As of: 05/2020

DWS
RESEARCH
INSTITUTE

TIME TO GET A GRIP ON ASSET ALLOCATION

May 2020

Executive summary

— GRIP is a new, state-of-the-art, intelligent portfolio construction process. The name is an abbreviation of: Group Risk in Portfolios.

— Unlike traditional asset allocation, which assigns weights to different asset classes regardless of risk, GRIP focuses on the risk contribution of clusters of assets or strategies to the overall portfolio.

— This proprietary methodology can result in portfolio allocations that are truly diversified – with less extreme weights and risk allocations, and a higher number of uncorrelated exposures.

— GRIP is flexible. It can be tailored to individual clients' needs and targets, while ensuring consistency across risk profiles, regions and currencies.

— The GRIP approach does not only work to allocate between asset classes, but can also be applied to risk factor strategies, tactical decision making and smart-beta strategies.

— The result is a whole new perspective on constructing strategic multi asset portfolios.

Contributors

Peter Warken
Portfolio Manager, Multi-Asset Group
peter.warken@db.com

What's wrong with the traditional way of asset allocating?

Asset allocation used to be about simple diversification – for example, an allocation of 40 per cent in equities versus 60 per cent in bonds. The problem with this approach is that portfolios could still contain a huge amount of risk as diversification is achieved only at the capital allocation level. In the allocation above the risk contribution from the equity exposure is around 90 per cent.[1]

To address this problem, along came Harry Markowitz in the 1950s and modern portfolio theory was born. These days mean-variance optimisation is regarded as the fundamental framework in portfolio construction. Markowitz's approach was the first to offer a quantitative insight into the trade-off investors face between returns and risk.

Diversification could now be shown to improve the trade-off between returns and risk – by optimising a portfolio along a so-called efficient frontier. But the reality is that even this approach can underperform the most basic diversification strategies – for example, equal weights in all asset classes.

The major shortcoming of mean-variance optimisation is that it is highly sensitive to inputs, with slight adjustments in parameters leading to dramatic changes in the optimal portfolio composition. And the most important input, expected returns, is the hardest to forecast of all. In practice, the potential benefits of diversification are often more than offset by estimation errors.

Therefore a new approach that improves upon Markowitz is crucial. After all, asset allocation is still the main driver of investment performance, with numerous academic studies suggesting that the long-term asset allocation explains a significant portion of the variability in portfolio returns.

Get a GRIP on the problem

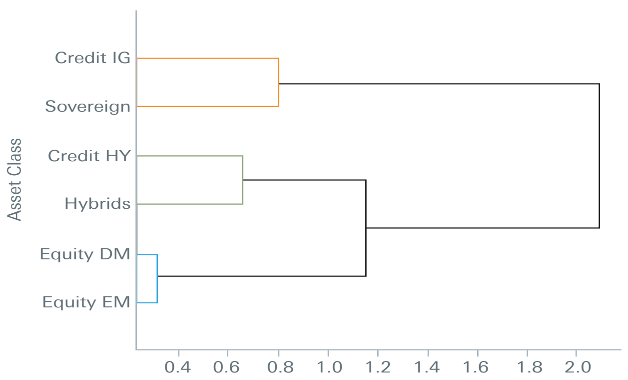
The key thing GRIP does differently to traditional approaches is focus on the risk contribution of assets or strategies to the overall portfolio. What it is trying to avoid is seemingly diversified portfolios suffering from surprisingly high risk concentrations. And in addition to traditional risk parity strategies GRIP utilises other information in the correlation matrix of the investment universe.

The first step in this process is to cluster asset classes together. This is done using a so-called proper distance metric, based on pairwise correlations. A correlation distance of zero means that asset classes are perfectly positively correlated. A measure of one means they are perfectly negatively correlated.

