AllianceBernstein

Protecting Fixed-Income Returns

The Role of Interest-Rate Duration in Credit Portfolios

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The global financial crisis has prompted some investors to consider disaggregating their fixed-income portfolios. In this article, we look at how the active and coordinated management of two key fixed-income market exposures can help moderate risk and enhance returns.

Portfolio Unbundling: What Are the Risks?

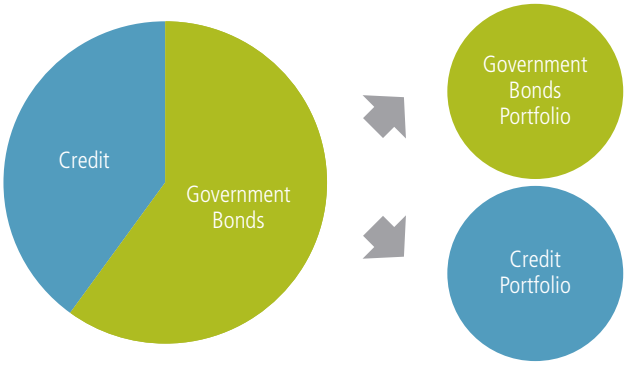
In the aftermath of the global financial crisis, a number of investors have been considering disaggregating their fixed-income portfolios (*Display 1*). They have been doing so for various reasons: to facilitate the appropriate pricing of client applications and redemptions across different components of the portfolio, to gauge more accurately managers' performance in different sectors, or to achieve greater certainty with regard to the composition of their core fixed-income allocation.

While the desire to disaggregate is understandable in many cases, we think it is appropriate to sound a note of caution. One of the benefits of an aggregated portfolio is that it provides opportunities for an active allocation between different sources of risk—a potentially important attribute during periods when exposure to one sector can offset downside risks in another. Consequently a danger of disaggregation is that the ability to optimally manage risk will be lost—particularly if disaggregated portfolios are assigned to different investment managers who target sector-specific benchmarks only, with no reference to the client's total risk and return objectives.

As we discuss below, our research suggests that interest-rate duration[1] exposure can serve as a form of protection against credit events that will almost inevitably occur during the market cycle. We believe that this can benefit even investors who are pursuing the disaggregation route, if they are prepared to allow appropriate use of duration management as protection for their credit portfolios.

Display 1
Some Fixed-Income Investors Wish to Disaggregate Portfolios

Aggregate Portfolio Moves to a Sector Sleeve Model



Source: AllianceBernstein

How Duration Can Provide a Form of Protection

There are three sources of risk and return in fixed income—risk-free cash, the risk premium paid by corporate bonds (the credit premium or spread) and the risk premium paid by bonds with longer, more interest-rate-sensitive maturities (the term premium or duration). In order to understand the relationships among them, we first gathered performance data from the

[1]*See Appendix 2, page 9.*

US bond market, which has the longest and deepest history, using three-month US Treasury bills for cash, the Barclays Capital US Investment Grade Credit Index for credit and the Barclays Capital US Treasury Index for sovereign bonds. For ease of comparison, we focused on a sovereign bond index which had the same duration as the credit index.

The next step was to deconstruct the returns from the credit and sovereign indices to estimate how much of the returns were the result of credit risk and duration risk, respectively. We estimated the duration return, for example, by subtracting the cash return from the historical sovereign index return. Similarly, we arrived at the credit spread by subtracting both the cash return and the sovereign return from the credit return.

