A key question when considering an investment in alternatives is whether they are really alternative? That is to say – what diversification properties do the alternatives bring to a portfolio? In this note, we look at some common properties of Alternative Risk Premia (ARP), how they can provide diversification and how the transparent exposures of ARP may allow for effective portfolio construction, a key component to delivering truly alternative sources of return.

The goal of including diversifiers
A driving force behind the use of alternative investment strategies has been a desire to improve the diversification of portfolios. We can broadly consider two categories of diversifying allocations. The first of these is to diversify by adding exposure that is negatively correlated to the main risk(s) in a portfolio. This is normally added as a defensive or “crisis risk” allocation to protect the portfolio during “bad times” and is intended to have a high payoff over a short time horizon when needed. The second form of diversification is an uncorrelated exposure which is designed to be effective over a longer time horizon. This form of allocation seeks to provide a more consistent source of positive returns, but may not provide large returns during “bad times”. ARP fall into the second of these diversification categories (Figure 1), a space traditionally thought to be occupied by hedge funds.

What are alternative risk premia?
The foundation of our ARP is a belief that human behavior is a key driver of asset prices beyond the traditional risk premia associated with growth, inflation and slowdown. We believe that certain behaviors create biases in asset prices that lead to systematically exploitable opportunities; opportunities that are typically unrelated to broader macro fundamentals. In our research we discuss six cognitive biases (prospect theory, extrapolation, hindsight, herding, ambiguity and availability) and show how these can lead to ARP such as momentum, value and carry within a range of asset classes.

The theoretical foundation of investor behavior provides a basis for ARP to add diversification; however we must recognize that some behavioral biases are pro-cyclical and that ultimately these premia have to be accessed using traditional asset classes. As a result, there is a risk of correlation with traditional portfolio exposures in a similar way to that experienced with hedge funds. To better understand how ARP interact with a portfolio of traditional equity and bond exposures we start by examining the more familiar world of hedge fund exposure.
Hedge funds: the traditional diversifiers and their challenges

Hedge funds can provide returns that are lowly correlated with traditional equity exposures. However their risk and return drivers are opaque and when allocating to a portfolio of hedge funds it is quite common for aggregate exposures to drift towards higher correlation with equities, particularly when return opportunities become harder to find. We have seen this in recent years as the correlation of a portfolio of investable hedge funds, represented by the HFRX Global Hedge Fund index, has a significant and positive correlation to equities (represented as the S&P500 - Figure 2). We also see that exposures across the hedge fund strategy universe can become concentrated, illustrated in Figure 3, which shows the absorption ratio1 for the same universe of hedge fund strategies. This suggests one risk factor can explain up to 90% of variation of returns in the hedge fund portfolio during times of stress.

Figure 1: Negative, Positive and Uncorrelated exposures with the S&P 500 over the last 5 and 10 years (to December 2014)

Figure 2: Correlation between hedge funds and equities

Figure 3: Absorption ratio (AR) of variance and correlation amongst hedge fund strategies in HFRX

1Absorption ratio is the percent of risk that can be explained by the first risk factor in a principal component analysis of strategy returns. We quote ARs for both variance and correlation, the latter adjusting for any bias created by more volatile strategies.
Although hedge fund returns are opaque, we can use ARP to de-construct the return drivers of the HFRX Index and we find the majority of returns can be explained by common ARP (Figure 4). This holds true even if we re-weight constituents to have equal allocation to each HF strategy within HFRX so as not to have a biased index. The idea that hedge funds, in aggregate, represent exposure to a combination of ARP is gaining traction across the industry, for example see Mladina 2015. This should not be confused with the suggestion that hedge funds do not provide real alpha, they can, but the important point is that when allocating to a portfolio of hedge funds the aggregate risk and return profile can be well explained by ARP and that the correlation and concentration dynamics of hedge funds pose challenges for wider portfolio construction.

The key element to understand is if the exposures in hedge funds and ARP are similar, how do ARP help us create a diversifying alternative portfolio?

How do alternative risk premia help?

ARP provides transparent exposure to systematic risk premia which may help in several ways:

- Each individual ARP has a consistent exposure to its systematic risk premia, leading to less concentration / style drift within the ARP portfolio.
- Each individual ARP has well understood core drivers, allowing effective portfolio construction.
- Each individual ARP has pricing transparency, allowing for effective management of transient fundamental premia exposures.