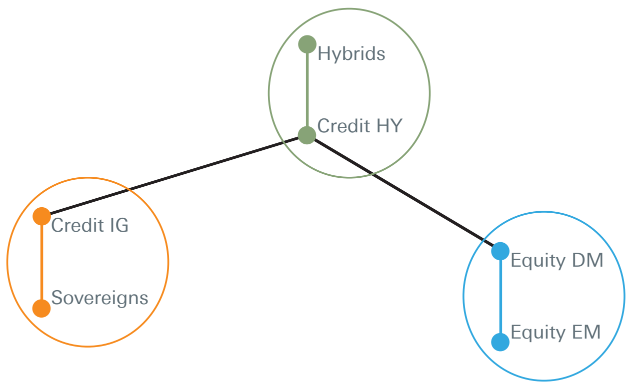
Something called a hierarchical clustering algorithm is then used to come up with specific asset class groups. The idea is to sort, then cluster together, the most comparable sources of risk. The two images below visualise the groupings for a simplified six-asset case study, based on developed and developing market equities, rates, investment grade and high yield credit, and hybrids.

In the Dendrogram the distance between the clustered data points is visualised. Likewise, the Minimum Spanning Tree, with weight of each edge equal to the corresponding correlation distance, offers further insights. Both methods show, for example, that credit investment grade is closer to sovereigns, from a correlation distance point of view, than developed market equities.

Dendrogram of cluster formation[2]



Minimum spanning tree[2]



[1] The risk calculation is based on a split between the EURO STOXX 50 and the Bloomberg Barclays Global Aggregate index.
[2] Source: DWS Investment GmbH, May 2020

The clustering results are finally used to rearrange the correlation matrix in a quasi-diagonal format. And it is worth mentioning again that although the example above focuses on correlation distances to define asset class clusters, this optimisation technique is not limited by this one criteria. Assets could be grouped by other common risk factors, such as carry, momentum or volatility.

The next step is using these clusters to create diversified risk allocations, employing what is known as a risk parity approach – the idea that each asset contributes the same amount to the overall portfolio risk. But unlike traditional methods, GRIP uses the previously defined clusters in order to seek parity of risk contributions from groups instead of individual assets.

How this overcomes the problem of a traditional risk parity framework can be shown as follows. Suppose a cross-asset risk parity optimisation is run on a broad universe that includes the STOXX Europe 600. If the MSCI Europe index is then added into the mix, the portfolio would seem to be exposed to similar risk factors, but there is suddenly a much bigger allocation to European equities. A clustering approach, on the other hand, can help prevent optimisation results having regional biases and asset class concentrations.

The stacked area charts below visualise the results for a universe of 13 traditional sub-asset classes[3] that are clustered in five groups for a range of target volatilities, starting from equities in dark blue to fixed income (bright blue) to alternatives (amber). The Y-axis is the percentage weight and the X-axis the percentage target volatility of the asset allocation.

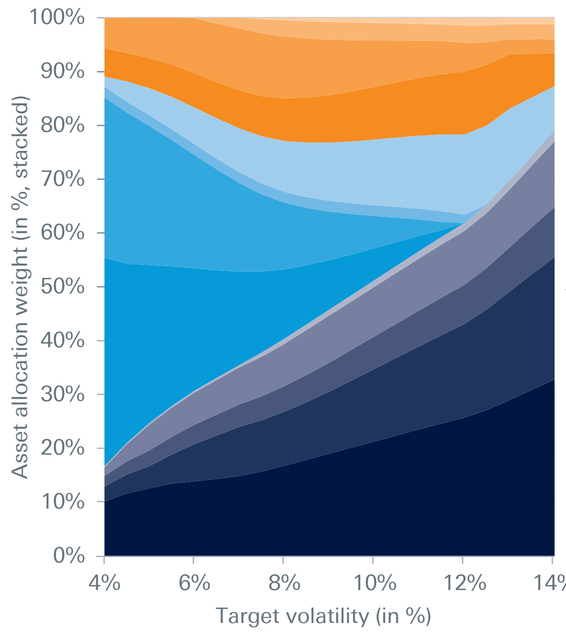
The chart on the left shows an asset allocation by risk profile, and on the right a risk allocation by risk profile. It can be seen from the former that a target volatility of eight per cent equates to about a 40 per cent asset allocation to equities. But from the right hand chart it is clear that only 75 per cent of the risk is associated with equities in this allocation opposed to the 90 per cent in the simple 40/60 portfolio.

Further analysis, outlined in the next section, shows that by moving beyond the usual risk parity framework it is possible to construct allocations that are diversified from a capital allocation as well as risk contribution perspective, with a higher number of uncorrelated exposures, and less extreme weights and risk allocations.

