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Insights from POINT® Global Risk Model

Credit in a Turning Rates Environment

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- **We use the POINT® Global Risk Model to provide an historical perspective on long-term trends or changes in the relationship between credit sector/quality spreads and Treasury curve movements.**
- **Consistent with earlier studies, we find a strong negative correlation between sector spreads and rate shifts. However, we also observe that the correlations between spreads and Treasury twists reversed recently, which is likely attributable to the Fed's ongoing quantitative easing. We also find that short-term effective durations in the banking industry are now significantly lower than historical patterns would indicate.**
- **Our findings are relevant for credit portfolio managers contemplating the effects of rising interest rates and a steepening Treasury curve on corporate bond portfolios. The findings are dependent on the historical relationships between interest rates and spreads, as described by the Global Risk Model.**

A version of this paper is forthcoming as Berd, A. Ranguelova, E. and A. B. Silva, "Credit Portfolio Management in a Turning Rates Environment," *Journal of Investment Strategies*, volume 3, issue 1, December 2013.

Introduction

The gradual recovery of the U.S. economy from the financial crisis has raised the prospect that the Fed will end its extraordinary quantitative easing (QE) policies. The eventual "moderate tapering" in the rate of QE, pre-announced in May 2013, has jolted the bond market and perhaps marked the turning point in interest rates from historically low levels. Although the timing may still be uncertain, the expected increase in rates has come to the forefront of many investors' concerns.

Over the past few years, we have witnessed an (albeit slow) economic recovery and a concurrent emergence of a benign credit cycle associated with tight spreads and low volatility. The management of credit portfolios in such an environment requires more precise positioning with respect to the movements of underlying interest rates, as the credit-specific spread movements become less pronounced and the effects of systemic factors become relatively more important.

It is a widely held belief among credit bond portfolio managers that rates and spreads are negatively correlated. The main fundamental reason is that both Treasury yields and credit spreads reflect the state of the economy; therefore, one can expect their changes to be correlated to the extent that they are caused by the same underlying economic expectation. A worsening economy is generally associated with falling rates, while an improving economy is associated with a rising overall level of interest rates. For spreads, the direction of dependence is precisely the opposite – spreads rise when the economy deteriorates and default risk rises, and they tighten as economic conditions improve. Accordingly, analysts find a negative correlation between corporate bond spreads and U.S. Treasury yields (see Ng, Phelps and Lazanas [2013] for a recent look into this issue).

The above statement about negative correlation applies only to overall changes in Treasury rates, i.e., to "parallel shifts" of the Treasury curve. However, the shape of the yield curve can change in much more complex ways, including twists and butterflies. The dependence of spreads on such changes in the underlying yield curve is much less documented. In terms of economic and statistical significance, the parallel shifts and (flattening or steepening) twists are the primary modes of change of the Treasury curve, explaining more than 80% of its variability. Therefore, we focus on these factors and their effect on credit spreads.

This report revisits the analysis of the co-movement between the interest rates and spreads originally published in 2003-04 (see Berd and Ranguelova [2003] and Berd and Silva [2004]). The main goal of this report is to provide an historical perspective on long-term trends or changes in this relationship. We analyze the relationship between U.S. interest rates and credit spreads using the statistically robust framework of the Barclays POINT® Global Risk Model (see Lazanas et al. [2011]).

We confirm the strong evidence that rates and spreads are negatively correlated: higher rates are associated with tighter spreads and steeper credit curves, while lower rates are associated with wider spreads and flatter credit curves across all industries. The change in the slope of the Treasury yield curve has a different effect on credit option-adjusted spreads (OAS): yield curve flattening typically coincides with a narrowing and steepening of credit spread curves, with yield curve steepening having the opposite effect.

Our results are qualitatively robust to different periods of analysis and different data calibration methods. However, our findings are conditional on the historical relationship between interest rates and spreads. Managers forecasting a reversal of this stable historical pattern (e.g., due to QE policies and intervention or increased sovereign risk) will find this analysis less useful.[1]

Our findings have significant implications for credit portfolio managers. The negative correlation of spreads with rates affects the duration management of credit portfolios, particularly when there is a significant under- or overweight position with respect to a benchmark containing Treasury bonds. The differential effect across industries and ratings gives rise to potential curve-driven cross-sector relative value opportunities.

