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Why re-correlation matters in alternative premia investing

Understanding this key risk can be the difference between success and failure, writes Luc Dumontier

This article studies the conditions in which alternative premia solutions can generate consistent positive returns as well as those that lead to significant drawdowns. A second article will set out 10 commandments to address the risks identified.

If you believe the many simulations by asset managers and investment banks, alternative premia[1] solutions should have delivered regular returns, uncorrelated with traditional asset classes and largely independent of the portfolio construction criteria used.

Since the launch of the first alternative premia funds in 2013, the reality has been quite different.

These strategies have delivered modest results on average, often correlated on the downside with risky asset classes and highly heterogeneous, from one product to another.

It seems the alternative premia label refers more to an analysis framework than a standalone investment strategy. And its robustness depends on choices made in implementation – particularly about correlation risk.

Whether you are a provider or a user of alternative premia solutions, trusting in simulations based on historical data is not enough.

Image: Shutterstock

Correlation

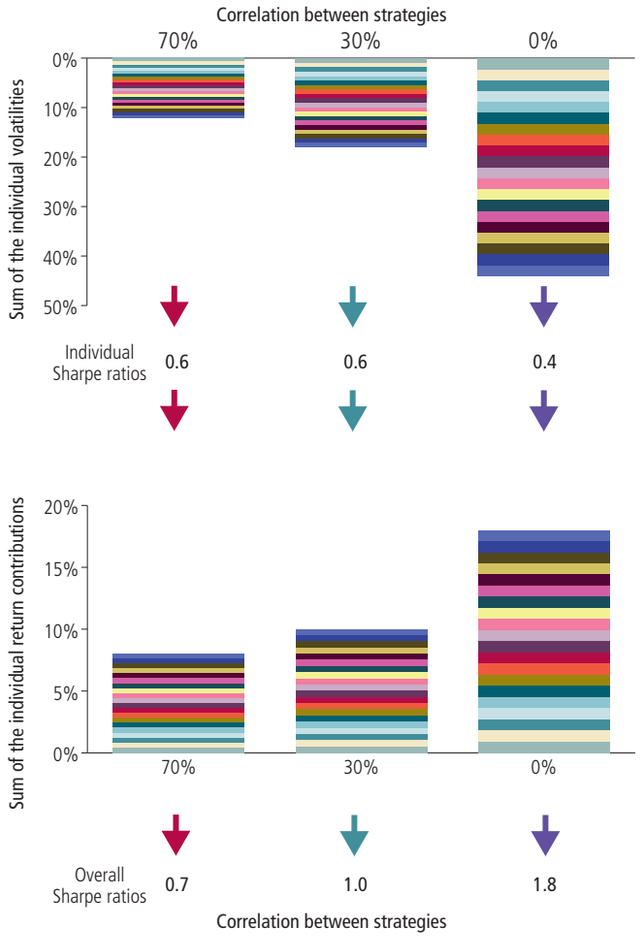
Put simply, success in alternative premia investing depends on the ability to combine uncorrelated strategies.

The classical alternative premia approach combines different long/short portfolios capturing the standard investment styles such as value, carry, momentum, low risk, or liquidity within a broader allocation to traditional asset classes.

These strategies are expected to deliver returns either as remuneration for exposure to an additional risk factor, economic or financial, that cannot be diversified away – often called risk premia – or stemming from biases linked to market participants' behavior, investment constraints and structural flows - often called style premia. Because the rationale behind each individual alternative premia[2] is different, they are expected to deliver largely uncorrelated performance.

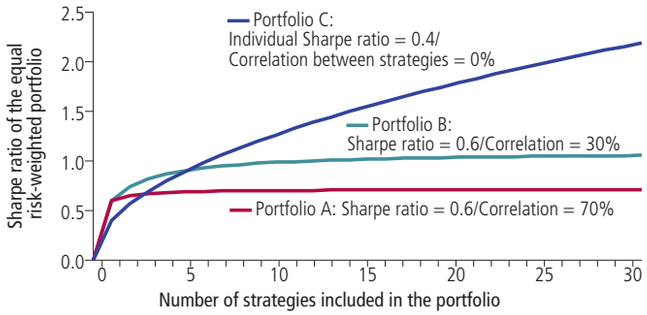
It turns out the level of correlation between the elements of any portfolio has a decisive impact on its risk-adjusted performance. To show this, let's consider a portfolio of 20 strategies[3] that is equally risk-weighted and has an overall target volatility of 10%.

