MOMENTUM INVESTING IN MULTI-ASSET PORTFOLIO

Katarína Synčáková

Abstract

This study examines performance of actively managed mutual fund, which is based on momentum allocation of various asset classes. The aim of the contribution is to analyse, whether the actively managed portfolio has the potential to outperform its reference index (benchmark). In addition, this study seeks to demonstrate that the classical diversification in a multi-asset mutual fund is not appropriate and asset classes should be managed dynamically. The calculations are based on the momentum of three indices (stocks, government bonds and commodities), using daily prices from 1988 to 2020. Reference portfolio is also constructed of those three asset classes, which are equally weighted and rebalanced monthly. The actively managed portfolio is then compared to the benchmark using fund performance indicators such as the Sharpe ratio, Jensen's alpha, beta, annual volatility and returns. We believe that dynamically managed asset allocation is able to produce superior investment returns compared to its benchmark.

Key words: active portfolio, momentum, multi-asset portfolio, asset allocation

JEL Code: F37; G12; G17

Introduction

Becoming more and more popular, mutual funds have begun to play an increasingly important role in financial markets. The mutual funds industry has experienced huge growth internationally in recent years, becoming the primary mean through which individuals and most institutions invest in capital markets. Generally, investors can choose from two types of mutual funds: actively and passively managed.

Active management refers to a portfolio management strategy where the manager makes specific investments with the goal of outperforming an investment benchmark index. The goal of active mutual funds is to beat the stock market's average returns and take full advantage of short-term price fluctuations. It involves a much deeper analysis and the expertise to know when to pivot into or out of a particular stock, bond, or any asset.

On the other hand, in passive management, investors expect a return that closely replicates the investment weighting and returns of a benchmark index and will often invest in an index fund or Exchange Traded Fund (ETFs). A passive fund tracks a market index or a specific market segment. The fund manager does not decide which security to invest in. (Fortin, 2005, Gruber, 1996; Mingo-López, 2017).

Many studies provide empirical evidence that the majority of active mutual funds underperform the market and that those few funds ouperform it. Still, the dominant share of professionally managed assets follows an active investment strategy, despite the strong growth of passive products in recent years. This apparent contradiction makes active mutual funds an interesting field of academic research on the behavior of market participants and its implications for the value of active management. However, according to Morningstar's August 2019 Barometer, 48% of active U.S. stock funds outperformed their average passive peer over the twelve months through June 2019. That is an increase of 11% over the year through June 2018. Also, active growth funds saw the biggest rebound in one-year success rates as 66% of such funds beat the average of the passive funds in their categories, an increase from the 44% reported in the previous year. (Fortin, 2005; Petajisto, 2013)

1 Momentum investing

The performance of actively managed mutual funds can be difficult to predict. Fund managers tend to select portfolios by using the past performance of assets to predict future performance. Analysis of the historical performance of a strategy can provide valuable insight into its general risk and return properties. Furthermore, historical analysis allows comparing variations of a strategy and examining the impact of various parameter choices and implementation rules. However historical performance of a strategy is not necessarily an indication of its success in the future, valuable insight can still be obtained in terms of general risk and return properties of a strategy as well as sensitivity to strategy parameters. It is important to note that in this type of analysis one is considering dynamic strategies where different decisions are made on each date based on the information available at that time. (Kolanovic, 2018; Seymour, 2018)

Portfolio managers use quantitative models such as momentum to build the portfolio and predict its performance. It is one of the oldest and most popular trading strategies in the investment industry. Momentum investing is based on the theory that established trends in the price of an asset will continue. The current period's winners will also be the winners of the

next period and losers will also be the losers of the next period. The strong becomes stronger and the weak becomes weaker. Short-term price increases, typically over six months and up to a year and can be an indicator of future performance. Its dynamic quantitative approach is designed to ensure the portfolio maintains significant exposure to the momentum factor even in changing market environments. Momentum strategy is generally implemented with equity, bond, currency and commodity futures contracts. (Antonacci, 2013; Kazemi, 2008)

2 Data and methodology

The empirical tests in this study are designed to meet the requirements of flexible multi-asset portfolios. Dynamically managed portfolio is composed of three total return indices using 32 years of daily return data from 1988 to 2020[1]:

- **Equities (S&P 500 Ex-Technology Index)**

  The index seeks to provide exposure to the companies of the S&P 500 with the exception of those companies included in the information technology sector. It is a float-adjusted, market capitalization-weighted index of 500 U.S. operating companies and real estate investment trusts selected through a process that factors in criteria such as liquidity, price, market capitalization and financial viability. As an asset category, stocks are a portfolio's "heavy hitters," offering the greatest potential for growth. The volatility of stocks makes them a very risky investment in the short term but over long periods shares generate a higher return than other asset classes.

