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Analyzing CDS Credit Curves

A Fundamental Perspective

US Credit Research

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We propose one approach to analyze fair value for CDS credit curves of different ratings. Our results suggest the market is pricing in a very benign default and recovery environment into investment grade and BBB-rated CDS credit curves from one to ten years and BB-rated credit curves from three to ten years. In contrast, the market appears to be pricing in a nastier default environment into BB-rated credit curves from one to three years. This partly reflects jump-to-default hedging and supports selling of short-dated (one- and two-year) protection.

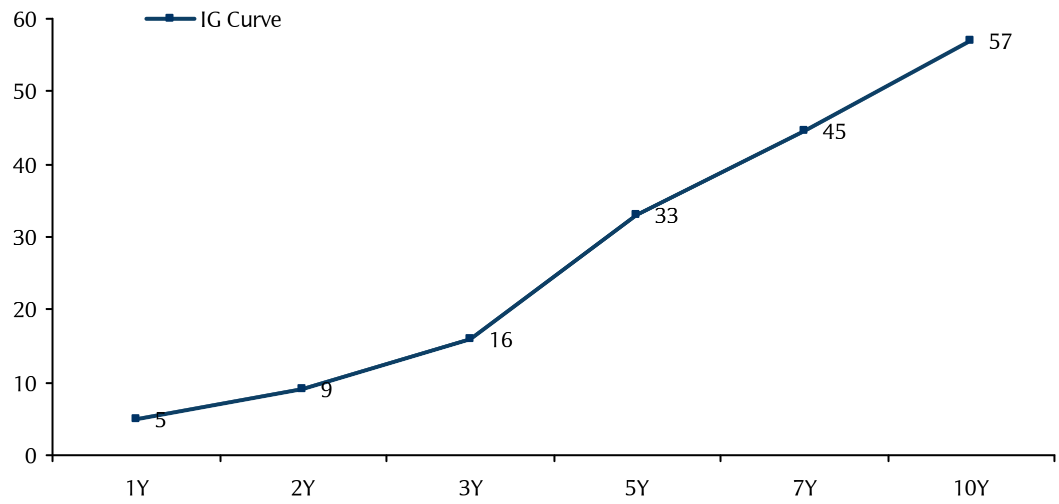
Introduction

While technical factors (such as supply of long-dated, single-name protection from bespoke CDO issuance and demand for long-dated, single name protection related to attractive carry and roll-down characteristics) exert significant influence on the CDS credit curves, particularly in the short term, the shape of the CDS credit curve over the long run should primarily reflect fundamental views on expected loss (ie, default probability and recovery rate assumptions). In this piece, we extract implied default probabilities from CDS index credit curves across investment grade, BBB-, and BB-rated issuers using a fixed 40% recovery assumption and a variable recovery assumption that we believe is more reflective of the current environment. We then analyze the implied default probabilities relative to long-term historical default rates based on Standard & Poor's default data dating back to 1981. We also consider short-term historical data from periods that we believe are more representative of the current default environment and form a fundamentals-based approach for assessing relative value across CDS credit curves.

Methodology

We use the IG6 CDS credit curve based on intrinsic spreads as a general representation of the average investment grade credit curve. We depict the curve from one to ten years (Figure 1).

Figure 1: IG6 Index Credit Curve Based on Intrinsic Spreads

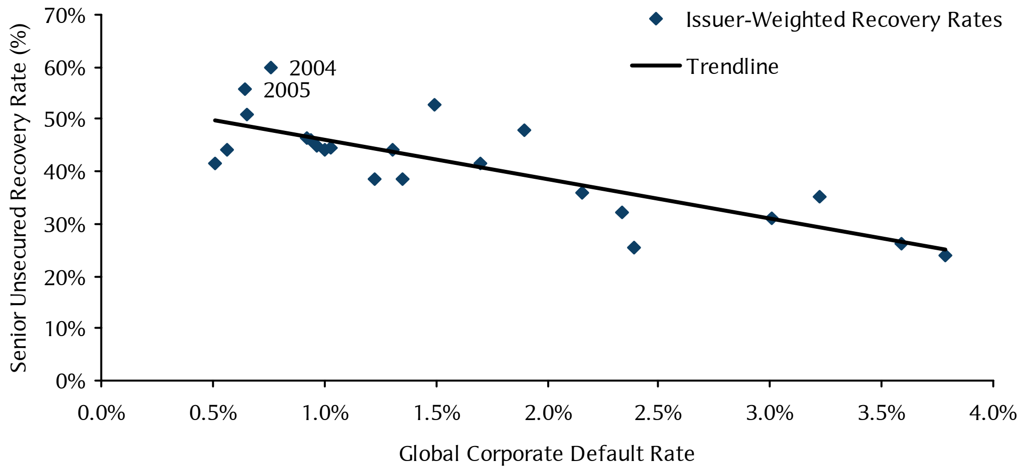


Source: Source: Barclays Capital.