1. Diversification in a portfolio of 20 strategies with a target volatility of 10%



Source: La Française Investment Solutions

2. The power of diversification



Source: La Française Investment Solutions

Figure 1 shows this portfolio can allocate a volatility budget of 0.6% to each strategy if they are 70% correlated, the sum of their individual volatilities being 11.8%; 0.9% if they are 30% correlated, sum of 17.3%; and 2.2% if they are uncorrelated, sum of 44.7%.

The contribution of each strategy to the portfolio's overall performance is simply its volatility budget multiplied by its Sharpe ratio. In this example, we apply a Sharpe ratio that is 50% higher for correlated strategies than for uncorrelated strategies (0.6 vs. 0.4). Notwithstanding, the overall return of the portfolio turns out to be much lower if the 20 strategies are correlated – 7.1% and 10.4%, if the pair-wise correlation is 70% and 30%, respectively – than if they are uncorrelated (17.9%).

So, the portfolios that combine correlated strategies have much lower overall Sharpe ratios (0.7 and 1 respectively) than the portfolio of uncorrelated strategies (1.8). To reach a Sharpe ratio of 1.8 by combining 20 strategies that are 70% correlated (or 30%, respectively), each strategy would have to deliver a Sharpe ratio of 1.52 (or 1.04, respectively) – a highly unlikely scenario.

Figure 2 generalises the study to N strategies (x-axis) that have the same characteristics as previously in terms of pair-wise correlation and individual Sharpe ratio. Portfolio A represents a traditional allocation to risky asset classes, such as equities, corporate bonds and private equity. These have delivered Sharpe ratios in the range of 0.6 over the long term, with correlations among portfolio components averaging 70% or higher in stressed periods. In this case, the overall Sharpe ratio (y-axis) tends towards 0.72 (ie $0.6/\sqrt{70\%}$) – and this limit is approached very rapidly – the Sharpe ratio is already at 0.67 with only three components.

Portfolio B represents traditional multi-strategy hedge funds. These combine individual strategies with target Sharpe ratios of 0.6 and correlations of roughly 30%. In this case, the diversification power is only marginally higher: the overall Sharpe ratio tends towards 1.10 (ie $0.6/\sqrt{30\%}$), a level that is again approached rapidly – the Sharpe ratio is already 0.9 with only five strategies.

Portfolio C represents the stated objective of alternative premia solutions, i.e. to combine many uncorrelated premia, even if they have lower individual Sharpe ratios (0.4 vs 0.6). In this case, the overall Sharpe ratio is potentially unlimited and it is highly profitable to add a new premia, even to an already large portfolio.

The primary lesson is that a portfolio's Sharpe ratio is more dependent on the number of strategies it combines - and especially on the correlation of each strategy to the others – than on each strategy's standalone Sharpe ratio. With Sharpe ratios ranging between 1.5 and 2 based on data over the past 10 to 20 years, simulations of portfolios combining 15 to 20 premia[4] are consistent with these theoretical figures.

But how do we then explain the disappointing returns of most alternative premia solutions since their launch?

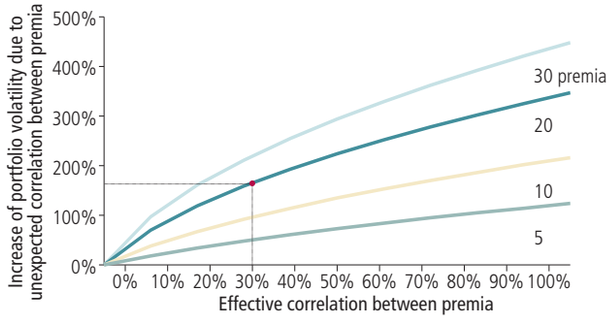
Re-correlation

A big part of the answer is re-correlation. Let's reconsider the equally risk-weighted portfolio of 20 uncorrelated premia and target overall volatility of 10% (see figure 1). As a reminder, the sum of the individual volatilities of the premia in this portfolio is 44.7%.

If in practice, the premia display 30% pair-wise correlations, the overall actual portfolio volatility is 25.9%, an error of nearly 160% versus the initial calibration of 10%. Figure 3 shows the potential calibration error of a portfolio's volatility (y-axis) increases with the number of premia (the different curves), and soars should these premia – initially expected to be uncorrelated – re-correlate strongly (x-axis).

