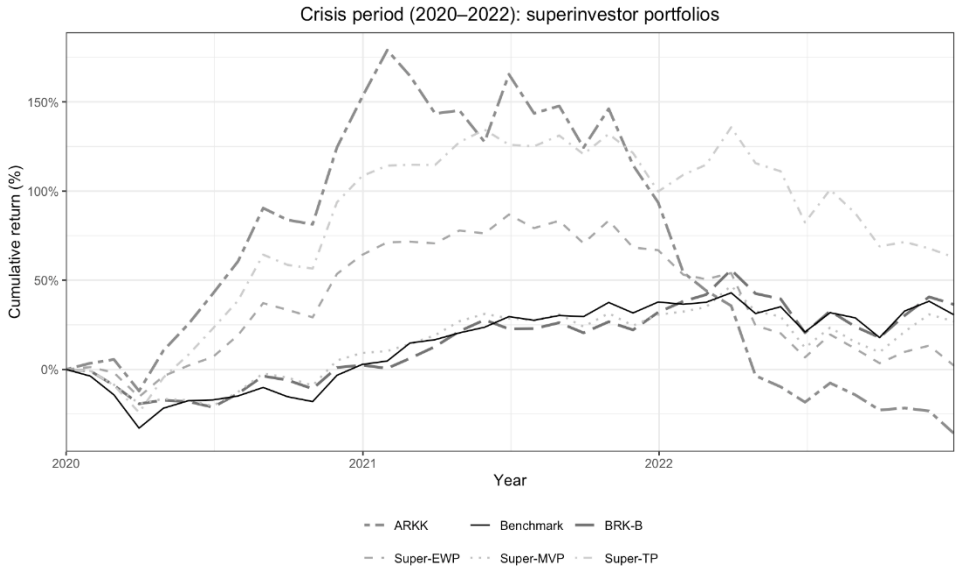
Superinvestor Portfolio Performance (2020 – 2022)

Metric	BRK-B (Warren Buffett)	ARKK (Cathie Wood)	Super – MVP	Super – TP	Super – EWP	Benchmark
Variance	0.057	0.194	0.057	0.113	0.084	0.072
Standard deviation	23.82%	44.09%	23.78%	33.5%	29.03%	26.92%
Average annual return	13.14%	–5.30%	10.70%	21.59%	4.77%	12.50%
Sharpe Ratio	0.15	–0.04	0.12	0.18	0.04	0.12
Beta	0.68	1.07	0.72	0.96	0.87	1.00

Source: Own calculations.

F i g u r e 4

Superinvestor Portfolio Returns during the Period 2020 – 2022



Source: Own calculations.

4. Discussion

4.1. Period of Economic Stability (2017 – 2019)

Our analysis indicates that during stable economic conditions, all portfolios delivered positive returns. Only the Equally weighted portfolio outperformed the benchmark, Warren Buffett's Berkshire Hathaway (BRK-B), and ARK Innovation ETF (ARKK), making Hypothesis 3 unsupported. Since BRK-B underperformed the Tangency Portfolio, Hypothesis 2 is also not supported. However, none of the other portfolios beat the exceptional returns that ARKK delivered, which is consistent with Hypothesis 1. This extraordinary performance of Cathie Wood came,

however, at the cost of the highest volatility out of all alternatives. Surprisingly, the Equally weighted portfolio slightly outperformed ARKK in annual return, but had a lower Sharpe Ratio and a higher standard deviation. It is also worth pointing out that the value-oriented investing approach of Warren Buffett yielded relatively modest returns. However, only the portfolios of both Superinvestors delivered positive returns in all three years. On the other hand, every hypothetical portfolio, as well as the benchmark, decreased in value during 2018. A potential underlying reason may be the fact that both Superinvestors rebalanced their portfolios in response to the changing conditions in that year. In contrast, our passively managed portfolios did not change the composition frequently enough and incurred losses.