From this credit curve, we bootstrap cumulative default probabilities[1] for each tenor using two assumptions of recovery. First, we use a fixed 40% recovery assumption, the market convention based on the long-term average recovery rate. Second, we use a variable recovery assumption based on our prior analysis,[2] suggesting that a dynamic assumption is more consistent with the historical inverse correlation between (low) default rates and (high) recovery rates. In our view, the standard 40% recovery assumption is too low for the next few years given average recovery rates of 56-60% over 2004-05 (Figure 2) and the potential for supply/demand imbalances in CDS settlement to elevate artificially recovery prices (eg, Delphi).

[1] Cumulative default probabilities can be estimated using the Bloomberg analytics, specifically the CDSW screen, using a fixed recovery assumption. We use Barclays analytics to calculate cumulative default probabilities for our variable recovery assumptions.
[2] See "Implications of Dana Default and Higher Recoveries on the CDO Market" from the **US Alpha Anticipator***, M. Mish and J. Meli, March 30, 2006.*

Figure 2: Global Default and Recovery Rates (1983-2005)



Source: Moody's, Barclays Capital.

Adjusting the Recovery Rate Assumption

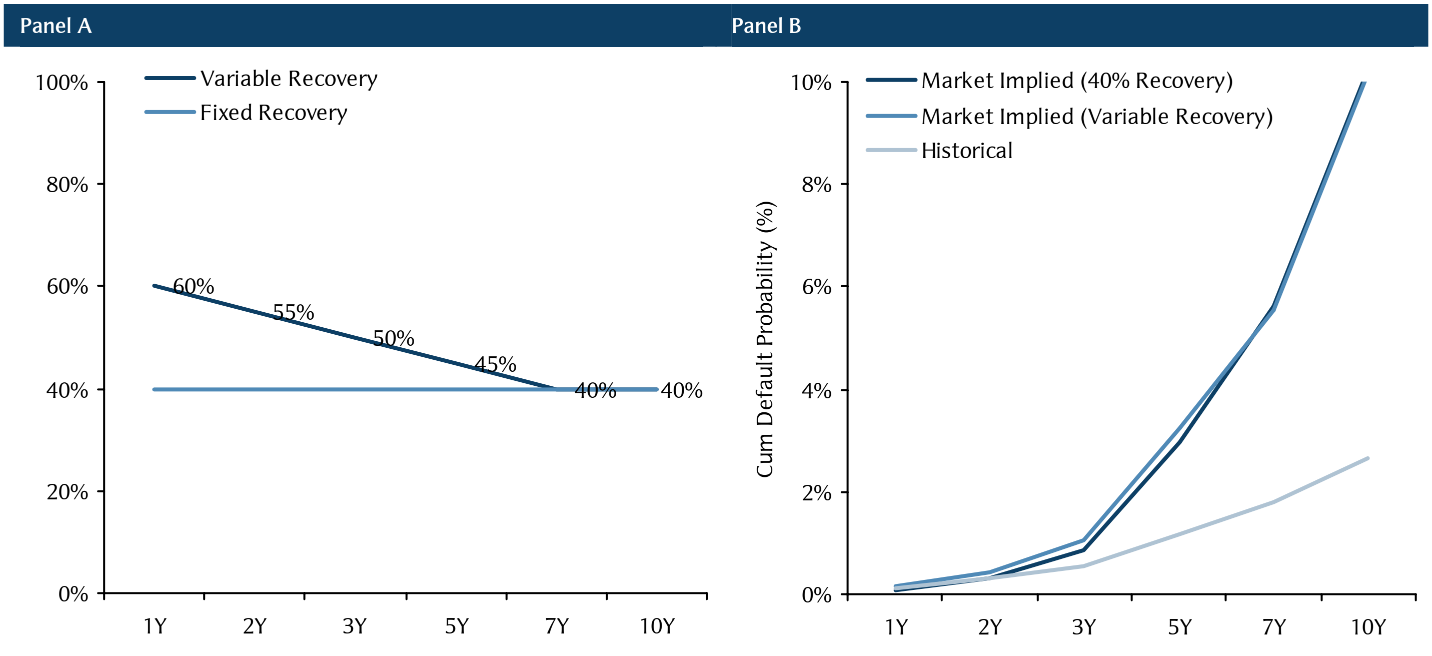
We believe spreads reflect the likelihood of higher recoveries/lower loss given default in shorter maturities, implying that default probabilities are higher than the standard assumption suggests for near-term maturities with the same spread. To reflect this, we use a variable recovery assumption [3] and calculate a second cumulative default probability distribution (Figure 3 – Panels A and B). Both distributions are significantly upward-sloping and convex in shape.

