Strategic Rebalancing

By Nicolas Granger, Campbell R. Harvey, Sandy Rattray and Otto van Hemert

February 2019

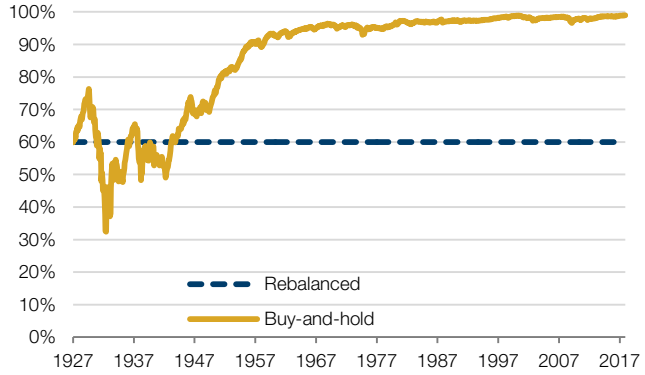
INTRODUCTION

Many investors don't realize that a mechanical rebalancing strategy, such as a monthly or quarterly reallocation towards fixed portfolio weights, is an active strategy. Winning asset classes are sold and losers are bought. During crises, when markets are often trending, this could lead to larger drawdowns than a buy-and-hold strategy. We show that these drawdowns induced by naïve rebalancing could be mitigated, taking the popular 60-40 stock-bond portfolio as our use case.

One alternative is an allocation to a trend-following strategy. This type of strategy has the potential to do better in periods of extreme negative returns and help counterbalance the rebalancing strategy. The second alternative we call strategic rebalancing, which uses smart rebalancing timing based on trend-following signals – without a direct allocation to a trend-following strategy. For example, if the trend-following model suggests that stock markets are in a negative trend, rebalancing is delayed.

Of course, a pure buy-and-hold portfolio has the drawback that the asset mix tends to drift over time and, as such, is untenable for investors who seek diversification. For a US stock-bond portfolio, an initial 60% of capital allocated to stocks in 1927 drifts to a 76% allocation by 1929, a 32% allocation by 1932, and a level close to 100% over time, as stocks tend to outperform bonds over the long run (Figure 1).

Figure 1: Allocation to Stocks for an Initial Capital Weighted 60-40 Stock-Bond Portfolio



Source: Federal Reserve, Kenneth French website, Global Financial Data; Between January 1927 and December 2017.

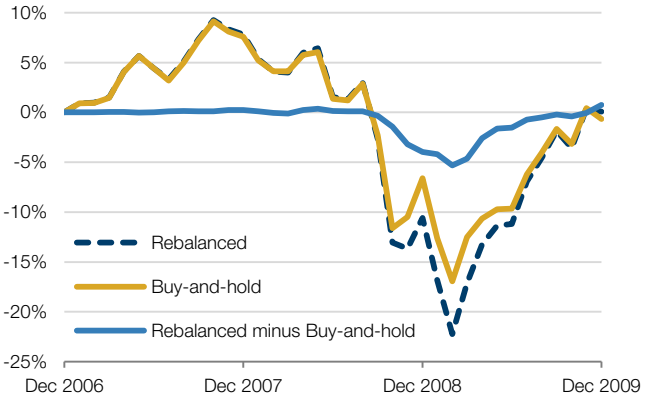
However, a stock-bond portfolio that regularly rebalances tends to underperform a buy-and-hold portfolio at times of continued outperformance of one of the assets. Intuitively, this is because rebalancing means selling (relative) winners, and if winners continue to outperform, that detracts from performance.

The link to the full paper can be found here:
https://papers.ssrn.com/abstract=3330134

COMPARING REBALANCED AND BUY-AND-HOLD PORTFOLIO RETURNS

As stocks typically have more volatile returns than bonds, relative returns tend to be driven by stocks. Hence, of particular interest are episodes with continued negative (absolute and relative) stock performance, such as the 2007-2009 global financial crisis. In Figure 2, we contrast the monthly-rebalanced and buy-and-hold cumulative performance over the financial crisis period, where both start with an initial 60-40 stock-bond capital allocation.[1] The maximum drawdown of the monthly-rebalanced portfolio is 1.2 times (or 5 percentage points) worse than that of the buy-and-hold portfolio, right at the time when financial markets turmoil is greatest.

