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Marty Flanagan
President and CEO
of Invesco Ltd.

Regular readers of Risk & Reward are already familiar with Invesco's view that the most effective portfolios are built using a combination of active, passive and alternative capabilities. Now that many investors are worried about inflation, we wanted to take a moment to highlight the important role real estate can play.

In this issue of Risk & Reward, three of my colleagues from Invesco Real Estate show why a global approach is so important, analyzing correlations, inflation protection effects and ways to deal with the apparent illiquidity of many real estate investments. You'll also find additional insights in an interview with our experts.

The other four articles in this issue deal with factor investing or ESG – or both.

We show how ESG integration is possible without changing a portfolio's time-tested factor structure – and why this can result in even better performance if only negative ESG exposures are neutralized.

We also analyze the puzzling fact that passive high yield indices often underperform the broad market. Once again, factors can help explain this – information that puts you at a performance advantage.

Looking at portfolios with a low volatility tilt, we investigate the aim of reducing risk while benefitting from the low-volatility anomaly. When it comes to implementation, there are good reasons to choose an individual approach rather than a standard solution.

Our final article deals with textual analysis to determine ESG risk, presenting a case study of modern slavery risk. Learn how Natural Language Processing and Big Data can be used to address this important ESG risk and make portfolios more sustainable.

We hope you enjoy the newest edition of Risk & Reward.

Best regards,

A handwritten signature in white ink that reads "Marty L. Flanagan". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Marty Flanagan
President and CEO of Invesco Ltd.

Global real estate: true diversification amidst looming inflation

By Mike Bessell, Dr. Nicholas Buss and Dr. Katherine Seamans

We discuss various aspects of integrating global real estate into an investment portfolio and lay out the case for investors to consider a truly global approach. The article focuses on correlations with other asset classes, such as equities and bonds, and analyzes the inflation protection real estate may offer. Possible remedies to the illiquid nature of direct real estate investments are also developed and an overview presented of how real estate investments are categorized at Invesco Real Estate so as to benefit from structural demand drivers.





Conclusion 1: To make the most of real estate's diversification benefits, investors should allocate to multiple regional real estate markets and invest in both direct real estate and REITs.



Conclusion 2: Historically, real estate is shown to offer some protection against rising inflation.

All too often, real estate investors concentrate exposures in their home geographies, ignoring diversification benefits from a broader geographic and sector mix.

At global level, real estate offers considerable diversification against the traditional asset classes of equities and bonds (figure 1). Measured in local currencies, we see returns from both direct real estate and listed real estate assets (REITs) with a negative correlation to both bonds and the wider equity market. Even when returns are rebased into US dollars, direct real estate can deliver a strong diversification benefit versus other asset classes.

Also of note – and counter to many general market perceptions – is the slightly negative correlation between REITs and direct real estate. This highlights the need to examine these asset classes in detail, rather than generalizing them all as 'alternatives'.

The diversification benefit of including direct and listed real estate in a portfolio is also evident on a regional basis. However, in Europe and Asia-Pacific in particular, some of the diversification benefits erode (figure 2), emphasizing a key failing of many asset allocation strategies that limit alternative investments to local assets.

Conclusion 1: To make the most of real estate's diversification benefits, investors should allocate to multiple regional real estate markets and invest in both direct real estate and REITs.

Inflation protection

Global monetary stimulus in reaction to pandemic-driven supply disruptions and post-lockdown demand have brought inflation back into focus. The result has been increased volatility, particularly in bond markets.

Direct and listed real estate have been mildly positively correlated to inflation, in contrast to the typically negative correlation seen in equities or bonds since 2010 (figure 3). The table shows the relationship over the past decade, when inflation was relatively subdued and trending lower globally. If the post-COVID economic recovery (with the possible short-term exception of the US) is similar to the post-GFC (global financial crisis) recovery, with steady economic growth while countries eventually seek to rein in the recent fiscal expansion, the table provides a useful guide to the expected performance of real estate going forward.

Importantly, the data also supports real estate's stronger negative correlation in periods with higher inflation (see box: US real estate and inflation).

Conclusion 2: Historically, real estate is shown to offer some protection against rising inflation.

Correlations over time

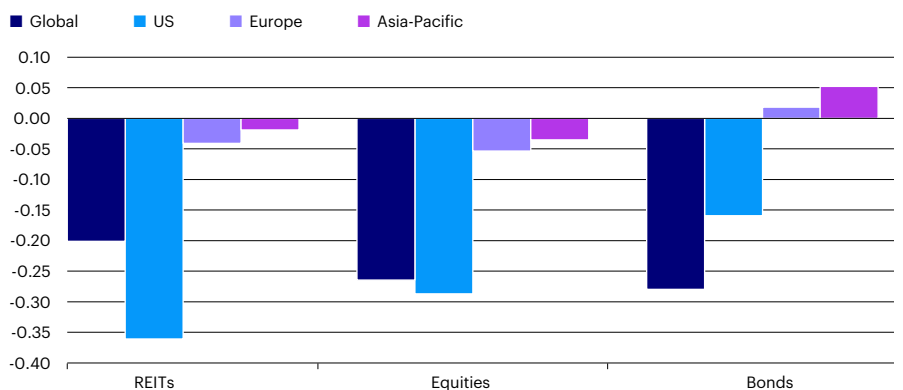
We next examine how correlations between different global asset classes change when measured over different time periods (figure 4). We start with correlations over

Figure 1
Correlation of global asset classes

	Direct real estate	REITs	Equities	Bonds
Direct real estate	1.00	-0.20	-0.26	-0.28
REITs		1.00	-0.04	-0.04
Equities			1.00	0.14
Bonds				1.00

All assets in local currency, Q3/2009 to Q1/2021 (the maximum period for which consistent data is available across all asset classes). The asset class indexes are listed in footnote 1 at the end of the article.
Source: Invesco Real Estate based on data from Macrobond as of September 2021.

Figure 2
Correlations of direct real estate with other asset classes in different regions



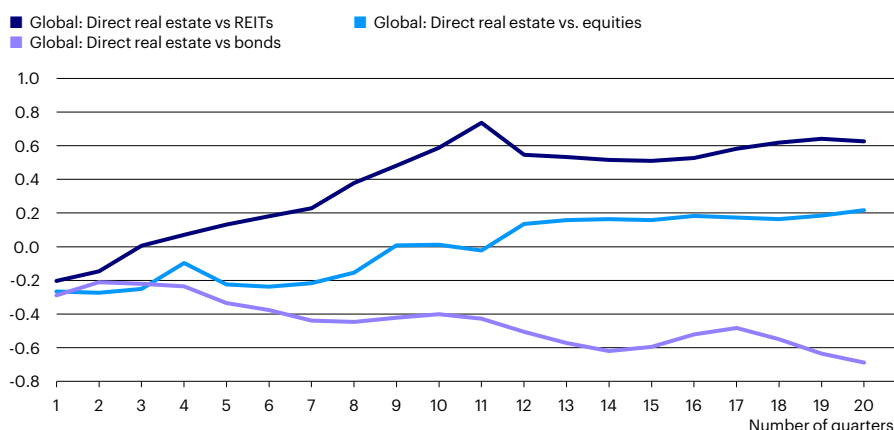
All assets in local currency, Q3/2009 to Q1/2021 (the maximum period for which consistent data is available across all asset classes). The asset class indexes are listed in footnote 1 at the end of the article.
Source: Invesco Real Estate based on data from Macrobond as of September 2021.

Figure 3
Correlation of direct and listed real estate with inflation

	Inflation	Global	US	Europe	Asia-Pacific
Direct real estate	Global	0.05	0.01	0.18	0.28
	US	-0.00	-0.04	0.19	0.26
	Europe	0.25	0.00	0.08	0.09
	Asia-Pacific	0.22	0.27	0.19	0.26
REITs	Global	0.06	0.28	0.23	0.38
	US	-0.08	-0.03	0.04	-0.19
	Europe	0.08	0.41	0.21	0.51
	Asia-Pacific	0.04	0.23	0.13	0.25
Equities	Global	-0.10	-0.00	0.03	-0.14
	US	-0.09	0.03	0.00	-0.11
	Europe	-0.11	-0.06	0.16	-0.16
	Asia-Pacific	-0.14	-0.03	0.02	-0.12
Bonds	Global	-0.10	0.06	-0.23	-0.10
	US	-0.19	-0.26	-0.28	-0.20
	Europe	-0.26	-0.25	-0.32	-0.25
	Asia-Pacific	-0.10	-0.07	-0.18	-0.06

All assets in local currency, Q3/2009 to Q1/2021 (the maximum period for which consistent data is available across all asset classes). The asset class indexes are listed in footnote 1 at the end of the article. Source: Invesco Real Estate using data from MSCI, Macrobond and Barclays as of September 2021.

Figure 4
Correlations over different time horizons



All assets in local currency, Q3/2009 to Q1/2021 (the maximum period for which consistent data is available across all asset classes). The asset class indexes are listed in footnote 1 at the end of the article. Source: Invesco Real Estate using data from MSCI, Macrobond and Barclays as of September 2021.

a single quarter and increase the time period progressively to five years (20 quarters).

We see that the correlation between direct real estate and all other asset classes is low over the short term, i.e., less than four quarters. However, the correlation between direct real estate and REITs increases over longer time periods, which is no surprise given their similar fundamental exposures. Meanwhile, the correlation between direct real estate and bonds starts negative and decreases further over longer periods, emphasizing the importance of long-term allocation strategies to ensure an appropriate weighting of real estate.

Conclusion 3: The diversification benefits of real estate vs. bonds increase over time.

Liquidity considerations

Since it offers good diversification relative to stocks and bonds, direct real estate can be valuable for most portfolios. But liquidity considerations need to be taken into account. Even real estate fund shares cannot always be sold quickly. Arguably, it is largely the longer time horizon of almost all direct real estate investments that drives the performance difference versus listed asset classes.

Listed real estate offers a long-term return profile similar to direct real estate, but with the benefit of more immediate liquidity and at the cost of greater volatility. Both REITs and direct real estate funds own physical real estate assets. As such, we regularly see listed entities selling assets to direct market funds, and vice versa. In the short run, however, listed and direct real



Conclusion 3: The diversification benefits of real estate vs. bonds increase over time.



Conclusion 4: Adding an exposure to REITs to a direct real estate portfolio can help address liquidity issues while maintaining the allocation to real estate.

estate represent very different types of investment and a different investor mix with different objectives and time horizons leads to very different profiles.

While larger investors may have the relative luxury of maintaining significant holdings in an illiquid asset class like direct real estate, providing an income-generating bedrock that requires only occasional allocation adjustments, a solution for many other investors could be to invest in a vehicle combining elements of both listed and direct real estate. Such a strategy could comprise a diversified mix, e.g., 70-75% direct property with a 25-30% liquidity sleeve that retains an underlying real estate exposure.

Conclusion 4: Adding an exposure to REITs to a direct real estate portfolio can help address liquidity issues while maintaining the allocation to real estate.

Exposures to different drivers

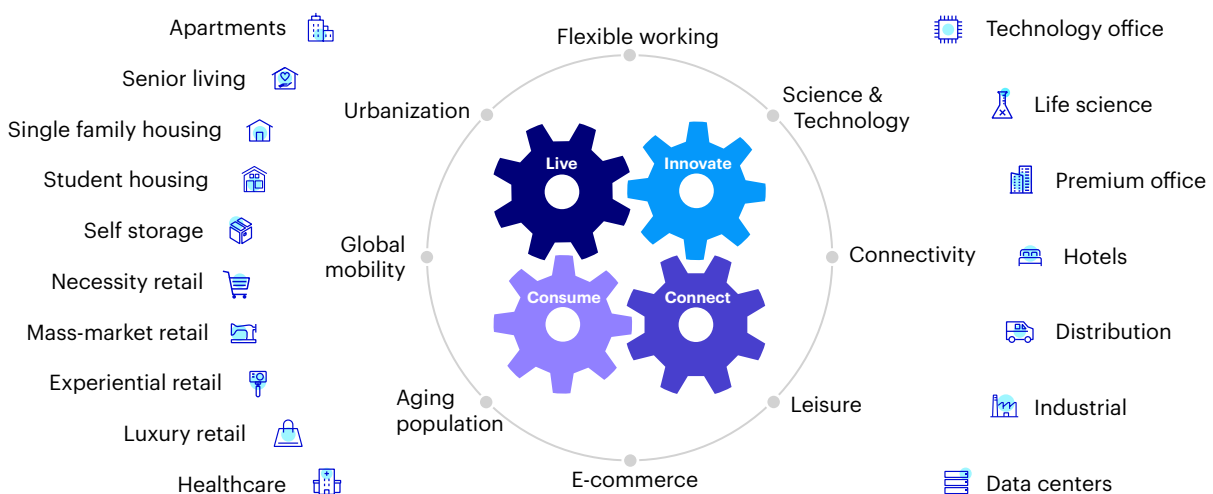
One key reason for the diversification benefits of real estate is that people need real estate for many different reasons. It may sound trite, but real estate houses the economy. As an asset class, real estate is always relevant – always and everywhere. Long lead times to development serve to limit new supply. This is often compounded by stringent planning regulations which seek to reflect multiple conflicting interests, even more so in locations where land is a scarce asset.

Traditionally, real estate is categorized as office, retail, industrial and residential – because that is how global data is gathered and reported. At Invesco Real Estate, we prefer to focus on the underlying influences driving the demand for real estate assets, and hence their performance.

Real estate returns are driven by human needs. How these combine with the influence of various global structural trends and economic cycles determines current and future demand for real estate. Fundamental requirements include the need for spaces to consume, live, innovate and connect (the ‘CLIC’ chart in figure 5).

- Where we consume includes sectors impacted by how and where we spend our money. This means traditional sectors such as retail and logistics (driven increasingly by e-commerce), as well as smaller sectors like healthcare (driven by aging demographics and limited public health provision in some counties) and self-storage facilities (driven by life’s disruptions, such as moving).
- Where we live includes sectors with beds, such as rental housing, seniors housing and student housing. Demographics are the key driver here, as are shifts in locational patterns as we may see created by more flexible work environments in a post-COVID world.
- Where we innovate includes sectors where collaborative working and innovation occur, and where creative and technology-driven industries want to locate. This includes office space oriented to these types of tenants as well as specific types of space to service the rapidly growing life-science sector.
- Where we connect includes the data center sector – another fast-emerging sector that is now the critical backbone of corporate infrastructure as we continue to generate exponential amounts of data. This needs to be safely stored and readily accessed to connect us all together, as we have all learned since the start of the global COVID-19 pandemic.

