PGIM FIXED INCOME

PERSPECTIVES

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A HEDGE AND A HOPE

THE EFFECTS OF CREDIT MIGRATION ON LIABILITY-DRIVEN INVESTMENT STRATEGIES (PART II)

Liability-driven investment (LDI) strategies are a good hedge for changes in the price of credit risk, but not such a good hedge for the '"events of credit risk"—rating downgrades and defaults.

Credit migration represents a fat, long-term, left-tail risk to a pension plan's funded status, while most standard asset allocation approaches are hardwired to a normal distribution. So is modern portfolio theory really a good framework for measuring and managing this risk?

In this paper we analyze the unusual risk characteristics of credit migration, explore what this means for pension asset allocation strategies, and suggest ways plan sponsors can employ LDI to both help meet short-term hedging objectives, while still combating the long-term tail risk of credit migration.

THE PRICE OF CREDIT RISK

Many plan sponsors use LDI strategies to reduce the volatility of their pension plan. One of the principal drivers of that volatility is movements in the high-quality, AA-rated corporate bond market spread used in the liability discount rate.

Changes in that corporate bond market spread represent changes in the price of credit risk—the extra expected return demanded by bond investors to bear credit risk. If the LDI portfolio is aligned with both the liability duration and discount rate spread quality, it can protect the plan's funded status, not just from changes in interest rates, but also from changes in this price of credit risk.

THE EVENTS OF CREDIT RISK

If market spread is the price of risk, then credit downgrades and defaults are the events of risk—the downside risk that corporate bond investors are paid to take.

In our previous paper, "A Tale of Two Recessions," we explained how pension liability discount rates are not subject to downgrade risk and showed that actual downgrades tend to bunch, or cluster, following a recession. Downgrade risk exhibits fatter tails than a normal distribution, which means that really bad outcomes happen more often than expected.

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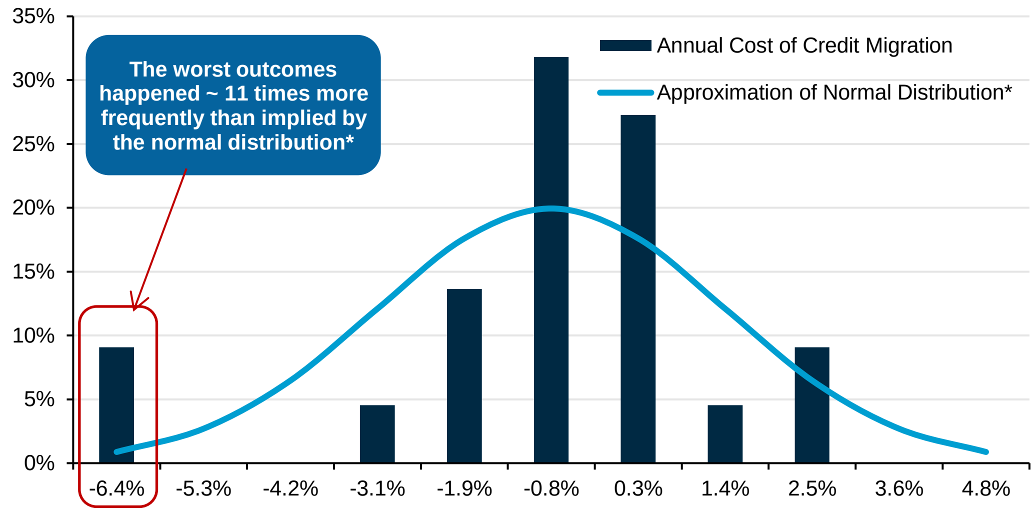
CREDIT MIGRATION IS NOT A NORMAL DISTRIBUTION

The chart below shows the distribution of the one-year estimated cost of credit migration[1] of the Barclays U.S. Corporate AA 10+ Year Index between 1993 and 2015 compared to the normal distribution. As you can see, the worst negative migration outcomes occurred almost 11 times more frequently than implied by the normal distribution.

ESTIMATED ANNUAL COST OF CREDIT MIGRATION

Barclays U.S. Corporate AA 10+ Year Index

November 1993 to December 2015



Standard Deviation:	-2	-1	Mean	+1	+2

Sources: Barclays POINT and PGIM Fixed Income as of December 31, 2015.
** Normal distribution with same mean and standard deviation as the annual estimated cost of credit migration.*

This result has two important implications for a pension plan's investment strategy. First, while LDI is a good hedge against changes in interest rates and changes in the price of credit risk, it is a poor hedge against the events of credit risk. Second, although most approaches to asset allocation focus on standard deviation as the measure of risk, downgrade risk does not fit that framework well.

WHAT LIES BEYOND?

LDI approaches are often selected on the basis of models that focus on a single-period optimization that assumes a normal distribution of credit risk. In this framework, one standard deviation is just as good as two or three. For example, reducing the expected tracking error (one standard deviation) between plan assets and liabilities appears to be the objective of many "hibernation" strategies.

> Credit migration is not a continual attrition—the worst outcomes are sporadic, but can be significant.