- **Government Bonds (U.S. Treasury Bond Index)**

  It is a broad, comprehensive, market-value weighted index that seeks to measure the performance of the U.S. Treasury Bond market. Though the outlook for interest rates is uncertain, treasury bonds continue to play an important role in portfolio, since they provide both income and return of capital. They are considered a relatively safe, defensive asset class. Government bonds are used to diversify the portfolio and reduce the sensitivity to interest rate changes during the inflation.

- **Commodities (S&P GSCI Commodity Index)**

  The S&P GSCI is a composite index of commodity sector returns representing an unleveraged, long-only investment in commodity futures that is broadly diversified across the spectrum of commodities. It holds all available futures contracts relating to

[1] The total return index is an index that measures the performance of a group of assets, provided that all cash payments (dividends, coupons, interest ...) from this index are reinvested.

physical commodities such as oil, wheat, corn, aluminum, live cattle, and gold. The combination of these attributes provides investors with a representative and realistic picture of realizable returns attainable in the commodities markets. A basket of commodities, including precious metals, energy and agricultural goods provides a hedge against inflation. Commodities are subject to sharp swings in volatility.[2]

Actively managed portfolio is based on momentum factor. The momentum effect is one of the most researched capital market phenomena. Simultaneously one of the most controversial but also one of the most recognized anomalies in financial markets and has attained a broad acceptance after the work of Jegadesh and Titman (1993). The literature not only identifies the effect of equities, but also the effect on whole equity sectors, investment styles, as well as commodities, currencies, and fixed income markets. As a common measure of the momentum only the past 12 months return on the asset. This is the most common measure of momentum, where assets are ranked on their historical total returns. The momentum portfolio is computed as follows:

$$m_{i(t)} = \frac{P_{i(t)}}{P_{i(t-12)}} \qquad (1)$$

where: $P_{i(t)}$ is the closing price of the asset *i* at the end of the month *t*, and $P_{i(t-12)}$ is the closing price of the asset at end of the month *(t-12)*. (Backhaus, 2016; Kolanovic, 2018)

According to article on GestaltU, we applied a Gaussian transform to the cross-sectional momentum across lookback horizons to apportion momentum weight. Essentially, this process uses a Gaussian transform to standardize relative momentum scores at each lookback horizon, such that the final momentum score for each asset is the average of the Gaussian score at each lookback. The following formulas describe the process we use to determine the weights of each asset in the portfolio.

$$G_i = \theta\left(\frac{m_i - \overline{m_j}}{\sigma_{ij}}\right) \qquad (2)$$

The observed weight w_i of an individual asset as a portion of a portfolio of size *n* is:

$$w_i = \frac{\overline{G_i}}{\sum_j^n \overline{G}} \qquad (3)$$

In the above equations, *G* is the Gaussian value of asset i using lookback horizon. *Θ* signifies that we are imposing a Gaussian transform on the value in brackets, which is simply the momentum of asset *i* at lookback horizon l minus the average momentum of all assets at

[2] All the indices descriptions are available at www.bloomberg.com

that horizon, all divided by the standard deviation of momentum values at that horizon. The function in brackets is a z-score calculation, and the Gaussian transform translates the z-score into a percentile value between 0 and 1. Once the raw momentum vectors for each lookback horizon is transformed into vectors of Gaussian values, we can average the vectors across lookbacks to derive the final Gaussian score vector. Finally, we need to releverage the Gaussian weights so that the final weights add up to 100%. The second function accomplishes this by dividing each average Gaussian asset score by the sum of all average Gaussian scores across all assets. ("Dynamic Asset Allocation," 2018)

$$r_p = \sum_{i=1}^{n} w_i r_i \qquad (4)$$

The assets weighting of mutual fund is changed every day based on momentum strategies. Portfolio weight is the percentage of an investment portfolio that a particular holding or type of holding comprises.