Although the hypothetical portfolios did not deliver the highest possible return during economic stability, the Tangency and Minimum Variance portfolios secured the lowest risk. It is reasonable to suppose that a risk-averse investor would simply choose the portfolio with the lowest volatility, or variance, the Minimum Variance Portfolio. Such a cautious investor would sacrifice higher returns, however, his annual return would be only 1% lower than BRK-B's, which was twice as volatile. An investor seeking the best possible risk-return profile would theoretically want to invest in the Tangency Portfolio, yet its optimization strategy did not deliver the highest, but the lowest Sharpe Ratio of all optimized portfolios. This surprising behavior is due to the fact that the optimization strategy maximizes the estimated Sharpe Ratio in the rolling estimation window. The realized Sharpe Ratio might, however, differ out of sample due to estimation error in expected returns (Yang and Luo, 2025). The portfolio further delivered the lowest returns while having a similar volatility to the much better performing benchmark.

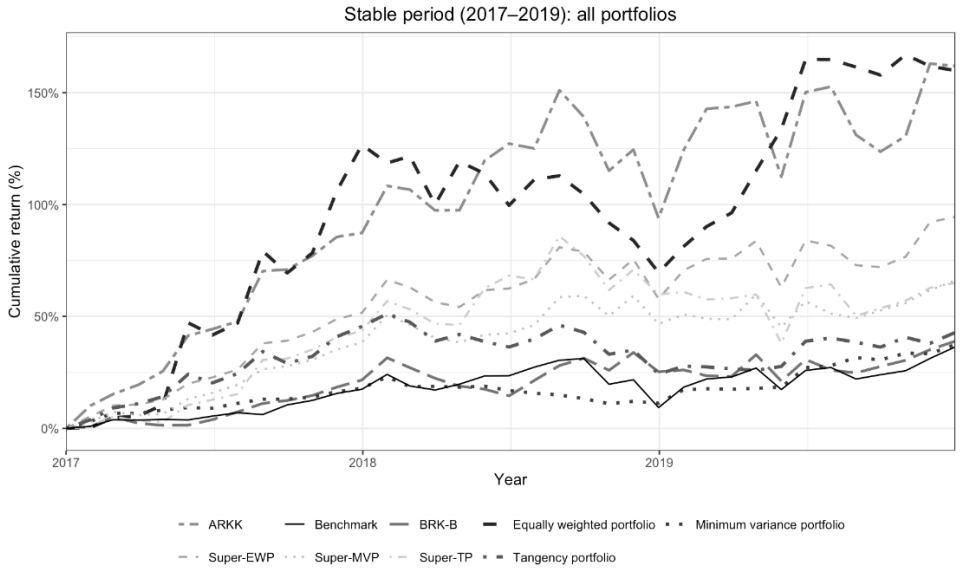
Another unanticipated finding was that the least sophisticated approach of distributing the investable wealth equally among five diverse assets delivered exceptional returns. As mentioned previously, it almost matched the performance of the ARK fund. An investor who is seeking the highest possible profits but still desires to reduce risk exposure may consider choosing the Equally weighted portfolio over the ARK ETF. This way, he could obtain a comparable return with lower risk and arguably better diversification, which is consistent with the evidence that simple diversification can perform competitively out of sample (DeMiguel, Garlappi and Uppal, 2009). This is also partially shown in the Beta coefficient and standard CAPM intuition (Brigham and Ehrhardt, 2013). Except for ARKK and the Super – EWP, all portfolios had a Beta lower than one. The portfolio of Warren Buffett moved closely with the broader market represented by the benchmark. This is indicated by a Beta of 0.73 and very similar variance and annual return. The three optimized hypothetical portfolios had low Betas, indicating their low volatility compared to the market benchmark.

Combining and optimizing the Superinvestor portfolios did not create any significant advantages over the optimized hypothetical portfolios. In this case, the Superinvestor Tangency Portfolio failed to maximize the Sharpe Ratio, similarly to the hypothetical Equally weighted Portfolio. The best performance was delivered by the EWP Superinvestor portfolio, but its returns and risk-return payoff were still below the hypothetical Equally weighted portfolio. Among the Superinvestor portfolios, the MVP performed on par with the EWP and Tangency, while securing lower volatility and higher Sharpe ratio. This might indicate that risky strategies may not deliver higher returns compared to low-risk investments, even in stable markets (Blitz, Van Vliet and Baltussen, 2020).