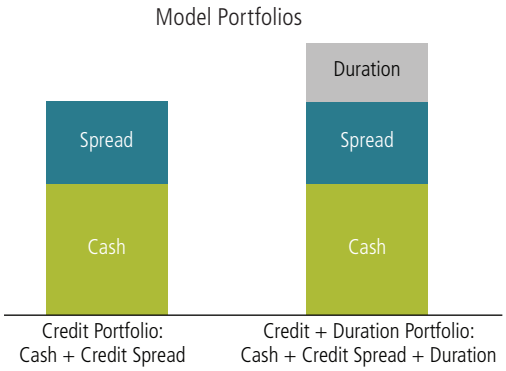
This approach and the historical richness of the US bond market data allowed us to examine the returns and their correlations and volatilities since the early 1970s. To make analysis simpler, we created two stylized portfolios—one for floating-rate credit (cash plus credit spread), the other for fixed-rate credit (cash plus credit spread plus duration). For ease of reference, we refer to these throughout as "credit-only" and "credit-plus-duration", respectively (*Display 2*).

Display 3 shows how the portfolios would have behaved over the past 35 years. Not surprisingly, the credit-plus-duration portfolio outperforms the credit-only portfolio, though at the cost of higher volatility. This cost is not the same at all times, however. A useful way of understanding this is in terms of the Sharpe ratio, which, by dividing excess returns over cash by volatility, provides a measure of how much risk is involved in achieving a particular level of return. The lower the Sharpe ratio, the higher the risk relative to the return.

Duration returns were particularly volatile during the 1980s, when the US and other western economies implemented high interest rates in what proved to be a successful effort to overcome stagflation (the combination of low growth and high inflation). As can be seen from the display, inflation volatility peaked and began to fall shortly after 1979 when Paul Volcker—who is widely credited with leading the fight against stagflation—became chairman of the US Federal Reserve.

Display 2

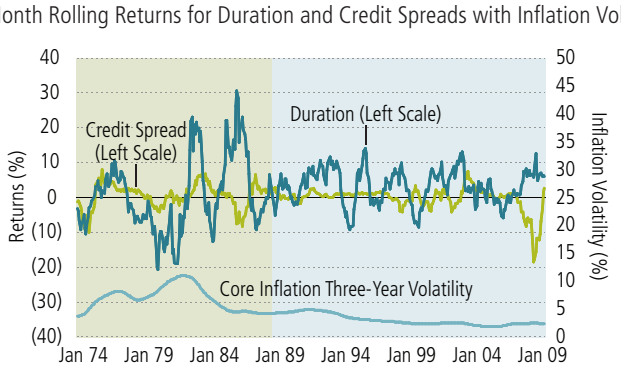
Credit vs. Duration: Comparing Risk and Return



Cash = three-month US Treasury bills
Source: AllianceBernstein

Display 3

Credit-Plus-Duration Wins—but Risks Are Higher



1974–2009	Returns (%)	Vol. (%)	Sharpe Ratio	1989–2009	Returns (%)	Vol. (%)	Sharpe Ratio
Credit Portfolio	6.52	3.60	0.07	Credit Portfolio	4.48	3.52	0.02
Credit + Duration Portfolio	8.28	7.41	0.27	Credit + Duration Portfolio	7.72	5.35	0.62

Through September 30, 2009
Source: Barclays Capital, Thomson Datastream and AllianceBernstein

Inflation volatility remained low from 1989 onward and, in what became a period of low interest rates, duration was also less volatile. For the credit-plus-duration portfolio during this period, the Sharpe ratio is 0.62, compared with 0.02 for the credit-only portfolio. For the time series as a whole (1974–2009), the credit-plus-duration portfolio's Sharpe ratio is lower at 0.27, pulled downward by the volatile years of 1974–1989. During this longer period, the Sharpe ratio for the credit-only portfolio is 0.07.

A cursory glance at the credit spread and duration lines in Display 3 suggests that they generally move in opposite directions—that is, they are negatively correlated—but that in some periods, such as between 1974 and the early 1980s, they can move in broadly similar directions. Analysis of returns and risk (as measured by standard deviations) shows that neither credit spread nor duration is dominant, but we can look at their relative performance another way, by analyzing the statistical distribution of their returns.