Consistent exposure leading to less concentration

In our earlier analysis we saw how the absorption ratio for a collection of hedge fund strategies within HFRX varied through time. Figure 5 shows the equivalent analysis for our current collection of ARP. Here we see that not only was the absorption ratio lower, but also it was more stable through time, thus helping to support ARP’s lower correlation with equities in Figure 6, even for an equally weighted portfolio of ARP.

Source: Schroders, Bloomberg, monthly data from January 31, 1998 to December 31, 2014. Average HFRX is an equal cap weight of the selected constituents. Data simulated and not actual performance. Construction of the HFRX Average Index: As well as showing analysis using the HFRX Global Hedge Fund Index, we also include an equally cap weighted equivalent. This is based on the following sub indices: HFRX Equity Hedge Index, HFRX Event Driven Index, HFRX Macro/CTA Index, HFRX Relative Value Arbitrage Index, HFRX EH - Equity Market Neutral Index, HFRX ED - Merger Arbitrage Index, HFRX RV - FI Convertible Arbitrage Index, HFRX ED - Distressed Restructuring Index.

Well understood core drivers, allowing effective portfolio construction
Just as with asset classes, ARP labels can be misleading. Our research into the drivers of different ARP allows us to make important distinctions. For example, Carry is not a homogenous factor, expressing different properties when implemented in different asset classes. When implemented long/short in equities through a dividend yield strategy, it can have relatively defensive or quality like properties, unlike the properties of FX or volatility carry which are more pro-cyclical. However during 2008/9 it seriously underperformed due to a relative concentration in the financial sector. This illustrates why careful construction of exposures and an active approach to the risk management of these strategies is critical.

In addition some ARP have complementary features, a product of their behavioral drivers. For example, value and momentum share a symbiotic relationship where herding behavior can lead to momentum in prices which, when unchecked, sets up tremendous value opportunities. When valuations become overstretched and correct, momentum strategies are capable of generating positive returns, causing correlation between value and momentum strategies to become negative during times of drawdown in the value strategy. We illustrate this in Figure 7 by showing Trend, a sub-set of Momentum.

Figure 7: Trend provides defensive properties when Value premia are in draw down. Value max drawdowns and correlation between Value and Trend

Figure 8: Target risk allocations by risk premia type, Value, Carry, Size and Momentum. Illustrative of the Schroders ARP risk allocations.

Source: Schroders, Bloomberg as of December 2014. This should not be viewed as a recommendation to buy/sell.
It is therefore important to look past the labels attached to ARP and to study their drivers and return profiles during portfolio construction. One way to approach this is to think about categories of ARP and to allocate risk to these groups. Figure 8 illustrates an approach to this.

As well as grouping ARP into categories, in order to manage correlations over shorter time horizons, it is important to consider how the interactions of the premia vary across the return distribution. A portfolio construction based on the interactions between different premia during periods of negative return can improve the drawdown characteristics of an ARP portfolio as illustrated in Figure 9 and Figure 10.

**Effective management of transient fundamental premia exposures**

We have seen that hedge funds have time varying correlation with equities and the same is true for ARP strategies. In our research note on the interaction of behavioral ARP with fundamental premia, the premia that drive most traditional portfolios, we highlighted there are time variant and non-linear interactions across the return distribution. Here we show two examples from that note (Figure 11 and Figure 12), illustrating how the Size and Value ARP interact with growth, inflation and slowdown premia.

Source: Schroders, as of April 2014. Risk premia categories shown are for illustrative purposes only and should not be viewed as a recommendation to buy/sell.
To directly tackle this time varying exposure, we beta hedge liquid representations of growth and duration risk premia though the S&P 500 and US Treasury futures, capping the portfolio beta exposure to 0.2. While over time this is expected to cause a drag on returns, since these are risk premia with positive return expectations, the addition of the beta hedge helps reduces portfolio volatility, but more importantly, limits the portfolio correlations to fundamental premia, maintaining the alternative nature of the portfolio. We see this in the correlation to equities, which for the final portfolio averages near zero.