The Co-movements of Credit Spreads and Interest Rates

Before presenting the model results, we define the relevant components of the interest rate curve and illustrate the historical co-movement of credit spreads and interest rates.

Defining the Treasury Curve Shifts and Twists

We define the Treasury shift factor as a uniform increase in the five key-rate factors included in the Barclays POINT® Global Risk Model,[2] corresponding to the 2-, 5-, 10-, 20-, and 30-year key rates. The Treasury twist factor is defined as a series of changes in the same key-rate factors that correspond to a steepening rotation around the 10-year maturity. Figure 1 uses a 10bp scale for shifts and twists as an illustration.

These definitions differ slightly from the statistically more precise approach known as *principal component analysis*. However, they get us close to the true principal components of rates changes and are easier to visualize and discuss.

FIGURE 1

Treasury Curve Primary Factors

Treasury Curve Movement (bp)	Key Rate Maturity (years)				
	2	5	10	20	30
Shift	10	10	10	10	10
Twist	-10	-5	0	5	10

Source: Barclays Research

To explain in practical terms, assume that the yield curve has undergone an arbitrary change in each of its key rate points, denoted as Δy_i, where the index *i* corresponds to maturities of 2, 5, 10, 20, and 30 years. We can now define the approximation to the yield curve change in terms of the shift and twist factors as a linear combination of a unit parallel shift and a unit steepening twist with yet undetermined coefficients and the residual term containing the portion of the yield curve change that is not captured by shift and twist:

$$\begin{bmatrix} \Delta y_2 \\ \Delta y_5 \\ \Delta y_{10} \\ \Delta y_{20} \\ \Delta y_{30} \end{bmatrix} = \gamma_{shift} \cdot \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} + \gamma_{twist} \cdot \begin{bmatrix} -2 \\ -1 \\ 0 \\ 1 \\ 2 \end{bmatrix} + \begin{bmatrix} \varepsilon_2 \\ \varepsilon_5 \\ \varepsilon_{10} \\ \varepsilon_{20} \\ \varepsilon_{30} \end{bmatrix}$$

[1] In this regard, Eisenthal-Berkovitz et al. (2013) document positive correlation between Treasury and credit bonds for some European distressed countries.

[2] We exclude the 0.5-year key rate factor in order to avoid picking up dependencies on peculiar movements of the short end of the Treasury curve.

If we assume that, by construction, the residual term does not contain either a parallel shift of a steepening/flattening component, we can easily find the factor loadings γ_{shift} and γ_{twist} of the two primary yield curve components as follows:

$$\gamma_{shift} = \frac{1}{5} \cdot \left(\Delta y_2 + \Delta y_5 + \Delta y_{10} + \Delta y_{20} + \Delta y_{30} \right)$$

$$\gamma_{twist} = \frac{1}{10} \cdot \left(-2 \cdot \Delta y_2 - \Delta y_5 + \Delta y_{20} + 2 \cdot \Delta y_{30} \right)$$

These formulas justify the representation of the shift and twist factors in Figure 1.

Historical Co-Movement of Credit Spreads and Interest Rates

The past two decades were characterized by large shifts and twists of the Treasury yield curve, with the current level of interest rates just off the historical lows and almost 600bp lower than in 1990 and curve steepness being close to its historical highs. At the same time, the Barclays Credit Index OAS has experienced wide swings from the tightest levels of around 50bp in early 1997 to the widest of more than 535bp in November 2008, returning to moderate levels of 140bp more recently. The corresponding time series are shown in Figure 2, which depicts the cumulative time series of the shift and twist factors, normalized to start from zero in December 1989, and the OAS.

We can identify several periods in the past fourteen years when rate changes have been visibly correlated with credit spreads.

First, the first Gulf War in 1991 resulted in a quick drop in Treasury rates by more than 80bp and a moderate 5bp steepening of the curve. At the same time, the credit OAS widened by almost 60bp.