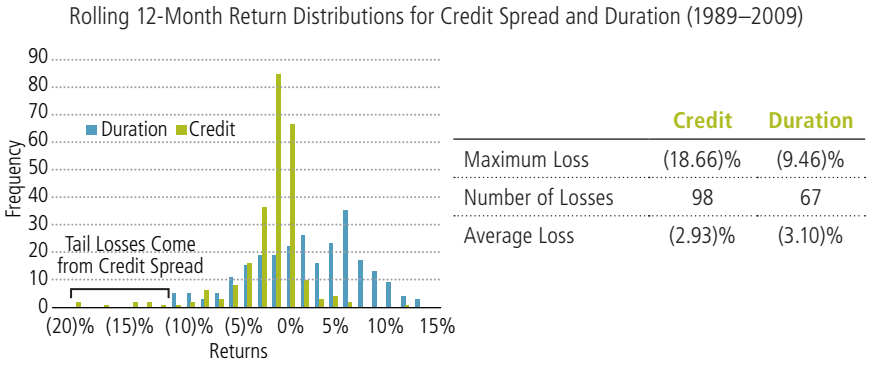
Display 4 focuses on the later subsample of data (1989–2009) when, as we have seen, the volatility in inflation and interest rates fell and remained low. We have focused on this period because we believe that these conditions largely continue to prevail and are, therefore, most relevant to our analysis.[2] As this display shows, the distribution of returns is much more uneven for credit than it is for duration. This can be seen in the high frequency of credit returns around the zero mark and the long tail of negative returns (that is, negative credit returns, while infrequent, can be large). Duration, by contrast, has milder losses, a much flatter overall distribution of returns and a mild skew toward positive returns. The statistics on the right of the bar chart show little difference between the two in terms of average losses, but a higher number of losses for credit than for duration and a much higher—nearly double—maximum loss for credit than for duration.

There is sufficient contrast between these distributions, in our view, to suggest that duration may mitigate some of the systemic or generic credit risk,[3] the most significant of which is the tail losses. For a credit-only manager unable or unwilling to use duration as protection, the only alternative course of action would be to seek diversification within the credit sector across industries and securities. This raises the issue, of course, that correlations within a single sector may not be sufficiently low to improve risk-adjusted returns.

For duration to hedge credit effectively, however, there must be sufficient negative correlation between the two sectors over time: that is, duration must generate positive returns to at least partially offset negative credit returns when they occur. *Display 5* measures the correlation between the credit spread and duration returns and shows that, for most of the period sampled,

Display 4

Credit Has High Tail Losses

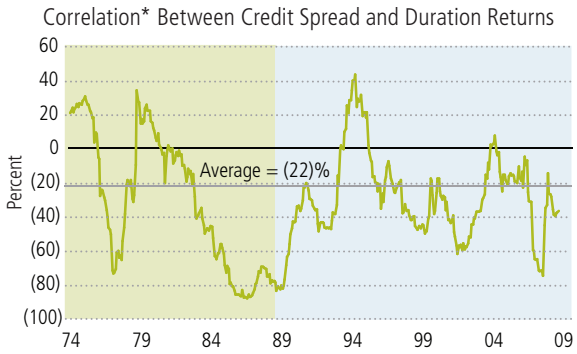


	Credit	Duration
Maximum Loss	(18.66)%	(9.46)%
Number of Losses	98	67
Average Loss	(2.93)%	(3.10)%

Through September 30, 2009
Source: Barclays Capital, Thomson Datastream and AllianceBernstein

Display 5

Credit and Duration Are Negatively Correlated



*Through September 30, 2009 *Rolling 24-month symmetrical correlations between credit and duration*
Source: Barclays Capital, Thomson Datastream and AllianceBernstein

[2] *See* Inflation Fixation—Where Will It End?, *AllianceBernstein white paper, August 2009, www.alliancebernstein.com.*
[3] *That is, risk common to all credits—as opposed to idiosyncratic or issuer-specific risk.*

the correlation is indeed negative. For a sample of the size used (441 months), a statistically significant negative correlation would need to be less than (12)%; the average correlation is in fact well below that, at (22)%. Furthermore, the correlation is negative during both periods of the time series—the high-duration volatility of 1974–1989 and the low-duration volatility of 1989–2009. The correlation is more statistically significant during the latter period, as shown by its tendency to move within narrower bands.[4]

From this historical analysis, we conclude that the combination of duration and credit can enable fixed-income investment managers to diversify away from systemic credit risk and improve portfolio returns.