However, the fat downside tail that lies beyond two standard deviations for credit asset classes should give sponsors pause. If the idea of hibernation is to run the pension plan on their balance sheet over several decades, we believe credit stress scenarios should be part of the LDI discussion.

THE TRADE-OFF BETWEEN SHORT-TERM AND LONG-TERM SURPLUS PROTECTION

This situation presents plan sponsors with a difficult trade-off—they can get short-term protection from a fluctuating actuarial discount rate only if they also accept exposure to the longer-term (fat) tail risk of downgrades.

[1] This estimate of the cost of credit migration follows the approach outlined in the section 'Historical cost of credit migration' on page 4.

For sponsors who choose to target the short-term reduction in volatility provided by LDI strategies, it is important to understand and estimate the cost of credit migration and then include it in their strategic asset allocation studies. The logical next step is to identify strategies to reduce or replace this cost.

ESTIMATING THE COST OF CREDIT MIGRATION

In this section, we outline an approach for estimating the expected cost of credit migration using the Barclays U.S. Corporate AA 10+ Year Index and then contrast that expectation against the historical cost.

THE EXPECTED COST OF CREDIT MIGRATION

To estimate the expected cost of credit migration, we assume that future downgrade rates will match the historical experience (as illustrated in the chart below) and that, when a bond is downgraded, its spread widens in line with the current spread term structure.[2]

This approach has the benefit of using currently observable market prices. However, it risks underestimating the future cost of credit migration because, inevitably, markets will undergo periods of stress and above-average downgrades, and market spreads may well be wider than they are today.

MOODY'S AVERAGE ANNUAL CREDIT RATING MIGRATION RATES

October 1993 to December 2015

		Ending Rating							
		AAA	AA	A	BBB	BB	B	CCC	D
Beginning Rating	AAA	**93%**	**6%**	0%	0%	0%	0%	0%	0%
	AA	**1%**	**91%**	**7%**	**1%**	0%	0%	0%	0%
	A	0%	**3%**	**91%**	**6%**	**0%**	0%	0%	0%
	BBB	0%	0%	**4%**	**91%**	**4%**	**1%**	0%	0%
	BB	0%	0%	0%	**8%**	**83%**	**8%**	**1%**	**1%**
	B	0%	0%	0%	0%	**5%**	**84%**	**7%**	**3%**
	CCC	0%	0%	0%	0%	0%	**4%**	**68%**	**27%**
	D	0%	0%	0%	0%	0%	0%	0%	**100%**

Sources: Moody's and PGIM Fixed Income. Shown for illustrative purposes only.

Using this approach, the expected annual cost of credit migration is approximately 37 bps based on spread data for the Barclays U.S. Corporate AA 10+ Year Index as of December 2015. Given the current option-adjusted spread (OAS) on this index of 150 bps, we would expect to lose about 25%[3] of that OAS due to credit migration.

But is this estimate robust? It might also be useful to compare this point-in-time estimate with an estimate of how much actual return has been lost to credit migration in the past.

[2] *For each beginning rating, i, and each ending rating, j, the formula for the expected cost of credit migration is:*

$$\sum_{x=i}^{beginning} \sum_{y=j}^{ending} (\text{Migration Rate}_{x,y} * \text{Quality Spread}_{x,y} * \text{Index Duration})$$

Where Migration Rate$_{x,y}$ is the migration rate for bonds with beginning period rating x and ending period rating y and Where Quality Spread$_{x,y}$ is the spread change assumption for a bond moving from rating x to rating y.

[3] *Estimated Cost of Credit Migration / Average OAS = 37 bps / 150 bps = 25%.*

THE HISTORICAL COST OF CREDIT MIGRATION

To estimate the historical cost over a long period, we compared the realized historical excess return of the Barclays U.S. Corporate AA 10+ Year Index (which includes downgrades) versus a naïve estimate of the excess return on this index with downgrades stripped out. This naïve model is our proxy of the liability—because liabilities cannot be downgraded.

To remove the effect of downgrades, we only considered the index's average spread, and any changes in that spread, during the period. Our formula is:

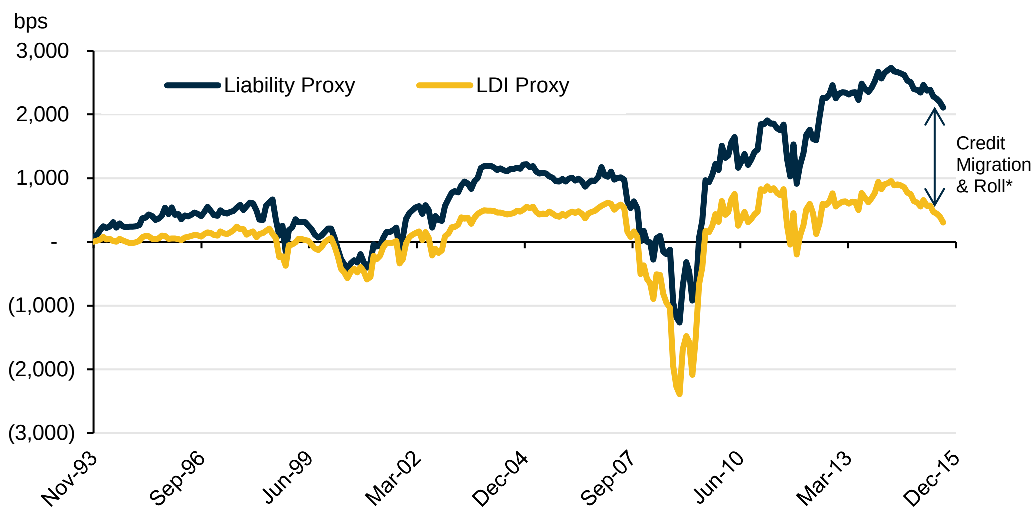
OAS – ∆OAS * Spread Duration + ½ (∆OAS)² * Convexity