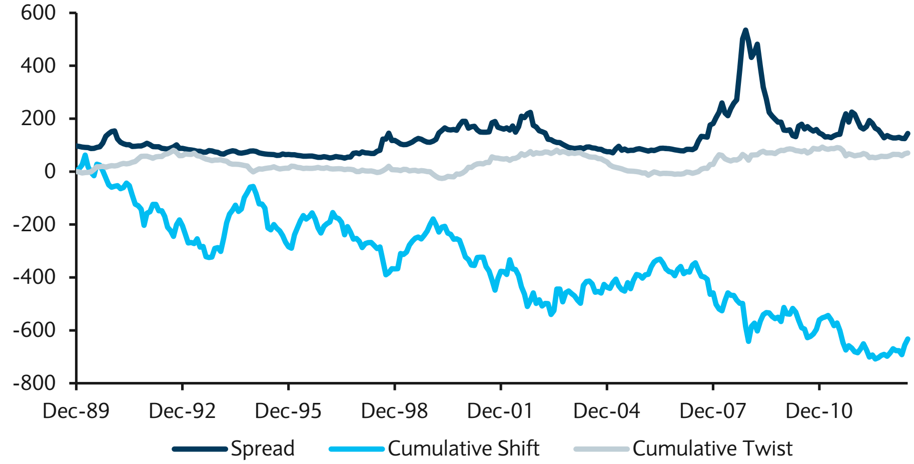
The dramatic rates swings in 1994, ignited by the Mexican peso crisis and the MBS market problems in the U.S., saw Treasury rates shift up by about 250bp, with a simultaneous flattening of the curve by 45bp. The OAS over the same period remained range-bound, eventually widening by 5bp, almost all of it during the last four months of the year, when most of the Treasury curve flattening also took place.

Then, in August-October 1998, the Treasury curve shifted 100bp in a negative direction and twist moved 10bp in a positive direction after the Russian default and LTCM crisis prompted the Fed to cut short rates. Spreads moved sharply wider, by 40bp, but then reversed just as the yield curve twist subsided and the rates themselves moved higher in the beginning of 1999.

Next, the interest rate curve inverted (twist became negative) in the late 1999 and through 2000 as the FOMC raised the fed funds rate to 6.50%, pushing the two-year yield to 6.70% while the Treasury buybacks, budget surpluses, and dampened inflation expectations helped to keep long yields subdued at 6.00%. Credit spreads widened through this period by about 80bp, with the looming risk on the equity markets with the end of the Nasdaq bubble.

FIGURE 2

Treasury Shift and Twist versus Credit Index OAS, 1990-2013



Source: Barclays Research

Then the rates curve steadily shifted down (200bp) and significantly steepened (80bp) from 2000 to 2003 as the Fed cut rates 12 times, from 6.50% to 1.25%. Spreads swung widely for most of this period, from lows close to 100bp to highs above 220bp. The correlation of spreads with the twists becomes significantly positive – in contrast to the negative correlation with the level of rates. Spreads seemed more sensitive to expectations for the near-term economic outlook, related to the short end of the yield curve, than to long-run growth and inflation, which are related to the long end of the curve.

The economic recovery that followed, accompanied by a rebound in rates (shift higher) and gradual reduction of the steepness of the Treasury curve from 2002 through the beginning of 2006, also saw credit spreads tightening from more than 200bp to a low of 78bp at the end of this period. Yet again, we see the negative co-movement of spreads and Treasury shifts and positive co-movement of spreads and twists.

And, of course, the most dramatic demonstration of this relationship came in 2007-08, when the unfolding financial crisis pushed credit spreads to historic highs while interest rates were brought further down by both the actions of the Fed and the effects of the economic recession. Between June 2007 and the end of 2008, the curve shifted down by another 300bp across the board, while steepening by 50bp.

The emergence from the crisis in 2009 brought a small rebound in rates (driven by the long end) but the ongoing Fed quantitative easing program has led to a further shift down and maintained the historically steep shape of the rates curve. The fast credit spread tightening coincided with the rate shift rebound in 2009.

However, the co-movement of rates and spreads from 2011 onward shows some change, with spreads widening while rates decline – as before – but with Treasury curve steepening. We discuss this in more detail later in the report.

Of course, spreads are influenced by many other factors besides the Treasury curve and the macroeconomic outlook encoded therein. However, the significant trends of the rate changes are typically reflected in spread moves. While the evidence presented above helped motivate this research, it is not sufficiently precise to draw conclusions for the future. To do that, we need a robust statistical estimation of co-movements in Treasury rates and credit spreads.