**Figure 13:** Correlation of hedge funds, an equally weighted ARP portfolio and the Schroders ARP portfolio with the S&P 500

The end result – ARP correlation characteristics across environments

Having brought together these different stages of portfolio construction to build a strategy that shows low and fairly stable long term correlation with equities, it is important to check if this result or our analysis has sensitivity to economic regimes of growth and inflation. To conduct this analysis we need more data history than is available for our own strategies. For ARP we have done extensive work extending datasets back in time using various academic data sources to aid test regime sensitivity, creating the “MA Proxy” (refer to Appendix 4 for further information). Absolute return levels of the extended data should be treated cautiously because these return streams are missing transaction costs and have some uncertainty about how fully they could be implemented. However, these return drags should not affect the shorter term dynamics of the ARP, allowing us to test regime dependency and relative performance in different regimes more fully.

**Figure 14:** Simulated performance by growth regime

**Figure 15:** Simulated performance by inflation regime
We find that ARP performance was stable during different growth regimes (Figure 14), showing much less dependency than equities. We also see that there was a slight preference for normal inflation environments, although this result is harder to determine due to a relatively benign inflation environment over much of the available sample period (Figure 15).

If we perform the same analysis and calculate conditional correlations against equities we find again a fairly stable relationship under different growth and inflation regimes (Figures 16 and 17 respectively). We therefore find that a carefully constructed ARP portfolio maintains its alternative nature though various different economic regimes.

**Figure 16:** Conditional correlation of the MA proxy vs. S&P 500 under different growth regimes

**Figure 17:** Conditional correlation of the MA proxy vs. S&P 500 under different inflation regimes

Conclusions

We have seen that ARP has the potential to provide exposure that is un-correlated to the fundamental premia that drive most tradition portfolios and provide return generators that are found in common hedge fund strategies. Therefore, such a risk/return profile makes ARP a strong choice for an alternatives allocation. Key to achieving this is careful construction of “pure” ARP and robust portfolio construction to address the combined issue of risk concentration and the transient exposures to fundamental premia.

Strategic Beta Research Series

This paper draws on previous papers published under the Strategic Beta research series. For more detail on the topics discussed in this paper please refer to the following Strategic Beta research notes:

- Understanding and investing in behavioral risk premia
- Capturing behavioral biases: an empirical analysis
- How behavioral and fundamental premia interact
Appendix 1: HFRX universe and the average HFRX index

HFRX Equity Hedge Index, HFRX Event Driven Index, HFRX Macro/CTA Index, HFRX Relative Value Arbitrage Index, HFRX EH - Equity Market Neutral Index, HFRX ED - Merger Arbitrage Index, HFRX RV - FI Convertible Arbitrage Index, HFRX ED - Distressed Restructuring Index. Average HFRX refers to an equally weighted index of these sub indices.

Appendix 2: Schroders ARP universe and the Equally Weighted ARP portfolio definition

The below represents the investment universe for the Schroders ARP portfolio. The portfolio is an equally capital weighted combination of the below ARP. Please note at present Volatility Alpha is not invested with the ARP solution due to minimum size restrictions, it is invested within our Strategic

<table>
<thead>
<tr>
<th>ARP Instrument</th>
<th>ARP Instrument</th>
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</thead>
<tbody>
<tr>
<td>Volatility Alpha</td>
<td>Long Option collars on S&amp;P, FTSE, Dax, Eurostoxx, Nikkei</td>
</tr>
<tr>
<td>Equity Value</td>
<td>TRS – Long customized global value basket v MSCI World</td>
</tr>
<tr>
<td>Equity Quality</td>
<td>TRS – Long customized global quality basket v MSCI World</td>
</tr>
<tr>
<td>UK Small Cap / Large Cap</td>
<td>TRS – FTSE 250 Index v FTSE 100 future</td>
</tr>
<tr>
<td>German Small Cap / Large Cap</td>
<td>TRS – Dax Mid-Cap Index v Dax future</td>
</tr>
<tr>
<td>Trend</td>
<td>Long basket of futures &amp; ETFs based on proprietary trend model</td>
</tr>
<tr>
<td>FX Carry</td>
<td>Long 7 high yield FFX v 7 low yield FFX</td>
</tr>
<tr>
<td>EM FX Carry</td>
<td>Long 5 high yield EMFFX v 5 low yield EMFFX</td>
</tr>
<tr>
<td>FX Growth</td>
<td>Long 7 high growth FFX v 7 low growth FFX</td>
</tr>
<tr>
<td>FX Value</td>
<td>Long 7 undervalued FFX v 7 overvalued FFX</td>
</tr>
<tr>
<td>Fixed Income Relative Value</td>
<td>Long attractive G6 govt. bonds v short unattractive G6 govt. bonds</td>
</tr>
</tbody>
</table>

Beta portfolios.