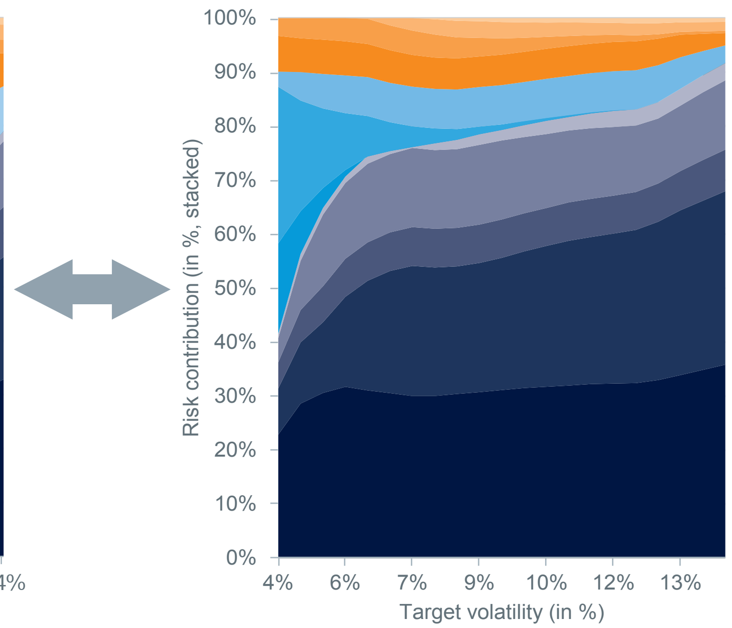
And at the same time all of this can be achieved while offering a huge degree of flexibility. In the case of the strategic asset allocation, above, for example, GRIP was calibrated to only hold long-only positions and ensure that the overall portfolio volatility equalled a given target. But it is possible to add further rules or constraints based on the risk profile, investment, or practical needs of a client.

In addition, the methodology can be applied to tactical decision making as well as strategic asset allocation. GRIP can also be used when clients have employed alternative risk premia (ARP) and smart beta strategies. GRIP even works on single stock portfolios.

Asset allocation by risk profile[2]



Risk allocation by risk profile[2]



For illustrative purposes only.
[3] S&P 500, STOXX Europe 600, Topix, MSCI AC Asia ex. Japan, MSCI EM Latin America, Bloomberg Barclays US Treasury, Bloomberg Barclays US Corporates, US Cash LIBOR 3-months, JPMorgan EMBI Global, Bloomberg Barclays US High Yield, S&P/LSTA Leveraged Loan, UBS Thomson Reuters Global Hedged Convertible Bonds, Bloomberg Commodity

What are the results in practice?

Having explained how GRIP works, the following section looks at how effective this new risk-based approach to diversification performs in practice. First of all, what does a hypothetical GRIP portfolio look like in terms of asset allocation?

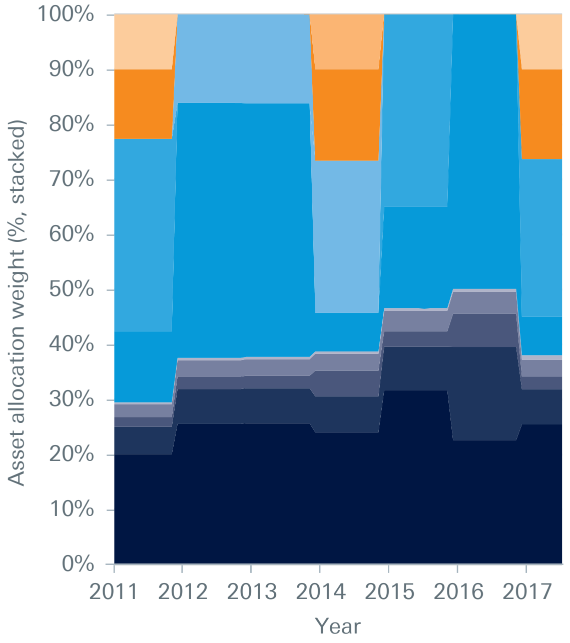
The charts below give a good illustration, showing optimal asset allocation on a monthly basis for the same 13 asset classes used above from 2011 to September 2017. The stacked areas show the weightings as a percentage on the Y-axis. On the left is a traditional mean-variance portfolio while the GRIP portfolio is shown on the right.