Estimates from POINT® Global Risk Model

To quantify the joint behavior of interest rates and credit spreads, we turn to the Barclays POINT® Global Risk Model (see Lazanas et al. [2011] for a good introduction to these type of models). The current approach employs the DTS (duration times spread) methodology to model credit risk (see Silva [2009]). However, the model allows for different risk configurations. In particular, for this report, we use the following decomposition: six Treasury (key-rate) factors and 27 spread factors, from a combination of nine industries times three rating buckets (AAA/AA, A, and BBB)[3].

The model estimates the covariance matrix of all common driving factors, as well as the issuer-specific risk of bonds belonging to each industry/rating sector. We analyze the covariance estimates as of June 2013 and discuss their implications for the relationship between rates and spreads.

The multi-factor risk model has different calibrations available. We use two standard ones: the first weights all past observations equally, while the second is an exponential-weighted moving average (12-month half-life) that overweights recent data. They are referred to as long-term and short-term models, respectively.

In order to take into account the issuer-specific risk and incomplete diversification of typical investors' portfolios, we defined a sector portfolio to consist of 20 equally weighted bonds having, on average, the same maturity and OAS as the corresponding sector. The sector correlations discussed are the correlations of the OAS changes of these hypothetical sector portfolios with the Treasury shift and twist factors.

The Effect of a Treasury Curve Shift

We start by documenting the effect of the Treasury curve shift on credit spreads. The results (Figure 3) demonstrate a strong negative correlation between these variables for each credit sector. Uniform increases in rates are associated with tighter spreads, while uniform drops lead to wider spreads.

As an example, we find a –33% correlation for the A-rated banking and brokerage sector, which implies that if rates rise by a typical amount (an amount equal to one standard deviation of the shift factor), the credit spreads in the sector will likely tighten by amount equal to 0.33 of a typical movement (a standard deviation) of the sector's spread factor, all else equal. To translate this into nominal levels, we note that the standard deviation of the shift factor, according to the risk model, is 24bp and the standard deviation of the A-rated banking and brokerage sector spreads is 14bp; therefore, a 24bp positive shift in rates should, on average, translate into almost 5bp of tightening for A-rated banking and brokerage spreads.

[3] We use this decomposition to keep our approach consistent with previous versions of this research and to allow the analysis to be done across different levels of spread, here proxied by different ratings. The qualitative results should be similar across approaches.

FIGURE 3

Spread Correlations with Treasury Curve Shifts (June 2013)

Model	Long Term Model (UW)			Short Term Model (WW)		
Rating	AAA/AA	A	BBB	AAA/AA	A	BBB
FINANCIALS						
Banking and Brokerage	-32%	-33%	-31%	-39%	-34%	-38%
Financial Companies, Insurance and REITS	-26%	-33%	-38%	-21%	-34%	-42%
INDUSTRIALS						
Basic Industries and Capital Goods	-32%	-35%	-35%	-25%	-26%	-36%
Consumer Cyclicals	-38%	-34%	-30%	-29%	-27%	-32%
Consumer Non-Cyclicals	-35%	-32%	-30%	-25%	-23%	-26%
Communication and Technology	-31%	-34%	-36%	-19%	-29%	-37%
Energy and Transportation	-37%	-37%	-38%	-21%	-31%	-36%
UTILITIES	-24%	-35%	-34%	-34%	-29%	-30%
NON-CORPORATE	-32%	-34%	-36%	-23%	-36%	-15%

Source: Barclays POINT

The negative correlation between sector spreads and rates shift is, overall, quite similar across both the short- and long-term versions of the models. However, there are some important differences regarding the range of correlations: they are significantly more disperse on the short-term model, while showing stronger convergence (about -30%) for the longer-term model. Another interesting difference is that the correlations are stable across ratings in the longer-term model while tending to show a negative slope for the short-term model (e.g., correlations are typically more negative for lower rating portfolios).

For comparison and to highlight the time variability of these estimates, Figure 4 shows the results estimated at the time of the most recent (potentially similar) turning rates environment: December 2003. We note that while the long-term risk models estimated currently and 10 years ago show similar patterns, the short-term versions are quite different. In particular, the short-term estimates from 2003 showed a significantly stronger negative correlation (an average of about -50%, against about -30% for the three other calibrations).

