
When Alpha Meets Beta: Managing Unintended Risk in Active Fixed Income

AUTHORS

Jamil Baz
Managing Director
Co-head of Client Solutions
and Analytics

Mukundan Devarajan
Executive Vice President
Quantitative Research Analyst

Mahmoud Hajo
Senior Vice President
Quantitative Research Analyst

Ravi Mattu
Managing Director
Global Head of Analytics

This paper addresses what we believe are serious flaws in a study which raised concerns about whether correlation with the credit risk factor limits the possibility of alpha in active fixed income funds. We argue that the typical active fixed income manager is far less correlated with the credit risk factor than a portfolio of all active managers. Moreover, substantial alpha can easily coexist with a portfolio that is highly correlated to credit returns. In fact, if a manager has superior security-selection skills, it may be optimal to overweight the credit risk factor.

We have written previously about the need for investors to look for and manage unintended risk when selecting active fixed income managers. In [“Fixed Income Manager Selection: Beware of Biases”](#) (Mattu et al., April 2016), we pointed out that the average fund manager’s active return over the benchmark has a significant exposure to the credit risk factor. Subsequently, in [“Bonds Are Different: Active Versus Passive Management in 12 Points”](#) (Baz et al., April 2017), we reiterated that active fixed income managers have historically had a structural overweight to credit beta.

Recently, some observers have claimed that the bulk of the active returns of fixed income managers can be explained by credit risk. A recent paper by AQR Capital Management ([“The Illusion of Active Fixed Income Diversification,”](#) December 2017) argued that the high correlation with a well-known risk factor largely precludes the possibility of alpha in active fixed income funds and reduces the ability of fixed income allocations to mitigate equity risk.

While the desire to understand the factor footprint of an active manager is laudable, some of the conclusions drawn from the empirical analysis appear to be hasty. Our analysis finds that less than half the variation in excess returns can be explained by credit risk exposure.

We wholeheartedly recognize that managing unintended risk is important when selecting active fixed income managers. However, alpha is valuable and asset owners should take advantage of it even if it comes bundled with credit beta. A thoughtful manager-selection process with offsetting top-level asset allocation tilts can help preserve the diversification benefits of active fixed income.

DEFICIENT DATA, QUESTIONABLE CONCLUSIONS

Before we address the stronger claims about credit risk in “The Illusion of Active Fixed Income Diversification,” it is useful to discuss the limitations of the data set used. Contribution to the eVestment database is voluntary, and managers self-report their returns. They may provide data on single or multiple accounts in a category; they can opt to be included at any time and provide historical performance data. Typically, managers contribute return data for multiple funds and will often provide returns for both a public mutual fund and representative separate accounts managed for institutional investors. It is not clear if participating managers are required to provide data since the inception of their strategies. Nor could we ascertain if the returns cover all the assets under management for every manager. The biases introduced by backfilling of returns and selective reporting are obvious.

Setting aside these reservations, what does the eVestment data tell us about the actual alpha achieved by active fixed income managers over the past 21 years (January 1997 to December 2017)? The AQR study reports that the equally weighted average active return of all managers in eVestment’s Core Plus category over this period had an information ratio (IR) of 0.62 and a correlation of 0.95 with the excess returns of the ICE Bank of America Merrill Lynch US High Yield Index. **We note that an IR of 0.62 compares very favorably with a Sharpe ratio of 0.26 for the high yield (HY) risk factor¹ over the past two decades.**

Thus, an allocation to the high yield sector does not come close to explaining this presumably outstanding performance of active managers in the Core Plus category. The average fund (both live and closed) outperformed the benchmark by 83 basis points (bps) per year.² More to the point, after stripping out the high yield credit factor returns, the average fund had an excess return of 34 bps per year (or 58 bps if we make the reasonable assumption that the systematic exposure was to the investment grade (IG) credit factor instead).³

Of course, we cannot have a high degree of confidence in factor exposures teased out statistically from historical returns. For instance, the correlation of active returns of these funds versus the duration factor is negative. Adjusted for this implied duration exposure, the average (equally weighted) fund had an estimated alpha of 134 bps per year.⁴ Though we do not take these empirical factor exposures literally, they serve to illustrate the potential pitfalls of relying on statistical methods alone to discriminate among correlated factor exposures.