Clearly the asset allocation is more stable using the GRIP methodology. But focusing on the asset allocation only can be beside the point. What matters is the likelihood of hidden portfolio concentrations, which could potentially lead to unexpectedly large losses.

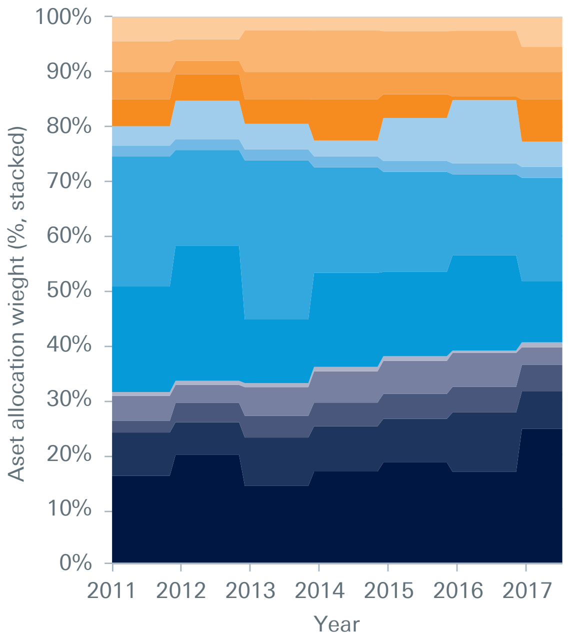
This is assessed by taking 520 weekly data points between 2008 and 2017 for each index in order to calibrate the risk estimators. A balanced risk target of nine per cent is used. Then, the optimisation was run annually and the allocations rebalanced monthly.

So what concentrations arise and how do they compare between GRIP – which combines asset and risk allocations – and other methodologies, such as pure risk parity (RP) or the traditional mean-variance approach (MV)[4]?

Mean-variance optimal asset allocation over time[5]



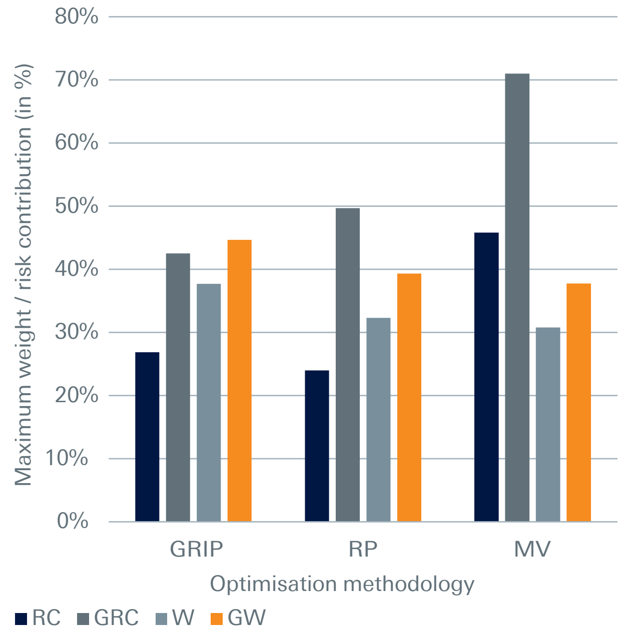
Group risk parity optimal asset allocation over time[5]



For illustrative purposes only.
No assurance can be given that the GRIP construction process will perform better than other methodologies.
[4] The mean-variance optimisation requires expected returns as additional inputs. For illustrative purposes, we use a simple 12-month price momentum as return projection.
[5] Source: DWS Investment GmbH, May 2020

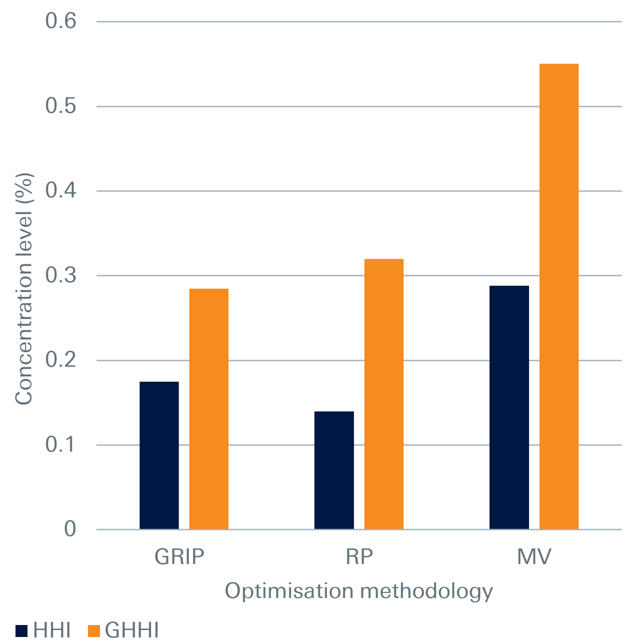
The higher the bars in chart below the higher the concentration risk (RC) and group risk (GRC), and weight (W) and group weight (GW). GRIP compares reasonably well on a group risk basis.