It seems that during stable economic environment mirroring the strategies of Superinvestors in question did not lead to better returns or lower risk than selecting a broad range of assets, even after optimization according to the Modern Portfolio Theory. A notable observation is, that in both cases, formal optimization failed to maximize the Sharpe ratio out of sample (Michaud, 1989). Unexpectedly, the best strategy for maximizing the realized Sharpe ratio in hypothetical and Superinvestor portfolios turned out to be a simple, equally weighted diversification of assets (DeMiguel, Garlappi and Uppal, 2009).

F i g u r e 5

Combined Portfolio Returns during the Period 2017 – 2019



Source: Own calculations.

4.2. Period of Economic Crisis (2020 – 2022)

After looking closely at the results during the recession, one can recognize that just one of the two professional investors successfully navigated the economic downturn. In this case, Cathie Wood's portfolio was still the most volatile but now also offered the lowest returns. The likely reason behind this development is the nature of Wood's investment philosophy. She invests in businesses, which require huge up-front capital (ARK Invest, 2023). However, because of the stricter credit conditions and elevated risk aversion among market participants during a recession, these businesses struggle to source loans and funding, and their valuations decrease since they are yet unable to generate cash flows (Pagano, Wagner and Zechner, 2023). The character of these investments is also reflected in the high Beta coefficient, which causes the ARK Innovation ETF to deliver excellent returns when the general market performs well but to underperform when the tables turn (Nazaire, Pacurar and Sy, 2021). Our results accurately depict that ARK's assets, which were in 2021 50 billion USD, fell to only 16 billion by May 2022 (Marquit, 2022).

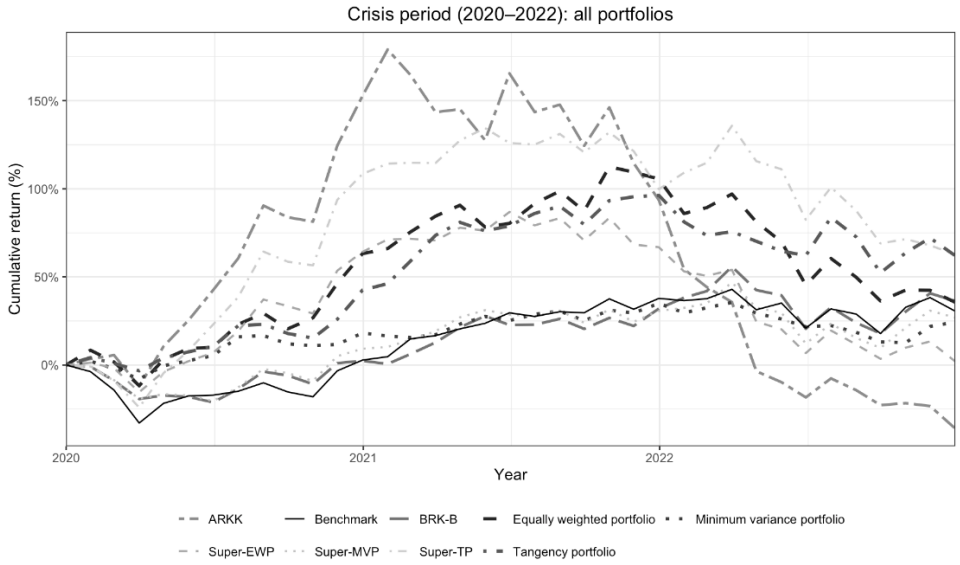
It is during times of uncertainty and fear that the "Value investing" approach of Warren Buffett truly shines (Asness et al., 2015). BRK-B delivered the above-average returns during this period and outperformed the MVP and almost matched the Equally weighted portfolio. Thus, the results are consistent with supporting Hypothesis 1. Even more impressively, Berkshire Hathaway performed during this period better than before, which agrees with the historical data (Gad, 2009).