Figure 5
The CLIC* framework
Opportunity: secular trends guide our thinking



* CLIC = Consume/Live/Innovate/Connect
Source: Invesco as of August 2021.



Conclusion 5: In order to capture the underlying drivers, we regard the consume/live/innovate/connect framework superior to the office/retail/industrial/residential classification.

All these activities are part and parcel of daily life around the globe, and all require real estate. The CLIC themes are constant in that they are the same today as they were hundreds of years ago. What changes is ‘how’ we consume, live, innovate and connect. Understanding the secular trends that influence the ‘how’ allows us to invest in the most relevant real estate worldwide today.

Conclusion 5: In order to capture the underlying drivers, we regard the consume/live/innovate/connect framework superior to the office/retail/industrial/residential classification.

Summary

The diversification benefits of alternative investments such as real estate within larger portfolios is reasonably well understood. However, to maximize the diversification benefits, we believe that asset allocators should examine the details of how this exposure is structured.

Direct and listed real estate assets offer both long-term risk diversification for large portfolios and the potential for significant inflation protection. These factors are expected to drive ongoing interest in real estate as an asset class as the global outlook normalizes after the COVID-19 pandemic, and beyond.

US real estate and inflation

Due to the substantial monetary support in response to COVID-19, financial markets remain focused on the global inflation outlook. With the highest levels of money supply growth, the US is at the center of these concerns, leading to questions regarding the impact on real estate.

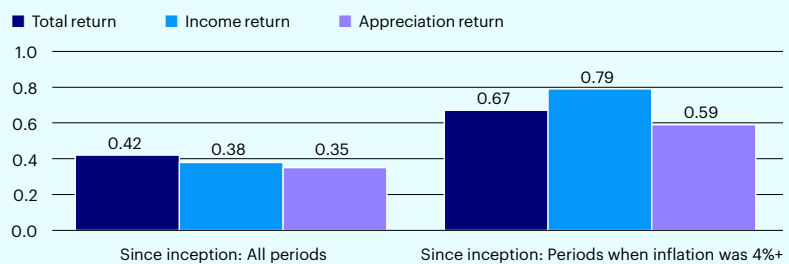
We find that US real estate is well placed to withstand any changes to the inflationary or interest rate environment. The relative pricing of real estate in 2021 appears favorable; with the spread between NCREIF Property Index current value cap rates and 10-year US Treasury averaging 247 basis points in Q2-2021 – above the long-term average of 244 bps.

There is clear room for movement. Based on the Q2-2021 cap rate spread, as well as the long-term average spread and an 87 bp standard deviation of the long-term spread, US Treasury yields could rise as much as 90 bps before the cap rate spread shrinks below the normal long-term range.

In addition, while real estate overall is positively correlated to inflation, as seen above, this correlation is actually strongest when inflation is high (figure 6). As such, we believe investors concerned about the sustainability of above-trend inflation in the US should consider increasing real estate allocations.

Furthermore, we find that all traditional real estate sectors, with the exception of retail, have served as effective hedges against high inflation, emphasizing the benefit of a diversified real estate strategy within a broader allocation (figure 7).

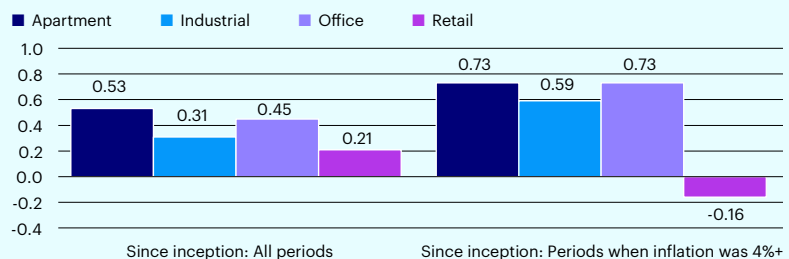
Figure 6
Correlation between inflation and real estate return components, Q1-1978 to Q4-2020



Since-inception returns for NPI (NCREIF Property Index) are from Q1-1978 to Q4-2020. It is not possible to directly invest in an index. Past performance is not indicative of future results.

Source: Invesco Real Estate using data from NCREIF and Moody’s Analytics as of March 2021.

Figure 7
Correlation between inflation and real estate sector total returns, Q1-1978 to Q4-2020



Since-inception returns for NPI (NCREIF Property Index) are from 1Q-1978 to 4Q-2020. It is not possible to directly invest in an index. Past performance is not indicative of future results.

Source: Invesco Real Estate using data from NCREIF and Moody’s Analytics as of March 2021.

Note

1 Asset class indices (maximum time period, at least since 1/1/2000, unless unavailable):

		Index	Source provider	Start date
Global	Direct real estate	MSCI Global Property Fund Index - Natural Weights Benchmark Returns	MSCI	Mar-08
Global	REITs	FTSE EPRA/NAREIT, Gross Total Return	Macrobond	Jun-09
Global	Equities	MSCI, Mid & Large Cap, Index, Total Return	Macrobond	Jun-01
Global	Bonds	Bloomberg-Barclays Aggregate Bond Index	Barclays	Jan-00
US	Direct real estate	MSCI U.S. Quarterly Property Index (Unfrozen) published Quarterly	MSCI	Jan-00
US	REITs	FTSE/NAREIT All Equity REITs Total Return	NAREIT	Jan-00
US	Equities	S&P, 500, Index, Total Return	Macrobond	Jan-00
US	Bonds	Bloomberg-Barclays Aggregate Bond Index	Barclays	Jan-00
Europe	Direct real estate	MSCI Pan-European Quarterly Property Fund Index (Unfrozen) published quarterly	MSCI	Mar-04
Europe	REITs	FTSE EPRA/NAREIT, Gross Total Return, Close, DEVELOPED EUROPE CAPPED	Macrobond	Dec-07
Europe	Equities	MSCI, Mid & Large Cap, Index, Total Return	Macrobond	Jun-01
Europe	Bonds	Bloomberg-Barclays Aggregate Bond Index	Barclays	Jan-00
AsiaPac	Direct real estate	MSCI Global Property Fund Index - APAC-Natural Weights Benchmark Returns	MSCI	Mar-08
AsiaPac	REITs	FTSE EPRA/NAREIT, Gross Total Return	Macrobond	Sep-09
AsiaPac	Equities	MSCI, Mid & Large Cap, Index, Total Return	Macrobond	Jun-01
AsiaPac	Bonds	Bloomberg-Barclays Aggregate Bond Index	Barclays	Dec-00

Further reading**Real estate: A real solution?***

Asset allocators are faced with a variety of challenging macroeconomic forces and competing investment goals. At Invesco Investment Solutions (IIS), we utilize both listed and direct real estate in our portfolios due to their versatile characteristics and attractive return profiles. This allows us to design specific allocations for common thematic objectives, namely: real return, growth and income.

Investors focusing on real return aim for stable cash generation in various inflation and interest rate environments. This requires a level of diversification not present in traditional assets. As real estate can pass through rising prices in the form of rent increases, exposure to this asset class may be attractive for investors seeking to preserve their assets on a real basis.

Investors focusing on growth look to expand their asset base with above-average price appreciation. Utilizing our proprietary capital market assumptions, we posit that stocks and bonds may not provide enough total return to reach common investor return objectives. Real estate in its various forms, on the other hand, is expected to outperform these assets on an absolute and risk-adjusted basis.

Investors focusing on income may benefit from real estate capitalization rates that provide an attractive spread over government bonds as well as medium-grade corporates.** Compared to high yield, private real estate debt also provides a spread, tends to be longer dated and maintains its correlations to the real underlying asset due to collateralization in case of default.

Real estate is an important asset class for investors across the risk spectrum. Few assets other than real estate can fit into as wide a selection of investment objectives, and we continue to view it as a critical piece of any broad asset allocation strategy.

* Based on Drew Thornton, 3Q21 Capital Market Assumptions Whitepaper, Invesco Investment Solutions.

**Source: Invesco Investment Solutions, NCREIF, US Board of Governors of the Federal Reserve System, Moody's Analytics, as of March 31, 2021.



“Adding global real estate to a portfolio has clear benefits.”

Interview with Mike Bessell, Dr. Nicholas Buss, and Dr. Katherine Seamans

Risk & Reward spoke to Mike Bessell, Dr. Nicholas Buss and Dr. Katherine Seamans about their views on the top-of-mind issues affecting today’s real estate market, including portfolio diversification, inflation, ESG and what a post-COVID landscape might look like.

Risk & Reward

We are talking about the diversification benefits of private assets today. How should asset allocators be thinking about the role of an asset class like real estate within a wider portfolio?

Mike Bessell

I guess we would say this being real estate investors, but there are clear benefits to holding real estate in most wider investment portfolios, both in terms of the diversification of real estate against other assets, but also in terms of the significant contribution that income makes to real estate’s total return. But more importantly, in thinking about the role that real estate plays, asset allocators should consider looking beyond just real estate as a single ‘amorphous’ asset class. No one looks at their equity allocation and just holds one stock, and in the same way a real estate portfolio should, in our view, be appropriately structured in a similar fashion.

Nick Buss

I think that there is an important benefit derived from adding global real estate to a portfolio in that different markets and/or geographies see limited correlations in performance. Real estate is a derived demand based on the economic drivers of a local economy. As we know, economic cycles are not always correlated across the globe and pace of growth can vary widely. As a result, investing across markets can provide additional diversification and risk mitigation within the asset class.

Katie Seamans

In addition to geographical diversification of real estate investments, different real estate sectors offer additional diversification benefits for a portfolio. The demand for different sectors is driven by the real estate needs of the local population; most of us

need a place to live, do our shopping and go to work. Real estate literally and figuratively houses our economy.

Risk & Reward

So how is IRE supporting clients looking to benefit from global diversification?

Mike Bessell

As a manager with experience across equity/debt markets, listed/direct and global/local real estate, creating a one-stop-shop for global diversification of the real estate asset class is important to us.

At the heart of our business is core real estate with its high-quality, long-income focus. I believe we are relatively uniquely positioned amongst our peers in having sufficiently sized core assets in each of the three regions – Asia Pacific, EMEA and North America.

Understanding the markets’ needs is crucial: some are looking for pure direct real estate exposure, while others want to overlay a liquidity sleeve in the form of listed real estate securities. And this is particularly important for those who need to have daily liquidity.

We are seeing how investing in both global direct and securities is appealing today, especially where, historically, access and exposure to the domestic markets have been the trend.

Risk & Reward

Inflation is a hot topic at present, given the combination of post-pandemic supply chain pressures and the strong growth in money supply in key markets. How does real estate perform in an inflationary environment?

Nick Buss

In the US, real estate has historically been a decent hedge against rising inflation. The US experience is that correlations between real estate performance and inflation have strengthened during periods of higher inflation. When you look at the data, the correlation over the long term (the last 40 years) has been 0.42. But when inflation has moved above 4%, the correlation has strengthened to 0.67.¹ We have seen differences across property types, with



Asset allocators should consider looking beyond just real estate as a single “amorphous” asset class.



Demand for real estate is driven by human activities and the need for physical accommodation.

stronger correlations for apartment, office and industrial properties and weaker for retail. This differentiation typically results from the ability and swiftness of a sector to increase rents, which in turn depends on underlying lease terms and structures. For example, the apartment sector, which is typically characterized by one-year leases, has the highest correlation as landlords can quickly reset rents in an inflationary period.

Katie Seamans

That said, from a global perspective it is actually less clear how real estate performs in an inflationary market. Part of the reason for this is the fact that real estate markets outside of the US are influenced by a stronger proportion of global capital flows relative to domestic investors. This breaks some of the connection to local influences, such as CPI.

Also, in some markets such as Europe and Australia, step-up rents – pre-arranged increases on agreed-to dates – are linked to inflation. In these markets, there is growth potential but not likely growth beyond inflation. Inflationary pressures can even vary by market and by sector. For example, industrial rents may benefit from rising inflation in markets with an undersupply of last-mile distribution facilities and as e-commerce penetration increases. Retail for non-discretionary goods (say, groceries) may benefit in an inflationary period, but those for luxury or discretionary goods may feel a squeeze from supply chain disruptions and, again, increasing shifts to e-commerce.

Risk & Reward

Could you provide more insight regarding why the correlations between asset classes change over time?

Mike Bessell

Over the longer term, the performance trends of direct and listed real estate have actually been very similar. Listed real estate, such as the FTSE EPRA NAREIT Global Index, has tracked a more volatile path around the smoother returns of the direct market, such as the MSCI Global Property Fund Index. In the short term, equity market noise can affect these returns but, longer term, both show the same fundamental growth profile.

Similarly, over the longer term, economic growth drives both equities and real estate markets, so it is to be expected that these will show an increasing correlation over time once the effects of the shorter-term equity market volatility dissipate from the returns.

Risk & Reward

You talk about real estate investors as longer-term holders. Can we explore the reasons for that a little more?

Mike Bessell

The acquisition of a physical real estate asset requires specialist input, which takes time and adds cost. Brokerage fees, legal

documentation and due diligence typically cost 1% - 2% of an asset's value. In addition, real estate transfer taxes may be due on a change of ownership, except where the asset can be sold within a corporate entity. While transfer taxes vary by country, these can be significant – around 5% of the purchase price in England and France, between 3.5% and 6.5% in Germany – while charges in the US vary by municipality and in the customary split between buyer and vendor. Due to these high costs in acquiring and liquidating real estate assets, it makes sense to hold the investment for longer than listed assets, which is exactly what we see in our market.

Risk & Reward

You have an interesting framework for looking at the role real estate assets play. Could you provide a little more color on the thinking behind this?

Katie Seamans

Demand for real estate is driven by human activities and the need for physical accommodation. We need locations to Consume, Live, Innovate, and Connect. It all just CLIC'd for us one day – we are actually investing in our own daily lives! As a population's needs change, the drivers of real estate demand change, and we adjust our allocations accordingly to align with the most relevant real estate for the market.