SPREADING ACTIVE RISK ACROSS MANAGERS: A FEW WILL DO

The first lesson in active management is to be thoughtful in diversifying – one can be too diversified and end up with a portfolio that looks like a high-cost index fund with perhaps a few commonly followed systematic risk factor tilts. In practice, we would expect the asset owner to understand the style of each active manager and not rely on more than a few managers for a certain style of investing.

We find that the active return of the typical manager is far lower than the return of active strategies taken as a whole. We calculated the correlation of each manager’s active returns with the high yield risk factor. The average of these correlations is 0.68 if we include only live funds and 0.62 if we include both live and closed funds (Figure 1a). This implies that, at best, 46% of the variation (R-squared) in active returns of the typical manager is explained by exposure to the credit risk factor. This is not trivial, but it still leaves a lot of room for active managers to take exposures to other risk factors and exploit alternative sources of alpha potential.

Figure 1a: Correlation of fund excess returns with U.S. high yield credit excess returns (live and closed funds)

	Single manager	Equally weighted portfolio of five managers
Number of funds	1	5
Average correlation	0.62	0.75
Minimum correlation	-0.53	-0.19
Maximum correlation	0.97	0.94

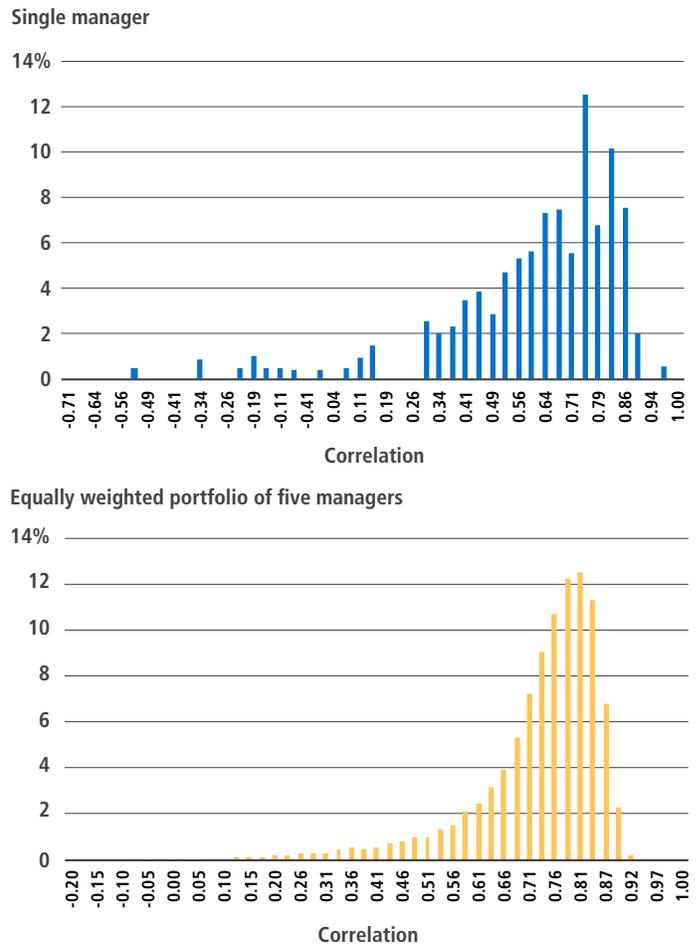
Source: eVestment, PIMCO and Bloomberg as of 31 December 2017. Results are based on a simulation with 25,000 iterations; in every iteration, N funds are picked randomly from the filtered set of 205 funds (live and closed) in the US Core Plus category in the eVestment database. All returns are gross of fees and span the period January 1997 to December 2017. An equally weighted portfolio of these N funds is regressed versus the high yield factor (Bloomberg Barclays US Corporate High Yield Index, over duration-matched Treasuries, per year of spread duration), and the correlation is recorded. The table shows correlations for N = 1 and N = 5, respectively.

What happens to this correlation as an asset owner expands the number of active managers? If an asset owner built an equally weighted portfolio of five active managers (investing 20% of its capital in each), such a portfolio would have a higher correlation (0.75) with the high yield risk factor on average.⁵ Roughly 60% of the variation in active returns of this portfolio would be explained by high yield excess returns. In Figure 1b we show the distribution of correlations to the high yield factor for a single manager as well as an equally weighted portfolio of five randomly selected managers. Taking this example to an extreme, if an investor were to allocate equal amounts to each of the active strategies covered in the eVestment universe, the resulting portfolio would have a correlation of 0.92 with the high yield risk factor.