Comparison of extreme allocations[5]



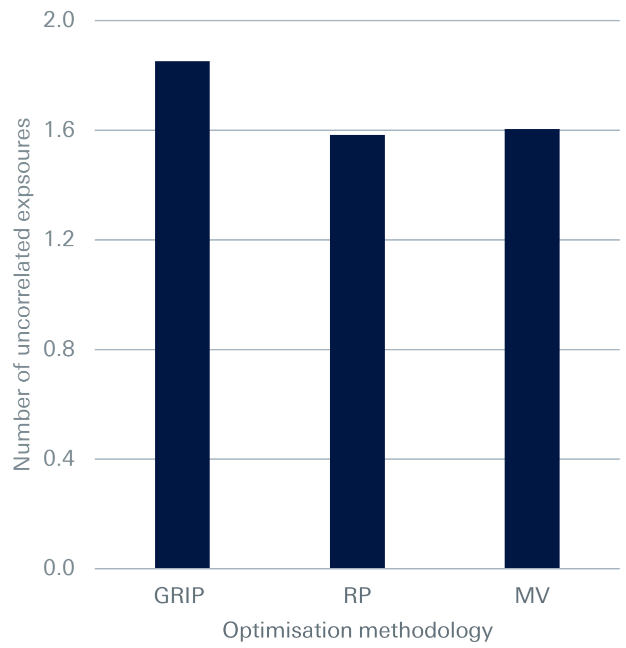
But within these allocations, are there any extreme concentrations to look out for? This can be tested using a Herfindahl-Hirschman-Index, as shown below. The higher the bars the higher the concentration, and again the GRP methodology (GRIP) looks favourable on a HHI and group HHI basis.

Comparison of concentrations[5]



Another way to test for unwanted concentrations is to look for them from the opposite side – that is, to see how many uncorrelated exposures there are in a portfolio. The more the better. So-called principal component analysis is the way to check this. In the bar chart below, the number of uncorrelated exposures is shown on the Y-axis.

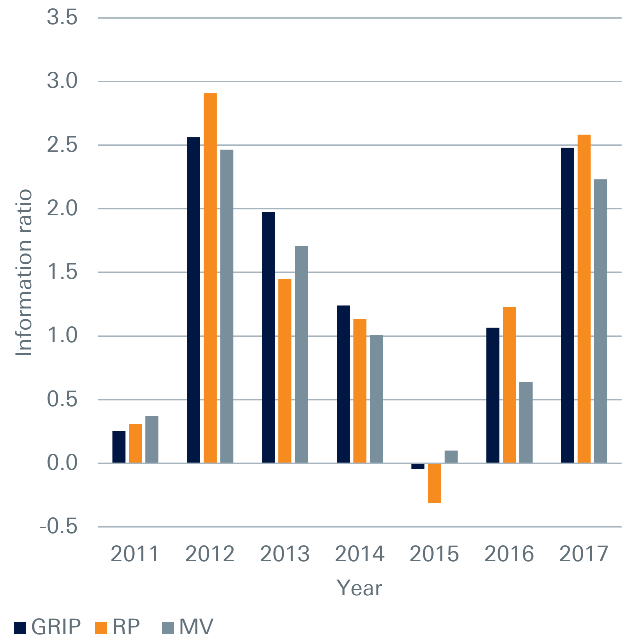
Comparison of uncorrelated exposures[5]