Nick Buss

Yes, this CLIC framework forms the basis of how we really view the market and is centered around global structural drivers, particularly demographics, technology disruption and lifestyle shifts. But these will all play out differently in different regions and markets across the globe depending on local structures and culture.

Let me walk you through some good examples. Firstly, shifts in demographics are expected to impact changing demand for housing. For instance, the aging of the large Millennial generation into their mid-30s/early 40s, entering the 'family' stage of their lifecycle, where they are looking for more space and factors such as school quality become more important. This may move demand from urban rental housing toward suburban single-family housing for that demographic. Meanwhile, the aging trend and the rise of seniors across the globe in my view will be impactful over the next two decades. Most directly, this has implications for housing choice and healthcare but will play out differently across the globe depending on social welfare structures and public health provisions.

A second example is how technology disruption is broadening. We are clearly seeing this today in the ongoing growth of e-commerce (driving logistics demand, negatively impacting the need for physical retail space), but we also see this driving demand for sectors such as life science and data centers. Meanwhile, shifts in lifestyle and working patterns continue



The pandemic has accentuated and accelerated structural shifts, favoring sectors such as logistics, residential, and life science.

to play out, and in some cases have been accentuated by the impact of the COVID pandemic. For instance, the shift to a more hybrid/work-from-home model may be less in some regions (Asia, Europe) than others (North America) due to the size of residences and cultural factors, such as multigenerational living.

Risk & Reward

ESG is a key topic for real estate. Could you share some details on how Invesco Real Estate is approaching this?

Katie Seamans

Across real estate markets, Environmental, Social and Governance (ESG) credentials are an increasingly important consideration for both real estate investors and occupiers. ESG+R (ESG and Resilience) investing is a fundamental commitment at Invesco Real Estate. Our ESG+R philosophy is based on our belief that ESG aspects can deliver both competitive financial returns and opportunities for business growth and innovation. To support this, we have set global targets of a 3% annual reduction in energy and emissions by 2030 from a 2018 baseline, net zero carbon emissions by 2050, and 1% annual reduction in water consumption and 1% annual increase in waste diversion.

Mike Bessell

We also place a lot of emphasis on the Global Real Estate Sustainability (GRESB) scoring. These are peer-relative scores that continually increase the standards required.

We are very pleased that the latest results show that 83% of the 60% of our AUM submitted to GRESB earned a 4- or 5-star ranking and our scoring improved across our AUM submitted from 2020 to 2021.

Risk & Reward

How do you see the returns outlook for global real estate from here?

Nick Buss

Looking ahead, we expect real estate yields to remain attractive vis-à-vis alternate investment options. In my view, the sector should continue to attract capital based on its income-generating characteristics and diversification benefits it brings to a mixed-asset portfolio. As we look across the globe, we recognize that recovery from COVID is occurring at an uneven pace, and that this is unlikely to change in the near term.

Generally, fiscal and monetary stimulus measures remain supportive, but inflationary pressures are real and may prove more persistent in some regions (although, as we discussed earlier, real estate can provide a hedge to this risk in some regions). Within the sector, we see secular trends remaining the bedrock of real estate demand and this will serve as our guidepost for asset and market selection.

The pandemic has accentuated and accelerated structural shifts, favoring sectors such as logistics, residential and life science. Cyclical uplift may provide tactical opportunities, but we expect greater divergence in asset performance. We feel that caution is warranted not to focus too much on the short-term pent-up demand story that may play out post-COVID. Regionally, with the aim of benefiting from the multispeed recovery, our current view is to maintain an overweight to the US, neutral to Asia Pacific and underweight Europe.

Note

¹ Since Inception returns for NPI (NCREIF Property Index) are from 1Q-1978 to 4Q-2020. You cannot directly invest in an index. Source: Invesco Real Estate using data from NCREIF and Moody's Analytics as of March 2021. Past performance is not indicative of future results.



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About risk:

The value of investments and any income will fluctuate (this may partly be the result of exchange rate fluctuations) and investors may not get back the full amount invested. Property and land can be difficult to sell, so investors may not be able to sell such investments when they want to. The value of property is generally a matter of an independent valuer's opinion and may not be realized.

Factors with ESG integration

By Erhard Radatz, Carsten Rother and Hao Zou, Ph.D.

Is it possible to make a portfolio *more ESG* without fundamentally altering its factor profile? We analyze how to best neutralize the ESG exposures in a factor portfolio and discuss impacts of ESG integration on the factor investing proposition.



Factor investing seeks to systematically invest in the salient drivers of risk and return¹ based on the notion that stable, characteristic-based factors (such as momentum, quality and value) can predict the cross section of equity returns.² Often, a variety of signals is used to capture different facets of the momentum, quality and value factors and ensure diversification.

Within this core philosophy, it is important to adopt a portfolio construction methodology that allows factor premia to be harvested efficiently. The goal is to construct a diversified portfolio that reflects the overall factor views while controlling for risk and incorporating client constraints. To this end, we first construct market-neutral factor portfolios for quality, momentum and value, in which we control for unwanted risks.³ Afterwards, we combine these factors into a 'model' portfolio that reflects the aggregate factor views and provides a foundation for building the optimal portfolio. Because the factor overlay represents active positioning atop a given benchmark, the model portfolio is market neutral.

As we strive for seamless ESG integration, it is crucial to improve the ESG profile of our portfolios without diminishing their factor exposures or harming their risk-return characteristics. Since a portfolio's ESG exposure doesn't always contribute to its alpha, this means reducing the portfolio's ESG risk by neutralizing negative ESG exposures.

To preserve the factor views on momentum, value and quality while improving the portfolio's ESG profile, we employ a systematic approach to construct factor portfolios with ESG characteristics better than the original portfolios. For instance, if a given factor comes with a negative ESG score, we can neutralize that characteristic to mitigate the related risk in the ESG-integrated portfolio. This can be done without jeopardizing the portfolio's overall factor exposures. Additionally, we investigate how to further improve a factor's ESG profile if it is already positive to begin with.

We start by calculating quality (QAL), momentum (MOM) and value (VAL) factor scores for a US large and mid-cap universe with more than 1,000 names on average.⁴ For ESG data, we use the MSCI industry-adjusted ESG scores. To ensure sufficient coverage and a consistent scoring methodology, our sample runs from

January 2013 to July 2020. Within that period, around 93% of stocks in the US large and mid-cap universe are covered by the MSCI ESG data. Table 1 shows summary statistics on the average period-by-period correlations between factor scores and ESG scores.

As it turns out, all correlations are modest, and none exceed 0.20 across all periods. Value proves to be less ESG friendly than quality, as stocks with high value scores tend to have low ESG scores. Stocks with high quality scores, on the other hand, tend to have high ESG scores. The relation between momentum and ESG is mostly flat in our sample.

Neutralizing factor portfolios

Neutralizing factor portfolios with respect to ESG exposures is simple. We start with standardized factor scores and regress them on ESG scores and beta.⁵ The residuals of the regression (which are by construction neutral to ESG scores) are used to form an ESG-enhanced, market-neutral factor portfolio. This procedure is carried out for every month in the sample. We call this the 'baseline' neutralization approach, as opposed to a 'conditional' neutralization approach where we neutralize the ESG exposure only in periods when it is negative. In the next sections, we show



Neutralizing factor portfolios with respect to ESG exposures is simple.

Table 1
Cross-sectional correlations of factor scores and ESG scores

	Minimum	Maximum	Mean	Median
Quality	-0.020	0.191	0.091	0.090
Momentum	-0.066	0.094	0.011	0.011
Value	-0.044	0.030	-0.015	-0.015

Source: MSCI, Invesco calculations; based on monthly data from January 2013 to July 2020.

Table 2
Baseline neutralization results

	Quality portfolio		Momentum portfolio		Value portfolio	
	Original	ESG-enhanced	Original	ESG-enhanced	Original	ESG-enhanced
ESG exposure	0.266	0	-0.002	0	-0.012	0
Factor exposure	2.105	2.087	2.163	2.179	2.191	2.164
Performance p.a.	0.17%	-0.27%	2.82%	2.93%	-2.88%	-2.63%
Standard deviation	3.28%	3.41%	5.35%	5.51%	6.53%	6.43%
Information ratio	0.051	-0.078	0.53	0.53	-0.44	-0.41
Tracking error		0.57%		0.52%		0.76%
Correlation		0.986		0.996		0.993

Source: Invesco.

empirical results for each method and discuss how 'conditional neutralization' improves upon the baseline approach.

Baseline neutralization ...

We first calculate the time series averages of the factor and ESG exposures for our three factors. Our starting point are three market-neutral factor portfolios – for quality, momentum and value. Each stock in the factor portfolios has a standardized factor score and an ESG score. Weighting them by the factor portfolio holdings gives us the factor exposure and ESG exposure for every month. Because market-neutral factor portfolios are of the unit leverage type (i.e., the long and short position sum to 1 and -1, respectively), a positive/negative exposure means that the long leg has a greater/lesser exposure than the short leg, and a zero exposure means that the exposure is neutral.

Table 2 shows the factor exposures of the original and the ESG-enhanced factor portfolios. The original quality factor portfolio has a positive ESG exposure (0.266), the original value factor portfolio has a negative ESG exposure (-0.012) and the original momentum factor portfolio's ESG exposure is close to zero (0.002). The

ESG-enhanced versions of the three portfolios have an ESG exposure of exactly zero, by construction. Importantly, the factor exposures of the original and the ESG-enhanced portfolios are very close (2.11 vs. 2.09 for quality, 2.16 vs. 2.18 for momentum and 2.19 vs. 2.16 for value). Obviously, ESG integration has little impact on the factor exposures.

We also compared ex-post factor performance. For momentum and value, ESG integration has no significant influence on factor performance, though it makes a mild difference in the case of quality. Furthermore, correlations between the original and the corresponding ESG-enhanced portfolios are very high, at more than 0.98 in all cases. These results are consistent with the fact that these factors have very similar factor exposure scores.

... and conditional neutralization

This ESG neutralization approach, however, has one important drawback: If the factor portfolio's ESG credentials are already very good overall, baseline neutralization reduces the average ESG rating. A simple alternative is 'conditional neutralization', which selectively preserves positive ESG

Table 3
Conditional neutralization results

	Quality portfolio		Momentum portfolio		Value portfolio	
	Original	ESG-enhanced	Original	ESG-enhanced	Original	ESG-enhanced
ESG exposure	0.266	0.276	-0.002	0.056	-0.012	0.037
Factor exposure	2.105	2.103	2.163	2.171	2.191	2.176
Performance p.a.	0.17%	0.04%	2.82%	2.91%	-2.88%	-2.72%
Standard deviation	3.28%	3.27%	5.35%	5.38%	6.53%	6.57%
Information ratio	0.051	0.013	0.53	0.54	-0.44	-0.41
Tracking error		0.17%		0.38%		0.50%
Correlation		0.998		0.997		0.997
Periods neutralized		9.9%		52.7%		61.5%

Source: Invesco.



Conditional neutralization selectively preserves positive ESG exposures.

exposures and only brings exposures to neutral in periods when they are negative. Thus, the ESG exposures of the ESG-integrated factor portfolio remain at least as good as those of the original, and most likely better. Rather than just ensuring neutralization of negative ESG impacts, this approach also maintains the positive exposures.

Table 3 shows the time series averages of factor and ESG exposures for conditional neutralization. Obviously, the ESG-enhanced factor portfolios now have higher ESG exposures than the originals. For example, the ESG-enhanced quality portfolio, which had an ESG exposure of zero under the baseline neutralization, is now at 0.276 – higher than original 0.266. At the same time, the factor exposures are now much closer to those of the original portfolios, another advantage of the approach.

When we compare factor performance, we see a great similarity between the original and the ESG-enhanced versions. The IRs of the original and ESG-enhanced momentum portfolios are 0.53 and 0.54, respectively; the annualized tracking error between the two is only 0.38% and the correlation is 0.997. These numbers make sense because conditional neutralization produces ESG factor portfolios that are more similar to the original portfolios. The bottom row, ‘periods neutralized’, shows the percentage of time periods where ESG neutralization was performed. Consistent with the correlation table, quality has the lowest neutralization rate (9.9%), representing the lowest number of negative ESG exposures, while value has the highest (61.5%) and momentum lies in the middle (52.7%).

We also investigated possible differences between the long and short leg of the portfolio. As an example, figure 1 shows the long and the short leg performance of the two momentum portfolios. It turns out that the similarity in factor performance between the original and ESG-enhanced

portfolios is not driven by either the long or the short leg alone.

Furthermore, the turnovers of the original and ESG-enhanced portfolio also end up being very similar, as do the holdings. For example, the mean absolute ‘active weight’⁶ between the two momentum portfolios is only 1.81 bps.

Baseline and conditional neutralization compared

As we have seen, we can improve the ESG exposures of our factor portfolios without sacrificing factor exposures or degrading the risk-return tradeoff. The conditional neutralization method achieves this goal better than the baseline neutralization method as it can selectively preserve already embedded positive ESG exposures while causing very little in terms of changes to factor performance. A natural question is: Can we further improve the ESG profile of the factor portfolios, i.e., create truly green factors? This would be possible with optimization methods,⁷ but the tradeoff needs to be carefully analyzed. These more sophisticated construction methodologies will be explored in future articles.

Combining factor portfolios into model portfolios

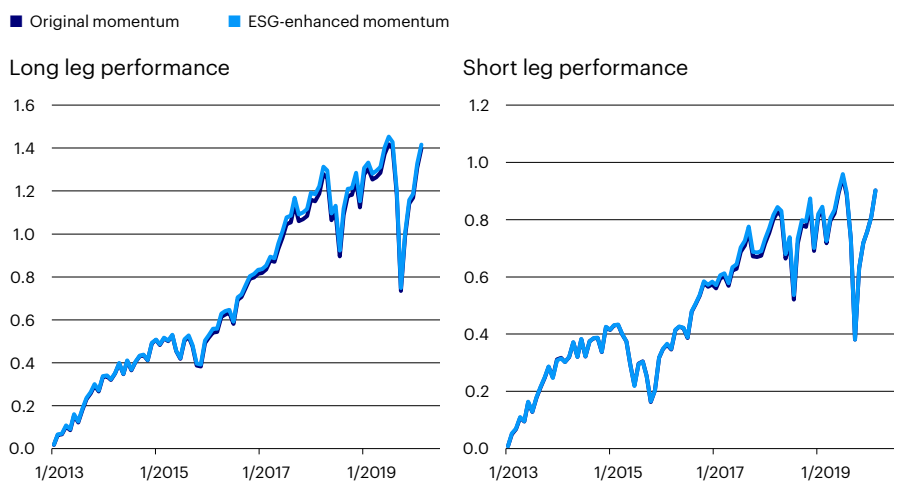
To complete the process, we assess the impact of ESG integration on a model portfolio. Our model portfolio is a multi-factor portfolio that combines the momentum, quality and value factors and would serve as an anchor for implementing live portfolios. To construct it, we need a set of factor weights. For the sake of simplicity, we use equal weights,⁸ assigning one-third each to quality, momentum and value.⁹ We compare the exposures (QMV factor exposures and ESG exposures) of the model portfolios when combining baseline factors as well as ESG-enhanced factors.