In Figure 3 – Panel B, we also plot cumulative default rates for investment grade credit based on a static pool over 1981-2005.[4] The implied default probabilities shown assume that the entirety of the credit spread premium is a reflection of default and recovery risk. In reality, realized default rates are much lower than implied default probabilities, particularly for investment grade credit, since the credit spread is compensation not only for expected loss (default and recovery rates), but also for factors including default and recovery volatility, mark-to-market (or spread) volatility, and liquidity risk.

[3] We attempt to be conservative in our above-average recovery rate assumptions. Specifically, we assume recovery rates remain near current levels in the short term but mean-revert to the long-term average by year seven (assuming a 55% recovery in year two, 50% in year three, 45% in year five, and 40% in year seven).

[4] S&P's Annual 2005 Global Corporate Default Study and Rating Transitions.

Figure 3: Recovery Rate Assumptions (Panel A) and Implied Default Probabilities for the IG Index Curve Versus Historical Default Rates (Panel B)



Source: Barclays Capital, S&P.

There has been a significant amount of academic research[5] analyzing the credit risk premium and quantifying its various subcomponents. Our objective is to approach the issue from a broader perspective, using basic theory to provide a framework for analyzing the *relative* proportion of risk premium that should be attributable to default risk versus other risk factors across maturities. We then run scenario analyses comparing implied default probabilities with long- and short-term historical default rates to draw some conclusions about potential mispricings across credit curves of different ratings.

Proportion of Expected Loss Due to Non-Default Factors

Prior to analyzing implied default probabilities in the context of historical default rates, we need to address non-default risk factors that also contribute to the expected loss distribution implied from credit spreads. Figure 4 – Panel A depicts the relationship *in absolute terms* between three primary risk factors (in addition to default risk) across maturity.

- **Volatility of default rates**: The relationship between the uncertainty around default rates and tenor is upward sloping (almost linear) based on S&P's historical data; ie, volatility increases as default rates rise over time. We obtain similar results running a ratings transition-based simulation using Moody's one-year transition rates from 1981-2005 and building in serial correlation and intra-period asset correlation.

- **Mark-to-market volatility**: The relationship between mark-to-market volatility and maturity should be upward sloping; ie, volatility increases but at a decreasing rate

[5] *For example "Corporate Yield Spreads: Default Risk or Liquidity? New Evidence from the Credit-Default Swap Market," F. Longstaff, E. Neis, and S. Mithal, September 2004.*