Figure 2: Performance Monthly-Rebalanced and Buy-and-Hold Portfolios During the Global Financial Crisis



Source: Federal Reserve, Kenneth French website, Global Financial Data; Between January 2007 and December 2009.

In earlier work, Granger et al. (2014) formally show that rebalancing is similar to starting with a buy-and-hold portfolio and adding a short straddle (selling both a call and a put option) on the relative value of the portfolio assets.[2] The option-like payoff to rebalancing induces negative convexity by magnifying drawdowns when there are pronounced divergences in asset returns.

ALLOCATION TO TREND

Indeed, our empirical analysis shows that time-series momentum (or trend) strategies, applied to futures on the same stock and bond markets, may act as natural complements to a rebalanced portfolio. This is because the trend payoff tends to mimic that of a long straddle option position, or exhibits positive convexity, see, e.g., Martin and Zou (2012)[3] and Hamill, Rattray, and Van Hemert (2016).[4]

1. For our empirical analysis, we use we use monthly value-weighted returns of firms listed on the NYSE, AMEX, and NASDAQ from Kenneth French's website. For bonds, we use US Treasury bond data from the Federal Reserve. **2.** Granger, N., D. Greenig, C.R. Harvey, S. Rattray, D. Zou (2014), "Rebalancing risk", SSRN working paper: https://ssrn.com/abstract=2488552. **3.** Martin, R. and D. Zou. (2012), "Momentum trading: 'skews me", *Risk*, 25(8), 52-57. **4.** Hamill, C., S. Rattray, and O. Van Hemert (2016), "Trend following: equity and bond crisis alpha", SSRN working paper https://ssrn.com/abstract=2831926.

Our main analysis is for the 1960-2017 period, which includes the bond bear market of the 1960 and 1970s, but omits the different bond regime before 1960.[5] We evaluate how 1-, 3-, and 12-month trend strategies perform during the five worst drawdowns for the 60-40 stock-bond portfolio. In our analysis, allocating 10% to a trend strategy and 90% to a 60-40 monthly-rebalanced portfolio improves the average drawdown by about 5 percentage points, compared to a 100% allocation to a 60-40 monthly rebalanced portfolio. The trend allocation has no adverse impact on the average return over our sample period. That is, while one would normally expect a drag on the overall (long-term) performance when allocating to a defensive strategy, in our sample, the trend-following premium earned offsets the cost (or insurance premium) paid.[6]

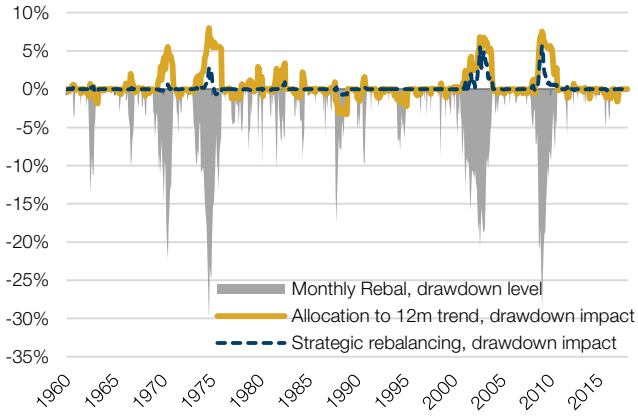
STRATEGIC REBALANCING

An alternative to a trend allocation is strategically timing and sizing rebalancing trades, which we label strategic rebalancing. We first consider a range of popular heuristic rules; varying the rebalancing frequency, using thresholds, and trading only partially back to the 60-40 asset mix. Such heuristic rules reduce the average maximum drawdown level for the five crises considered by up to 1 percentage point. However, using strategic rebalancing rules based on either the past stock or past stock-bond relative returns gives improvements of 2 to 3 percentage points.

STRATEGIC REBALANCING VERSUS A DIRECT ALLOCATION TO TREND

In Figure 3, we show the impact on the drawdown level of the types of trend exposures we discussed. Concretely: a 10% allocation to a 12-month stocks and bonds (equal risk) trend strategy and a strategic rebalancing rule to delay rebalancing if the 12-month stock-bond spread trend is negative. The main takeaway is that either a direct allocation to a trend strategy or using trend signals as a basis of a rebalancing rule tends to reduce the drawdown materially. The performance around Black Monday is the only exception here in case of an allocation to trend (less so for the strategic rebalancing rule).