Unsurprisingly, the Minimum Variance Portfolio was the most stable but yielded only moderate returns. It delivered modest returns of 8.23%. The low Beta of only 0.29 shows that this portfolio is relatively immune to strong movements in the broader market (Blitz, Van Vliet and Baltussen, 2020). Broadly speaking, the Equally weighted portfolio performed similarly to Berkshire Hathaway. However, it provided a slightly higher return (13.92%) and higher volatility, as measured by the standard deviation (27.79%). The most surprising results are related to the Tangency Portfolio. In contrast to the period of economic stability, where it failed to achieve a high Sharpe Ratio and delivered underwhelming returns, it now offered the second-highest return (18.34%) and Sharpe Ratio (0.24), (Torrente and Uberti, 2025).

The optimized Superinvestor portfolios performed significantly better during the crisis. The most impressive was the Super-Tangency portfolio that now delivered the highest overall return of 21.59%, even higher than during market stability. This shows that there is a benefit to following the moves of Superinvestors during turbulent economic periods (Pankratz, Bauer and Derwall, 2023). It also shows that predicting and optimizing the Sharpe ratio seems to be an effective defensive strategy, as it was the most profitable approach in both hypothetical, and Superinvestor portfolios.

F i g u r e 6

Combined Portfolio Returns during the Period 2020 – 2022



Source: Own calculations.

Conclusions

During an economic recession, due to the increased degree of unpredictability in financial markets, investors are cautious and try to find means to minimize the adverse effects of potential economic turbulence. The goal of our work was to develop hypothetical portfolios that could be effective in reducing the impact of these damaging economic events. To achieve this goal, we mapped the behavior of financial markets during the recent economic recession caused by COVID-19 and created three hypothetical portfolios. We compared these portfolios with the portfolios of Superinvestors who use fundamentally different investment strategies – Cathie Wood's "Thematic Investing" and Warren Buffett's "Value Investing" and examined the varied behaviors of all the portfolios in question during both recessionary and economically stable periods.

The hypothetical portfolios proposed in this work were relatively immune to large market swings, each indicating some special differences compared to the Superinvestors whose portfolios behaved differently in stable and unstable market periods. Although ARKK provided one of the highest returns during periods of stability, it came with significant volatility. This instability manifested in a sharp decline in portfolio value during the second period of the COVID-19 recession.

On the other hand, W. Buffett's "Value investing" approach showed significantly lower returns during periods of economic stability, but these gains were reliably achieved throughout various economic cycles and even increased during recessionary periods. Our hypothetical portfolios were also of a various nature, each putting emphasis on different investing preferences. As expected, the Minimum Variance Portfolio was the most stable during both periods, but with relatively low financial gain. The highest gains were achieved by the Equally weighted portfolio in the period of stability, which almost matched ARKK and even surpassed during the recession. However, this gain came at the expense of a relatively high level of volatility bearing a potential for adverse changes. Interestingly, the strategy of maximizing the Sharpe Ratio did not prove to be an effective approach in a stable market environment as it failed to achieve its purpose of delivering the best ratio of risk and return. Nevertheless, the strategy yielded above-average returns in the case of Superinvestor portfolios. In short, the recession has revealed that Cathie Wood's "Thematic Investing" strategy is not resilient enough to withstand economic downturns, as reflected in the significant turbulence and underperformance of Wood's portfolio during these periods. This portfolio recovered very quickly from the initial decline in early 2020, but the losses in the later years eventually offset all the gains it made initially. Thus, while it may offer the potential for high returns during economic growth, its sensitivity to market fluctuations highlights the importance of diversification and risk management, as Berkshire's "Value Investing" portfolio suggests. Two of our hypothetical portfolios, the Tangency Portfolio and the Equally Weighted Portfolio, performed better than the benchmark in both periods examined, with returns comparable, or even better than the Superinvestors. However, the strong returns of the Equally weighted portfolio came at the expense of its higher volatility. On one hand, it was unexpected that the Tangency Portfolio failed to achieve its objective of achieving the best risk-return payoff during stable and relatively predictable economic setting but achieved this goal during the turbulent climate of economic downturn. It turned out to be the most successful strategy, irrespective of the underlying assets. On the other hand, the MVP achieved its aim of minimizing volatility during both periods, but this came at the expense of returns, that were consistently among the lowest.

