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QUANTITATIVE RESEARCH

October 2016

The Carry and Value Pendulum

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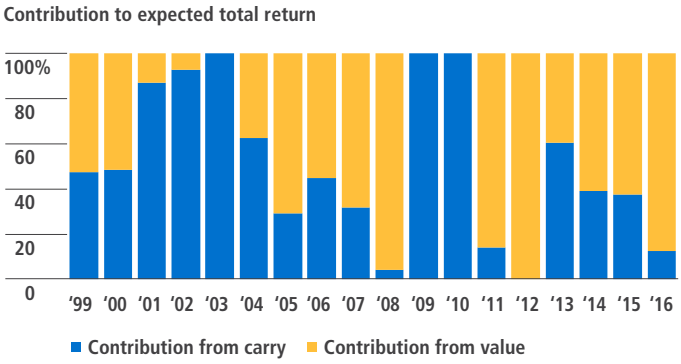
Alternative risk premia portfolios, which typically employ strategies such as carry, value and momentum across asset classes, are growing increasingly popular as investors look to enhance returns and diversification. Here, we focus on carry and value in particular and propose that, rather than treat them as distinct factors, investors should consider them as connected subcomponents of an asset's total expected return.

The expected return on any security can be thought of in this framework as the sum of the carry earned or paid through the holding period plus the return due to any convergence of the price to its fair value. We find that portfolios formed by ranking expected returns calculated in this way are more natural, robust and intuitive to evaluate as an allocator, than portfolios formed by ranking carry and value separately.

Integrating these factors leads to a natural rebalancing between carry and value through time – an effect we might call the carry and value pendulum. Some alternative risk premium products advocate equal risk weights across strategies. We believe there is information from markets on the attractiveness of carry versus value that warrants a time-varying allocation. As an example, dispersion in carry across global interest rates is at an all-time low, leading to a low expected return from carry. A naïve carry strategy would lever up these small differences across markets, whereas a portfolio constructed using an integrated carry and value approach would put more weight on valuation differentials in the current environment (see Chart 1).

Finally, carry and value portfolios constructed this way have a natural portfolio-expected return (the sum of weights multiplied by constituent excess returns). This quantity can be used in the overall allocation process across risk premia and across asset classes.

Chart 1: The carry and value pendulum in interest rate relative value, 1999-2016. The chart shows the proportion of the expected return, on a long-short portfolio of swaps in G6 countries, coming from carry and assumed convergence toward fair value over the subsequent 12 months.



Hypothetical examples are for illustrative purposes only. Refer to important disclosures for additional hypothetical example and expected return information.
Source: Bloomberg and PIMCO as of 30 June 2016

CARRY AND VALUE – CONCEPTS FROM DIFFERENT ASSET CLASSES

Carry originated as a concept from the fixed income and currency worlds. Carry can be defined in general as the excess return generated over time assuming that market prices remain constant. Currency carry[1] is defined as the interest rate differential earned between foreign and domestic currencies, assuming the spot rate is unchanged. Bond carry is defined unambiguously as the excess yield earned over the "risk free rate" plus the return generated from rolling down the curve toward maturity. The concept is also readily extended to futures markets such as commodity futures. Here, it's defined as the "roll yield" earned by buying the future and allowing it to roll along the futures curve through time, assuming the curve stays constant and adjusting for financing costs. In equities, however, carry is a more ambiguous concept, with a number of potential definitions. Perhaps the most common of these is the dividend yield minus the risk free rate. However, this quantity is rarely used by equity investors directly.

Value as an investment style, on the other hand, originated from the equity world.[2] Value strategies require the definition of a value metric which can then be compared across securities. The most standard definition of value of a stock is found by using its price-to-book ratio. Stocks that have a high price-to-book ratio are deemed expensive, and those with a low ratio, cheap. The concept of valuation outside of equities, however, is more elusive and subjective. Some strategies define value purely on historical price-based data – for example, setting "fair value" equal to the trailing five-year average price. Others use more fundamental metrics, such as the purchasing-power-parity level of exchange rates in currency markets.

However value is defined, in equities or in other asset classes, it is by nature a medium- to long-term concept (unlike momentum, for instance, which is usually a relatively higher-frequency signal). Asset prices can deviate from "fair value" for years (or even decades). With this in mind, it seems logical that a value strategy should also incorporate the cost of holding these positions (i.e., the carry). For example, it is more attractive to go long an undervalued asset that is positive carry, because it provides a cushion if the spot price holds steady or drifts farther from fair value before reverting. In an asset that is negative carry, we are paying every day that the spot price fails to move sufficiently back toward fair value.

