

QUANT ALLOCATION

COLLECTED ROBECO ARTICLES

Quant Allocation

Collected Robeco articles

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For professional investors only

We would like to show our thanks and appreciation to all of our Robeco colleagues who were fellow authors or delivered input to the articles in this collection:

Paul Beekhuizen, David Blitz, Johan Duyvesteyn, Peter Ferket, Wilma de Groot, Daniël Haesen, Winfried Hallerbach, Patrick Houweling, Dennis Karstanje, Peter van Kleef, Laurens Masereeuw, Yann Morell y Alcover, Olaf Penninga, Laurens Swinkels, Casper Zomerdijk, Weili Zhou, Jeroen van Zundert.

For the latest research and insights go to: [Robeco.com/quant](https://www.robeco.com/quant)
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Foreword

Striving for excellence

Rigorous empirical research is indispensable for developing successful investment strategies. This is particularly true in the field of quantitative finance, where investment ideas need to be thoroughly vetted and validated, before they can eventually be turned into top-notch products.

At Robeco, we believe that the excellence that characterizes our in-house research sets us apart in the investment industry. Ever since our first director, Wim Rauwenhoff, said that “every investment strategy should be research-driven”, we have placed great emphasis on the pursuit of scientific knowledge.

Our organization has also been ahead of the pack in quantitative investment approaches from the very beginning. For over a quarter century, we have developed solutions that exploit inefficiencies across financial markets and asset classes. Quantitative techniques are a natural fit with our prudent, scientific and disciplined approach to investing, dating back to our foundation in 1929.

This book, which is dedicated to ‘quant allocation’, is the third in a series of collected research articles. Earlier volumes focused on low volatility investing and factor based investing, mostly in the equity market. This time, we look beyond the stock market and expand our analysis to include other major asset classes.

In a way, this book closes a gap in our series of research reference works, since ‘quant allocation’ strategies have the longest live track record of any of Robeco’s wide range of quantitative solutions. Over the years, we have accumulated a wealth of theoretical and practical knowledge that we are happy to share with our clients.

But what makes this knowledge valuable? And what makes for excellent research anyway? Many would argue that good research is simply research that successfully gets through the demanding and rigorous peer review process of the most prestigious academic journals. Indeed, ensuring adherence to the highest scientific standards, is certainly of utmost importance.

At Robeco, however, we see things slightly differently. We believe good research, valuable research, should, first and foremost, aim to improve the investment strategies we offer. That means, for example, that contrary to most peer-reviewed academic journals, which tend to favor research that supports the hypothesis being tested,¹ we consider ‘non-results’ just as meaningful.

¹ In recent years, several prominent academics, including Campbell Harvey from Duke University, have warned of the potential risk of ‘data mining’, or ‘p-hacking’, implied by this bias on the part of academic journals towards publishing research leading to positive results.

We never forget that our purpose, as asset managers, is to enable our clients to achieve their financial objectives through superior investment returns and solutions. And we know that, for investors, 'non-results' are also extremely significant, even if they don't stand a chance of getting published in peer-reviewed academic journals.

They help determine which investment strategies don't work in practice, even if they are based on seemingly good ideas. And we know that avoiding bad investment ideas is just as crucial as finding good ones. So, while getting published on a regular basis is obviously commendable, it should only be incidental and should not be considered anything more than a welcome side effect.

In fact, most of our research effort does not lead to positive conclusions on the hypothesis being tested. And while the articles gathered in this book – some of which have been published in prestigious journals – demonstrate the outstanding nature of our research, they are only the tip of the iceberg.

If we were to publish a collection of relevant articles refuting the hypotheses we've studied, the book would probably end up being ten times thicker. From that perspective, keeping track of all the research we produce is essential. Fostering the right research culture within our teams and making sure that the long-term performance of our strategies remains the number one priority is also essential.

Peter Ferket

Head of Investments

Peter Ferket

Head of Investments and member of the Executive Committee. He holds a PhD in Scientific Computing as well as a Master's degree in Applied Mathematics (cum laude) from Eindhoven University of Technology.

Introduction

Factor investing across and within asset classes

This book is about quantitative investing and dynamic market timing using systematic factors at the global 'macro' level. We refer to this as 'Quant Allocation'. This rapidly growing field covers the dynamic allocation across and within various asset classes, like equities, government bonds of various maturities, currencies and commodities. It covers solutions for areas such as total and absolute return multi-asset, fixed income and liquid alternatives.