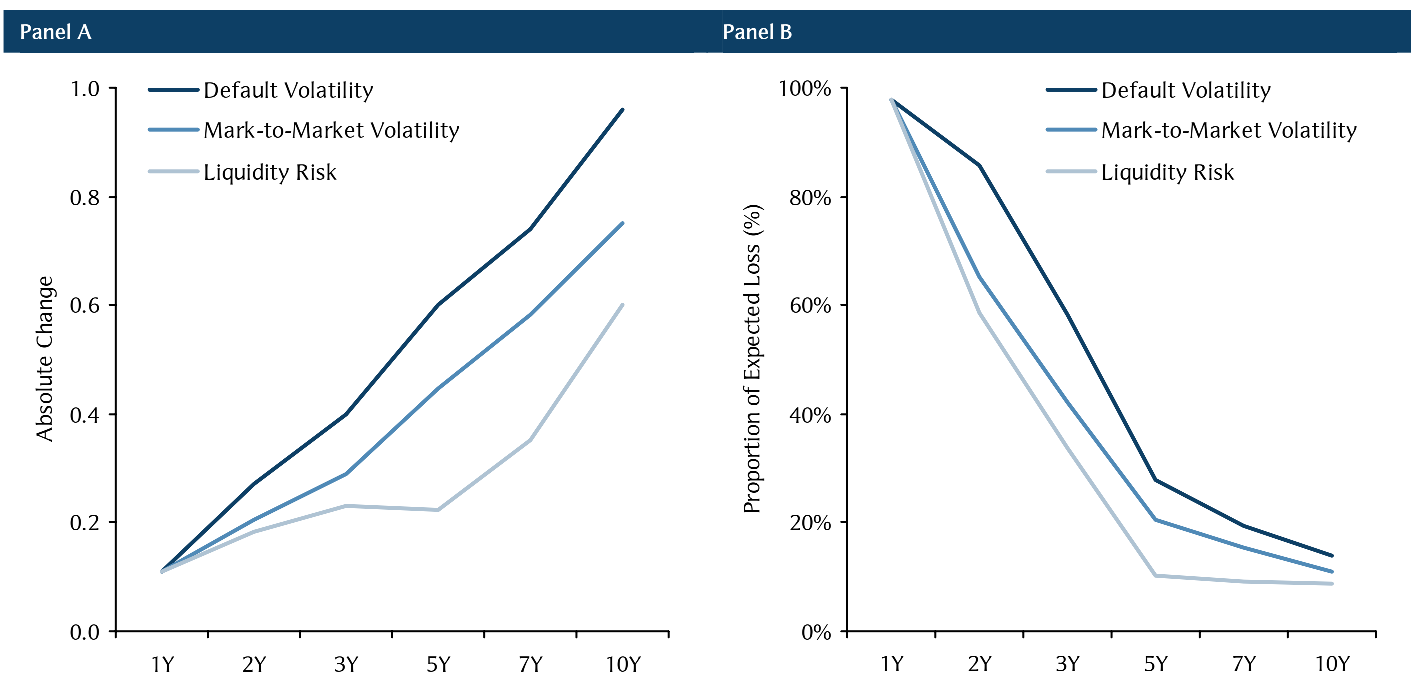
as maturity increases faster than duration and, for more distressed credits, valuations across maturities converge to recovery.

- **Liquidity risk**: The relationship between liquidity and maturity should also be upward sloping in two related ways. First, transaction costs reflecting bid/offer spreads and duration increase with tenor. The relationship is flatter from years one to five as tighter bid/offers offset larger durations, but steeper from five to ten as wider bid/offers combine with higher durations. Second, in bearish credit environments, wider bid/offer spreads across maturities will be magnified by duration. We believe liquidity risk is of secondary importance relative to the other factors.

The y-axis scale in Figure 4 normalizes the absolute values for our purposes because we are concerned primarily with trends in slopes for each factor across maturities. In absolute terms, the level of expected loss implied from credit spreads due to these three factors increases with maturity in a non-convex manner. However, *in relative terms* the proportion of expected loss due to these three factors actually decreases with maturity since the distribution of implied defaults increases in a convex manner across maturities (Figure 4 – Panel B).

If we assume that the expected loss implied from credit spreads is primarily a function of default risk and these three factors, we would expect the proportion of credit spreads explained by historical default experience to *increase* with maturity in some fashion so that the proportion of credit spreads from the combined risk factors is similar across maturities.