(Spread duration would be the whole story, however, given the long dated nature of the index, including a convexity term in this estimate gives a better approximation of the expected excess return.)

The chart below compares this naïve expected excess return (dark blue line) to the actual excess return achieved by the Barclays U.S. Corporate AA 10+ Year Index from 1993 to 2015 (light blue line). The difference between these two return series represents our estimate of the historical cost of migration (and monthly roll down[4]).

ESTIMATED HISTORICAL COST OF CREDIT MIGRATION

November 1993 to December 2015



Sources: Barclays POINT (Barclays U.S. Corporate AA 10+ Year Index) and PGIM Fixed Income as of December 31, 2015.
** Credit Migration + Roll Down ≈ Excess Return – (OAS – ∆OAS * Duration + 1/2 * Convexity * ∆OAS^2)*

Using the historical approach, the average annual cost of credit migration and roll down is 83 bps, while the average OAS during this period was 111 bps. This means that, without any mitigating strategies, we estimate that 74%[5] of the expected average OAS was lost due to credit migration during this period.

MITIGATING THE RISK OF CREDIT MIGRATION

Comparing these two approaches, we observe a reasonably significant difference between the expected annual migration cost (37 bps or 25% of the current OAS) versus the historical migration cost (83 bps or 74% of the average OAS). This difference highlights the impact of bunched downgrade experiences following the two most recent recessions in 2001 and 2008/2009. It also contrasts the

[4] *Because the spread curve typically slopes upward, new issues entering the Barclays U.S. Corporate AA 10+ Year Index usually have wider spreads than bonds that leave the index once their maturity is too short for inclusion. The performance due to this typical spread tightening is referred to as roll down. Since this effect is generally positive, we underestimate the cost of credit migration. Using our simple approach for estimating the cost of credit migration, it is not possible to split out the roll down effect.*

[5] *Estimated Cost of Credit Migration / Average OAS = 83 bps / 111 bps = 74%.*

smooth expectations of migration cost with the lumpiness of the realized historical experience. In happy times the market underestimates future losses from credit migration.

In practice, the actual realized cost of credit migration will be a function of the severity and the nature of the recessions experienced in the future. Both of these factors are difficult to predict, pointing to the need to explicitly consider the uncertainty of credit migration assumptions in asset allocation decisions. As we pointed out in our previous paper, "A Tale of Two Recessions," the last two U.S. recessions had different patterns of credit migration and precipitated downgrades from different industry sectors and credit quality cohorts.

HERE'S HOPING…

Additionally, plan sponsors should consider strategies to mitigate this lop-sided risk. One option is to diversify the LDI portfolio with assets that offer greater structural protection against downgrades than corporate bonds—for example, high quality structured products.

Another option is to employ active management within the LDI portfolio and generate alpha to replace credit migration costs. Given the opportunity set currently available in the fixed income markets, we believe that it should be achievable to replace the credit migration cost of between 37 bps to 83 bps from alpha.

The analysis presented in this paper uses the excess returns of the Barclays U.S. Corporate AA 10+ Year Index. Naturally, the index bears the brunt of every downgrade, while the liability suffers no downgrades. To mitigate this tail risk, LDI managers need to focus on understanding which sectors and issuers could be downgraded. This points to the need for alpha generation driven by fundamental research and security and sector selection.

By choosing an alpha generation strategy that is aligned with the goal of avoiding downgrades, hopefully the alpha will be produced at the same time that downgrades occur, offsetting, at least partially, the cost of credit migration. But keep in mind, this is a hope rather than a hedge.

CONCLUSION

LDI is not just a hedge. It's a hedge and a hope. You get a good hedge against movements in interest rates and credit spreads. And you hope that the cost of credit migration is not too bad. But hope is not a strategy. Instead, we believe plan sponsors should try to generate sufficient alpha to replace the cost of credit migration, align that alpha generation with the goal of avoiding downgrades (fundamental credit research) and diversify the LDI portfolio with assets which offer greater structural protection from downgrades (high quality structured products).

NOTICE: IMPORTANT INFORMATION

Source(s) of data (unless otherwise noted): PGIM Fixed Income as of November 2018.

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