Figure 2 shows the time series plots for ESG exposures. The ‘original model’ is the



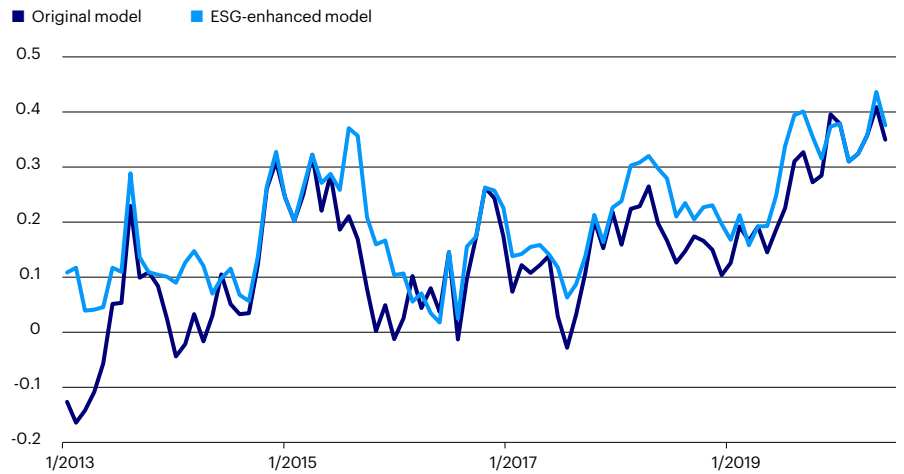
We see a great similarity between the original and the ESG-enhanced versions.

Figure 1
Performance of the long and the short leg of the momentum portfolio



Source: Invesco. Data as of July 31, 2020.

Figure 2
Time series of ESG exposures



Source: Invesco. Data as of July 31, 2020.

Table 4
Factor exposures of the model portfolios

	Quality exposure	Momentum exposure	Value exposure
ESG-enhanced model	1.363	1.083	1.210
Original model	1.376	1.095	1.235

Source: Invesco.

portfolio obtained through equal weighting of the original quality, momentum and value factors; 'ESG-enhanced model' denotes the portfolio obtained by equally weighting ESG-integrated factors in the conditionally neutralized version. We can see a rather significant improvement of ESG profiles,¹⁰ with average exposures for the ESG-enhanced model portfolio at 0.1977, compared to 0.1412 for the original model.

Table 4 shows the time series averages of factor exposures for the two model portfolios. As was the case for the three factor portfolios, ESG enhancement has very little effect on factor exposures.

Conclusion

Deep integration of ESG considerations into the factor portfolio construction process can bring about notable improvements in the ESG profiles of resulting factor and model portfolios while keeping their factor characteristics mostly unchanged. The low correlations between the factor scores and ESG scores allows for significant ESG improvement with very little reduction in factor exposures. Such ESG-aware factor and model portfolio construction enables full integration of ESG considerations into the portfolio construction process.

Notes

- 1 See Ang et al. (2009).
- 2 E.g., Fama and French (1992), Jegadeesh and Titman (1993) and Novy-Marx (2013).
- 3 We consider beta-neutral factor portfolios with unit leverage (USD 1 long, USD 1 short).
- 4 These factor scores are standard-normalized scores based on industry-neutral ranks; see: "Factor Investing: An Introduction", Risk & Reward 2016 Q4.
- 5 We perform a multivariate regression. The basic factor portfolios are beta neutral.
- 6 Active weights are differences between two sets of portfolios, e.g., the original MOM and ESG-enhanced MOM factor portfolios.
- 7 For example, maximizing ESG exposures subject to a minimal decrease in factor exposures.
- 8 Other weighting schemes are certainly possible, e.g., risk-parity, minimum-variance or maximum diversification.
- 9 Our portfolio construction methodology stipulates that, after we combine the factors through the specified factor weights, we 'reweight' so that the resulting model portfolio is unit leverage and beta neutral.
- 10 A simple two-sample t-test gives a t-statistic of 3.32, rejecting the null hypothesis that the two have equal time series means.



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Cracking the passive high yield conundrum

By Ward Bortz

Many investors are surprised by the underperformance of common passive high yield indices relative to the broader high yield market. A factor perspective sheds light on the reasons and could help investors to 'crack' the passive high yield conundrum.



Allocating to high yield corporate bond strategies poses challenges. One major challenge is finding a benchmark that accurately reflects the performance of the broad high yield market, rather than underperforming it.

What is the passive high yield conundrum?

Figure 1 illustrates how several widely followed passive high yield bond indices have underperformed the broad market¹ in recent decades (this underperformance comes before costs associated with implementing investment strategies, such as transaction costs and management fees).

The underperformance of passive high yield indices relative to the broader high yield market comes as a surprise to many investors. We call this disparity the ‘passive high yield conundrum’. In this article, we highlight how fixed-income factors can help investors understand the drivers of

this underperformance and help them ‘crack’ the passive high yield conundrum.

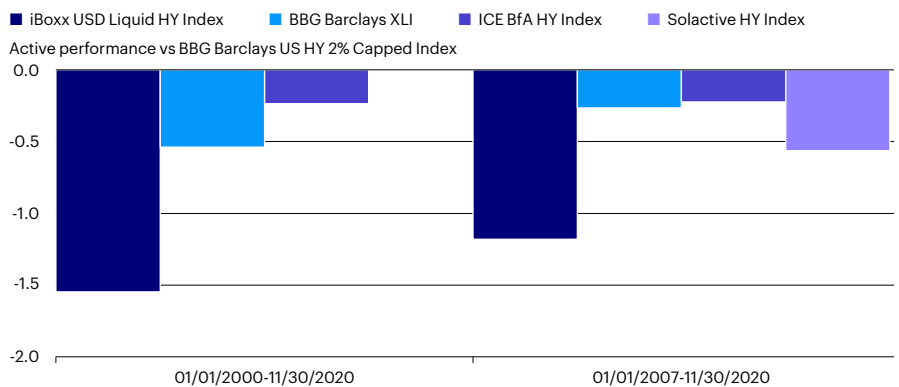
Fixed income factors

Factors are groups of securities that academic research has shown tend to deliver risk-adjusted outperformance relative to the broad market. Each dot in figure 2 represents a ‘factor’ bond in the broad high yield market (figure 2 includes 2000 corporate bonds, all rated below investment grade, i.e., below BBB-). The dots represent a snapshot of the factor bonds as of September 2020, plotted according to characteristics familiar to fixed income investors: yield and credit rating.

The light blue dots represent low volatility bonds. We find these securities to have higher risk-adjusted return potential over long periods of time, with more stability than the broad market but a similar return profile. They tend to have lower yields and higher credit quality than the index. They also tend to have a shorter time to maturity.²

Figure 1

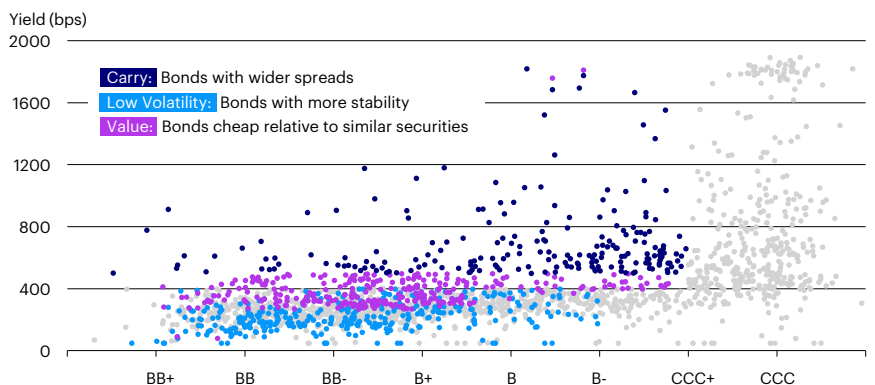
Passive high yield bond indices have tended to underperform the broad market



Source: Bloomberg L.P. Data from January 31, 2000 to November 30, 2020. The broad high yield market is represented by the Bloomberg Barclays US High Yield 2% Issuer Capped Index. The iBoxx USD Liquid HY Index, Bloomberg Barclays High Yield Very Liquid Index (BBG Barclays XLI), ICE BofA HY Index and Solactive USD High Yield Corporates Total Market Index (Solactive HY) are passive indices. Active performance is the total return minus the total return of the Bloomberg Barclays US High Yield 2% Issuer Capped Index. The inception date for the iBoxx USD Liquid HY Index is October 31, 2006, and August 31, 2016 for the Solactive HY Index. All information presented prior to the inception dates is backtested. Backtested performance is not actual performance but is hypothetical. Although backtested data may be prepared with the benefit of hindsight, calculations are based on the same methodology in effect when the index was officially launched. Index returns do not reflect payment of any sales charges or fees. Performance, actual or hypothetical, is not a guarantee of future results. An investment cannot be made in an index.

Figure 2

Visualizing fixed-income factors



For details about the construction of each factor, please see the Appendix 2. Source: Bloomberg L.P., Invesco. Data as of September 2020. Initial universe is the Bloomberg Barclays US High Yield 2% Issuer Capped Index. For low volatility, value and carry factors, the group selects the 10% of bonds with the best scores on each characteristic. The information presented is intended to illustrate academic research on factors within the fixed income asset class. Past performance is not a guarantee of future results.

The dark blue dots represent carry bonds. Carry bonds are the highest yielding, highest spread bonds in the universe. These securities tend to have higher returns over time and greater risk. They typically have longer maturities, lower ratings and are in sectors with the highest spreads. Carry bonds tend to be the riskiest bonds in the universe.

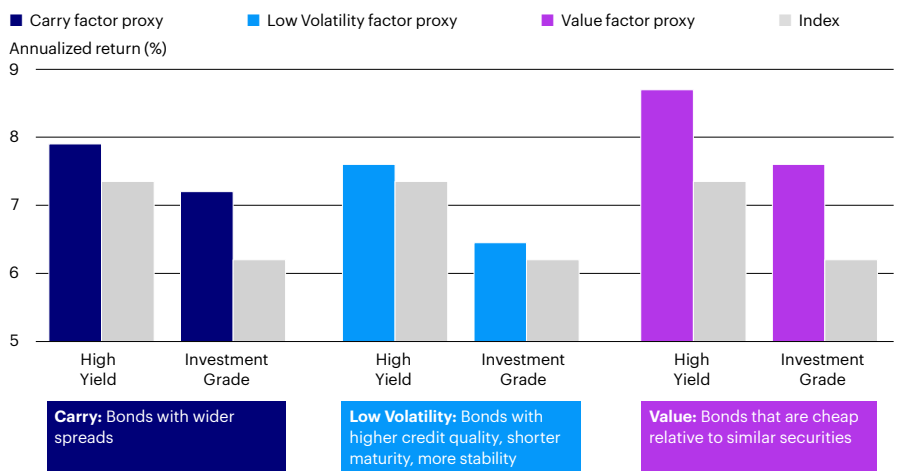
The purple dots represent value bonds. Value and carry bonds both tend to comprise higher yielding securities, but value bonds tend to have higher yields relative to similar securities. We group the universe based on rating, sector and duration. Value bonds are the securities with the widest spreads in each bucket.

All three factors have outperformed in the past

Figure 3 shows the historical returns of the three groups of bonds – for the high yield universe from figure 2 as well as for the investment grade universe. Figure 3 illustrates that factors have worked in both high yield and investment grade corporate bond investing. For both markets, factor bonds – carry, low volatility and value – have outperformed the broad market. The outperformance is least pronounced for low volatility securities, but with only 60% - 70% of market volatility.

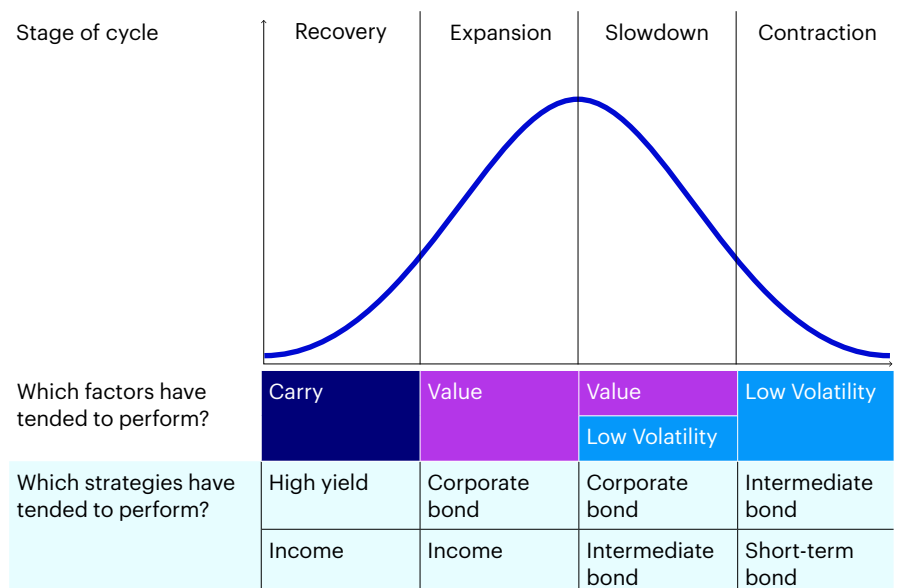
Figure 4 shows the average performance of the three types of bonds over a longer period. Like other financial assets, their

Figure 3
Fixed income factors have historically outperformed their benchmarks



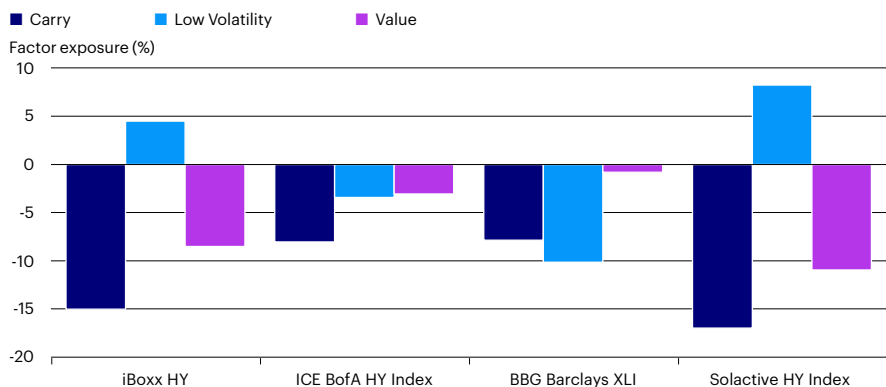
Source: Bloomberg L.P., Invesco. Data from January 2000 to December 2020. The investment grade index is the Bloomberg Barclays Corporate Bond Index and the high yield index is the Bloomberg Barclays US High Yield Corporate Bond 2% Issuer Capped Index. An investment cannot be made in an index. See the appendix for more information on the mathematical process underlying the value, carry and low volatility factor proxies. Past performance is not a guarantee of future results. The information presented is intended to illustrate academic research of factors within the fixed income asset class. Performance results shown are hypothetical (not real) and were achieved by retroactive application of the statistical model. It may not be possible to replicate hypothetical results.