Figure 3: Impact of Adding a Trend Exposure on the Portfolio Drawdown Level



Source: Federal Reserve, Kenneth French website, Global Financial Data; Between January 1960 and December 2017.

CONCLUSION

A pure buy-and-hold portfolio may be untenable for many investors as it leads to a highly concentrated, undiversified portfolio. However, a 60-40 stock-bond portfolio that rebalances every month to the 60:40 target ratio loses several percentage points more than a buy-and-hold portfolio during periods of continued stock market drawdowns.

Negative convexity induced by rebalancing could be effectively countered with a trend exposure, which exhibits positive convexity and can be either implemented as a direct allocation to a trend investment product or with a strategic trend-based rebalancing rule.

While our focus is on countering the negative convexity induced by rebalancing, other considerations matter in practice as well. For example, investors can also use monthly in- and out-flows to move back toward the target asset mix. For taxable investors, rebalancing using income has the added potential benefit that no assets need to be sold, which can be tax efficient; see Colleen, Kinniry, and Zilbering (2010).[7]

Finally, a stock-bond trend exposure is just one way to mitigate drawdowns at times of continued stock market losses. An investor has more arrows in her quiver. A good starting point is a more diversified portfolio that includes more asset classes and has an international exposure. An allocation to a broader trend strategy that benefits from trends in other macro assets at times of equity market distress may further dampen equity market losses; see Hamill, Rattray, and Van Hemert (2016). And Harvey et al. (2018) study volatility targeting and show that it can help manage the risk of a 60-40 stock-bond portfolio.[8]

The link to the full paper can be found here:
https://papers.ssrn.com/abstract=3330134

5. See also Harvey et al. (2018) for a discussion on the different US bond regimes. **6.** We find that the performance of trend strategies is consistent over time, not driven by any particular sub-period. **7.** Colleen, J., F. Kinniry, and Y. Zilbering (2010) "Best practices for portfolio rebalancing", Vanguard working paper. **8.** Harvey, C. R., E. Hoyle, Russell Korgaonkar, S. Rattray, M. Sargaison, and O. Van Hemert (2018), "The impact of volatility targeting", Journal of Portfolio Management, 45(1), 14-33.

Nicolas Granger

CIO at Man AHL (On sabbatical)

Nicolas Granger is Chief Investment Officer of Man AHL, and a member of the Man Group Executive Committee. He is also Portfolio Manager of AHL Dimension Program, Man AHL's flagship systematic multi-strategy program. Previously, Nicolas was Co-Head of Research and Deputy CIO of Man AHL. Nicolas joined Man AHL in 2008, initially to lead the development of Man AHL's systematic volatility trading strategies and later running cross asset-class research across the group. Before joining Man AHL, Nicolas was an Equity Derivatives Strategist at JP Morgan, developing quantitative trading models. Nicolas graduated from the University of Oxford in 1996 with a First Class Degree in Mathematics, and gained a PhD in Mathematical Logic in 1999 from the University of Manchester.

Professor Campbell R. Harvey

Investment Strategy Advisor at Man Group

Professor Campbell R. Harvey, a leading financial economist, has been an Investment Strategy Advisor to Man Group since 2005 and has contributed to both research and product design. He is a Professor of Finance at Duke University and Research Associate at the National Bureau of Economic Research in Cambridge, Massachusetts. He served as Editor of *The Journal of Finance* from 2006 to 2012 and as the 2016 President of the American Finance Association. Professor Harvey received the 2016 and 2015 Bernstein Fabozzi/Jacobs Levy Award for the Best Article from the Journal of Portfolio Management for his research on differentiating luck from skill. He has also received eight Graham and Dodd Awards/Scrolls for excellence in financial writing from the CFA Institute. He has published over 125 scholarly articles on topics spanning investment finance, emerging markets, corporate finance, behavioural finance, financial econometrics and computer science. Professor Harvey is teaching a course called Innovation and Cryptoventures that focuses on the mechanics and applications of blockchain technology. He has served on the faculty of the University of Chicago, Stockholm School of Economics and the Helsinki School of Economics. He has also been a visiting scholar at the Board of Governors of the Federal Reserve System. He was awarded an honorary doctorate from Svenska Handelshögskolan in Helsinki. He holds a PhD in Finance from the University of Chicago.