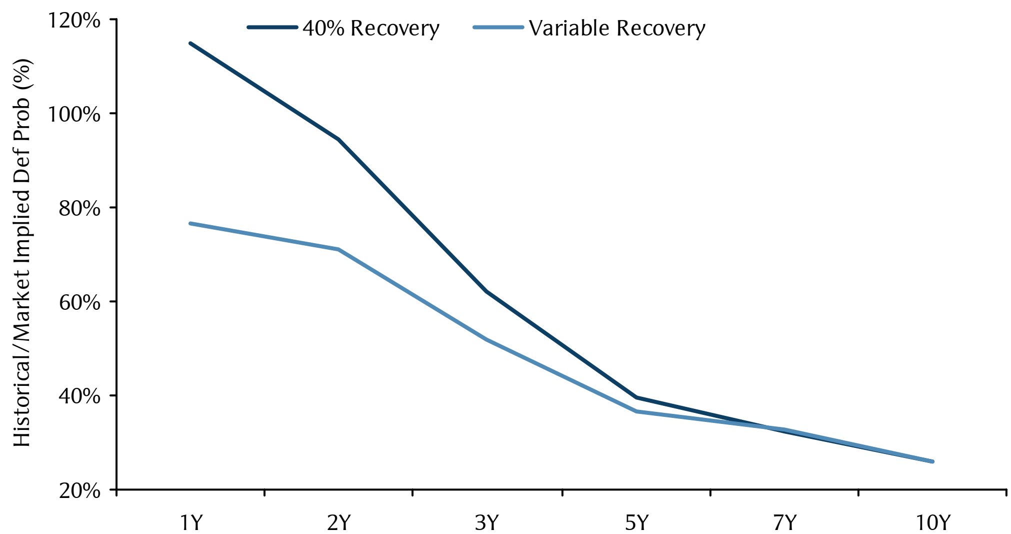
Figure 4: Relationship between Other Risk Factors across Maturities in Absolute Terms (Panel A) and as a Proportion of Expected Loss (Panel B)



Source: Barclays Capital, S&P.

Figure 5 depicts the relationship between the proportion of credit spreads (expressed as probability of default based on our fixed and variable recovery assumptions) explained by historical default rates based on S&P's data for 1981-2005. Given a fixed recovery assumption, the proportion of expected loss is downward sloping, running contrary to our expectations and implying that the curve is too steep (ie, short-end spreads compensate investors less for historical default and recovery risk *and* the other three risk factors than do long-end spreads). Using our variable recovery rate, the relationship is still downward sloping, but to a lesser extent. As outlined earlier, we believe the variable recovery assumption is more representative and its results more valid.

Figure 5: Implied Default Probabilities for the IG Index Curve versus Historical Default Rates under Different Recovery Assumptions



Source: Barclays Capital.

However, our initial analysis uses long-term historical default rates. But short-term default rates from more benign default periods are arguably more consistent with the present default environment and likely more appropriate.

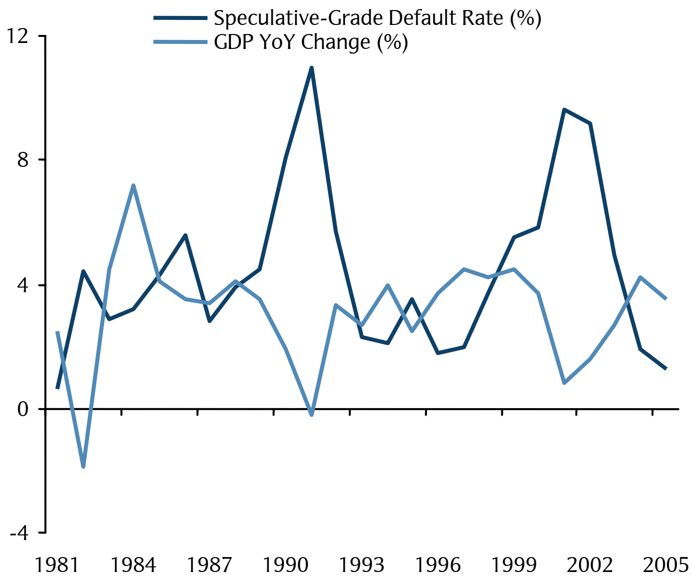
Factoring in a Benign Default Environment

Specifically, we believe data from two similar low-default environments are likely more consistent with the present default environment: 1987-89 and 1994-96. In both cases, default rates were at comparably low levels and economic growth robust, near 3-4% (Figure 6 – Panel A). This is roughly consistent with 3.7% US GDP growth in 2005 and 3.5% and 2.8%, respectively, projected for 2006 and 2007 by our economists. Interest rates were also rising, as the Fed hiked in the initial years of both periods. In the former case, there was a boom in private equity and leveraged loan markets, which was less robust in the latter, although then the monetary policy was similarly accommodative, with real fed funds peaking at about 4% in early 1995, versus about 3% at present (compared with over 5% in early 1989).