This raises a question: how much duration is needed to offset the expected losses in a credit portfolio?

Before we consider the practicalities of using duration to hedge credit, however, we need to acknowledge a reality that should be taken into account by fixed-income investment managers thinking of taking duration exposure through fixed-rate corporate bonds: a credit bond's empirically observed sensitivity to interest rates may be different from its stated or modified[5] duration. The reason for this is, in fact, related to the negative correlation between duration and credit discussed above.

We explore this in more detail, together with its implications for our analysis, in Appendix 1 (page 7).

How Much Duration Is Needed to Hedge a Credit Portfolio?

The blue bars in *Display 6* show how much duration would have been necessary in our stylized credit-plus-duration portfolio to offset credit losses where such opportunities occurred during 1974–2009. It would not always have been possible to hedge credit losses with duration, because credit losses sometimes occurred in the absence of declines in market yields. This can be seen in the first OPEC crisis, when the opportunity to hedge with duration was severely restricted (limited to a single bar of duration), and in the second OPEC crisis, when it was nonexistent. The biggest opportunities to hedge credit with duration occurred during the low-volatility era of 1989–2009. As we observed in relation to Display 5, the negative correlation between credit and duration during this period was significant.

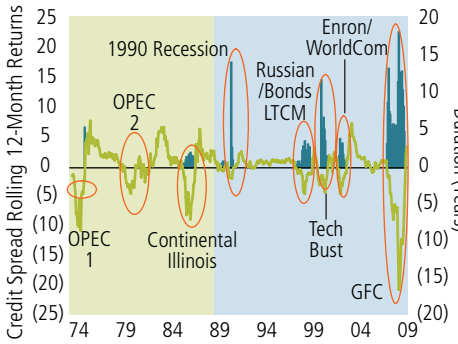
As shown in the box next to the graphic in Display 6, the average duration required to immunize credit portfolio losses would have been 3.7 years.[6] On three of the six occasions—Continental Illinois, Russian default/Long Term Capital Management and Enron/WorldCom—the amount of duration required was less than half the average, at 1.2 or 1.5 years. On the other hand, there are occasions when 3.7 years would not have been sufficient to offset credit losses completely, although the losses would have been substantially mitigated.

Given that 3.7 years is the average duration required to immunize credit losses, how would our credit-plus-duration portfolio perform with a constant duration exposure of that size, and how would its performance compare to that of the credit-only portfolio? The question is of interest not least because—as we saw with the OPEC crises in Display 6—duration is not always available to hedge against credit losses.

Display 6

How Much Duration Protection Do You Need?

Credit Spread Rolling 12-Month Returns with Duration Required for Immunization (Blue Bars)



Bear Credit-Market Episode	Duration Required to Immunize Credit Losses (Yrs.)
Continental Illinois	1.2
1990 Recession	4.4
Russian Bonds/LTCM	1.5
Tech Bust	4.3
Enron/WorldCom	1.5
GFC	7.6
Average	**3.7**

Through September 30, 2009
Source: Barclays Capital, Thomson Datastream and AllianceBernstein

[4] *Our confidence in this analysis is supported by the fact that the average negative correlation increases to (36)% when the analysis is restricted to bear markets after 1989.*
[5] *See Appendix 2, page 9.*
[6] *The total differs from the straight arithmetic average of the numbers shown (3.4 years). This is because the underlying bear market episodes were of varying lengths.*

Display 7 tracks the two portfolios through bear and non-bear credit markets[7] during 1989–2009. By construction, the average bear market returns for the credit-plus-duration portfolio have been set to zero (that is, the portfolio's constant 3.7-year duration is the result of a calculation designed to offset credit losses). As might be expected, the portfolio with the static duration allocation outperforms, especially during credit-tail-loss events. It also outperforms in non-bear markets, although at the cost of higher volatility and a lower risk-adjusted return.