Sandy Rattray

CIO at Man Group

Sandy Rattray is Chief Investment Officer of Man Group and a member of the Man Group Executive Committee. He is also a member of the Man Group Responsible Investment Committee. He was previously CEO of Man AHL from 2013 to 2017, and CIO of Man Systematic Strategies from 2010 to 2013. Before joining Man Group in 2007, Sandy spent 15 years at Goldman Sachs where he was a Managing Director in charge of the Fundamental Strategy Group. He also ran Equity Derivatives Research at Goldman Sachs in London and New York. Sandy is a co-inventor of the VIX index and has served on the FTSE UK, FTSE World and Russell index committees. He sits on the MSCI Editorial Advisory Board and the Jesus College Cambridge investment committee. Sandy is a founding patron of the London Cycling Campaign. He holds a Master's Degree in Natural Sciences and Economics from the University of Cambridge and a Licence Spéciale from the Université Libre de Bruxelles.

Otto van Hemert

Head of Macro Research at Man AHL

Otto van Hemert is Head of Macro Research at Man AHL. Prior to joining Man AHL in 2015, Otto ran a systematic global macro fund at IMC for over three years. Before that he headed Fixed Income Arbitrage, Credit, and Volatility strategies at AQR, and was on the Finance Faculty at the New York University Stern School of Business where he published papers in leading academic finance journals. Otto holds a PhD in Economics and Masters Degrees in Mathematics and Economics.

SIMULATED HYPOTHETICAL PERFORMANCE: Hypothetical Results are calculated in hindsight, invariably show positive rates of return, and are subject to various modeling assumptions, statistical variances and interpretational differences. No representation is made as to the reasonableness or accuracy of the calculations or assumptions made or that all assumptions used in achieving the results have been utilized equally or appropriately, or that other assumptions should not have been used or would have been more accurate or representative. Changes in the assumptions would have a material impact on the Hypothetical Results and other statistical information based on the Hypothetical Results.

The Hypothetical Results have other inherent limitations, some of which are described below. They do not involve financial risk or reflect actual trading by an Investment Product, and therefore do not reflect the impact that economic and market factors, including concentration, lack of liquidity or market disruptions, regulatory (including tax) and other conditions then in existence may have on investment decisions for an Investment Product. In addition, the ability to withstand losses or to adhere to a particular trading program in spite of trading losses are material points which can also adversely affect actual trading results. Since trades have not actually been executed, Hypothetical Results may have under or over compensated for the impact, if any, of certain market factors. There are frequently sharp differences between the Hypothetical Results and the actual results of an Investment Product. No assurance can be given that market, economic or other factors may not cause the Investment Manager to make modifications to the strategies over time. There also may be a material difference between the amount of an Investment Product's assets at any time and the amount of the assets assumed in the Hypothetical Results, which difference may have an impact on the management of an Investment Product. Hypothetical Results should not be relied on, and the results presented in no way reflect skill of the investment manager. A decision to invest in an Investment Product should not be based on the Hypothetical Results.

No representation is made that an Investment Product's performance would have been the same as the Hypothetical Results had an Investment Product been in existence during such time or that such investment strategy will be maintained substantially the same in the future; the Investment Manager may choose to implement changes to the strategies, make different investments or have an Investment Product invest in other investments not reflected in the Hypothetical Results or vice versa. To the extent there are any material differences between the Investment Manager's management of an Investment Product and the investment strategy as reflected in the Hypothetical Results, the Hypothetical Results will no longer be as representative and their illustration value will decrease substantially. No representation is made that an Investment Product will or is likely to achieve its objectives or results comparable to those shown, including the Hypothetical Results, or will make any profit or will be able to avoid incurring substantial losses. Past performance is not indicative of future results and simulated results in no way reflect upon the manger's skill or ability.

IMPORTANT INFORMATION

This information is communicated and/or distributed by the relevant AHL or Man entity identified below (collectively the "Company") subject to the following conditions and restriction in their respective jurisdictions.