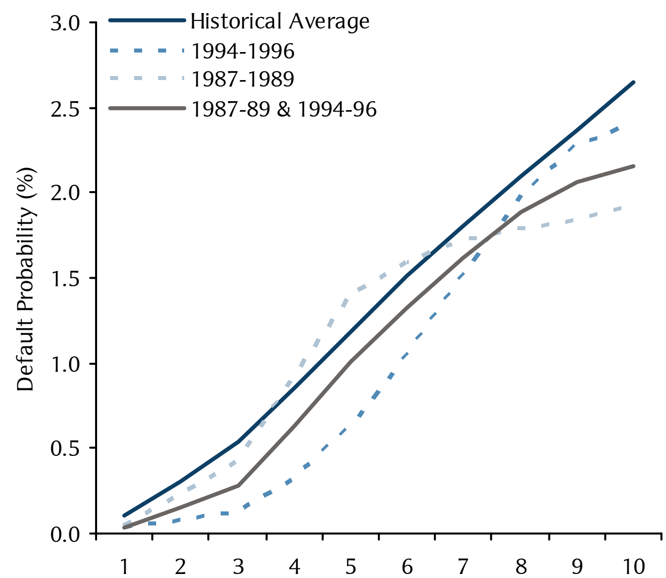
In both periods, short-term default rates were lower than average, but defaults were more middle-loaded in 1987-89 and back-loaded in 1994-1996. This is relevant because default rates from these periods differ notably from long-term rates and affect our results and conclusions. We select a blended average of default rates from both periods to represent more accurately the current environment (Figure 6 – Panel B).

Figure 6: Speculative Grade Default Rate versus Annual GDP Growth (Panel A) and Cumulative Default Probabilities from Different Periods by Maturity (Panel B)

Panel A



Panel B



Source: Barclays Capital.

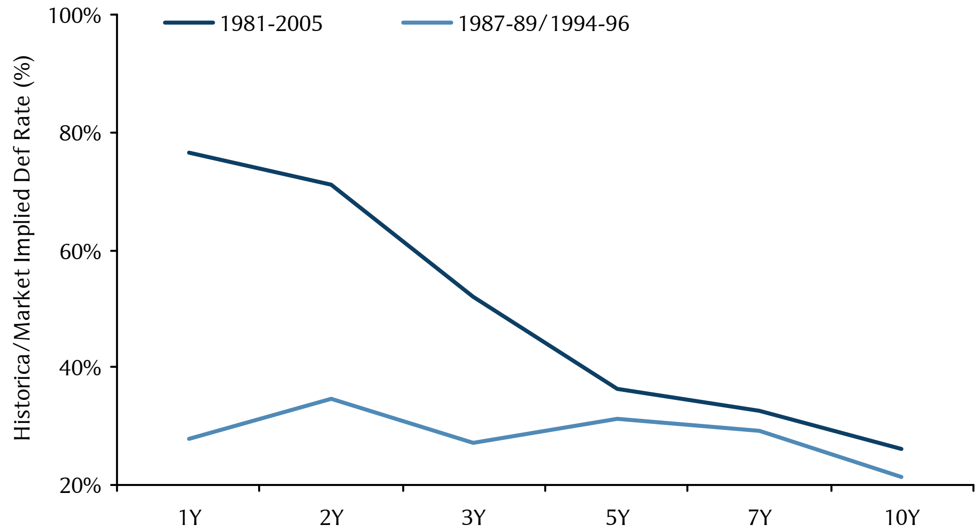
Figure 7 depicts implied default probabilities[6] for investment grade credit relative to the historical and blended-average default rates. In summary:

- **Long-term default rates over 1981-2005** showed that the proportion of expected losses attributable to default risk is downward sloping, particularly from years two to five, inconsistent with our expectations and implying short-end spreads compensate investors less for default and other risk factors. This suggests curves are too steep on a fundamental basis.
- However, **blended default data from 1987-89 and 1994-96** imply that the proportion of expected losses attributable to default risk is relatively flat across tenors, suggesting credit curves are still steep from a fundamental perspective (but closer to fair value compared with results using long-term default data).

In short, the market appears to be pricing in a very benign default and recovery environment into investment grade CDS curves based on fundamentals.