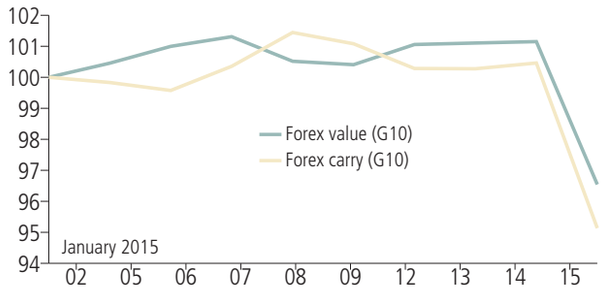
The investor, expecting to benefit from a high level of diversification

3. The danger of re-correlation



Source: La Française Investment Solutions

5. Forex carry versus forex value premia in January 2015



Sources: La Française Investment Solutions, Deutsche Bank and Bloomberg

from holding many uncorrelated premia, is ultimately exposed to a far higher level of risk than desired. The calibration error can be even higher given that re-correlation often occurs in a context of rising volatility across asset classes and thus across premia.

The danger is that premia register negative returns precisely when the portfolio's volatility is exceptionally high resulting in heavy losses. Re-correlation risk is the Achilles' heel of alternative premia strategies. A sound grasp of the circumstances in which this phenomenon can occur is essential to mitigate this risk.

Structural exposure to the same systematic risk

Some alternative premia may be sensitive to a common systematic risk. For example, concerns over global economic growth tend to penalise both high-yielding currencies and value stocks. Currencies that offer an attractive carry are often those of countries whose economies are the most open, cyclical, and/or dependent on commodity exports, such as Australia and New Zealand among G10 countries. Similarly, stocks trading at attractive valuations are most vulnerable to the so-called value trap phenomenon, should reasons for the stocks' low valuation multiples intensify. As an example, forex carry and equity value premia re-correlated on the downside in 2015 (see figure 4), amid mounting concerns about economic growth in the US and China.

Exposure to the same idiosyncratic risk

Different types of alternative premia – for instance carry, value and momentum – can be implemented within the same asset class. These are therefore prone to exposure – with the same directionality – to the same underlying assets. This is even more the case as the investment universe is restricted. If different premia are locally exposed to an asset that performs abnormally, they can display correlated performance.

One of the most spectacular events of 2015 occurred when the Swiss National Bank abandoned its cap on the Swiss franc against the euro. The day of the announcement (January 15), the Swiss franc appreciated by more than 20% against the other G10 currencies, on average. At that time however, the Swiss franc was the least attractive currency in the G10 universe in carry terms (three-month interest rate), and in valuation terms (OECD purchasing power parity), while its price momentum (return over the past 12 months) was among the worst.

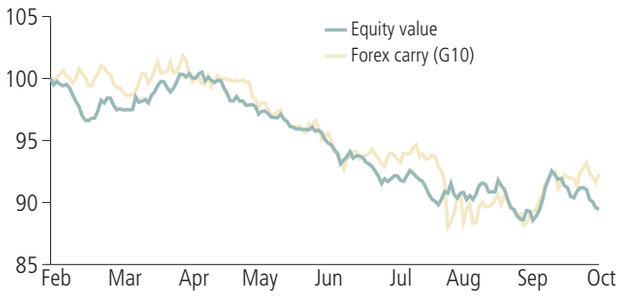
An investor that had overlaid carry, value and momentum premia in the currency universe would likely have accumulated three short positions in the Swiss franc, with harsh consequences in terms of correlation and performance (see figure 5).

Re-correlation on the downside to the underlying asset class

Other alternative premia, initially designed to be insensitive to the underlying market, can end up exposed to it – positively or negatively – during volatile periods.

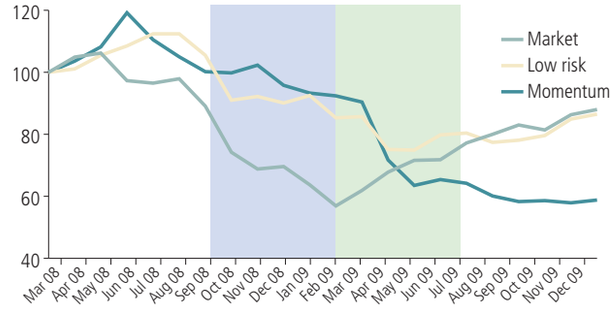
One of the best examples of downward re-correlation is the low risk equity premia during the market collapse of 2008. This premia is usually captured by building a portfolio that buys less-risky stocks, and sells the

4. Forex carry versus equity value premia in 2015



Sources: La Française Investment Solutions, Deutsche Bank and Bloomberg

6. Equity premia in the years 2008 and 2009



Sources: La Française Investment Solutions and JP Morgan

riskiest ones. To ensure the portfolio is beta neutral, the long leg is usually leveraged based on the historical beta of stocks, so the portfolio is net long in nominal terms.

However, investors often indiscriminately liquidate all their stock holdings when there is a sharp increase in risk aversion and/or funding liquidity risk. As a consequence, the actual betas of individual stocks converge and the low risk premia may exhibit positive beta versus the market at the worst possible time (see the blue area in figure 6).