Figure 4
Factor performance in different environments



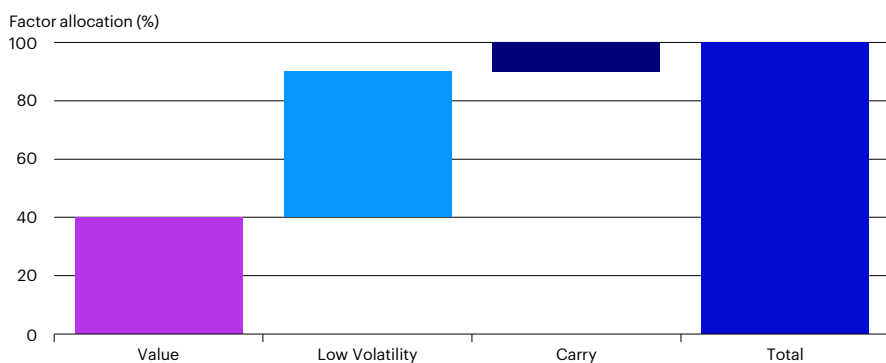
Source: Invesco. For illustrative purposes only. Information does not constitute a recommendation of the suitability of any investment strategy for any particular investor. Past performance is not a guarantee of future results.

Figure 5
Factor exposures of popular high yield bond indices



Source: Bloomberg LP. Data as of December 31, 2020. The factor allocation represents the portfolio's active allocation to the top third of the index minus active allocation to the bottom third based on value, low volatility and carry. The value score is determined by the rank of the spread relative to other bonds in the same sector rating category. Low volatility is based on a 50%/50% weighting of rating and duration. Carry is the percent of the portfolio in the top third of the index in terms of spread. For details, please see: "Know your factors: a case study in fixed income portfolio analysis", Risk and Reward #2/2020. For illustrative purposes only.

Figure 6
Factor proxy allocations to factor bonds



Source: Invesco. Data as of December 31, 2020. Please see the appendix for the mathematical process underlying the high yield value, low volatility and carry factors.

performance varies depending on the environment. Broadly speaking, value and carry bonds have tended to be 'risk-on' – performing well when higher yielding fixed income asset classes (correlated to stocks) delivered strong performance in general. Low volatility bonds tended to outperform the broad market when equities sold off.

Quantifying the cause of the conundrum ...

If factors have delivered positive returns relative to the broad high yield market, then perhaps the underperformance of passive high yield indices can be explained by their negative factor allocations. Figure 5 shows the factor allocations of popular high yield bond indices. Indeed, each index has a negative factor allocation to at least two of the three factors – and some to all three.

... and cracking it: Building a proxy for a high yield factor strategy

Now that we have an idea of the reasons for the underperformance, we can use this to develop a more promising way to gain exposure to the high yield market. To start with, we build a simple factor proxy portfolio for a high yield strategy that has explicit allocations to factors that tend to outperform the broad market over time.

The proxy maintains overweight positions in the three factors relative to the broad benchmark.

Figure 6 shows an allocation for a hypothetical factor strategy. The specific allocations were chosen to equally balance the risk-on factors (carry and value) against the risk mitigating factor (low volatility).

This allocation generates a portfolio tending toward higher credit quality (due to the exposure to low volatility) and higher yield (due to the exposure to carry and value) relative to the broad market or common passive high yield indices.³

How did the factors do?

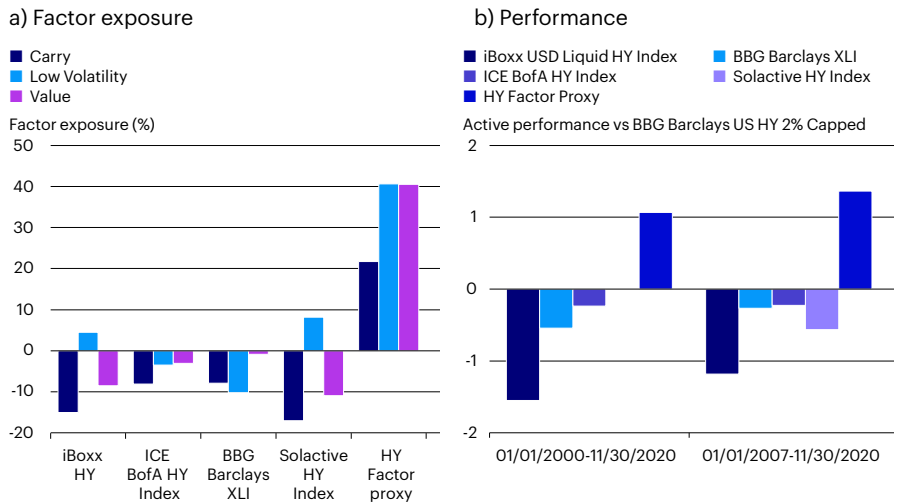
Our next two figures will look familiar, except that we have now added our factor proxy as a fifth portfolio. Figure 7a shows that the factor exposures of the proxy are positive, whereas – as already shown – the factor exposures of the high yield indices are generally negative. The proxy's positive factor exposure drives its outperformance relative to the broad market, as shown in figure 7b. Since the factors have performed well in the past, it is not surprising that a proxy tilted towards them would also do well. This example illustrates how factors



The underperformance of passive high yield indices can be explained by their negative factor allocations.

Figure 7

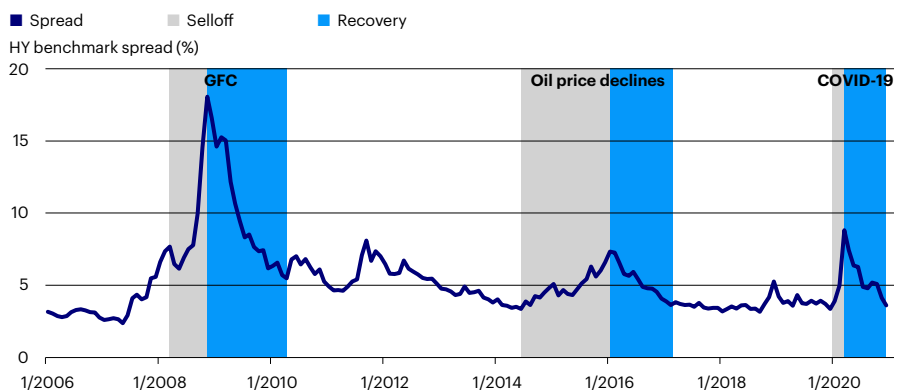
Factor exposure and performance of high yield indices and our HY factor proxy



Source: Bloomberg L.P. Data as of December 31, 2020. See notes under figure 5 for details on the criteria used to generate the factor allocation. The inception date for the iBoxx USD Liquid HY Index is October 31, 2006, and August 31, 2016 for the Solactive High Yield Index. All information presented prior to the inception dates is backtested. Backtested performance is not actual performance but is hypothetical. Although backtested data may be prepared with the benefit of hindsight, calculations are based on the same methodology in effect when the index was officially launched. Index returns do not reflect payment of any sales charges or fees. Performance, actual or hypothetical, is not a guarantee of future results. An investment cannot be made in an index. The high yield broad market/benchmark is the Bloomberg Barclays US High Yield 2% Issuer Capped Index. The results shown are hypothetical (not real) and were achieved by means of the retroactive application of the statistical model. It may not be possible to replicate hypothetical results. Please see the appendix for more information on the mathematical process underlying the high yield factor proxy.

Figure 8

High yield cycles



Source: Bloomberg L.P., Invesco. Data from January 1, 2000 to December 31, 2020. Global financial crisis (GFC) selloff: April 2008-November 2008, recovery: December 2008-April 2010; Oil price declines selloff: June 2014-January 2016, recovery: February 2016-February 2017; COVID-19 selloff: March 2020, recovery: April 2020-December 2020. The high yield benchmark is the Bloomberg Barclays US High Yield 2% Issuer Capped Index.

can help investors understand the underperformance of typical high yield indices and crack the high yield beta conundrum.

Is there a catch?

Unfortunately, there is no free lunch in investing – and factor-based fixed income strategies are no exception. Figure 8 shows high yield spreads from 2006 to 2020.

During that period, there were three market cycles: the global financial crisis (GFC), oil price declines and the COVID-19 pandemic.

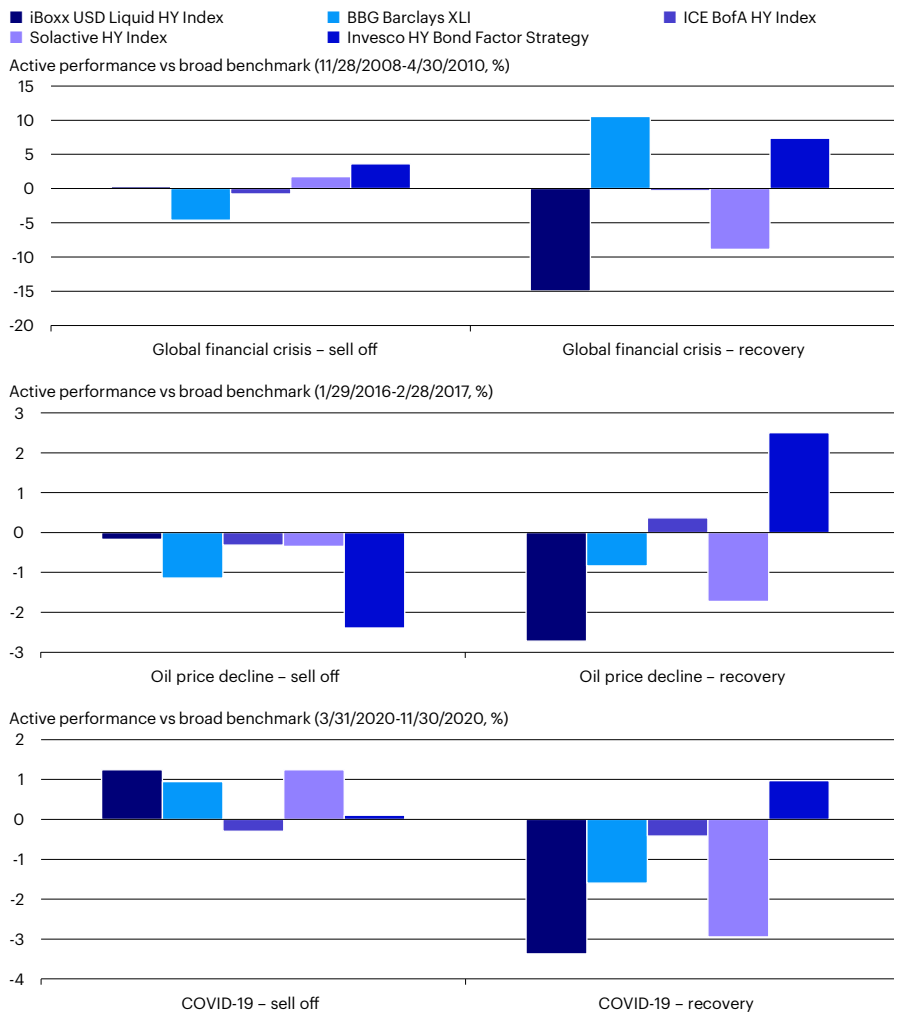
Figure 9 shows the relative performance of the factor proxy and major high yield indices during those periods. In four of the six periods, our factor proxy outperformed. But in some, even long, periods (such as during the oil price decline of 2014 and 2015), factor strategies underperformed.

Conclusion

Many common high yield indices have tended to underperform the broad high yield market as measured by the Bloomberg Barclays US High Yield 2% Issuer Capped Index. Fixed income factors may help explain why some passive indices have tended to underperform and offer a potential solution to the problem.

Figure 9

Performance of high yield indices and our factor proxy during key market cycles



The inception date for the Solactive High Yield Index is August 31, 2016. All information presented prior to the inception dates is backtested. Backtested performance is not actual performance but is hypothetical. Although backtested data may be prepared with the benefit of hindsight, calculations are based on the same methodology in effect when the index was officially launched. Index returns do not reflect payment of any sales charges or fees. Performance, actual or hypothetical, is not a guarantee of future results. An investment cannot be made in an index.

Notes

- 1 The broad market proxied by the Bloomberg Barclays US High Yield 2% Issuer Capped Index.
- 2 A shorter time-to-maturity leads to a shorter duration, which, in turn, leads to less price sensitivity due to changes in interest rates or credit spreads, which mechanically drives the lower volatility of these bonds.
- 3 For details on the characteristics of the high yield factor proxy and other high yield indices, please see the appendix.