Can Active Management Reduce Proection Costs?

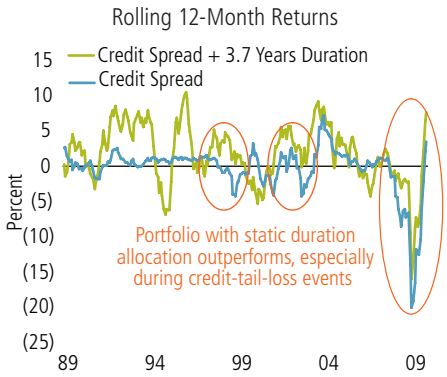
While the credit-plus-duration strategy offers clear advantages from a total return perspective, these advantages must be weighed against the higher risks. In effect, these can be viewed as the cost of protection.

It is possible to reduce this, however—that is, it is possible to reduce overall portfolio volatility while maintaining the downside protection characteristics. This argues, in our view, for an active duration management strategy which is biased toward defensiveness—one in which the investment manager is clearly charged with using duration as protection for the credit portfolio, and not as a source of alpha to be pursued aggressively. Our research suggests that widening credit spreads tend to coincide with falling interest rates—a reason for the negative correlation described earlier between duration and spreads over time. In tactical terms, for example, this would encourage the manager to take a long duration position when credit spreads are widening and interest rates are likely to fall.

How, then, should an investment manager implement a strategy using duration as a hedge for credit? And how would the returns from a portfolio with a dynamically managed duration position compare to one in which duration remained static?

Display 7

A Static 3.7-Year Duration Exposure Offsets Credit Losses

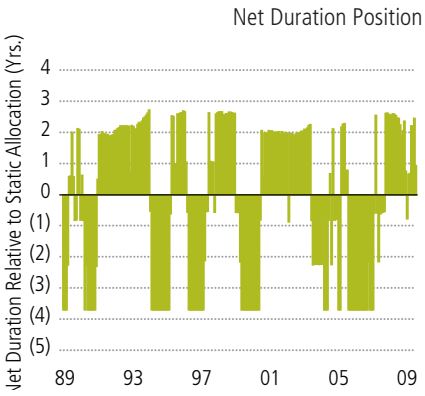


Bear Market	Avg. Ret. (%)	Vol. (%)
Credit	(2.96)	4.42
Credit + 3.7 Years Duration	0.00	4.31
Non-Bear Market	**Avg. Ret. (%)**	**Vol. (%)**
Credit	1.33	1.39
Credit + 3.7 Years Duration	2.83	4.02
Combined	**Avg. Ret. (%)**	**Vol. (%)**
Credit	0.08	2.16
Credit + 3.7 Years Duration	2.16	4.32

Through September 30, 2009
The 0% bear market return is by construction–the 3.7 years duration was solved so that bear market returns are 0%.
Source: Barclays Capital, Thomson Datastream and AllianceBernstein

Display 8

Active Duration Management Improves Risk/Return



1989–2009	Returns (%)	Vol. (%)	Sharpe Ratio
Dynamic	7.47	3.62	0.85
Static	6.65	4.34	0.50

Through September 30, 2009
Source: Barclays Capital, Thomson Datastream and AllianceBernstein

Higher Returns, Less Risk

One way to begin implementing such a strategy would be to allow duration positions on either side of a duration benchmark—flexibility which recognizes that an active credit-plus-duration manager will not always want duration in the portfolio. Given such parameters, what would be the likely pattern of allocation between duration and credit over time? We approached this question using a simple momentum, or trend-following rule, based on rolling 12-month returns. *Display 8* shows the net duration position of an actively managed credit-

[7] *Bear credit markets are markets in which rolling 12-month returns on credit are negative; in non-bear credit markets, rolling 12-month returns are positive.*

plus-duration portfolio during 1989–2009 based on the rolling 12-month momentum of returns and volatilities. The duration strategy has been set at either side of a 3.7-year benchmark. We assume that, when the rolling 12-month returns from duration turn positive, the manager starts allocating more to duration and less to credit (and vice versa).