One could argue that these weaker correlations are due to the Fed's quantitative easing program, which has weakened the normal relationships between the economic recovery (represented by spreads) and monetary policy (represented by rates). If this hypothesis is correct, and if one assumes that the QE program is about to end – taking the economy closer to its historical norm – then the long-term model, or perhaps even the models estimated in 2003, may be more appropriate for prediction than the short-term model of 2013 vintage.

In the end, the particular patterns of dependence of the strength of negative correlation on the sector or credit quality are driven by several factors, including the underlying economics of the corresponding sectors, fiscal and monetary policy, and the varying composition of the Credit Index, which occasionally has a greater representation of certain types of companies in a particular rating class. These shifts were particularly visible after the financial crisis. Many companies were downgraded from AAA/AA to A or even the BBB category, thus changing the compositions of those baskets and their dependence.

FIGURE 4

Spread Correlations with Treasury Curve Shifts (December 2003)

Model	Long Term Model (UW)			Short Term Model (WW)		
Rating	AAA/AA	A	BBB	AAA/AA	A	BBB
FINANCIALS						
Banking and Brokerage	-31%	-31%	-22%	-56%	-52%	-46%
Financial Companies, Insurance and REITS	-38%	-31%	-29%	-52%	-43%	-45%
INDUSTRIALS						
Basic Industries and Capital Goods	-31%	-43%	-36%	-61%	-62%	-56%
Consumer Cyclicals	-41%	-41%	-22%	-58%	-56%	-49%
Consumer Non-Cyclicals	-40%	-35%	-33%	-57%	-53%	-55%
Communication and Technology	-31%	-38%	-31%	-44%	-51%	-45%
Energy and Transportation	-41%	-43%	-40%	-57%	-60%	-60%
UTILITIES	-21%	-36%	-29%	-56%	-54%	-40%
NON-CORPORATE	-31%	-35%	-41%	-60%	-53%	-55%

Source: Barclays POINT

The dependence patterns in correlations between industry sector/rating category spreads and interest rate shift factors, which remain valid across time and model types, include:

- Cyclical industries exhibit a stronger negative correlation with the shift factor than non-cyclical industries. This should come as no surprise, because by definition, the dependence of cyclical industries on economic decline or recovery, reflected by the changing levels of interest rates, is stronger.

- In most industries, with the exception of the banking and brokerage and consumer sectors, lower credit quality is associated with a greater degree of negative correlation. This is rather intuitive, because companies with lower credit quality are typically more affected by the changes in the economic outlook, as reflected in the general level of interest rates.

Equally telling are some of the dependence patterns that changed substantially with time and depend strongly on model type:

- In the years prior to the financial crisis – and contrary to other industries – the financial sector uniformly exhibited a pattern of higher credit ratings associated with a greater degree of negative correlation. After the crisis, the pattern changed – the correlations in the banking and brokerage sector are now almost independent of rating levels, and those in the financial companies, insurance, and REITs sectors are actually increasing strongly for the lower ratings, closer to the pattern seen for other industries.

- Before the crisis, the short- and long-term models showed a similar variability of correlations across sectors and ratings. After the crisis, markets tended to move more in tandem, and long-term variability decreased. Only recently (short-term model) do we see an increased range of behavior, more consistent with historical patterns.

The Effect of a Treasury Curve Twist

We now discuss the effect of the Treasury curve twist on credit spreads. One of the biggest casualties of the financial crisis and subsequent QE-filled years was the statistical dependence of credit sectors on the Treasury twist factor.

Credit spreads across all sectors and ratings used to have a consistently positive correlation with the steepening yield curve (see Figure 5 for results from 2003). That is, a steepening of the curve is associated with higher spreads. This was true for both the long-term and short-term models and consistent with what we observed at the bottom of the economic cycle, when the curve inversions and steepening were driven by Fed actions at the short end of the curve.