The Modern Portfolio Theory, as presented by Markowitz, provides a valuable tool that can help investors to protect themselves during times of economic recession (Elton and Gruber, 1997; Guerard, 2009). In our sample, although optimization-based allocations struggled to deliver excess returns over simple diversification strategies during times of economic prosperity, they were particularly resilient in periods of crises, where controlling risks became crucial.

At the same time, the results indicate that there is no universally effective investment approach across all market environments. The key is to match the strategy

to the prevailing economic climate. Consistent with this view, our work suggests that even a simple rules-based portfolio, well diversified across stocks and other assets, can be resilient even during recessionary pressures and, in several cases, outperform the broader stock market and even the actively managed portfolios of professional investors.

References

ARK INVEST (2023): ARKK | The ARK Innovation ETF managed by Cathie Wood. Available at: <https://ark-funds.com/funds/arkk/>.

ASNESS, C. S. – FRAZZINI, A. – ISRAEL, R. – MOSKOWITZ, T. J. (2015): Fact, Fiction, and Value Investing. The Journal of Portfolio Management, *42*, No. 1, pp. 34 – 52. DOI: 10.3905/jpm.2015.42.1.034.

BAUR, D. G. – LUCEY, B. M. (2010): Is Gold a Hedge or a Safe Haven? An Analysis of Stocks, Bonds and Gold. Financial Review, *45*, No. 2, pp. 217 – 229.

BLITZ, D. – VAN VLIET, P. – BALTUSSEN, G. (2020): The Volatility Effect Revisited. The Journal of Portfolio Management, *46*, No. 2. DOI 10.3905/jpm.2019.1.114.

BRADLEY, C. – STUMPNER, P. (2021): The Impact of COVID-19 on Capital Markets, One Year in. Chicago, IL: McKinsey & Company. Available at: <http://ceros.mckinsey.com/covid-capitalmarkets-exhibit1>.

BRIGHAM, E. – EHRHARDT, M. (2013): Financial Management: Theory & Practice. Boston: Cengage Learning. ISBN 978-1-111-97220-2.

BUFFETT, W. E. (1984): The Superinvestors of Graham-and-Doddsville. Columbia Business School. Available at: <https://business.columbia.edu/cgi-finance/chazen-global-insights/superinvestors-graham-and-doddsville>.

CAZAN ZAFIU, D. – CUCOS SARACU, A. F. (2013): The Economic Crisis – Meanings and Significations Causes and Solutions. Annals of Dunarea de Jos University. Fascicle I: Economics and Applied Informatics, *19*, No. 2, pp. 21 – 24.

DAVIS, J. (2011): The Crypto-Currency. Electronic Journal. Available at: <https://www.newyorker.com/magazine/2011/10/10/the-crypto-currency>.

DEMIGUEL, V. – GARLAPPI, L. – UPPAL, R. (2009): Optimal versus Naive Diversification: How Inefficient is the 1-N Portfolio Strategy? The Review of Financial Studies, *22*, No. 5, pp. 1915 – 1953.

ELTON, E. J. – GRUBER, M. J. (1997): Modern Portfolio Theory. Journal of Banking & Finance, *21*, No. 11, pp. 1743 – 1759.

FELSENTHAL, M. (2020): COVID-19 to Plunge Global Economy into Worst Recession since World War II. Washington, DC: World Bank. Available at: <https://www.worldbank.org/en/news/press-release/2020/06/08/covid-19-to-plunge-global-economy-into-worst-recession-since-world-war-ii>.

GAD, S. M. (2009): The Business of Value Investing: Six Essential Elements to Buying Companies Like Warren Buffett. Hoboken: John Wiley & Sons. ISBN 978-0-470-55385-5.

GUERARD, J. (2017): Portfolio Construction, Measurement, and Efficiency: Essays in Honor of Jack Treynor. Berlin: Springer. ISBN 978-3-319-33974-0.