Typically, the portfolio changes from an underweight to an overweight duration position every nine months—a reasonably measured pattern that might be described as a series of short-term structural shifts. The allocation to extra duration is surprisingly balanced, at 48% of the time. In terms of investment performance, dynamic duration management can deliver a higher total return than static management. Most importantly, however, it reduces the volatility of the model, and the risk-adjusted return rises from 0.50 for the static approach to 0.85 for the dynamic approach.

It should be noted that these results represent an extreme, in that they do not take into account transaction costs or the fact that no portfolio manager in reality would follow a momentum model exactly. In a general sense, however, the results point to probable outcomes and, in our view, form a strong case to suggest that active duration management in a credit portfolio can both supplement total returns and reduce volatility.

Conclusion: Allow Your Credit Managers to Actively Use Duration

As stated at the beginning of this article, a number of fixed-income investors have been considering disaggregating their fixed-income portfolios in response to the volatility they have experienced during the global financial crisis. While this is understandable in many instances, disaggregation poses the risk that the internal hedging benefits of an aggregated portfolio may be lost. This paper has explored the relationship between relative risk and returns from credit and interest-rate duration exposures, and the potential for using duration as a hedge or protection for credit portfolio returns.

In summary, we conclude that:

- Credit portfolios should have some duration exposures;
- The necessary exposure changes with credit spreads; and
- An active strategy is preferred to a passive strategy, as a way of reducing the overall cost of protection.

There is a case, in our view, for not confining duration exposure to the government bond sector of a disaggregated portfolio. Instead, allowing credit managers to take active duration positions can create protection to help underpin returns from credit through the market cycle. Some continuing relationship or overlay between the management of credit and duration risk is, therefore, recommended, in our view. We also see merit in both strategies being vested with a single investment manager—the better to manage sector returns and the hedging between them in keeping with each client's total risk and return requirement.

Our analysis has also shed light on the usefulness of empirical duration as a tool for assessing how much duration is required to protect the returns of a credit portfolio. We further suggest that, given the tendency for corporate bonds to become less sensitive to interest rates as credit spreads widen, managers wishing to take interest-rate exposure may need to supplement credit bonds with other asset classes which are more closely linked to sovereign yields. ■