If periods of beta compression can be painful for investors, the opposite phenomena of beta decompression can be even more dramatic. The best-known examples are the equity momentum crashes (see Daniel and Moskowitz, 2012), like the one during the market rebound in the second and third quarters of 2009 (see the green area in figure 6) after sharp decreases in previous quarters.

When the market falls significantly over the momentum formation period, assets that fall more than the market tend to be – or become – high beta assets while those that fall less tend to be – or become – low beta assets. Thus, in periods of market decline, momentum portfolios are likely to become long low-beta assets and short high-beta assets, and carry implicit negative exposure to the underlying asset class. If the market rebounds strongly, as was the case for equities in mid-March 2009, momentum strategies can lose the profits of several years in a matter of weeks.

Forced sales/de-leveraging

Co-ordinated forced selling or deleveraging of similarly constructed portfolios can also cause re-correlation of alternative premia. The best-known example is the market dislocation experienced by long/short equity strategies in August 2007 – the so-called 'quant crisis'.

On average, equity market neutral funds (as represented by the HFRX sub-index) lost 5.2% between August 6–9, while equity markets posted only modest declines (-0.9% for the S&P 500 TR Index). This loss corresponds to about 1.5 times the historical annual volatility of the HFRX sub-index (3.5% over the previous three years) and 13 times its three-day volatility (0.4%).

This startling event, which normally (in the statistical sense) has a near-zero probability of occurring, has given rise to numerous studies. Khandani and Lo (2008) explain the losses incurred on the first day as resulting from an initial wave of forced selling by multi-strategy funds or proprietary traders, itself the result of a tightening in liquidity conditions – notably in the aftermath of the liquidation of Bear Stearns' credit funds. This first drop caused many funds to reach their stop-loss limits, thereby aggravating the de-leveraging phenomenon over the following two days. If all equity hedge funds lost ground at the same time, at least initially they must have held the same positions. Analysis of the returns of equity premia over this specific period gives a good indication of what those positions were (see figure 7).

7. Equity premia during the quant crisis

Style	Premia	Sector neutral		Non-sector neutral	
		Loss (%)	Loss (σ)	Loss (%)	Loss (σ)
Value	1-year forward earnings yield	-3.8%	-4.8	-2.2%	-1.9
Value	Free cashflow yield	-3.6%	-5.4	-4.2%	-5.6
Value	Piotroski score	-1.7%	-3.2	-1.7%	-2.9
Quality	Historical ROE	-1.4%	-2.1	-1.5%	-1.8
Quality	Altman Z-Score	-1.7%	-2.7	-1.7%	-2.2
Quality	Ope margin 1-year growth	-3.0%	-4.4	-1.9%	-2.5
Momentum	12-month price momentum	-3.5%	-2.9	-3.2%	-2.0
Momentum	3-month average mean EPS	-3.3%	-3.7	-2.9%	-2.5
Low risk	Historical beta	-3.2%	-2.4	-2.9%	-1.7

Sources: La Française Investment Solutions and JP Morgan

Whether they are labeled value, quality, momentum, or low risk, equity premia posted significant losses over these three days.

The criteria used by equity hedge fund managers to select stocks seem to be the same as those used to build equity alternative premia. This finding is no surprise: how does one select stocks if not by comparing their multiples (such as price/earning ratio), their profitability (such as return on equity), their price momentum (past 12-month return), and so on? In other words, the majority of long/short equity funds are exposed to alternative premia, and were exposed well before the label was invented.

The data in figure 7 requires an additional comment. Rebased to their respective standard deviations, the losses of the equity alternative premia during the quant crisis (between two and six times) are much smaller than those recorded by the hedge funds (13 times on average). But the reader must keep in mind the results discussed in the second section of this article. If the funds posted such huge losses, it is not only because the strategies they were exposed to registered negative returns but also – and especially – because strategies the manager expected to be de-correlated ended up displaying highly correlated returns.

Circumstances in which alternative premia are prone to re-correlation can occur at the worst possible time – when risk aversion is rising and risky assets move to the downside. The mixed results registered by alternative premia solutions since 2013 should prompt investors to question simulations that ignore such risks. ■

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[1] Alternatively "risk premia", "style premia", "style factors", "risk factors", "factor premiums", etc.
[2] For the rest of the paper, we use the term of "premia", "alternative premia" or "strategy" whatever the underlying rationale.
[3] About the number of alternative premia that are often presented in the academic papers.
[4] Simulations performed by AQR and Deutsche Bank as detailed in the bibliography.