AN EXPECTED RETURNS FRAMEWORK COMBINING CARRY AND VALUE

The most natural approach, in our view, to incorporating carry information into a value model is through an expected returns framework:

> **Expected Return** = Cost (or gain) from holding position **(carry)** + return due to (partial) convergence of price to fair value **(value)**

This approach does require the additional assumption of the expected pace of convergence to fair value. This quantity has the effect of changing the average weight given to the value component, so it must be set carefully. Estimating from historical data is usually noisy but can be informative. Alternatively, the use of a more fundamentally motivated quantity (e.g., over a business cycle of 5 - 7 years) is appealing.

Tables 1 and 2 give examples of basic carry and value metrics, and combined expected returns, for G6 interest rate swap markets and G10 currencies as of 30 June 2016. For the swaps we use 10-year swaps in AUD, CAD, EUR, GBP, JPY and USD (the most liquid markets). Carry is defined as the swap rate minus the local Libor rate, plus the return from rolling down to the

nine-year point over one year. Fair value is defined as the five-year trailing average of the 10-year yield. The expected return over the next year is calculated as the carry plus the return from a one-fifth reversion of spot to the five-year moving average yield.[3]

Table 1: Carry and value in G6 interest rate swap markets as of 30 June 2016

Swap Market	Spot Rate *(Par 10Y swap rate)*	Carry *(1Y carry + roll-down per year duration)*	Fair Value *(Average 10Y swap rate over last 5 years)*	Expected Return *(Carry + 1/5 reversion to fair value, per unit duration)*
AUD Swaps	2.17%	0.02%	3.85%	-0.31%
CAD Swaps	1.29%	0.04%	2.34%	-0.17%
EUR Swaps	0.42%	0.07%	1.59%	-0.16%
GBP Swaps	0.96%	0.04%	2.23%	-0.21%
JPY Swaps	-0.04%	0.00%	0.72%	-0.16%
USD Swaps	1.36%	0.08%	2.24%	-0.10%

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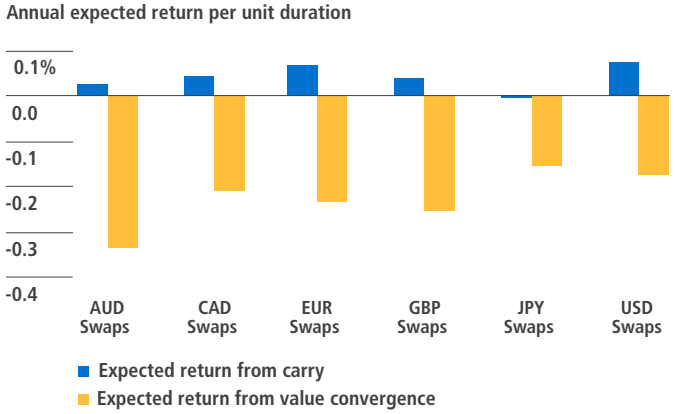
Source: Bloomberg and PIMCO as of 30 June 2016

Because yields are so low and curves relatively flat, the carry component is small compared to the value component currently, and the expected returns for all six markets are negative. Chart 2 illustrates this graphically, showing how the (negative) value effect on expected returns is much more significant, and that dispersion across currencies is also higher in the value component than in the carry component.

Chart 2: Current expected returns in interest rate swap markets are primarily driven by differences in valuation rather than carry



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Source: Bloomberg and PIMCO as of 30 June 2016

For currencies the carry is calculated as the difference between the foreign and USD deposit rates. For simplicity we again use the trailing five-year average spot rate as the value metric,[4] to match the rates example above, and a convergence rate of one-fifth per year.

Table 2: Carry and value in G10 currency markets as of 30 June 2016

Currency Market	Spot Rate *(USD/CCY)*	Carry *(1Y carry of long CCY versus USD)*	Fair Value *(Average spot rate over last 5 years)*	Expected Return *(Carry + 1/5 reversion to fair value)*
AUD	0.75	1.3%	0.92	6.1%
CAD	0.77	-0.1%	0.92	3.6%
CHF	1.02	-2.5%	1.08	-1.4%
EUR	1.11	-1.5%	1.27	1.4%
GBP	1.33	-0.4%	1.58	3.3%
JPY	0.01	-1.6%	0.01	-0.1%
NOK	0.12	0.1%	0.16	6.5%
NZD	0.71	1.9%	0.79	3.9%
SEK	0.12	-1.6%	0.14	2.5%

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Source: Bloomberg and PIMCO as of 30 June 2016

IMPACT ON PORTFOLIO CONSTRUCTION

Typically, portfolios are formed by ranking separately on carry and value metrics, by going long the highest carry/most undervalued, and by shorting the lowest carry/most overvalued securities. Within an integrated carry and value model we can instead directly rank the expected returns of each security, going long the highest and shorting the lowest. (Alternatively, the expected returns can be used in a more formal portfolio optimization).