However, quantitative easing has changed this situation dramatically, with the Fed now explicitly targeting also the longer end of the rate curve. The moderate flattening of the curve caused by the start of the QE a few years ago coincided with some spread widening with uncertainty about the strength of the recovery, leading to negative correlations between Treasury twists and spread, which was contrary to the normal pattern. More recently, the further steepening of the curve due to concerns about the end of QE – while the short end is still nailed down by the Fed's near-zero interest rate policy – coincided with a modest credit pickup, again in contrast to the long-term norm. This is most obvious in the comparison of results from the short-term models – which are more sensitive to current market conditions – as shown in Figure 5 and Figure 6. The effect is also seen in long-term calibrations, but to a lesser extent. In this regard, changes in monetary policy can have a significant effect on how portfolios react to changes in interest rates.

FIGURE 5

Portfolio Spread Correlations with Treasury Curve Twists (December 2003)

Model	Long Term Model (UW)			Short Term Model (WW)		
Rating	AAA/AA	A	BBB	AAA/AA	A	BBB
FINANCIALS						
Banking and Brokerage	17%	19%	15%	33%	31%	30%
Financial Companies, Insurance and REITS	20%	18%	16%	35%	33%	23%
INDUSTRIALS						
Basic Industries and Capital Goods	15%	21%	20%	23%	28%	31%
Consumer Cyclicals	19%	21%	15%	22%	32%	40%
Consumer Non-Cyclicals	19%	17%	18%	25%	23%	25%
Communication and Technology	16%	20%	18%	26%	32%	36%
Energy and Transportation	18%	21%	21%	26%	29%	30%
UTILITIES	11%	18%	16%	27%	31%	33%
NON-CORPORATE	15%	18%	21%	21%	26%	36%

Source: Barclays POINT

FIGURE 6

Portfolio Spread Correlations with Treasury Curve Twists (June 2013)

Model	Long Term Model (UW)			Short Term Model (WW)		
Rating	AAA/AA	A	BBB	AAA/AA	A	BBB
FINANCIALS						
Banking and Brokerage	13%	13%	13%	-26%	-24%	-26%
Financial Companies, Insurance and REITS	11%	13%	12%	-16%	-23%	-28%
INDUSTRIALS						
Basic Industries and Capital Goods	11%	12%	13%	-18%	-18%	-24%
Consumer Cyclicals	13%	13%	14%	-20%	-19%	-22%
Consumer Non-Cyclicals	12%	12%	12%	-18%	-17%	-19%
Communication and Technology	9%	13%	14%	-14%	-20%	-25%
Energy and Transportation	12%	13%	14%	-15%	-22%	-25%
UTILITIES	10%	12%	13%	-23%	-20%	-21%
NON-CORPORATE	8%	13%	14%	-14%	-25%	-12%

Source: Barclays POINT

Duration Management of Credit Portfolios

These results have important implications for risk management, as well as for identifying relative value opportunities across sectors with different interest rate sensitivities.

The directionality of credit spreads and interest rates poses a challenge to credit investors who want to manage the interest rate exposure of their portfolios. Because spreads tend to move in conjunction with underlying interest rates, corporate bonds are not fully insulated from rate movements if hedged with same-duration Treasury bonds. In other words, a credit bond portfolio benchmarked against a government bond index (such as the overweight credit portion of a typical fixed income portfolio) will not be neutral to interest rate movements if it has a matching duration with the Treasury benchmark.

Indeed, duration measures the sensitivity of bond prices with respect to the change in yield. For a given shift in interest rates, the corresponding change in the corporate yield is smaller because it is partially offset by the tightening of the spread. To account for this, we introduce the concept of *effective duration*, defined as the sensitivity of corporate bond prices to changes in the interest rate component of the yield.

The Multi-factor Risk Model allows us to estimate the volatility σ_F of the shift and twist factor of the yield curve, as well as the volatility σ_S of the typical industry/rating sector portfolio spread and its correlation $\rho(S, F_{treas})$ with the rate factors. Given these values, the expected change in spread given the change in the treasury factor (either shift or twist) is:

$$\frac{\Delta S}{\sigma_S} = \rho(S, F_{treas}) \cdot \frac{\Delta F_{treas}}{\sigma_F}$$