■ Appendix 1: Details on factor proxy and portfolio characteristics

Figures 10a and b show the yield and duration of the factor proxy. The proxy's yield is higher than the broad market yield, whereas yields on the commonly used indices tend to be lower. The factor proxy's higher yield is driven by the allocation toward value and carry bonds.

Figure 10b shows that the duration of the factor proxy is in line with the benchmark.*

Overall proxy duration is kept in line with the broad market to avoid an active bet on interest rate changes.

Figure 11 shows that the rating allocation of the factor proxy is tilted toward higher quality, which could seem surprising since the yield of the proxy portfolio is higher than the benchmark's. The main reason is the significant allocation of value

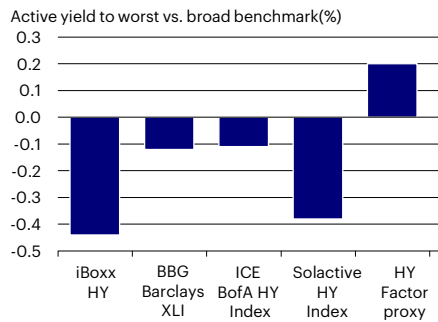
bonds, which are higher yielding for each level of quality. The tilt toward low volatility is another reason, since low volatility bonds tend to be of higher credit quality.

* The average maturity and duration of the bonds in the proxy portfolio are less than that of the index. This is driven by the allocation to low volatility bonds.

Figure 10

Yield and duration of key high yield indices versus the factor proxy

a) Yield



b) Duration

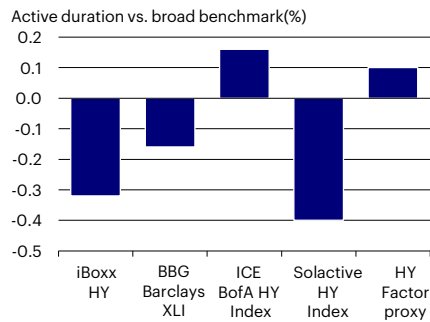
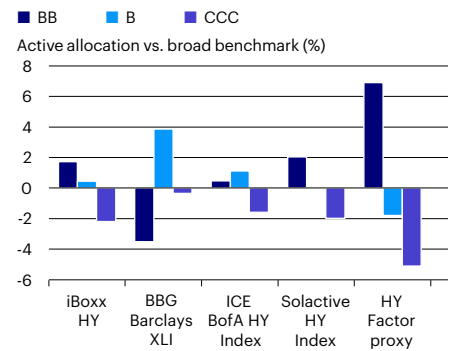


Figure 11

Rating allocation of key high yield indices versus the factor proxy



Source (figure 10 and 11): Morningstar, Bloomberg L.P. Data as of December 31, 2020. The broad market benchmark is the Bloomberg Barclays US High Yield 2% Issuer Capped Index. Past performance is not a guarantee of future results.

■ Appendix 2: Factor construction in detail

To build individual factor portfolios, we use a non-parametric filtering and bucketing process. The starting universe for each factor is the Bloomberg Barclays US High Yield 2% Issuer Capped Index.

To construct the **carry factor**, we filter out bonds rated CCC+ and below. We do this because we find that the primary metric for carry, the option-adjusted spread (OAS), is not a good indicator of credit quality for very low quality high yield bonds. After filtering out these securities, we create a portfolio of bonds in the top 10% of the filtered universe in terms of spread. The securities are then weighted based on face value, which is the bond equivalent of capitalization weighting in equities. We do not control for rating, sector or duration. This portfolio is rebalanced monthly.*

To construct the **value factor**, we filter out bonds rated CCC+ and below for the same reason as above. We then create buckets based on rating, sector and duration. Within each bucket, we select the bonds in the top 10% in terms of OAS. We combine the buckets and weight securities based on face value. This produces a portfolio with a similar rating, sector and duration profile as the benchmark, but with a higher OAS. This portfolio is rebalanced monthly.

To construct the **low volatility factor**, we filter out securities with time-to-maturity of 2.5 years or less and those with a rating of single-B or less. We then create four rating buckets: BB+, BB, BB- and B+. Within each bucket, we select the top 10% of securities in terms of the shortest time-to-maturity (around 2.5 years) and

combine the buckets. The resulting portfolio has a shorter duration than the benchmark and a higher credit quality. We find that this filtering process tends to provide a good proxy for the lowest volatility portfolio.** This portfolio is rebalanced monthly.

* To implement a carry (or value or low volatility) strategy in practice, an investor could refrain from selling securities each time they moved out of the top 10% of carry bonds and only sell when a security moves outside of the 15% or 20% of widest spread bonds in the universe, for example. This would produce a portfolio with similar characteristics as the raw carry factor but would mitigate turnover. This is important in the high yield market in which implementation costs can erode the potential premiums associated with factors.

** We do not merely buy the securities with the lowest historical volatilities because many of the securities in the current index may have not existed within the window of backward-looking volatility. For example, there was only a 57% overlap between the names in the high yield index on Dec. 31, 2020 and Dec. 31, 2019.

The recipe for building individual factor portfolios

Carry: Bonds with wider spreads	Low Volatility: Bonds with higher credit quality, shorter maturity, more stability	Value: Bonds that are cheap relative to similar securities
<p>Step 1: Filter</p> <ul style="list-style-type: none"> Lower credit quality bonds <ul style="list-style-type: none"> CCC+ or less <p>Step 2: Bucket</p> <ul style="list-style-type: none"> No bucketing in Carry <p>Step 3: Select</p> <ul style="list-style-type: none"> Select the widest OAS bonds <ul style="list-style-type: none"> 10% for HY <p>Targeted result: A portfolio with wide spreads, lower credit quality and tilts towards out-of-favor sectors</p>	<p>Step 1: Filter</p> <ul style="list-style-type: none"> Lower credit quality bonds and the shortest maturity bonds <ul style="list-style-type: none"> HY: <2.5 years to maturity, B or less <p>Step 2: Bucket</p> <ul style="list-style-type: none"> Bucket by rating <ul style="list-style-type: none"> HY: BB+, BB, BB-, B+ <p>Step 3: Select</p> <ul style="list-style-type: none"> Within each rating bucket, select the shortest duration <ul style="list-style-type: none"> 10% for HY <p>Targeted result: A portfolio with a shorter duration, but not so short that it is rolling off quickly inducing high turnover, and a positive credit quality tilt from the exclusion of lower quality bonds</p>	<p>Step 1: Filter</p> <ul style="list-style-type: none"> Lower credit quality bonds <ul style="list-style-type: none"> HY: CCC+ or less <p>Step 2: Bucket</p> <ul style="list-style-type: none"> Bucket by rating, sector, duration <ul style="list-style-type: none"> HY: BB, B <p>Step 3: Select</p> <ul style="list-style-type: none"> Within each rating bucket, select the widest OAS bonds <ul style="list-style-type: none"> 10% for HY <p>Targeted result: A portfolio with high spreads relative to the benchmark, but a similar rating/sector/duration profile</p>

Source: Invesco. Ratings are the average ratings of Fitch, Moody's and Standard and Poor's. For illustrative purposes only. Information does not constitute a recommendation of the suitability of any investment strategy for any particular investor.



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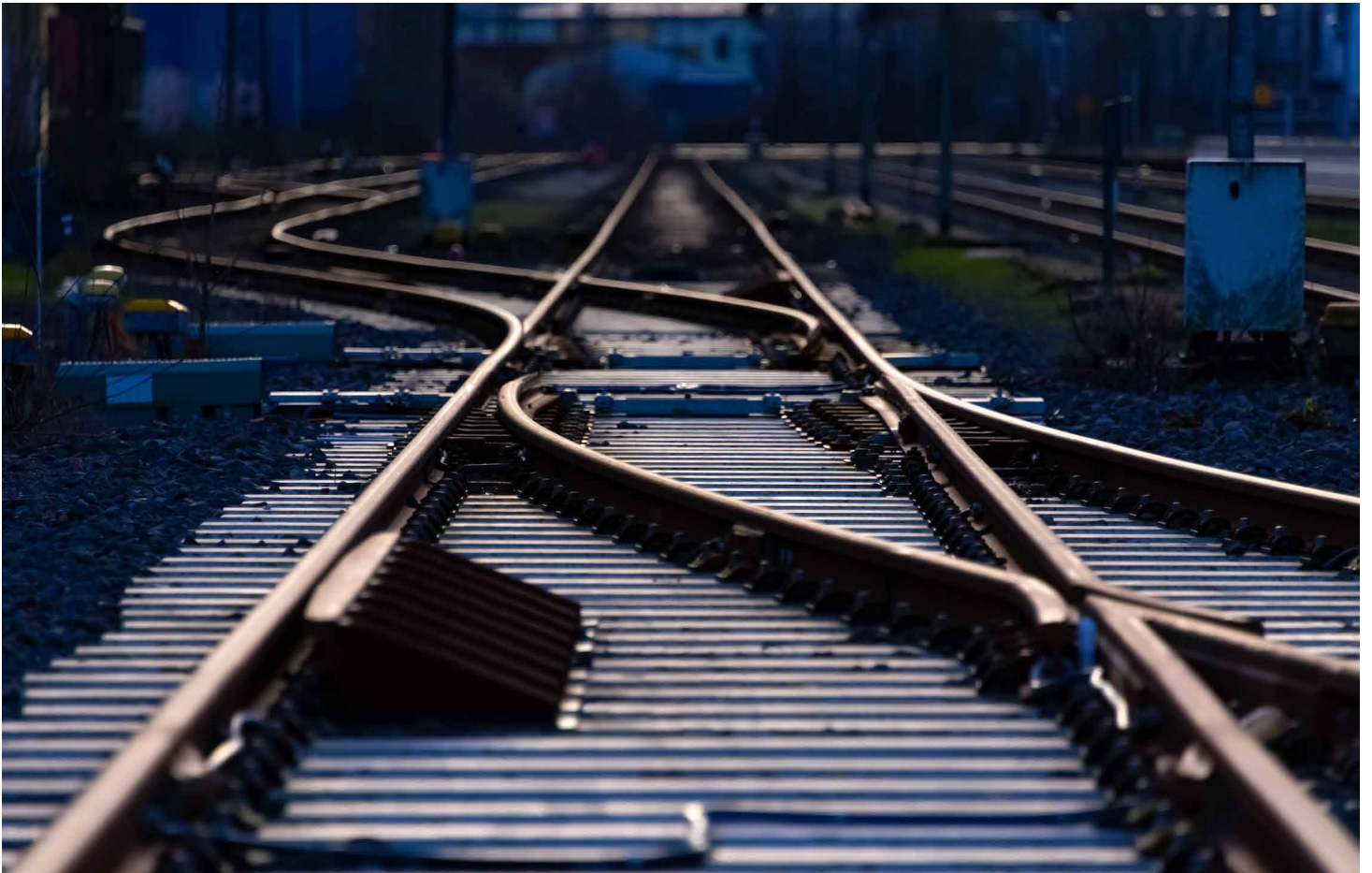
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On the importance of performance attribution for low volatility-tilted factor portfolios

By Tarun Gupta, Ph.D., Tim Herzig, Viorel Roscovan, Ph.D., and Carsten Rother

A low volatility tilt in a portfolio may reduce active risk and – due to the low volatility anomaly – enhance returns. But since there is a tradeoff between the two goals, attribution analysis is important to avoid a misalignment with investor objectives.





Investors looking for a low volatility tilt aim to lower risk (relative to a pre-defined benchmark) and enhance returns.

There is overwhelming evidence that in the long run, low risk stocks outperform high risk stocks on a risk-adjusted basis.¹ However, unlike other factor premiums, harvesting the low volatility anomaly requires risk adjustment as – by construction – the long (low risk) and short (high risk) legs of the anomaly show significantly different risk characteristics. As a result, evaluating the benefits of a low volatility tilt is not straightforward, especially for long-only investors.

We assume that investors looking for a low volatility tilt aim to lower risk (relative to a pre-defined benchmark) and enhance returns. Disentangling these two objectives is no easy task, especially when relying on traditional performance attribution techniques that evaluate returns against a capitalization weighted index. Usually, they rely on various risk-adjusted performance measures, such as Sharpe Ratio or Jensen's alpha. But this alone does not provide full transparency with respect to the investor's implicit choices.

A low volatility bet within a long-only strategy implies: 1) an asset allocation decision to reduce risk by deviating from a beta of 1 and 2) a decision to enhance the return of the targeted asset allocation by harvesting the low volatility anomaly. Low volatility investors, thus, aim to gain exposure to these two return drivers in line with their preferences and objectives.

In our analysis, we attribute the performance of a sample comprising seven low volatility funds using a two-factor regression model. The first factor is the market factor, the second is an equilibrium representation of the low volatility anomaly. Our sample consists of proprietary low volatility strategies from January 2013 to March 2021.

Methodology

A myriad of tools exist to help understand the risk and return drivers of a portfolio. Return-based style analysis is perhaps most popular because it decomposes portfolio performance into systematic factor returns plus an unrelated residual return, or alpha. This approach fits well with our objective of evaluating the two distinct decisions investors implicitly make.

Key to capturing the low volatility anomaly is the understanding that low risk assets outperform high risk assets on a risk-adjusted basis. The return of the minimum-variance portfolio of Markowitz (1952), the ultimate low-volatility portfolio, can be written as:

$$(1) \quad r_{MinVar} - r_f = \alpha + \beta_{MinVar} \cdot (r_{Mkt} - r_f) + \varepsilon,$$

where r_{MinVar} is the return on the minimum-variance portfolio, r_{Mkt} is the return on the market portfolio, r_f is the risk-free rate, α is the abnormal return earned by the low volatility anomaly and ε is a residual term that assumed to independent and identically distributed. β_{MinVar} is the beta of the minimum-variance portfolio.