Appendix 3: Regime identification for figure and figure 1

**Growth regime indicator:** OECD US Composite Leading Indicator
Data: Monthly from 1951 – 2014
Classification: The YoY change is sorted where
- Top 33% of the months are classified as *High Growth Regime*
- Middle 33% of the months are classified as *Medium Growth Regime*
- Bottom 33% of the months are classified as *Low Growth Regime*

**Inflation regime indicator:** US CPI
Data: Monthly from 1951 – 2014
Classification: The YoY change is sorted where
- Top 33% of the months are classified as *High Inflation Regime*
- Middle 33% of the months are classified as *Medium Inflation Regime*
- Bottom 33% of the months are classified as *Low Inflation Regime*
Appendix 4: MA proxy definition

In order to measure the dynamics of an Alternative Risk Premia portfolio under various growth and inflation regime we have extended our ARP back through time using a combination of available data sources. This process requires some compromise between data availability and representativeness. The details of the composition of the MA Proxy through time are:

Details of the Proxy data sets used are:

- **US Size and Equity Value (Fama-French)**: Size (SMB) and Value (HML) factors from [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)

- **UK Size (Gregory)**: Size factor from [http://business-school.exeter.ac.uk/research/areas/centres/xfi/research/famafrench/files](http://business-school.exeter.ac.uk/research/areas/centres/xfi/research/famafrench/files)

- **Volatility Selling (CBOE)**: Average of CBOE S&P 500 2% OTM BuyWrite Index (BXY) and CBOE S&P 500 PutWrite Index (PUT)

- **FX Carry (Burnside)**: Currency data from [http://people.duke.edu/~acb8/Burnside/Currency_Speculation_Data.html](http://people.duke.edu/~acb8/Burnside/Currency_Speculation_Data.html)

- **FX Value and Equity Quality (AMP)**: Asness, Moskowitz and Pedersen Value and Quality factors from [http://www.lhpPedersen.com/data](http://www.lhpPedersen.com/data)

- **Cross-Asset Trend (Barclays CTA Index)**: Barclays US Managed Futures Industry BTOP 50 Index (Bloomberg Ticker: BARCBTOP Index)

Important information: The returns are presented as gross returns, including cash, reinvestment of dividends, interest and other income earned in the period and are calculated on a trade date basis after transaction charges (brokerage commissions), but before taxes and management and custody fees. Performance would have been reduced by such fees and the effect of these fees on performance compounds over time. As an illustration see the chart below. The value of a $5,000,000 account would be reduced by the following amounts due to the compound effect of the management fees. (This has been calculated assuming an assumed constant return of 10% per annum* and a hypothetical management fee of 0.75% per annum, which has been applied on a simple average of opening and closing annual fund values).

<table>
<thead>
<tr>
<th>Gross value</th>
<th>Net value</th>
<th>Compound effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>$5,500,000</td>
<td>$5,447,500</td>
</tr>
<tr>
<td>3 years</td>
<td>$6,655,000</td>
<td>$6,466,238</td>
</tr>
<tr>
<td>5 years</td>
<td>$8,052,550</td>
<td>$7,675,491</td>
</tr>
<tr>
<td>10 years</td>
<td>$12,968,712</td>
<td>$11,782,633</td>
</tr>
</tbody>
</table>

*The assumed 10% return is hypothetical and should not be considered a representation of past or future returns. The actual effect of fees on the value of an account over time will vary with future returns, which cannot be predicted and may be more or less than the amount assumed in this illustration. Actual fees may differ from the assumed rate presented above. Please consult the Firm's Advisory Brochure (ADV Part 2) for a description of the fees.

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