To evaluate a portfolio performance, we used Sharpe ratio, which is the measure of risk-adjusted return of a financial portfolio. "

$$SR_p = \frac{r_p - r_f}{\sigma_p} \qquad (5)$$

where: r_f is a risk-free rate (U.S. Treasury) and σ_p is volatility of realized portfolio. A portfolio with a higher Sharpe ratio is considered superior relative to its peers. It is a measure of excess portfolio return over the risk-free rate relative to its standard deviation.

The CAPM is used to calculate the amount of return that investors need to realize to compensate for a particular level of risk. It subtracts the risk-free rate from the expected rate and weighs with a factor beta, to get the risk premium. The CAPM is expressed as follows:

$$r_p = r_f + \beta(r_b - r_f) + \alpha \qquad (6)$$

The alpha of a portfolio, also known as Jensen's alpha is the excess return of portfolio compared to a benchmark index. The alpha ratio is often used along with the beta coefficient, which is a measure of the volatility of an investment. (Le Sourd 2007; Mattei, 2018).

3 Portfolio formation

The analysis deals with construction of actively managed portfolio composed of three asset classes: stocks, government bonds and commodities. We believe that multi-asset funds have the potential to be the better option in good as well as bad market environments.

Fig. 1: Historical indices performance

Source: Authors' calculation

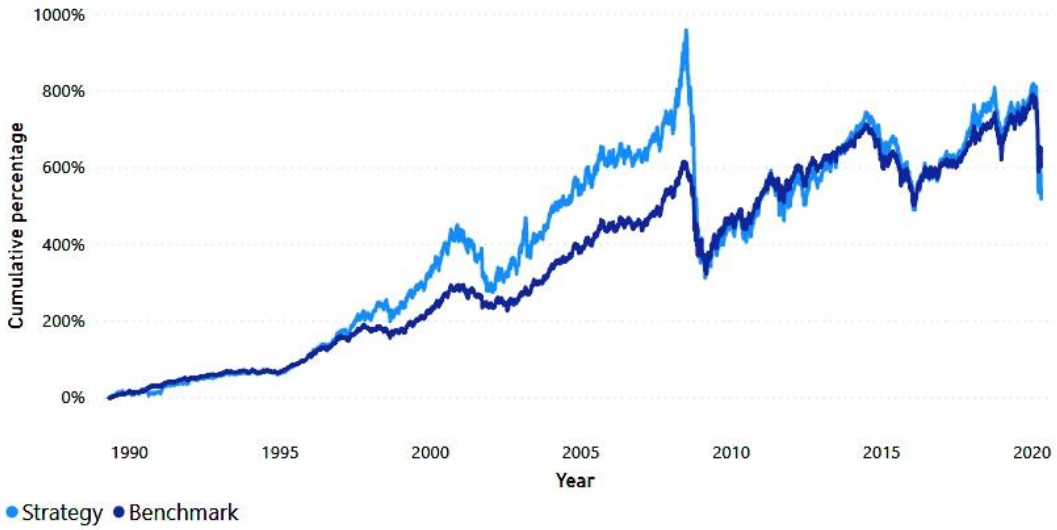
All the data are obtained from the Bloomberg website. We analysed the daily log returns of these three assets for the period between 31/03/1988 and 24/02/2020. The chart above constitutes historical indices performance for the whole period. The individual indices are expressed in real time in USD. The chart illustrates that the S&P 500 Ex-Technology Index brings the greatest appreciation. The biggest declines are visible especially in 2000 and in 2008, which results in the onset of the crisis, when the stock market was extremely undervalued by up to half. Also, there is a significant decline in stocks in 2019, which continues until now. The development of U.S. Treasury was relatively constant over 30 years without any fluctuations, until 2019, where there was a significant decline in performance. Because government bonds are issued by the US government, they are relatively safe with a high degree of certainty of return on funds. Despite the lower valuation, they bring a stable return at a relatively low risk, which is why they are so popular among investors. The development of the commodity index was relatively unstable with large fluctuations in performance. Investing in commodities is one of the most risky operations in financial markets, as commodity prices are affected by factors such as seasonal fluctuations or weather.

A simulation of mutual fund evaluation was performed independently for the active strategy and the benchmark. Dynamically managed portfolio is composed of three assets and their weights are determined by the momentum factor. In other periods, many assets might be performing well at the same time while a couple of assets lag dramatically. This approach allows the portfolio 'breathe' based on the concentration of momentum in the asset universe.

We adjusted this mechanism in such a way that at the beginning of each month the weights are re-evaluated, which will be the same until the next rebalancing, i.e. until the next month.