This correlation is high and broadly consistent with the correlation of the average active return reported in the AQR study. However, this is hardly surprising. All it tells us is that most managers have exposure to credit and that the other systematic risk factors cancel out across managers. Investing in every manager leads to diversifying away the other systematic and idiosyncratic exposures of individual managers – in effect, diluting the impact of the more skilled active managers.

Manager selection is important!

Figure 1b: Distribution of correlation of active returns with the high yield risk factor



Source: eVestment, PIMCO and Bloomberg as of 31 December 2017. Results are based on a simulation with 25,000 iterations; in every iteration, N funds are picked randomly from the filtered set of 205 funds (live and closed) in the US Core Plus category in the eVestment database. All returns are gross of fees and span the period January 1997 to December 2017. An equally weighted portfolio of these N funds is regressed versus the high yield factor (Bloomberg Barclays US Corporate High Yield Index, over duration-matched Treasuries, per year of spread duration), and the correlation is recorded. The table shows correlations for N = 1 and N = 5, respectively.

Figure 2: Performance of various fixed factor exposures versus that of investors with “perfect foresight”

Investor	Risk and return characteristics			Correlation with		Alpha vs. HY corp
	Avg. excess returns (% p.a.)	Volatility (% p.a.)	Sharpe ratio	U.S. IG corp	U.S. HY corp	
Static investors						
A: U.S. IG corp	0.14	1	0.14	1	0.86	-9 bps
B: U.S. HY corp	0.26	1	0.26	0.86	1	-
C: EM external	0.40	1	0.40	0.58	0.62	24 bps
D: Average (equal weights)	0.27	0.89	0.30	0.91	0.93	12 bps
Perfect-foresight investors						
P1: Monthly rebalance	1.52	0.89	1.70	0.83	0.83	133 bps
P2: Quarterly rebalance	0.98	0.91	1.08	0.79	0.80	79 bps
P3: Annual rebalance	0.74	0.88	0.85	0.79	0.83	55 bps

Source: PIMCO and Bloomberg. Data covers period from 1 January 1997 to 31 December 2017. **Hypothetical example for illustrative purposes only.** Investors A, B and C hold a constant exposure to the Bloomberg Barclays US Corporate and US Corporate High Yield Indexes, and the JP Morgan EMBI Global Index, respectively, such that the realized volatility of excess returns over the period 1997–2017 is equal to 1%. Investor D holds an equally weighted average of the positions held by investors A, B and C. Perfect-foresight investors P1–P3 choose the asset that will have the highest excess returns in the next period. P1 rebalances their portfolio once every month, P2 once a quarter and P3 once a year. Alpha is measured versus each investor’s univariate exposure to the US HY Corporate Index over the full sample. No representation is being made that any account, product, or strategy will or is likely to achieve profits, losses, or results similar to those shown.

SECTOR TIMING SKILLS: AN EXAMPLE OF HIGH CORRELATION AND POSITIVE ALPHA

It is a fallacy that a high correlation with a single risk factor allows us to draw any conclusions on alpha. In order to isolate alpha, one must examine the true active returns – that is, active returns after accounting for returns due to systematic risk factors. A manager with a large factor footprint might also have a respectable alpha.

As an illustration, consider a menu of three credit risk factors that an active manager can deploy: U.S. investment grade, U.S. high yield and emerging market (EM) external debt. In Figure 2 we show the historical performance of these three risk factors, all normalized to have the same realized volatility over the past 21 years (1997 to 2017). Over this period, IG, HY and EM had Sharpe ratios of 0.14, 0.26 and 0.40, respectively. The IG and HY spread factors were highly correlated with each other (86%) and had a correlation of approximately 60% with the EM spread factor. There was no economic reason for an investor in 1997 to have expected that HY would outperform IG over the next 21 years, so an investor who substituted the HY factor for IG

arguably has a legitimate claim to having gotten one big call right. An investor who took an equivalent amount of risk in an equal-risk-weighted portfolio of IG, HY and EM would have had a Sharpe ratio of 0.3 – more than twice the return of an equivalent risk exposure to IG, with a correlation of 0.91 to the IG risk factor. As Figure 2 shows, the four strategies have very similar risk but widely different realized returns over the past 21 years.