If the low volatility anomaly α is significantly greater than zero, the expression can be rewritten as:

$$(2) \quad r_{LowVol} = (r_{MinVar} - \beta_{MinVar} \cdot r_{Mkt}) - (1 - \beta_{MinVar}) \cdot r_f$$

Equation (2) implies that, to earn the low volatility premium, the performance of the market portfolio needs to be risk adjusted by going 100% long into the minimum-variance portfolio and β_{MinVar} short in the market portfolio, with the remaining $(1 - \beta_{MinVar})$ borrowed at the risk-free rate.²

We can now disentangle the two decisions of low volatility investors – lowering risk and harvesting the anomaly – by estimating the following regression:

$$(3) \quad r_p - r_f = \alpha + \beta_{Mkt} \cdot (r_{Mkt} - r_f) + \beta_{LowVol} \cdot r_{LowVol} + \varepsilon,$$

where r_p is the return on a portfolio with a low volatility tilt and r_{LowVol} is the return on the low volatility anomaly defined in equation (2). Low volatility investors implicitly aim to achieve lower risk than the benchmark, $\beta_{Mkt} < 1$ and enhance the return on their portfolio with a positive exposure to the low volatility anomaly, $\beta_{LowVol} > 0$. Exposure to these two drivers should be controlled such that they are aligned with the investor's preferences and objectives.

Obviously, the two decisions are interconnected such that reducing β_{Mkt} allows harvesting more of the low volatility anomaly, as shown in equation (2). Modern low volatility strategies might also use other factors to enhance the return of the portfolio. But since we are analyzing strategies that harvest the low volatility anomaly first and foremost, their contributions are expected to be marginal. They are included in the residual term ε in equation (3).

Furthermore, we do not make any statements on the abnormal return α in equation (3). Generally, modern portfolio strategies are expected to also deliver positive α , but estimating this added value on top of the factor exposures requires a longer time horizon. As we have our focus on live strategies rather than backtests, our sample period is less than a decade. We thus leave the data to speak for itself and provide a discussion on these estimates below.

Estimating equation (3) requires a representation of the low volatility anomaly. This is defined in equation (2) as a function of the return on the market portfolio, the risk-free rate, and the return on the minimum-variance portfolio. The first two are readily available. For the minimum-variance portfolio, we use the MSCI Minimum Volatility Index as a proxy, which is designed to deliver the lowest absolute risk given a set of constraints.

Table 1
Risk exposures of MSCI World Minimum Volatility Index

	$\hat{\alpha}$ (ann.)	$\hat{\beta}_{Mkt}$	R^2
coefficient	3.20%	0.65	76.8%
t-stat	1.164	12.600	

Average coefficient estimates for equation (1) rolling 36 months over the sample period from December 2001 to March 2021 where the portfolio return is the return on the MSCI World Minimum Volatility Index and the benchmark return is the return on the MSCI World Index.
Source: Invesco.

Performance drivers of proprietary low volatility strategies

Inspired by the abundant empirical evidence on the low volatility anomaly and the literature on optimization techniques to construct minimum-volatility portfolios,³ MSCI launched its Minimum Volatility Index series in April 2008. These indices are calculated by optimizing their corresponding parent index for the lowest absolute risk using the MSCI Barra risk model and a set of restrictions.⁴ The objective is to improve the risk/return profile of the corresponding market capitalization weighted indices.

The estimates in table 1 show that the MSCI World Minimum Volatility Index has delivered considerable risk reduction relative to its benchmark, with a statistically and economically significant $\hat{\beta}_{Mkt}$ of 0.65. It also delivered an economically significant alpha, estimated at 3.2% per year. Its statistical significance, however, is rather weak. These results are not entirely surprising as the methodology behind the MSCI Minimum Volatility Index series closely resembles the minimum variance optimization. By construction, the MSCI Minimum Volatility Index shows the lowest absolute (ex-ante) volatilities, given a set of constraints. Thus, it could be considered a generic minimum variance portfolio. We therefore define the low volatility anomaly using this generic minimum variance representation following equation (2) and use it as input into our analysis of the performance drivers of a sample of low volatility managers.

While there are numerous proprietary low volatility strategies available, their history is rather short, in most cases going back only a couple of years. Based on peer group tags provided by Bloomberg and Morningstar, we select the enhanced low volatility strategies with the longest history in the global developed universe. Our final sample consists of seven strategies with return data from January 2013 to March 2021. We keep the names of the funds anonymized and focus on better understanding the risks and return drivers of these low volatility strategies. To this goal, we estimate equation (3) for each of the seven managers in our sample from January 2013 to March 2021. Table 2 shows the averages of these estimates.

The estimates for the average manager are broadly in line with expectations, although they do bring along a taste of disappointment. As expected, at 0.81 the average market beta across our sample is lower than 1 and statistically and economically significant. The average exposure to the low volatility anomaly is also statistically and economically significant and, at 0.42, is greater than zero. Most importantly, however, there is noticeable variation between managers, with betas ranging from 0.7 to as high as 0.91 and low volatility anomaly exposures ranging from 0.7 to as low as 0.26. This suggests that the various approaches might have very different effects on the risk/return profile. To clarify this, we further decompose the risk contributions to each



The various approaches might have very different effects on the risk/return profile.

Table 2
Performance drivers of selected low volatility strategies

	Manager 1	Manager 2	Manager 3	Manager 4	Manager 5	Manager 6	Manager 7	Average Manager 1-7
$\hat{\alpha}$ (ann.)	-0.24%	-0.29%	-0.20%	-2.43%	-5.10%	-0.71%	-2.98%	-1.71%
t-stat	-0.342	-0.149	-0.121	-1.389	-1.553	-0.627	-1.452	-0.911
$\hat{\beta}_{Mkt}$	0.91	0.82	0.83	0.70	0.90	0.73	0.79	0.81
t-stat	62.326	32.204	23.554	17.999	11.702	24.334	16.286	10.669
$\hat{\beta}_{LowVol}$	0.26	0.37	0.25	0.70	0.28	0.61	0.47	0.42
t-stat	7.268	6.196	2.811	7.890	1.484	9.283	4.015	2.306
R^2	99.01%	96.88%	94.40%	91.71%	77.51%	95.20%	88.26%	91.9%

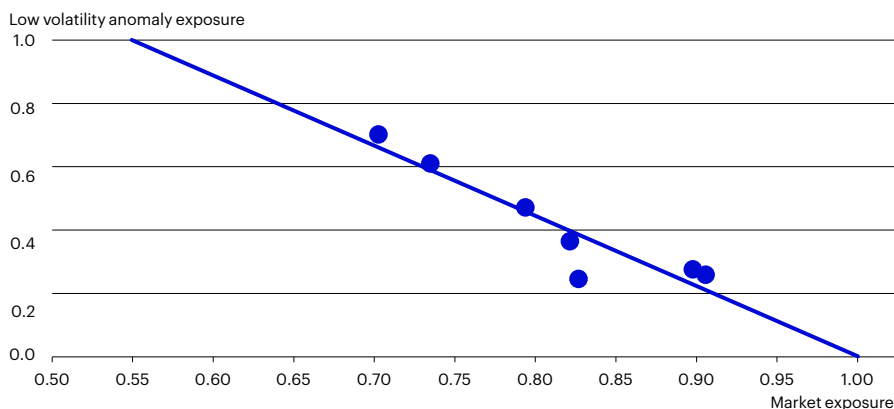
Average coefficient estimates for equation (2) rolling 36 months over the sample period from January 2013 to March 2021 where the portfolio return is the net-of-fee return for each of the seven managers in our sample, the benchmark return is the return on the MSCI World Index and the return on the low volatility anomaly is constructed as in equation (1) using the MSCI World Minimum Volatility Index as proxy for the long-only minimum-variance portfolio. All returns are expressed in USD and gross of management fees and transaction costs to allow for fair comparisons.
Source: Invesco.

Table 3
Tracking error contribution for selected enhanced low volatility strategies

	Tracking error	Contribution to tracking error		
		Asset allocation	Low volatility anomaly	Residual
Manager 1	2.2%	62.2%	27.8%	10.0%
Manager 2	4.3%	54.9%	23.8%	21.3%
Manager 3	4.4%	58.9%	11.8%	29.3%
Manager 4	7.0%	67.8%	23.1%	9.2%
Manager 5	5.6%	30.5%	13.3%	56.1%
Manager 6	6.0%	60.6%	25.8%	13.6%
Manager 7	6.0%	59.2%	17.5%	23.2%
Average	5.1%	56.3%	20.4%	23.2%

The table decomposes the tracking error of each of the seven managers in our sample relative to the MSCI World Index into contributions from the asset allocation effect, the low volatility anomaly effect and an uncorrelated residual. The figures are averages over a sample period from January 2013 to March 2021. Source: Invesco.

Figure 1
Asset allocation vs. low volatility anomaly exposure



Market beta against low volatility anomaly beta coefficient estimates from table 3. Source: Invesco.

fund’s return into: asset allocation, low volatility anomaly and residual effects, the results of which are shown in table 3.

A significant portion of the relative risk is driven by both the asset allocation and the low volatility anomaly, though the share of each effect varies significantly. The relative risk contribution from asset allocation ranges from 30% to almost 70%, while the relative risk contribution from the low volatility anomaly lies between 11% and roughly 30%. Interestingly, we also find that the residual now plays a significant role – its contribution to relative risk is between 9% and roughly 60%. Again, our results show that these proprietary approaches could have very different consequences in terms of the risk investors have to bear.

Finally, in figure 1, we plotted the market beta against the low volatility beta. The graph suggests that balancing out the asset allocation decision and the low volatility anomaly exposure is not trivial. There is an obvious tradeoff between low volatility exposure and lower beta. Lowering the risk

(beta) of a strategy also lowers its return, and harvesting the low volatility anomaly pushes the beta back up. This interaction can be managed using sophisticated portfolio construction approaches, and it may be possible to break this link with other instruments (e.g., futures) to increase/decrease the market beta, provided this is not prohibited by client restrictions.

Conclusion

Investors who implement low volatility tilts in their portfolios aim to achieve lower risk relative to a pre-defined benchmark and some exposure to the low volatility anomaly. But there is no one-size-fits-all approach. Different portfolio construction techniques can have various impacts on the risk and return drivers of a low volatility strategy. Our findings suggest that, rather than relying on standard strategies available in the market, investors might benefit from a customized solution, giving them more control and transparency over the risk and return drivers of their portfolio. Investors should therefore carefully evaluate whether an off-the-rack approach fits their preferences.



A significant portion of the relative risk is driven by both the asset allocation and the low volatility anomaly, though the share of each effect varies significantly.



There is no one-size-fits-all approach.

Notes

- 1 See, for example, Black, Jensen and Scholes (1972), Fama and MacBeth (1973), Haugen and Heins (1975), Fama and French (1992), Black (1993), Falkenstein (1994), Blitz and van Vliet (2007), Baker, Bradley and Wurgler (2011).
- 2 Fraikin, Gerard and Roberts (2020) derive this representation in a minimum-variance optimization framework.
- 3 Alighanbari, Doole, Mrig, and Shankar (2016) give a brief review of the literature on low-volatility investing.
- 4 For details, please refer to the index methodology document of MSCI available https://www.msci.com/eqb/methodology/meth_docs/MSCI_Minimum_Volatility_Methodology_Sep2017.pdf.



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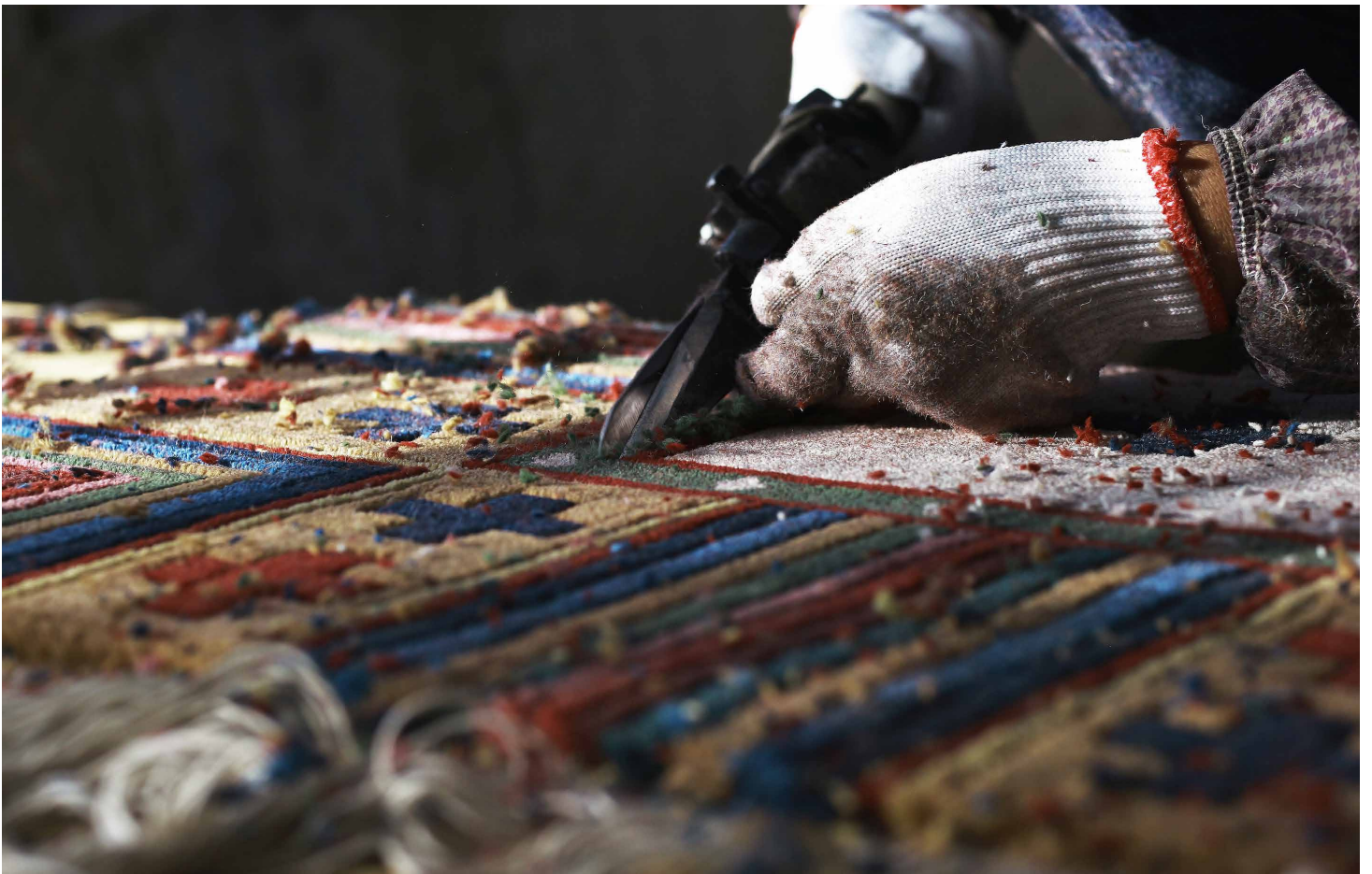
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Textual analysis to determine modern slavery risk

By André Roberts, Margit Steiner, Ph.D., and Erhard Radatz

We develop a practical approach to identifying companies with a heightened risk of modern slavery in their supply chains. Using a wide range of news sources from different agencies, we look for appropriate indicators in third party data sets and complement them with our own textual analysis tools. Our approach is similar to the 'positive screening' presented in the previous issue of Risk & Reward (Shea et al., 2021).