These fields have witnessed rapid growth over the past decade. Robeco has been managing systematic Quant Allocation strategies since 1998. As shown in this book, our vast experience and extensive research, have enabled us to harvest return premiums in an efficient way. In addition, it has allowed us to gain experience with building portfolios across and within asset classes that yield stable and robust returns for our clients. These portfolios typically fit well in fixed-income, multi-asset and liquid alternative buckets, leading to style diversification and enhanced returns on traditional portfolios.

This book presents some of the most important research articles we have written on Quant Allocation strategies over the past few years. We follow up on earlier collections of articles on low-volatility investing and factor-based investing in equities by going a step beyond the equity markets, an area in which we are currently one of the market leaders and pioneers. This time, we look at all other major financial markets, for which we have accumulated valuable theoretical and practical insights on factor strategies.

The main takeaway of this book is that quantitative strategies backed by robust economic rationale, or factors, offer attractive returns across the board ('everywhere'). In other words, factor investing, or systematically harvesting academically proven sources of performance, works with all major asset classes. One of our most frequently downloaded articles (>10,000 downloads on SSRN), which was written in 2008, illustrates this. It shows that momentum and value strategies work in a global tactical cross-asset allocation ('GTCAA') context. In this book, we explain that this finding is reconfirmed by data gathered over the last ten years as well as 19th- and early 20th-century research.

In equity markets, factor premiums can be explained by behavioral biases, compensation for risk, or structural impediments (like investors being evaluated relative to benchmarks), all of which should apply equally well to other asset classes. We argue that the concept of factor premiums holds for other asset classes, as well. Therefore, factor premiums exist across the board. Throughout this book, we provide empirical evidence in support of this message. One example

is the carry factor, on which we have included two articles: one for bond markets and one for currency markets. We make the case for investing in these widely available factor premiums. As investors, we believe it is highly beneficial to allocate to these factor premiums, be it with a one-stop-shop solution or by selecting different products for different segments of a portfolio.

Part A ('Factor premiums: multi-asset space') of this book starts with four articles that look at various factors (or economically-motivated quant strategies) in a multi-asset context. We first provide strong and robust evidence supporting the presence of factor premiums in the multi-asset space. We show that return factors, such as momentum, value and carry, work not only within individual asset classes, like equity indices, bond indices, currencies and commodities, but also more broadly across asset classes. Figure 1, taken from the first article of this book, illustrates this point. It shows the historical annual return and risk (measured by volatility) characteristics of various factor premiums applied within and across the major asset classes (i.e. equity indices, country bonds, currencies and commodities) since 1800. For the sake of comparison, we have also listed the total returns on a global equity ('Equities') and bond ('Bonds') portfolio.

Figure 1: 217 years of multi-asset factor investing

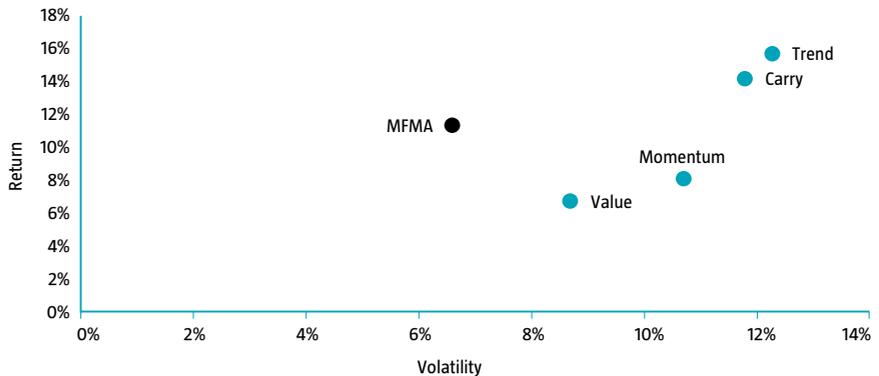


Figure 1: Trend, carry, momentum and value are applied within and across equity indices, bond indices, currencies, commodities. For each factor, the combination of the applications within and across is shown in risk-return space. Multi-factor multi-asset (MFMA) is the equally weighted combination of the trend, carry, momentum and value factors. For the sake of comparison, the equally weighted equities and bond portfolios are also included. The sample period is 1800-2017. This figure is part of the first article of the book which of course goes into much more detail on this subject. Source: Robeco