Next, let us imagine a clairvoyant investor who can predict which of these three risk factors will outperform in every period. No one would argue that this investor is not highly skilled in timing the spread risk factor. Assuming this mythical “perfect foresight” investor gets one shot a year at rebalancing their portfolio, they would have an alpha of 55 bps per year after accounting for systematic exposure, but a very high correlation (0.83) with the HY risk factor. What if they could rebalance more frequently – say, once a month? If this were possible, this hypothetical investor would have an even more impressive alpha of 133 bps per year, and the correlation with the high yield factor would still be 0.83.

SYSTEMATIC OVERWEIGHTS – A NONISSUE FOR DIVERSIFICATION

In our view, a fixed income fund portfolio with a systematic overweight to the credit risk factor should not pose serious problems in constructing a diversified portfolio. True alpha is difficult to source, and one should take it wherever one can find it. The due-diligence question an asset owner ought to ask is whether there is robust evidence of alpha generated by a fund's active fixed income manager. If the answer is in the affirmative and the factor footprint of the manager is persistent, the asset owner can adjust their top-down allocation to offset this unintended exposure and preserve the diversification benefits of their allocation to fixed income.

Consider a manager with superior credit selection skills. The manager may find it optimal to overweight credit because the cost of shorting cash bonds can be prohibitive. The incremental cost of hedging via credit default swaps on indexes might also be high due to the demand from certain participants, like dealers, to hedge counterparty credit risk through liquid derivatives. Such a manager should not be excluded simply because of the systematic credit overweight of their portfolio. In contrast, if an active manager is selected for their macro skills, such as factor timing, we should not expect (or allow) a structural tilt to credit by such a manager.

In constructing their overall portfolios, asset owners should account for the investment styles of their managers and their potential systematic tilts. If an active manager has been selected because of their skill in sector, name or security selection within credit, it is rational to allow them to have an overweight to credit. Asset owners could offset this incremental credit risk by reducing their portfolio allocations to other risky investments that have similar expected returns but lower expected alpha.

ALPHA IN FIXED INCOME: EASIER TO SOURCE FOR STRUCTURAL REASONS

We believe that it's generally easier to find outperforming managers of fixed income than those of equities. In [“Bonds Are Different: Active Versus Passive Management in 12 Points,”](#) we pointed to many reasons it may be easier to outperform fixed income indexes. To recap, we believe the prevalence of noneconomic investors within fixed income; index construction

rules (size, rating and maturity restrictions in core bond indexes); higher turnover of the constituents of these indexes (bonds have a finite maturity, while equities are perpetual), which requires more frequent price discovery; and investor segmentation create alpha opportunities for active fixed income investors. In addition, the use of derivatives allows exposures to opportunities such as futures basis, cash–CDS basis and “to be announced” (or TBA) rolls in agency mortgages, which are typically not exploited by passive or constrained investors. Finally, risk factors such as carry, value, momentum, low volatility and volatility work as well in fixed income as they do in equities.

Blackrock⁶ has questioned the impact of noneconomic agents on bond prices. Although institutions like central banks are acting rationally, their market operations reflect larger and more complex goals, such as delivering macroeconomic stability via quantitative easing or managing foreign exchange reserves. In this process, they often have a temporary distorting effect on relative asset prices or spreads. Those who argue otherwise must not have observed the high frequency data around events like the U.S. Federal Reserve's announcement that it would buy mortgages and the European Central Bank's plan to buy corporate debt. In equilibrium, the impact of such actions by official institutions on relative prices in asset markets may be small. However, this outcome does not happen by divine intervention, and it takes the offsetting action of active managers to align relative prices. Passive investors have to sit out this party, just as they mechanically follow index inclusion and exclusion rules.

As the saying goes, the proof of the pudding is in the eating. Unfortunately, as explained above, the eVestment performance database is an inadequate guide to the alpha generated by active fixed income managers. Indeed, for what it is worth, we found that 86% of the active managers in the eVestment Core Plus category outperformed their benchmarks (gross of fees), even after adjusting for their high yield factor footprint.

Using the Morningstar database, we examined the after-fee performance of publicly available mutual funds in two studies (Baz et al., 2017 and Mattu et al., 2016) and came to conclusions that were favorable to active fixed income management. This database does not suffer from survivorship or backfill biases.