Appendix 1: Empirical Duration

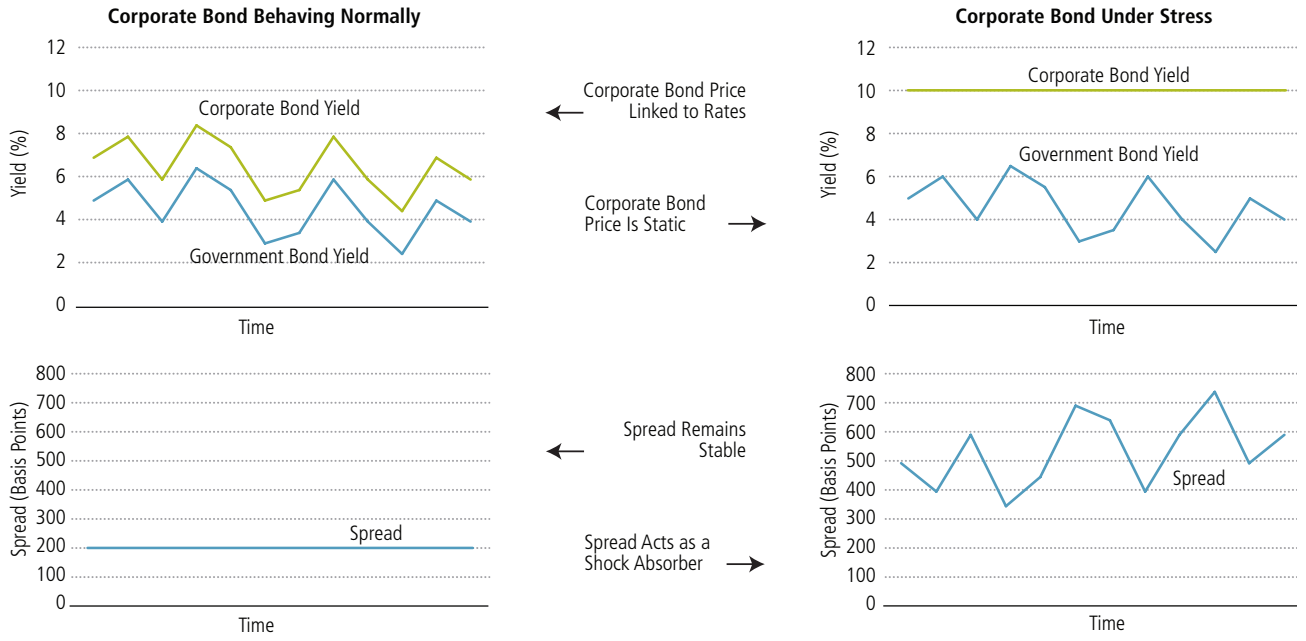
The difference between the observed and stated duration of fixed-rate corporate bonds is likely to be pronounced during periods of elevated spreads, where recent history tells us that credit risk dominates bond prices and the relationship with government bonds starts to break down. *Display A* provides two stylized representations of yield changes for corporate bonds. One shows a normal relationship between a corporate bond yield and a government bond yield, with both moving more or less in tandem and the spread or differential between them remaining broadly constant. The other representation shows the relationship having broken down under market conditions of extreme stress. The corporate bond yield has frozen at 10% while the government bond yield continues to move up and down. As a result, the spread between the two narrows and widens dramatically.

Fixed-income fund managers typically describe their portfolios' duration positions in terms of modified duration, which expresses the measurable change in value of a security in response to a change in interest rates. While a useful measure, modified duration does not allow for the real-life possibility that the relationship between corporate and government bond yields may break down. As noted in the article, we based the duration component of the credit-plus-duration portfolio used in our analysis on a government bond index. We can refine this aspect of our analysis, however, by capturing the possibility of a breakdown between corporate and government yields. One way of doing this is to look at the empirical or historical duration of bonds in a portfolio. We did so by combining historical data from the Barclays Capital US Corporate Investment Grade + High Yield Index.

Display B, next page, uses these data to plot the relationship between modified duration and empirical duration for different levels of credit spreads from 1999 to 2009, a period that includes recent market disruptions. The spreads and duration are option-adjusted, meaning they take into account the duration-shortening effect of the rights of some

Display A

Corporate Bonds Can Lose Interest-Rate Sensitivity



Source: AllianceBernstein

bond issuers to buy back their securities before the official maturity date (in other words, they give as realistic a picture as possible of spread and duration behaviour over time). The trajectory of the green line (based on US data) shows that as spreads increase, the interest-rate sensitivity of a corporate bond begins to fall away quite sharply until—at a spread of around 500 basis points (b.p.)—it becomes zero. In other words, the interest-rate sensitivity of corporate bonds falls as spreads widen.