Using this relationship, we can estimate the price effect of the parallel shift for the credit bond using the chain rule:

$$\frac{1}{P} \cdot \frac{\Delta P}{\Delta F_{shift}} = \frac{1}{P} \cdot \frac{\Delta P}{\Delta Y} \cdot \frac{\Delta Y}{\Delta F_{shift}} + \frac{1}{P} \cdot \frac{\Delta P}{\Delta S} \cdot \frac{\Delta S}{\Delta F_{shift}}$$

In the first term on the left-hand side, we introduced the change in the underlying yield of the Treasury curve, which by construction is assumed to be same as the change in the shift factor when the parallel shift is the sole movement of the yield curve. Therefore, $\Delta Y / \Delta F_{shift} = 1$. The fractional change in price with respect to change in yield is, by definition, the modified duration of the bond (with negative sign).

In the second term, we introduced the spread, whose relationship with the shift factor was explained above. The fractional change in price with respect to change in spread is, by definition, the spread duration of the bond (with negative sign).

Defining the fractional change in price with respect to change in shift factor as the effective duration (with negative sign), we obtain:

$$D_{eff} = D_{mod} + \rho\left(S, F_{shift}\right) \cdot \frac{\sigma_{spread}}{\sigma_{shift}} \cdot D_{spread}$$

Here, D_{eff} stands for effective duration, D_{mod} is modified duration, D_{spread} is spread duration, ρ is the correlation between spreads and Treasury shift, σ_{spread} is the volatility of spreads, and σ_{shift} is the volatility of the Treasury shift factor (both volatilities must be measured in absolute terms and expressed in equal units, e.g., bp/month).

Since the correlation of spreads and yields is negative and substantial, effective duration will typically be smaller than modified duration. For most fixed-coupon bonds, modified duration and spread duration differ very slightly; hence, effective duration is approximately equal to a fraction of modified duration. We denote this fraction as *effective duration multiplier* M_{eff} and rewrite the effective duration definition as follows:

$$D_{eff} \approx M_{eff} \cdot D_{\mathrm{mod}}$$

$$M_{eff} = 1 + \rho\left(S, F_{shift}\right) \cdot \frac{\sigma_{spread}}{\sigma_{shift}}$$

The estimated values of the effective duration multiplier are shown in Figure 7 for 2013 and Figure 8 for 2003. To illustrate with an example, look at the results for the long-term risk model from 2013. Consider two 10-year par bonds – a Treasury and a typical corporate bond in A-rated consumer cyclicals. Suppose that both have a modified duration of 7.5 years; the spread duration of the corporate bond is also 7.5 years.

FIGURE 7

Effective Duration Multipliers for Industry/Rating Sectors (June 2013)

Model	Long Term Model (UW)			Short Term Model (WW)		
Rating	**AAA/AA**	**A**	**BBB**	**AAA/AA**	**A**	**BBB**
FINANCIALS						
Banking and Brokerage	79%	81%	65%	68%	70%	48%
Financial Companies, Insurance and REITS	83%	69%	46%	83%	65%	32%
INDUSTRIALS						
Basic Industries and Capital Goods	87%	79%	67%	88%	84%	62%
Consumer Cyclicals	84%	75%	63%	85%	79%	63%
Consumer Non-Cyclicals	84%	82%	77%	88%	86%	78%
Communication and Technology	88%	74%	59%	92%	75%	55%
Energy and Transportation	82%	79%	70%	88%	80%	66%
UTILITIES	87%	79%	69%	79%	83%	73%
NON-CORPORATE	91%	82%	66%	93%	75%	82%

Source: Barclays POINT

We observe that the correlation between the 10-year yield and the spread on the corporate is -34%. This means that a 10bp increase in Treasury rates will typically be accompanied by a decrease in the spread of the corporate bond equal to the correlation multiplied by the ratios of the standard deviations of spreads and rates factors. The standard deviation of the rate shifts is 24.3bp/month (as determined by the Barclays POINT® Risk Model), and the standard deviation of the spreads in single-A consumer cyclicals is 18.2bp/month. Therefore, the corresponding spread tightening predicted by the risk model is equal to 10bp * 34% * 18.2 / 24.3 = 2.5bp.