GUERARD, J. B. (2009) Handbook of Portfolio Construction: Contemporary Applications of Markowitz Techniques. Berlin: Springer Science & Business Media. ISBN 978-0-387-77439-8.

HILLIER, D. – GRINBLATT, M. – TITMAN, S. (2011): Financial Markets and Corporate Strategy European Edition 2e. London: McGraw Hill. ISBN 978-0-07-714135-6.

MARKOVIČ, P. – POLLÁK, F. – VAVREK, R. – KOSTIUK, Y. (2022): Impact of Coronavirus Pandemic on Changes in e-Consumer Behaviour: Empirical Analysis of Slovak e-Commerce Market. Ekonomický časopis/Journal of Economics, *70*, No. 4, pp. 368 – 389. DOI: 10.31577/ekoncas.2022.04.04.

MARKOWITZ, H. (1952): Portfolio Selection. The Journal of Finance, *7*, No. 1, pp. 77 – 91.

MARQUIT, M. (2022): Cathie Wood: Who Is She and Why Do So Many People Follow Her Investing Advice? Yahoo Finance. Available at: <https://finance.yahoo.com/news/cathie-wood-she-why-many-221800315.html>.

MICHAUD, R. O. (1989): The Markowitz Optimization Enigma: Is "Optimized" Optimal? Financial Analysts Journal, *45*, No. 1, pp. 31 – 42.

MLYNAROVIČ, V. (2006): Investment Opportunities Efficient Frontiers Modelling. Ekonomický časopis/Journal of Economics, *54*, No. 1, pp. 80 – 97.

NAZAIRE, G. – PACURAR, M. – SY, O. (2021): Factor Investing and Risk Management: Is Smart-Beta Diversification Smart? Finance Research Letters, *41*, July, 101854. DOI: 10.1016/j.frl.2020.101854.

PAGANO, M. – WAGNER, Ch. – ZECHNER, J. (2023): Disaster Resilience and Asset Prices. Journal of Financial Economics, *150*, No. 2, 103712. DOI: 10.1016/j.jfineco.2023.103712.

PANKRATZ, N. – BAUER, R. – DERWALL, J. (2023): Climate Change, Firm Performance, and Investor Surprises. Management Science, *69*, No. 12, pp. 7352 – 7398. DOI: 10.1287/mnsc.2023.4685.

RAPP, D. (2014): Bubbles, Booms, and Busts: The Rise and Fall of Financial Assets. Berlin: Springer. ISBN 978-1-4939-1092-2.

SCHULTZ, H. D. (2002): Bear Market Investing Strategies. Chichester: John Wiley & Sons. ISBN 978-0-470-84702-2.

SHARPE, W. F. (1994): The Sharpe Ratio. The Journal of Portfolio Management, *21*, No. 1, pp. 49 – 58.

SIDDIQUEE, M. (2022): Walter J. Schloss: The Superinvestor of Graham-and-Doddsville. Electronic Journal. Available at: <https://papers.ssrn.com/abstract=4205950>.

TORRENTE, M.-L. – UBERTI, P. (2025): The Reasons Why Maximum Diversification Is Better Than Minimum Risk, Including in Terms of Risk. Journal of Asset Management, *26*, No. 6, pp. 642 – 675. DOI: 10.1057/s41260-025-00420-4.

VISHNOI, A. – MOOKERJEE, I. (2020): Perfect Storm Plunges Asia Stocks into Bear Markets One by One. Bloomberg. Available at: <https://www.bloomberg.com/news/articles/2020-03-09/perfect-storm-is-plunging-asia-stocks-to-bear-markets-one-by-one>.

WRIGHT, R. E. – QUADRINI, V. (2009): Money and Banking. Boston: Flat World Knowledge. ISBN 978-0-9820430-8-0.

YANG, H. – LUO, Z. (2025): Entropy and Minimax Risk Diversification: An Empirical and Simulation Study of Portfolio Optimization. Stats, *8*, No. 4, pp. 115. DOI: 10.3390/stats8040115.