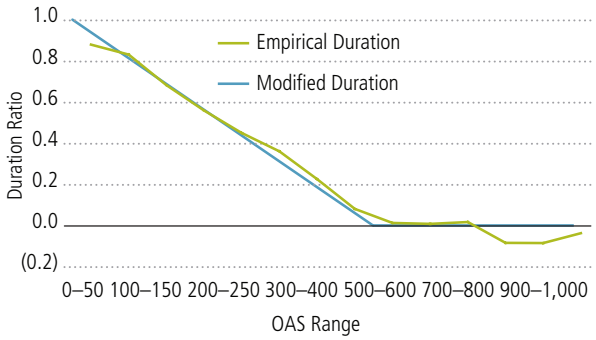
We believe that empirical duration can be a useful tool for an investment manager to measure the interest-rate sensitivity of a credit portfolio and assess how much duration would be needed to hedge returns. The first column of *Display C*, for example, shows the stated modified duration of the UBS Australia Credit Index compared with our calculation of its empirical duration. The empirical duration is shorter by a whole year, indicating that credit portfolios are less sensitive to interest rates than modified duration would suggest (as Display B demonstrated, this is particularly so when credit spreads widen). Empirical duration also falls as portfolio credit quality decreases—as can be seen from the breakdown of three model credit portfolios by credit rating, each of which is of progressively poorer credit quality. While the modified duration of each remains unchanged, the empirical duration falls.

Note that this question is addressed in the article using government bonds as a source of duration, in which case there is no difference between duration and empirical duration, as spreads are equal to zero. In practice, duration exposure would be taken through a combination of government bonds and credit, so it is important to have a manager who understands the potential differences between duration and (the more relevant) empirical duration. ■

Display B

Empirical Duration Falls as Credit Spreads Widen

US Credit Empirical Duration Ratio over Average OAD* by OAS* Range
1999–2009



Through September 30, 2009
**OAD = option-adjusted duration; OAS = option-adjusted spread*
Source: AllianceBernstein

Display C

Empirical Duration Falls as Portfolio Credit Quality Decreases

UBSA Credit Index vs. Model Portfolios

1999–2009	Index = UBSA Credit	Port. 1	Port. 2	Port. 3
Modified Duration	2.5	2.5	2.5	2.5
Empirical Duration	1.5	1.2	0.9	0.8
MV%* AAA	5%	5%	0%	0%
MV% AA	60%	52%	35%	27%
MV% A	26%	38%	57%	62%
MV% BBB	9%	5%	8%	11%

**MV% = percent of portfolio market value*
Source: AllianceBernstein

Appendix 2: Key Concepts

Duration
An estimate of the percentage price change of a security for a 100-basis-point (1-percentage-point) change in interest rates.

Modified Duration
An estimate of the percentage price change of a security for a 100-basis-point change in interest rates, assuming that the bond's expected cash flows are not sensitive to yield changes.

Empirical Duration
An estimate of a bond's sensitivity to interest rates (duration) based on observed historical bond market data.

About the Authors

Hayden Briscoe
Head of Australian and New Zealand Fixed Income

Hayden Briscoe joined AllianceBernstein in August 2009 as Head of Australian and New Zealand Fixed Income. He has 19 years of experience in the industry and was previously a senior member of the fixed-interest team at Schroders Australia for nearly three years, responsible for the domestic fixed-income funds and global core plus funds. Prior to Schroders, Mr. Briscoe spent six years with Colonial First State, managing domestic, global credit and core bond funds, with tactical asset allocation responsibility across the cash funds. While there, he teamed with another portfolio manager to set up a global bond fund investment process. Mr. Briscoe originally spent nine years with Bankers Trust in investment banking, where he started out trading bonds. He moved to Macquarie Bank for a short while after the BT merger before joining Colonial First State. He holds a BA in economics from the University of New South Wales.

Phillip Gould
Quantitative Research Analyst

Dr. Phillip Gould joined the firm in July 2008 and is responsible for maintaining and developing quantitative models used for interest-rate forecasting and portfolio optimization. Prior to joining the firm, he spent four years in risk management at the ANZ banking group, where he was responsible for econometric stress-testing models and credit-cycle analysis. He completed his PhD in econometrics at Monash University and has held academic posts there and at the Vrije Universiteit in the Netherlands. Dr. Gould also holds honours degrees in commerce and chemical engineering from the University of Melbourne.

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