Continuing with the examples from above, we calculated expected returns for both the swap markets and currencies at the end of each month — from January 1998[5] to June 2016. We ranked the securities by one of the metrics and took long and short positions. The positions taken were proportional to the rank, such that the long positions summed to 1 unit, and shorts to -1 unit.[6] In this way we formed four portfolios:

1: Carry Portfolio – Securities ranked on carry only
2: Value Portfolio – Securities ranked on value only
3: 50% Carry Portfolio, 50% Value Portfolio – an equal weight combination of 1 and 2
4: Integrated Carry and Value Portfolio – Securities ranked on expected return

Tables 3 and 4 report performance statistics for these four portfolios, first for the 10-year swap markets, and second for currencies. The results and conclusions are quite similar in the two markets. Over this time period the portfolios constructed on the basis of carry alone performed well, with Sharpe ratios of 0.61 and 0.42, respectively. The value metrics chosen performed less well, with Sharpe ratios of 0.09 and 0.19, respectively.

The combination portfolios, which are a 50/50 split between the carry and value portfolios, benefited slightly from the low correlation between carry and value, and had lower volatilities. In the case of the swap markets the Sharpe ratio improved to 0.68, whereas the currency portfolio Sharpe was basically unchanged from that of the straight carry portfolio.

Last, portfolios constructed by ranking expected returns incorporating both carry and value outperformed the 50/50 combinations, with Sharpe ratios of 0.80 and 0.53, respectively.

Table 3: Performance of four portfolios of 10-year interest rate swap positions constructed monthly using carry and value metrics, January 1998 to June 2016

	Carry Portfolio	Value Portfolio	50% Carry Portfolio, 50% Value Portfolio	Integrated Carry & Value Portfolio
Average Annual Excess Return	3.1%	0.4%	1.7%	2.2%
Annual Volatility	5.0%	4.3%	2.5%	2.7%
Sharpe Ratio	0.61	0.09	0.68	0.80
Correlation with Carry Portfolio	100%	-41%	64%	50%

Hypothetical examples are for illustrative purposes only. Refer to important disclosures for additional hypothetical example and expected return information.

Source: Bloomberg and PIMCO as of 30 June 2016

Table 4: Performance of four currency portfolios constructed using carry and value metrics, January 1998 to June 2016

	Carry Portfolio	Value Portfolio	50% Carry Portfolio, 50% Value Portfolio	Integrated Carry & Value Portfolio
Average Annual Excess Return	3.49%	1.41%	2.45%	4.18%
Annual Volatility	8.30%	7.52%	5.65%	7.89%
Sharpe Ratio	0.42	0.19	0.43	0.53
Correlation with Carry Portfolio	100%	2%	75%	81%

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Source: Bloomberg and PIMCO as of 30 June 2016

Our primary motivation for showing these results, however, is not to back test performance (which could be a function of the time period, or of certain parameter choices) but to show that the expected returns framework provides a natural way to evaluate the attractiveness of carry versus the attractiveness of value through time. We see this clearly in these examples, where the effects of carry have been significant over the time frame measured but arguably are now at compressed levels. Current expected returns calculations (as shown in Tables 1 and 2) are now dominated more by the value signals. We discuss this in the next section.

ALLOCATING TO CARRY AND VALUE

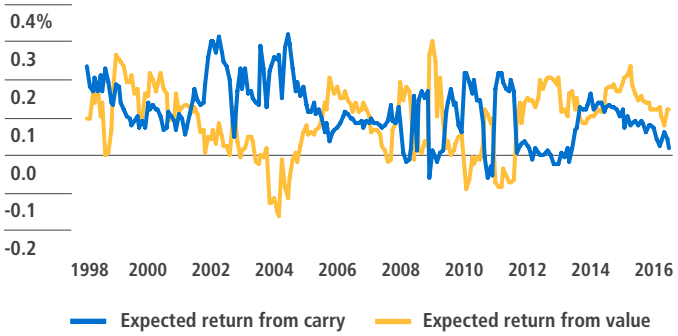
A key challenge in alternative risk premia investing is allocating between different risk premia over time. Many managers choose the approach of equally weighting across premia (where each premia is scaled to have similar volatility). While we think this is reasonable, combining carry and value in an expected return framework offers a natural quantification of the return due to carry and the return due to convergence of spot to fair value.

While these returns are of course subject to the modeling used, it seems intuitive that there should be some information contained in the relative attractiveness of the carry versus value components. This seems especially true in the current environment, where compressed yields and flat yield curves mean the returns available from the carry component must be lower than in other periods.