Opinions expressed are those of the author and may not be shared by all personnel of Man Group plc ('Man'). These opinions are subject to change without notice, are for information purposes only and do not constitute an offer or invitation to make an investment in any financial instrument or in any product to which the Company and/or its affiliates provides investment advisory or any other financial services. Any organisations, financial instrument or products described in this material are mentioned for reference purposes only which should not be considered a recommendation for their purchase or sale. Neither the Company nor the authors shall be liable to any person for any action taken on the basis of the information provided. Some statements contained in this material concerning goals, strategies, outlook or other non-historical matters may be forward-looking statements and are based on current indicators and expectations. These forward-looking statements speak only as of the date on which they are made, and the Company undertakes no obligation to update or revise any forward-looking statements. These forward-looking statements are subject to risks and uncertainties that may cause actual results to differ materially from those contained in the statements. The Company and/or its affiliates may or may not have a position in any financial instrument mentioned and may or may not be actively trading in any such securities. This material is proprietary information of the Company and its affiliates and may not be reproduced or otherwise disseminated in whole or in part without prior written consent from the Company. The Company believes the content to be accurate. However accuracy is not warranted or guaranteed. The Company does not assume any liability in the case of incorrectly reported or incomplete information. Unless stated otherwise all information is provided by the Company. Past performance is not indicative of future results.

Unless stated otherwise this information is communicated by AHL Partners LLP which is registered in England and Wales at Riverbank House, 2 Swan Lane, London, EC4R 3AD. Authorised and regulated in the UK by the Financial Conduct Authority.

Australia: To the extent this material is distributed in Australia it is communicated by Man Investments Australia Limited ABN 47 002 747 480 AFSL 240581, which is regulated by the Australian Securities & Investments Commission (ASIC). This information has been prepared without taking into account anyone's objectives, financial situation or needs.

European Economic Area: Unless indicated otherwise this material is communicated in the European Economic Area by Man Solutions Limited which is an investment company as defined in section 833 of the Companies Act 2006 and is authorised and regulated by the UK Financial Conduct Authority (the "FCA"). Man Solutions Limited is registered in England and Wales under number 3385362 and has its registered office at Riverbank House, 2 Swan Lane, London, EC4R 3AD, England. As an entity which is regulated by the FCA, Man Solutions Limited is subject to regulatory requirements, which can be found at http://register.fca.org.uk.

Germany/Lichtenstein: : To the extent this material is used in Germany and/or Liechtenstein, the communicating entity is Man (Europe) AG, which is authorised and regulated by the Liechtenstein Financial Market Authority (FMA). Man (Europe) AG is registered in the Principality of Liechtenstein no. FL-0002.420.371-2. Man (Europe) AG is an associated participant in the investor compensation scheme, which is operated by the Deposit Guarantee and Investor Compensation Foundation PCC (FL-0002.039.614-1) and corresponds with EU law. Further information is available on the Foundation's website under www.eas-liechtenstein.li. This material is of a promotional nature.

Hong Kong: To the extent this material is distributed in Hong Kong, this material is communicated by Man Investments (Hong Kong) Limited and has not been reviewed by the Securities and Futures Commission in Hong Kong. This material can only be communicated to intermediaries, and professional clients who are within one of the professional investor exemptions contained in the Securities and Futures Ordinance and must not be relied upon by any other person(s).

Liechtenstein: To the extent the material is used in Liechtenstein, the communicating entity is Man (Europe) AG, which is regulated by the Financial Market Authority Liechtenstein (FMA). Man (Europe) AG is registered in the Principality of Liechtenstein no. FL-0002.420.371-2. Man (Europe) AG is an associated participant in the investor compensation scheme, which is operated by the Deposit Guarantee and Investor Compensation Foundation PCC (FL-0002.039.614-1) and corresponds with EU law. Further information is available on the Foundation's website under www.eas-liechtenstein.li.

Switzerland: To the extent this material is distributed in Switzerland, this material is communicated by Man Investments AG, which is regulated by the Swiss Financial Market Authority FINMA.

United States: This material was prepared by AHL Partners LLP ("AHL Partners") and is presented by Man Investments Inc. ("Man Investments"). Man Investments is registered as a broker-dealer with the U.S. Securities and Exchange Commission ("SEC") and is a member of the Financial Industry Regulatory Authority ("FINRA"). Man Investments is also a member of Securities Investor Protection Corporation ("SIPC"). Man Investments is a wholly owned subsidiary of Man Group plc. 'Man Group' refers to the group of entities affiliated with Man Group plc. AHL Partners is registered as an investment advisor with the SEC. AHL Partners is also registered as a commodity pool operator and a commodity trading adviser with the National Futures Association ("NFA") as authorized by the US Commodity Futures Trading Commission ("CFTC"). The registrations and memberships in no way imply a certain level of skill or expertise or that the SEC, FINRA, SIPC, CFTC or NFA have endorsed the entities mentioned above.

19/0278/RoW/GL/I/W