The price effect of the 10bp increase in rates is a 7.5 * 0.10 = 0.75 decrease in price per 100 initial value in both bonds. However, for the corporate bond, this price decrease will be offset by a 2.5bp decrease in spreads and an associated price effect of 7.5 * 0.025 = 0.1875 per 100 initial value. Thus, the price of the corporate bond will decrease by only 0.75 – 0.1875 = 0.5625. Since this price change was effected by a 10bp rise in rates, the effective duration is 0.5625 / 0.10 = 5.625 years. This effective duration value represents 75% of the original modified duration of 7.5 years (as reported in Figure 7).

FIGURE 8

Effective Duration Multipliers for Industry/Rating Sectors (December 2003)

Model	Long Term Model (UW)			Short Term Model (WW)		
Rating	**AAA/AA**	**A**	**BBB**	**AAA/AA**	**A**	**BBB**
FINANCIALS						
Banking and Brokerage	89%	87%	81%	84%	83%	79%
Financial Companies, Insurance and REITS	88%	87%	84%	85%	79%	75%
INDUSTRIALS						
Basic Industries and Capital Goods	92%	87%	84%	83%	79%	75%
Consumer Cyclicals	89%	83%	79%	85%	75%	64%
Consumer Non-Cyclicals	89%	89%	87%	83%	83%	79%
Communication and Technology	89%	84%	78%	80%	76%	58%
Energy and Transportation	87%	86%	82%	80%	80%	77%
UTILITIES	93%	87%	81%	77%	77%	62%
NON-CORPORATE	93%	88%	71%	89%	86%	61%

Source: Barclays POINT

Thus, a credit portfolio that is overweight this corporate bond while benchmarked to a Treasury portfolio with matching modified duration will, in fact, be mismatched in terms of effective duration and, consequently, expected sensitivity to interest rate moves.

Another interesting take-away from this analysis is related to banking and brokerage portfolios. The effective duration of these portfolios is significantly lower in 2013 (compared with 2003), especially in the short-term model. As discuss previously, this may be the consequence of the atypical behaviour this industry register since the financial crisis.

We emphasize that when measuring the risk of credit portfolios using the Barclays POINT portfolio analytics system, the effect of the correlation between the credit spreads and Treasury rates is fully taken into account by virtue of using the complete Multi-factor Risk Model with full covariance matrix of dependencies. The example above illustrates the source of the high contribution of interest rate risks to the tracking error of many credit portfolios even when they are apparently well balanced in terms of modified duration.

Many credit portfolio managers are not actively managing the duration or curve positions of their portfolios, but instead follow the constraints imposed by broader multi-asset class and duration allocations within the risk-budgeting frameworks of aggregate fixed income portfolios. In such cases, either the portfolio managers responsible for asset allocation can take into account rate-spread directionality in setting the goals for the credit PMs, or the credit portfolio managers can explicitly adjust their duration targets if the implicit assumption in the asset allocation process is that of independence of rates and spreads.

Conclusions

This study used the statistically robust framework of the Barclays POINT® Global Risk Model to analyze the co-movements of interest rates and credit spreads. The main message is that both shifts and twists of the Treasury yield curve are accompanied by significant changes in both the level and slope of the credit spread curve.

We reiterate that this study concerns contemporaneous correlations and is not a statement of causal relationship. Rather, the existence and robustness of correlations across a long historical period from 1990 until the present can be taken as evidence of the common economic driving factors between rates and spreads.

Portfolio managers need to consider rate-spread directionality effects when fine-tuning their interest rate-hedging strategies and relative value decisions across credit sectors in an environment in which credit-specific news is dominated by macroeconomic news leading to significant Treasury curve moves.

The years since our original studies included periods ranging from very low risk (2005-06) to extremely high risk (2008), as well as the subsequent recovery accompanied by the peculiar experience of the Fed's quantitative easing, which influenced both interest rates and credit markets. As discussed, some of the results (such as the negative correlation of spreads and Treasury curve shifts) remain robust, while others (the correlation of spreads and Treasury curve twists) have become dislocated or even changed signs.

Although we do not provide specific forecasts, we caution investors to choose their scenarios carefully and pick those that they believe will be representative of the near future when applying this framework to credit portfolio management. Whether the most recent estimates hold depends on the assumption that economic conditions and the effect of the Fed's actions on the shape of the Treasury curve will remain the same. For investors who think that these conditions will change, it is possible that more representative statistics could be found in the more past.

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