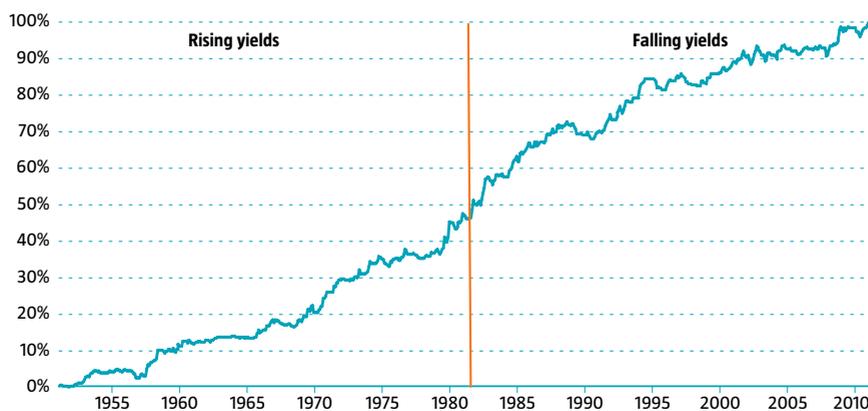
We have found strong evidence that these factors are not a statistical fluke or the result of 'academic p-hacking'. They can be found in the data from every ten-year period since 1800, and a multi-factor multi-asset portfolio helps to materially improve the risk and return profile of traditional portfolios. The second article, written in 2008, shows the presence of various factors premiums, such as momentum and value, in a global tactical cross-asset allocation ('GTCAA') context. Ten years later, we are finding out-of-sample evidence to support this study, not only from the last ten years but also the 19th and early 20th centuries. Risk management

proves to be key, as different asset classes and markets within each asset class are quite heterogeneous. As a result, concepts like dynamic risk budgeting, which are introduced in Part A are very important for managing multi-asset portfolios.

In Part B ('Factor premiums: stocks and credits'), we reprint three academic articles on the pioneering work we did on factor premiums in individual stocks and corporate bonds ('single names'), or what we term 'selection' space. Article 5 of this book starts out with our landmark article on the low risk effect, showing that the low risk effect that stocks with low volatility consistently outperform stocks with high volatility in risk-adjusted terms, is a universal phenomenon. In 2007, we won the Emerald Citation of Excellence award for this article, the conclusions of which form the foundation of our pioneering EUR multi-billion low-risk, or 'Conservative', equity strategies, launched in 2006. Next, we reprint an article summarizing findings on factor premiums in individual equities, revealing strong and consistent evidence of factor premiums in equities, which forms the basis of our multi-factor equity funds introduced in 2012. The final article in Part B argues that factor premiums are also found across individual names in the corporate bond space. There is strong empirical evidence to support this claim, evidence that is delivered by the unique corporate bond pricing database that Robeco has maintained since 1999 and that has formed the basis of our Conservative and Factor Credit strategies since 2012.

In the final part, Part C ('Factor premiums: dynamic allocation'), we summarize our research on quantitative strategies and factor premiums at the global or country level, within all major asset classes. Articles 8 and 9 of this book show that there is strong evidence to support the idea that factor based, or quantitative strategies work in government bond markets, an area of expertise in which Robeco has more than 20 years of demonstrable experience. Figure 2 illustrates this by highlighting the cumulative performance of our quantitative timing model in bond markets, a strategy Robeco has pursued since 1998.

Figure 2: Cumulative performance of Robeco's duration model, extended backtest



Source: Robeco, Ibbotson. Cumulative performance duration model, extended backtest



Guido Baltussen, PhD, Director,
Head of Quant Allocation

Similarly, dynamic factor based strategies also work with other asset classes, as shown for index-level credit markets in articles 10 and 11, and in equity index markets, as highlighted for seasonal factor strategies in article 12. For both equities and credits, Robeco has been using quantitative models for over 15 years. Finally, the last two articles of this book reveal that quantitative strategies, such as carry, also work in currency and commodity markets.

We believe these articles contain valuable information, presenting interesting ideas that could help in dissecting investor behavior. By sharing these insights, we hope you can improve existing portfolios and we can start building robust solutions together. For investors wishing to exploit the findings put forth in this book, Robeco offers a variety of solutions, depending on your needs and priorities, as well as your existing portfolios. We do not address very practical implementation issues in this book, but we would be more than happy to help you find answers. We hope you are eager to embark on this journey with us and start building evidence-based portfolios!

Rotterdam, March 2018

Guido Baltussen, Martin Martens and Pim van Vliet



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This document is an excerpt of the book Quant Allocation – Collected Robeco articles, which presents some of the most important research articles we have written on Quant Allocation strategies in recent years. For more information about this publication, please do not hesitate to contact your local Robeco sales representative/office.

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