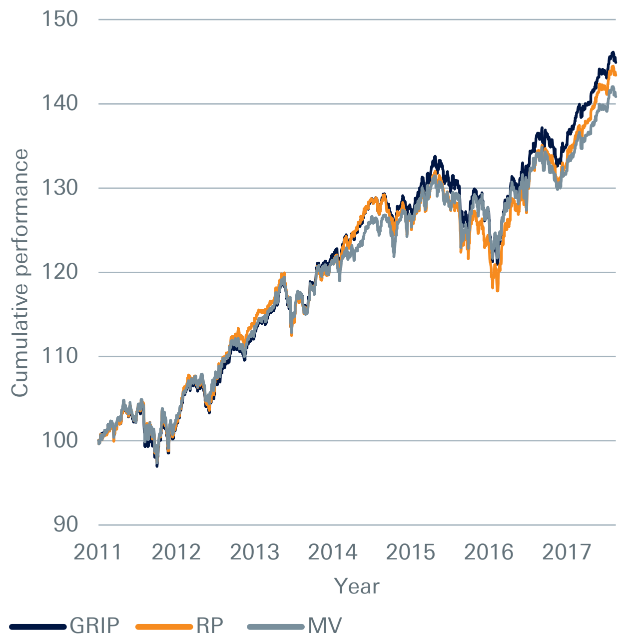
As well as being less concentrated, our analysis shows that a GRIP portfolio outperforms the traditional risk parity and mean-variance optimal allocations in absolute and risk-adjusted terms. The final two charts on the next page show the annual information ratios (total return divided by volatility) and the performance of the three optimisation techniques from 2011 to September 2017.

No assurance can be given that the GRIP construction process will perform better than other methodologies.

Comparison of annual information ratios[6]



Comparison of performance over time[6, 7]



[6] Source: DWS Investment GmbH, May 2020
[7] Past performance is not indicative of future performance.

References

Bai, Xi, Katya, Scheinberg, and Reha Tutuncu, 2016, Least-Squares Approach to Risk Parity in Portfolio Selection, Quantitative Finance, Vol. 16, Issue 3.

Best, Michael J., and Robert R. Grauer, 1991, On the sensitivity of mean-variance-efficient portfolios to changes in asset means: some analytical and computational results, Review of Financial Studies, 4(2), pp. 315 – 342.

Bruder, Benjamin and Thierry Roncalli, 2012, Managing Risk Exposures Using the Risk Budgeting Approach.

Choueifaty, Yves and Yves Coignard, 2008, Toward Maximum Diversification, Journal of Portfolio Management 35(1), pp. 40 – 51.

DeMiguel, Victor, Lorenzo Garlappi, and Raman Uppal, 2009, Optimal Versus Naïve Diversification: How Inefficient is the 1/N Portfolio Strategy?, Review of Financial Studies 22(5), pp. 1915 – 1953.

Hamacher, Horst W., and Kathrin Klamroth, 2000, Introduction to Graph Theory and Shortest Spanning Trees, Linear and Network-Optimization.

Ibbotson, Roger G., 2010, The Importance of Asset Allocation, Financial Analysts Journal, Vol. 66, No. 2.

Keller, Wouter J., Adam Butler, and Ilya Kipnis, 2015, Momentum and Markowitz: A Golden Combination.

Lohre, Harald, Ulrich Neugebauer, and Carsten Zimmer, 2012, Diversified Risk Parity Strategies for Equity Portfolio Selection, Journal of Investing, 21(3).

Lopez de Prado, Marcos, 2016, Building Diversified Portfolios that Outperform Out-of-Sample, Journal of Portfolio Management, Forthcoming.

Maillard, Sébastien, Thierry Roncalli, and Jerome Teiletche, 2008, On the Properties of Equally-Weighted Risk Contributions Portfolios.

Markowitz, Harry, 1952, Portfolio selection, Journal of Finance, Vol. 7, pp. 77-91.

Meucci, Attilio, 2009, Managing Diversification Risk, Bloomberg Education & Quantitative Research and Education Paper, pp. 74 – 79.

Michaud, Richard O., 1989, The Markowitz Optimization Enigma: Is Optimized Optimal?, Financial Analysts Journal, Vol. 45, No. 1.

Rokach, Lior, and Oded Maimon, 2005, Clustering Methods. Data Mining and Knowledge Discovery Handbook, Chapter 15.

Important information

This marketing communication is intended for professional clients only.