To evaluate a fund's performance, we created a reference portfolio (benchmark) for comparative purposes. Of course, the benchmark should reflect the overall risk and return characteristics for the investment in question. Benchmark is also constructed using previously mentioned asset classes, which are equally weighted, so 33,3% of portfolio is invested in each asset on a monthly basis with rebalancing back to 33,3% every month.

Fig. 2: Strategy and benchmark performance

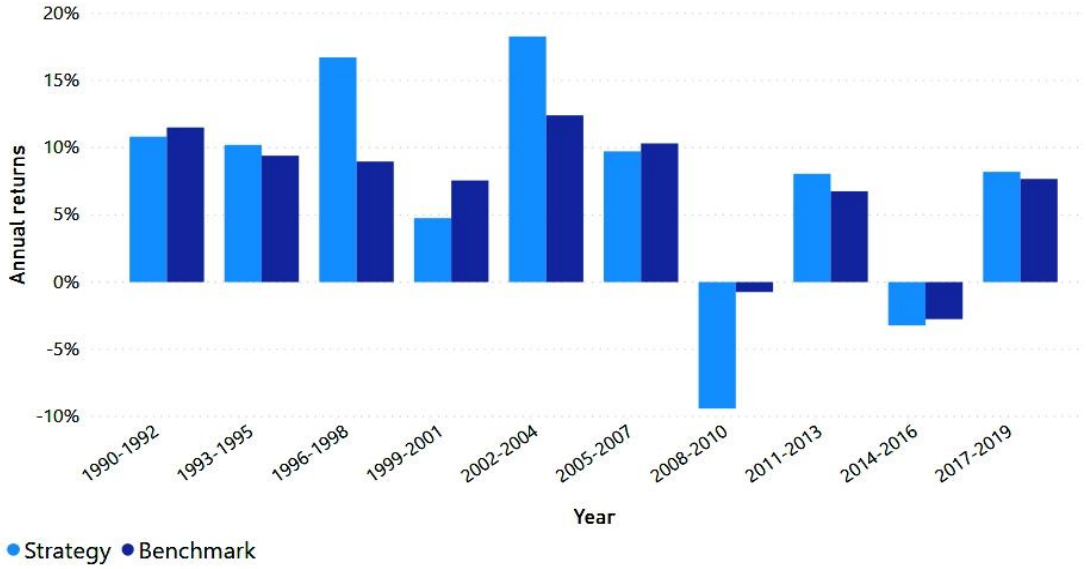


Source: Authors' calculation

Performance of both portfolios is expressed as the cumulative sum of daily logarithmic returns of both strategy and benchmark[3]. The ex-post analysis of the returns shows, that the cumulative return of the dynamically managed strategy is significantly higher than equally weighted benchmark. The development of both portfolios was quite identical, the difference was in their evaluation. Compared to the benchmark the results of active strategy are nevertheless superior till the financial crisis in 2008 (959,8%), but after that, active strategy could not protect the invested capital and fell sharply (312,4%). However, the simulation clearly shows that the momentum factor generates a significant excess return during the period overall and has the potential to outperform a comparable passive asset allocation.

[3] The results are hypothetical and they are not an indicator of future results and do not represent returns that any investor actually attained. Portfolios are unmanaged, do not reflect management or trading fees, and no one cannot invest directly in an index.

Fig. 3: 3-year annual returns



Source: Authors' calculation

Figure shows the 3-year annualized returns are significantly above of the comparative benchmark especially in period 1996-1998 (16,7%) and 2002-2004 (18,2%). The results show that 80% of the returns are positive, expect of period in 2014-2016 and during the financial crisis in 2008, when the strategy cannot protect the invested capital. The returns of the worst period is -9.4%, while the value for the benchmark is just -0,74%. It is obvious that strategy does not work at 100% for whole period and reaches lower performance in comparison to benchmark. Overall, the results indicate that momentum factor has the potential to generate excess return and outperform the benchmark during the overall period.