No one wins when a company is embroiled in ESG controversies.

The finance industry today is awash in ESG data providers. But, as long as there is significant disagreement on company ESG credentials, how can these sources be relied upon? And while many datasets cover controversial activities like tobacco or coal production, it is harder to assess an evil like modern slavery, which requires further investigative work beyond simply examining vendor datasets.

In 2020, Invesco Quantitative Strategies (IQS) made the decision to divest a listed European fashion retailer due to evidence of modern slavery in the supply chain. Given the Modern Slavery Act (UK) since 2015 and a similar law enacted in Australia in 2018, we have also observed an increasing awareness of this matter among clients and a growing demand for monitoring in this field.

As with other controversies an issuer may be involved in, ESG-related matters present investors with a twofold problem:

1. No one wins when a company is embroiled in ESG controversies. The company is distracted from its core business and faces a public-relations disaster. Investors don't want to be associated with such a company so the investment performance suffers. And society – often the subject of the controversy – typically pays the greatest price.
2. Sourcing ESG data to highlight the risk of specific controversies is a challenge. Companies don't readily signpost issues like links to modern slavery, and third-party research is often not specific enough until it is too late.

Considering these shortcomings, we have outlined an approach to better tackle these problems and make more of ESG research datasets, as well as designing a screening tool to more readily identify companies involved in ESG controversies. A case study focusing on the issue of modern slavery is offered as an example of controversy screening used by Invesco Quantitative Strategies.

The ESG data challenge

Practitioners often criticize third-party ESG data, asking how it can be relied upon when company ratings from different providers diverge so much. The criticism is understandable and has been studied by researchers. Li et al. (2020) acknowledge the situation by titling their paper: "What a difference an ESG ratings provider makes!"

Indeed, the correlation between the ratings from different providers is not particularly high. Figure 1 shows the percentage of agreeance between quintile ranks of two leading ESG data vendors, MSCI and Sustainalytics. The proportion of company scores with quintiles in agreeance (diagonal cells in the grid) is 30.7%, suggesting that over two-thirds of the quintile ranks of MSCI and Sustainalytics data do not agree. On the other hand, it is interesting to note that the highest frequency of agreeance is at the extremes. That is, there is more of a tendency for MSCI and Sustainalytics to agree on which companies are the best and worst on ESG.

Divergence of composite ratings across research providers is understandable. Berg et al. (2019) have observed that divergence can be explained by three reasons: different scope of categories, different measurement of categories and different weights when combining categories. On reflection, it is hardly surprising to see a high level of divergence when the process of deriving the data leaves so much opportunity for variation.

Working better with ESG data

If the ESG credentials of a company depend greatly on the research provider and its methodology, perhaps choosing only one perspective is not the best answer. We have thus explored ways in which seeking the wisdom of crowds can lead to better outcomes.

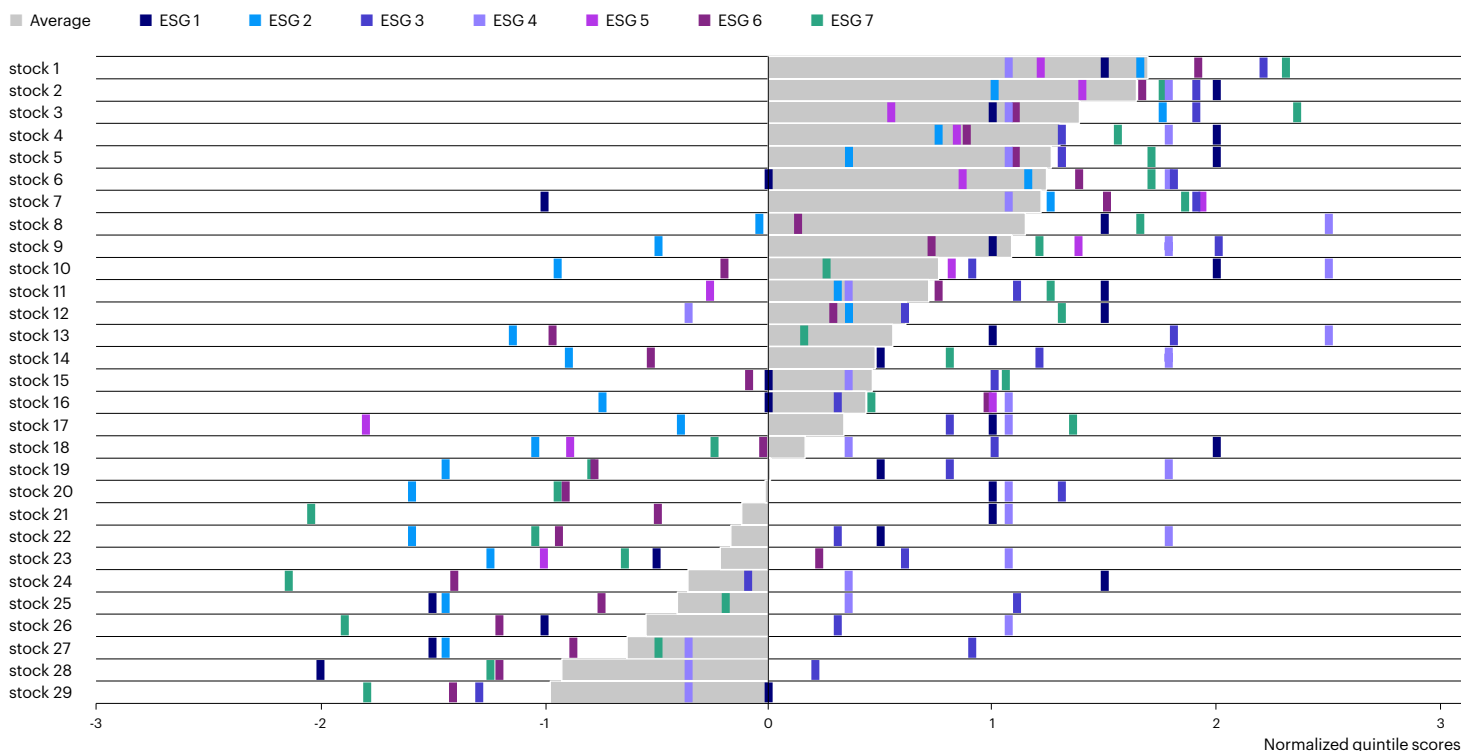
Consider, by comparison, the common practice of creating consensus earnings estimates sourcing opinions from a cross-section of research analysts on the future prospects for company earnings. While there exists scope for divergence across contributors, the consensus view

Figure 1
Agreement between quintile ranks of MSCI and Sustainalytics data

		Sustainalytics quintile ranks				
		1	2	3	4	5
MSCI quintile ranks	1	8.0%	5.5%	3.5%	1.8%	1.0%
	2	4.1%	5.5%	4.7%	3.4%	2.4%
	3	3.2%	4.3%	4.6%	4.2%	3.6%
	4	2.8%	3.0%	4.2%	4.6%	5.4%
	5	1.2%	1.7%	3.0%	6.2%	8.1%

Source: Invesco, MSCI, Sustainalytics, IQS global large-midcap research universe as of March 2021 and corresponding MSCI & Sustainalytics quintile ranks (industry neutral) comprising 2,972 companies having scores from both providers. Quintile 1 is the poorest 20% of ESG scores; Quintile 5 is the best 20% of scores.

Figure 2
ESG consensus and contributor data
 ASX Financial Services sector



Source: Invesco, Jeffries. The following third-party vendors are included in the consensus average, randomly labelled ESG_1 through ESG_7: Bloomberg, Sustainalytics, RobecoSAM, FTSE, MSCI, DJSI (SP Global) and ISS.

is widely appreciated today. But creating a meaningful consensus estimate was not always an easy exercise. It has taken decades of evolution – creating careful definitions of financial metrics, comparing companies within peer groups and benefiting from improved data processing and delivery platforms – until this example of the wisdom of crowds embedded itself in our industry. It isn't far-fetched to expect the ESG data industry to follow a similar trajectory, only swifter.

Figure 2 displays the calculation of the ESG consensus for companies in the Australian S&P/ASX Financial Services Index. The colored markers represent the composite ESG scores from seven different providers, for 'stock 1' through 'stock 29'. The grey bars indicate the seven-provider average. While there is plenty of divergence of opinions between individual vendors, we note some convergence at the extremes, in particular for companies considered to have the strongest ESG credentials. Curating ESG definitions and creating consensus-type views can be a worthwhile exercise and is likely to be more widely adopted as ESG research becomes more widespread.

But until this is the case, moving beyond the use of top-level ESG composites and into the more granular vendor data may represent the best alternative. As should be the case for all good research, the first step is to contemplate the objective and rationale, then source the data to test the

hypothesis. In the context of ESG data research, the philosophy summarized by Krosinsky (2017) makes sense:

1. *Objective*: Figure out what outcomes we seek, then
2. *Strategy*: Pinpoint the strategies we need to deploy and, finally,
3. *Data*: Determine what data we need to determine how we are doing.

We heed this advice when screening for controversies. To build a controversy screen, we first think about the area being tackled. Then, in pinpointing the strategy, we consider the possible sources of information and how they should be combined. Finally, the sources of data are curated, often seeking specialist providers or granular data indicators from the more comprehensive datasets. For some purposes, multiple sources can be combined as a consensus average view; but a non-linear combination could make more sense, depending on the case. For instance, the screening criteria might specify that a company needs to be captured by multiple data filters.

Textual analysis to identify ESG controversies

A key challenge in controversy screening is timeliness. If we wait for a controversy to occur, much of the damage is already done. Depending on the data provider's methodology, it can take weeks for the event information to trickle through to



A key challenge in controversy screening is timeliness.

users. While research has shown that the negative price impact of significant controversies can persist for some time, the sooner investors can review the information surrounding a controversy, the better. Keeping up with relevant news is critical.

We tackle this challenge through textual analysis tailored to specific controversies. Our custom natural language processing (NLP) engine trawls news headlines to find occurrences meeting search criteria for each controversy. The general approach follows two broad steps:

Step 1: We begin with keyword definition: Words from a corpus of controversies and related industry reports on the issue are scanned for relevance related to targeted topics. After removal of common and less relevant words, the most frequently occurring words and bigrams make up a custom keyword dictionary.

Step 2: This is followed by textual analysis of news, using this dictionary, based on daily natural language processing of headlines sourced from the data analytics platform, Ravenpack.

The results are combined with purpose-built third-party data screens to help improve effectiveness – and to influence the prioritization of further research and decision making around recently identified controversies.

Note that the results can be mapped to current portfolio holdings. Portfolio companies appearing in news controversies are candidates for engagement or, in severe cases, divestment. Such engagements should be implemented in conjunction with the global ESG team and potentially other investment centers. In fact, knowledge about controversies surrounding assets purchased is helpful for the trade reviewer ahead of every trade.

Modern slavery: a case study

At its broadest, the term ‘modern slavery’ refers to any situation of exploitation where a person cannot refuse or leave work due to threats, violence, coercion, abuse of power or deception.

This is a fundamental issue. It is precisely the kind of ESG topic investors need to incorporate into their investment processes. They should do everything possible to avoid investing in companies guilty of supporting modern slavery. But companies aren’t exactly going to trumpet their association with modern slavery. And many cases of human rights abuses are buried in the company’s supply chain – hidden from the public eye.

Because of the impact for investors of the Modern Slavery Act (2015) in the UK and the related act (2018) in Australia, companies in these jurisdictions have to provide disclosure statements on modern slavery. This raises awareness of the risks and builds on the existing legal framework

to address modern slavery crimes. With increased awareness comes increased news coverage of risks and controversies. Developing an approach using third-party data and systematic textual analysis of news has helped triangulate the risk of companies being embroiled in modern slavery.

Indicator definition

Following Krosinsky (2017), we first defined a screen to identify companies with heightened risk of modern slavery in their business or supply chain (*objective*). This screen supports the process of verifying companies identified by our proprietary NLP analysis of news headlines.

Then, we applied screens from a range of third-party data providers utilizing indicators relevant to modern slavery (*strategy*). The aim is to know which companies external researchers have identified as being embroiled in modern slavery controversies. Depending on the recency of third-party research, we look for companies with new or emerging controversies. For verification, we use our own NLP analysis of current news headlines.

Finally, we selected indicators that are as relevant to the topic as possible (*data*).

Examples include:

- *Controversies:* Social Supply Chain Incidents (Sustainalytics)
- *Risk Indicators:* Human Rights – Supply Chain, Risk Score (Sustainalytics)
- *Controversies:* Human Rights, (high/critical severity) (Vigeo Eiris)
- *ESG Assessments:* Human Rights, overall score (Vigeo Eiris)

Textual analysis of news

Our NLP approach can analyze thousands of news headlines every day for the occurrences of words related to specific controversies. To tackle modern slavery, designing the process required the following steps:

- *Controversy theme definition in the ESG topic ‘Social’:* Using a corpus of the most frequently occurring controversies from Vigeo Eiris, the text is cleaned to remove common patterns and named entities. The most frequent keywords and expressions are extracted from the corpus and grouped into themes, with one emerging theme being modern slavery.
- *Dictionary definition per theme:* To focus further on modern slavery, a collection of additional documents on the topic is aggregated into a second corpus of relevant text. This expands the dictionary of keywords that may appear when searching for controversies in news. The corpus is cleaned, removing common words, patterns and named entities,



The term ‘modern slavery’ refers to any situation of exploitation where a person cannot refuse or leave work due to threats, violence, coercion, abuse of power or deception.



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