[6] *Again we assume the variable recovery rate.*

Figure 7: Implied Default Probabilities for the IG Index Curve Relative to Long- and Short-Term Historical Default Rates

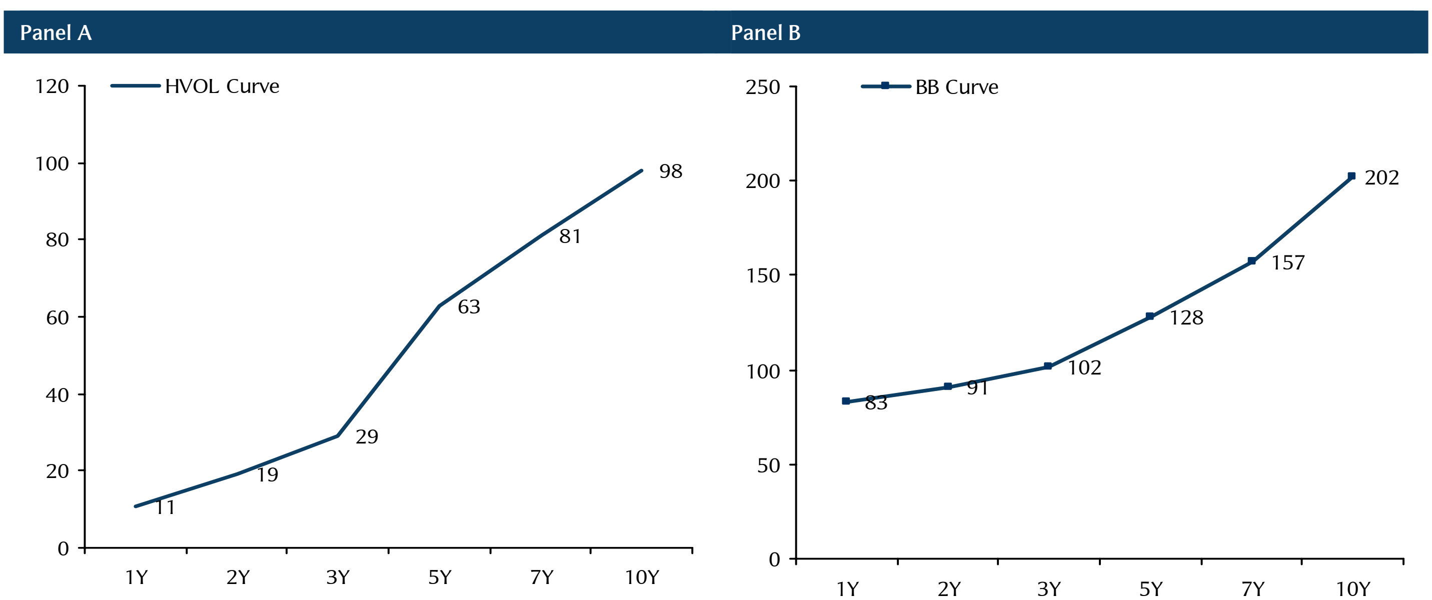


Source: Barclays Capital, S&P.

Extending the Analysis to Lower-Rated Credit Curves

We extended our analysis to triple and double B credit curves using the HVOL index credit curve and a composite BB index credit curve (Figure 8).[7] Similarly, we computed implied default probabilities across the curve based on our variable recovery rate assumptions and calculated the proportion of expected losses attributable to long- and short-term historical default rates for BBB and BB rated credit from S&P.

Figure 8: HVOL6 and BB Index Credit Curves Based on Intrinsics



[7] *Given the concentration of autos in the CDX.XO.6 index, we decided to use a more broad-based BB index curve based on MarkIT Partners data.*