Tab. 1: Comparison of strategy and benchmark

	Volatility (annual)	Sharpe ratio	Alpha	Beta	R-squared (adjusted)
Strategy	0,1165	0,0514	0,0012	1,19	0,7671
Benchmark	0,0989	0,0223	0	1	-

Source: Authors' calculation

Table 1 presents the indicators for comparing portfolio and benchmark performance. Results indicate that the volatility of the strategy is 11,65% and the benchmark is 9,89%. A higher volatility and a beta shows a higher risk of the strategy, nevertheless the Sharpe ratio is clearly positive and superior compared to benchmark. We used statistical regression to understand how a mutual fund performance relates to benchmark components and whether the

results are significant. R-squared measures the relationship between a portfolio and its benchmark index. It is expressed as a percentage from 1 to 100. However, R-squared is not a measure of the performance of a portfolio, rather it measures the correlation of the portfolio's returns to the benchmark's returns. The regression explains 76 % of the variance of active portfolio. In absolute terms, the alpha of the strategy is positive and can be categorized as above-average. The risk-adjusted excess return is therefore significantly greater than the benchmark, which demonstrates the high factor quality in the context of multi-asset allocation.

Conclusion

The performance of dynamic strategies can be difficult to predict. Although not without its problems, analysis of the historical performance can provide valuable insight into its general risk and return properties. Furthermore, historical analysis allows investors to compare variations of a strategy and examine the impact of various parameter choices and implementation rules.

The analysis deals with construction of actively managed multi-asset portfolio that were assumed to be invested in equities, government bonds, and commodities, in which the asset allocation decision was driven by the momentum factor. This study examines whether an active strategy has the potential to beat the reference portfolio. Allocations to the available assets were determined on each rebalance date via a constrained optimalization procedure. A simulation was performed independently for the dynamically managed strategy and equally-weighted benchmark.

Findings indicate that the strategy has the potential to outperform a comparable equally-weighted reference index over the sample period. Using momentum strategy to dynamically managed asset allocation historically produced superior investment returns compared to a benchmark in some periods. However, active portfolio does not reflect trading cost, which may result in lower portfolio performance. Therefore, it would be beneficial to expand the case study to trading fees, which will provide a more realistic picture of the portfolio's performance and also compare it to passive buy and hold portfolio for better objectivity.

Of course, before selecting a mutual fund as part of an investment implementation, an investor should consider a wide range of additional factors such as expense ratio, asset allocation targets (and limits) and manager capabilities.

References

Antonacci, G. (2013). Absolute Momentum: A Simple Rule-Based Strategy and Universal Trend-Following Overlay. *SSRN Electronic Journal.* doi:10.2139/ssrn.2244633

Backhaus, A; Zhakanova Iisksal, A. (2016). The impact of momentum factors on multi asset portfolio. *Journal for Economic Forecasting*, vol. 0(4)

Dynamic Asset Allocation for Practitioners Part 3: Momentum Weighting. (2018, June 22). Retrieved September 08, 2020, from https://www.gestaltu.com/2013/08/dynamic-asset-allocation-for-practitioners.html/.

Gruber, M. J. (1996). Another Puzzle: The Growth in Actively Managed Mutual Funds. *The Journal of Finance*, 51(3), 783-810. doi:10.1111/j.1540-6261.1996.tb02707.x

Kazemi, H. B., Spurgin, R. B. (2008). Momentum in Asset Returns. *The Journal of Alternative Investments,* 10(4), 23-36. doi:10.3905/jai.2008.705530.

Kolanovic, M.., Wei, Z. (2018). Momentum Strategies across Asset Classes. J.P.Morgan

Le Sourd, V. (2007). Performance Measurement for Traditional Investment. *Financial Analysts Journal*, 58(4), 36-52.

Mattei, M. (2018). Enhanced Portfolio Performance Using a Momentum Approach to Annual Rebalancing. *International Journal of Financial Studies,* 6(1), 15. doi:10.3390/ijfs6010015

Mingo-López, D. V., Matallín-Sáez, J. C. (2017). Investing in mutual funds: The determinants of implied and actual net cash flows. *Applied Economics,* 49(60), 5962-5970. doi:10.1080/00036846.2017.1366641

Petajisto, A. (2013). Active Share and Mutual Fund Performance. *Financial Analysts Journal,* 69(4), 73–93. https://doi.org/10.2469/faj.v69.n4.7

Seymour, A., Flint, E. J., Chikurunhe, F. (2018). Dynamic Portfolio Management Strategies: A Framework for Historical Analysis. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.3214453

Contact

First and last name of author: Katarína Synčáková

Institution: Technical University of Košice, Faculty of Economics

Full address of institution: Němcovej 32, 040 01 Košice, Slovak Republic

Mail: katarina.syncakova@tuke.sk