The last 20-plus years have been a period in which carry strategies have generally performed well, due in part to the overwhelming bull market in fixed income overall. Back tests therefore tend to show carry as deserving a higher weight, but this may not be prudent on a forward-looking basis.

Charts 3 and 4 illustrate this by decomposing the overall expected return of the swaps market and currency strategies introduced above. Although both sets of series are noisy, there is a general trend lower in the expected returns from carry in each case. In swap markets this is quite extreme, with the carry component almost zero (as we saw in Table 1). In earlier periods, such as 2001-2004 and post crisis, two periods when curves were steeper, this pattern is flipped.

Chart 3: Decomposing the expected return for the swaps markets strategy into the return from carry and the return from value



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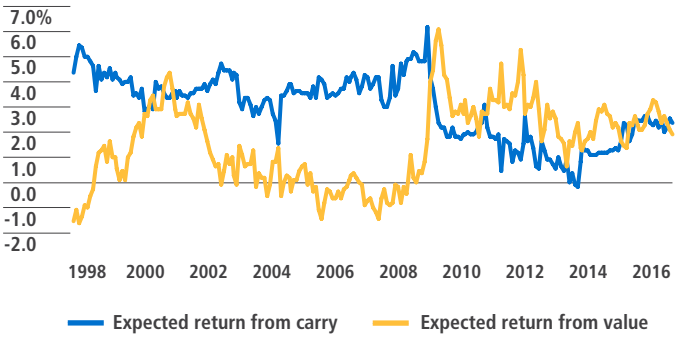
Source: Bloomberg and PIMCO as of 30 June 2016

For currencies, carry was the dominant part of expected returns from the mid-1990s until the 2008 crisis (at which point global short rates converged dramatically). Since this point, carry and value have been approximately equal in this framework.

Chart 4: Decomposing the expected return for the currencies strategy into the return from carry and the return from value



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Source: Bloomberg and PIMCO as of 30 June 2016

EXTENDING TO COMMODITIES AND EQUITY MARKETS

We believe this approach can make sense in other asset classes, too, including commodities (conditional on having a reasonable model of value) and even returning to equities. Carry in equity markets, perhaps defined as dividend yield minus the risk free rate (and potentially also adjusting for stock buybacks), can be added to some kind of valuation model that incorporates earnings growth and a reversion term to some long-time price-to-earnings ratio. This in fact leads us to a fairly standard equity valuation model, so in some ways this combined approach is equally natural in equities.

CONCLUSION

In "Carry and Trend in Lots of Places" we argued that carry information should be incorporated directly in a trend-following strategy. Likewise, we believe carry and value should not be thought of as two unrelated and distinct factors, but as two connected components of return. Value is a long-term concept – you cannot judge long-term returns, even with a good model of value, without taking into account the carry effect. Combining them in an expected return is one potential solution that has the additional benefit of providing a useful quantification of the relative attractiveness of the components. It also provides an expected return for the combined carry and value portfolio that can be used in overall portfolio construction.

Going forward we believe this approach will be very useful for investors in the alternative risk premia space for both portfolio construction and risk management.

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[1] Early academic evidence of the failure of the uncovered interest rate parity in currencies, and the existence of carry returns was presented in Meese, R.A., and Rogoff, K, 1983, "Empirical Exchange Rate Models of the Seventies: Do they fit out of sample? *Journal of International Economics* 14, 3–24

[2] For example, most famously, Fama, Eugene F., and Kenneth R. French, 1992, "The Cross-Section of Expected Stock Returns," *The Journal of Finance* 47, 427-465.

[3] This reversion speed corresponds roughly to a half-life of three years. If we use the full data set to estimate empirically the reversion speeds, we get roughly 30% per year in both cases, corresponding to a half-life of approximately 2 years.

[4] We could also use the PPP value as a simple, and often cited, value metric. Interestingly, the PPP metric can be flawed for certain currencies that are strongly driven by other factors such as exports. An example would be Norway, whose currency is largely affected by oil prices, for which the PPP model shows little mean-reverting behavior over the 2000-2014 period. This is a potential pitfall of our a naïve expected return approach, since an asset that can drift very far from fair value for long periods in a unit-root form will then generate unrealistically large value-convergence returns that will dominate the carry component completely.

[5] The first five years of our dataset required us to calculate the initial five-year averages of spot rates used as value metrics.

[6] In our examples we define one unit as follows: For swaps, long one unit is equivalent to receiving fixed on a 10-year interest rate swap with a duration of 10 years. For currencies, one unit is 100% notional invested in foreign currencies versus the USD. This scaling choice is largely arbitrary since these portfolios are long/short and unfunded.

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