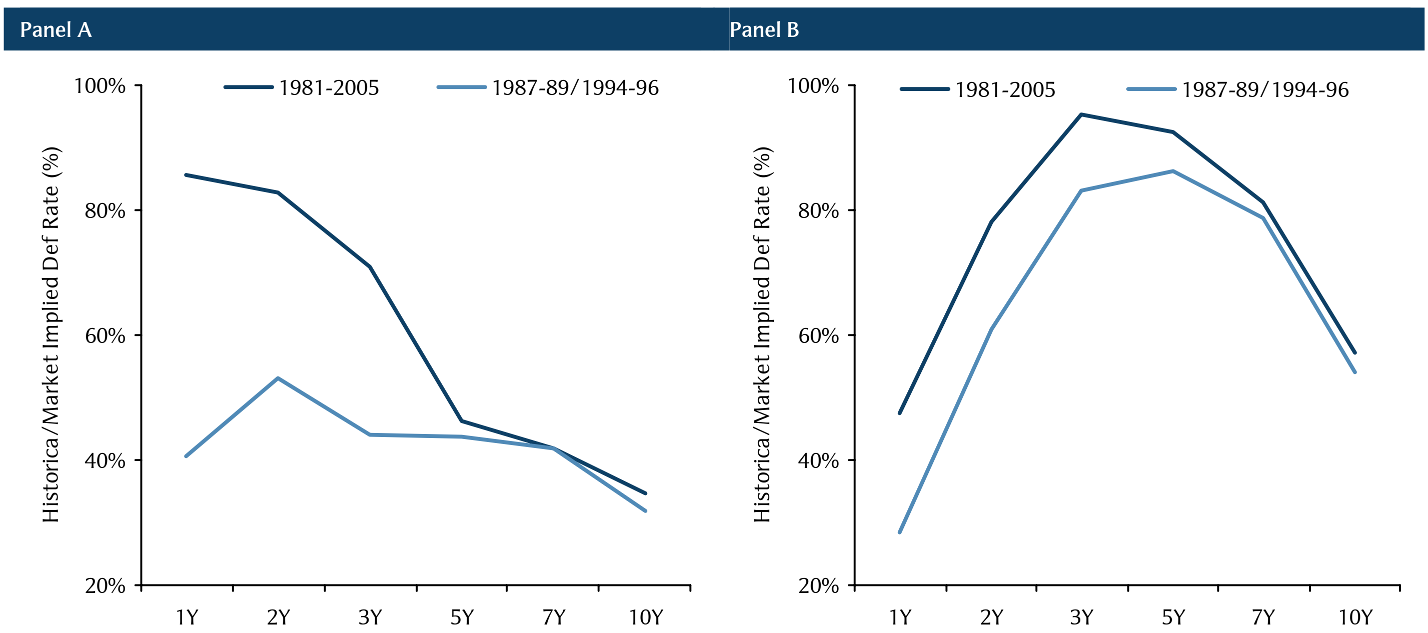
Source: Barclays Capital.

Figure 9 – Panel A and Panel B depict the results for the BBB- and BB-rated credit curves, respectively. We summarize the results for both curves using the blended average default rates from 1987-89 and 1994-96, which are more representative, in our view:

- **BBB-Rated Curves:** These results are very similar to those for investment grade curves. The proportion of expected losses attributable to default risk is relatively flat from one to ten years, implying credit curves are steep from a fundamental perspective.
- **BB-Rated Curves:** Results here differ notably. The proportion of expected losses attributable to default risk is significantly upward sloping out to year three, implying that the short end of the curve is fairly valued or flat (potentially reflecting jump-to-default hedging that is not justified at the macro level based on fundamentals). The slope is still slightly upward sloping from three to five years, but after that it becomes downward sloping, particularly from years seven to ten. This implies that seven-to-ten year curves are steep.

In sum, the market is pricing in a rather sanguine default and recovery environment into BBB-rated CDS curves based on fundamentals. In contrast, the market seems to be pricing in a nastier default and recovery environment into BB-rated, short-dated CDS curves.

Figure 9: Implied Default Probabilities for the HVOL (Panel A) and BB (Panel B) Index Curves Relative to Long- and Short-Term Historical Default Rates



Source: Barclays Capital.

Concluding Remarks: Fundamentals Are One Piece of the Puzzle

Our fundamental analysis implies CDS credit curves are flat (with the exception of short-dated, BB-rated curves). Fundamental analysis is an important component in assessing value across credit curves, but it is not the only one – particularly for longer tenors, given that holding periods for many investors are generally less one or two years. Technical and relative value considerations must also be considered. On the one hand, there is interplay between fundamentals and technicals. More recently, bespoke CDO issuance in longer tenors has been driven not only by investors reaching for absolute yield levels, but also added compensation for historical default risk in seven- and ten-year credit spreads relative to five-years, highlighted above.

On the other hand, technicals can influence value across credit curves irrespective of fundamentals. For example, the steepness in BBB- and BB-rated five- to ten-year credit curves is driven by attractive carry and roll-down characteristics. 5s7s and 5s10s duration-neutral curve steepeners offer positive carry and positive roll-down in the five-year relative to the seven- and ten-year for many BBB and BB credits – although the attractiveness of these attributes has lessened considerably. Similarly, seven- and ten-year maturities offer market participants cheaper protection per unit of duration than do shorter maturities. Investors need to assess which factors will be primary versus secondary drivers of credit curves over their investment horizon. We expect to reference this piece as a benchmark for more specific micro (index and single-name) curve trades.

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