DWS is the brand name of DWS Group GmbH & Co. KGaA and its subsidiaries under which they operate their business activities. The respective legal entities offering products or services under the DWS brand are specified in the respective contracts, sales materials and other product information documents. DWS, through DWS Group GmbH & Co. KGaA, its affiliated companies and its officers and employees (collectively "DWS") are communicating this document in good faith and on the following basis.

This document has been prepared without consideration of the investment needs, objectives or financial circumstances of any investor. Before making an investment decision, investors need to consider, with or without the assistance of an investment adviser, whether the investments and strategies described or provided by DWS Group, are appropriate, in light of their particular investment needs, objectives and financial circumstances. Furthermore, this document is for information/discussion purposes only and does not constitute an offer, recommendation or solicitation to conclude a transaction and should not be treated as giving investment advice.

The document was not produced, reviewed or edited by any research department within DWS and is not investment research. Therefore, laws and regulations relating to investment research do not apply to it. Any opinions expressed herein may differ from the opinions expressed by other legal entities of DWS or their departments including research departments.

The information contained in this document does not constitute a financial analysis but qualifies as marketing communication. This marketing communication is neither subject to all legal provisions ensuring the impartiality of financial analysis nor to any prohibition on trading prior to the publication of financial analyses.

This document contains forward looking statements. Forward looking statements include, but are not limited to assumptions, estimates, projections, opinions, models and hypothetical performance analysis. The forward looking statements expressed constitute the author's judgment as of the date of this document. Forward looking statements involve significant elements of subjective judgments and analyses and changes thereto and/ or consideration of different or additional factors could have a material impact on the results indicated. Therefore, actual results may vary, perhaps materially, from the results contained herein. No representation or warranty is made by DWS as to the reasonableness or completeness of such forward looking statements or to any other financial information contained in this document. Past performance is not guarantee of future results.

We have gathered the information contained in this document from sources we believe to be reliable; but we do not guarantee the accuracy, completeness or fairness of such information. All third party data are copyrighted by and proprietary to the provider. DWS has no obligation to update, modify or amend this document or to otherwise notify the recipient in the event that any matter stated herein, or any opinion, projection, forecast or estimate set forth herein, changes or subsequently becomes inaccurate.

Investments are subject to various risks, including market fluctuations, regulatory change, possible delays in repayment and loss of income and principal invested. The value of investments can fall as well as rise and you might not get back the amount originally invested at any point in time. Furthermore, substantial fluctuations of the value of any investment are possible even over short periods of time. The terms of any investment will be exclusively subject to the detailed provisions, including risk considerations, contained in the offering documents. When making an investment decision, you should rely on the final documentation relating to any transaction.

No liability for any error or omission is accepted by DWS. Opinions and estimates may be changed without notice and involve a number of assumptions which may not prove valid. DWS or persons associated with it may (i) maintain a long or short position in securities referred to herein, or in related futures or options, and (ii) purchase or sell, make a market in, or engage in any other transaction involving such securities, and earn brokerage or other compensation.

DWS does not give taxation or legal advice. Prospective investors should seek advice from their own taxation agents and lawyers regarding the tax consequences on the purchase, ownership, disposal, redemption or transfer of the investments and strategies suggested by DWS. The relevant tax laws or regulations of the tax authorities may change at any time. DWS is not responsible for and has no obligation with respect to any tax implications on the investment suggested.

This document may not be reproduced or circulated without DWS written authority. The manner of circulation and distribution of this document may be restricted by law or regulation in certain countries, including the United States.

This document is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction, including the United States, where such distribution, publication, availability or use would be contrary to law or regulation or which would subject DWS to any registration or licensing requirement within such jurisdiction not currently met within such jurisdiction. Persons into whose possession this document may come are required to inform themselves of, and to observe, such restrictions

Issued in the UK by DWS Investments UK Limited which is authorised and regulated by the Financial Conduct Authority (Reference number 429806).

In Hong Kong, this document is issued by DWS Investments Hong Kong Limited and the content of this document has not been reviewed by the Securities and Futures Commission.

In Singapore, this document is issued by DWS Investments Singapore Limited and the content of this document has not been reviewed by the Monetary Authority of Singapore.

In Australia, this document is issued by DWS Investments Australia Limited (ABN: 52 074 599 401) (AFSL 499640) and the content of this document has not been reviewed by the Australian Securities Investment Commission.