The Mattu study showed that the top quartile funds had a net alpha of 50 bps per year after accounting for five major risk factors over the decade ended in 2005. A decade may be too short a period to distinguish between performance due to factor timing and a structural exposure to a risk factor. A good example of that would be the impressive performance of bank debt and nonagency mortgages after the Great Recession of 2008–2009. An investor who took these exposures prior to 2007 would have suffered huge losses during the financial crisis. However, many successful fixed income managers avoided these exposures before the crisis and went overweight these risk factors after 2009. Was that luck or skill?

FISHING FOR RISK FACTORS

Not all recently discovered risk factors are legitimate. In fact, most are not. There is a temptation to look back at active performance strategies and, whenever they are successful, rebaptize these strategies as risk factors – thereby showing zero alpha once performance has been adjusted for exposure to these factors.

Success has a thousand fathers. The late MIT Sloan School of Management professor Stephen Ross thought that a sensible asset pricing framework should allow no more than three or four factors in markets.⁷ Yet not a month passes without the factor industry introducing new factors, elevating data mining to an art form. Hindsight is indeed a wonderful thing. As Hegel said, “The owl of Minerva spreads its wings only with the falling of the dusk.” In plain English, this means that people are powerless to make claims about the future because they do not understand it and instead seek comfort in the irrelevant past.

REFERENCES

- AQR Capital Management. 2017. “The Illusion of Active Fixed Income Diversification.” *Alternative Thinking*.
- Baz, Jamil, Ravi Mattu, James Moore and Helen Guo. 2017. “Bonds Are Different: Active Versus Passive Management in 12 Points.” PIMCO *Quantitative Research and Analytics*.
- Mattu, Ravi, Mukundan Devarajan, Steve Sapra and Dzmitry Nikalaichyk. 2016. “Fixed Income Manager Selection: Beware of Biases.” PIMCO *Quantitative Research and Analytics*.
- Small, Martin. 2018. “Don’t Believe in the Boogeyman: The ‘Noneconomic’ Bond Buyer Doesn’t Exist.” *BlackRock Blog*. <https://www.blackrockblog.com/2018/01/10/boogeyman-noneconomic-bond-buyer/>.

- ¹ The HY risk factor return is defined as the excess return over duration-matched Treasuries of the Bloomberg Barclays US Corporate High Yield Index.
- ² This is the equally weighted average alpha of 205 funds from the US Core Plus category in the eVestment database. Category includes composites of institutional portfolios, commingled funds and mutual funds. Only funds benchmarked to the Bloomberg Barclays US Aggregate are included. Closed/inactive funds are included up to the last reported return. All returns are gross of fees. The average alpha for each fund is computed over the period 1 January 1997 to 31 December 2017. The start/inception date of each fund or composite varies.
- ³ Excess returns of the high yield and investment grade credit factors are derived from the Bloomberg Barclays US Corporate High Yield Index and the Bloomberg Barclays US Corporate Investment Grade Index, respectively, over duration-matched Treasuries per year of spread duration.
- ⁴ The duration factor returns are derived from the Bloomberg Barclays US Treasury Index over cash (one-month overnight index swap rates) per year of duration.
- ⁵ Results are based on a simulation with 25,000 iterations; in every iteration, five funds are picked randomly from the filtered set of 205 funds (live and closed) in the US Core Plus category in the eVestment database. All returns are gross of fees and span the period January 1997 to December 2017. An equally weighted portfolio of these five funds is regressed versus the high yield factor (US Corporate High Yield Index, over duration-matched Treasuries, per year of spread duration), and the correlation is recorded. The average correlation of these 25,000 iterations is 0.75.
- ⁶ <https://www.blackrockblog.com/2018/01/10/boogeyman-noneconomic-bond-buyer/>
- ⁷ We have some questions about high yield being a separate and legitimate risk factor from investment grade credit, simply because it has outperformed on a relative basis over the past two decades. The same can be said for the credit of BB rated companies and ultra-short-maturity credit. These subsectors have historically outperformed the broad credit market. It took some insight to identify these opportunities ex ante. It is not clear to us that at current valuations the relative value of these credit subsectors is compelling. The investor segmentation that created these opportunities is no longer as constraining.

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650 Newport Center Drive
Newport Beach, CA 92660
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