Endgame portfolios: making the most of CDI

Introduction: the CDI debate

The benefits of cashflow driven investment (CDI) are slightly controversial. Some believe it is a powerful risk management strategy for DB schemes nearing their endgames, whereas others are more sceptical given that it may compromise multi-asset diversification.

One of the issues is that CDI is a buzzword, but is poorly defined. The broadest definition of CDI is any strategy with a heavy tilt towards corporate bonds and other debt instruments, rather than using a diversified growth approach that only recognises the benefits of such assets as diversifiers. In its narrowest sense, CDI involves 'full matching', i.e. closely lining up contractual cashflows from corporate bonds and other debt with expected liability payments in a similar manner to an insurance company. What is the right balance for a DB scheme nearing its endgame? Any movement away from full cashflow matching is a step towards rejecting CDI, but we should be careful to avoid 'slippery slope' arguments.

The aim of this paper is not to debate whether a credit-heavy strategy in the endgame makes sense – overall, we believe it does; our case for DB schemes tilting towards credit in the endgame was made a few years ago in our paper 'Endgame portfolios and the role of credit'.[1] Rather, we ask if full cashflow matching is the right answer and, if not, how credit portfolios ought to be structured to maximise efficiency. However, in the appendix we have briefly outlined the basic arguments for and against a CDI approach.

Our paper looks at what we believe is the best way to structure credit portfolios[2] in the endgame. On the return side, this involves investigating whether a 'credit term premium' exists. On the risk side, we look at whether taking on some reinvestment risk may make sense given that the returns on shorter-dated credit are less impacted by downgrades and may be a powerful diversifier for returns on cashflow-matching credit.

Our main conclusion is that reducing downgrade risk by taking on a degree of re-investment risk is often justified; combining longer-dated credit with shorter-dated credit can improve overall efficiency compared with a full matching approach.[3]

Although we argue against full cashflow matching, we also discuss how allowing for longevity uncertainty in the liability cashflows doesn't necessarily make matching less attractive, although it may warrant consideration of longevity hedging solutions.

John Southall
Head of Solutions Research

CDI can be a controversial topic.

We believe a bias towards credit makes sense in the endgame, but investigate how CDI portfolios should be structured to maximise efficiency.

We find mixing shorter-and longer-dated credits can improve outcomes.

However, in defence of matching we argue that uncertainty in liability cashflows may be less detrimental to CDI than commonly argued.

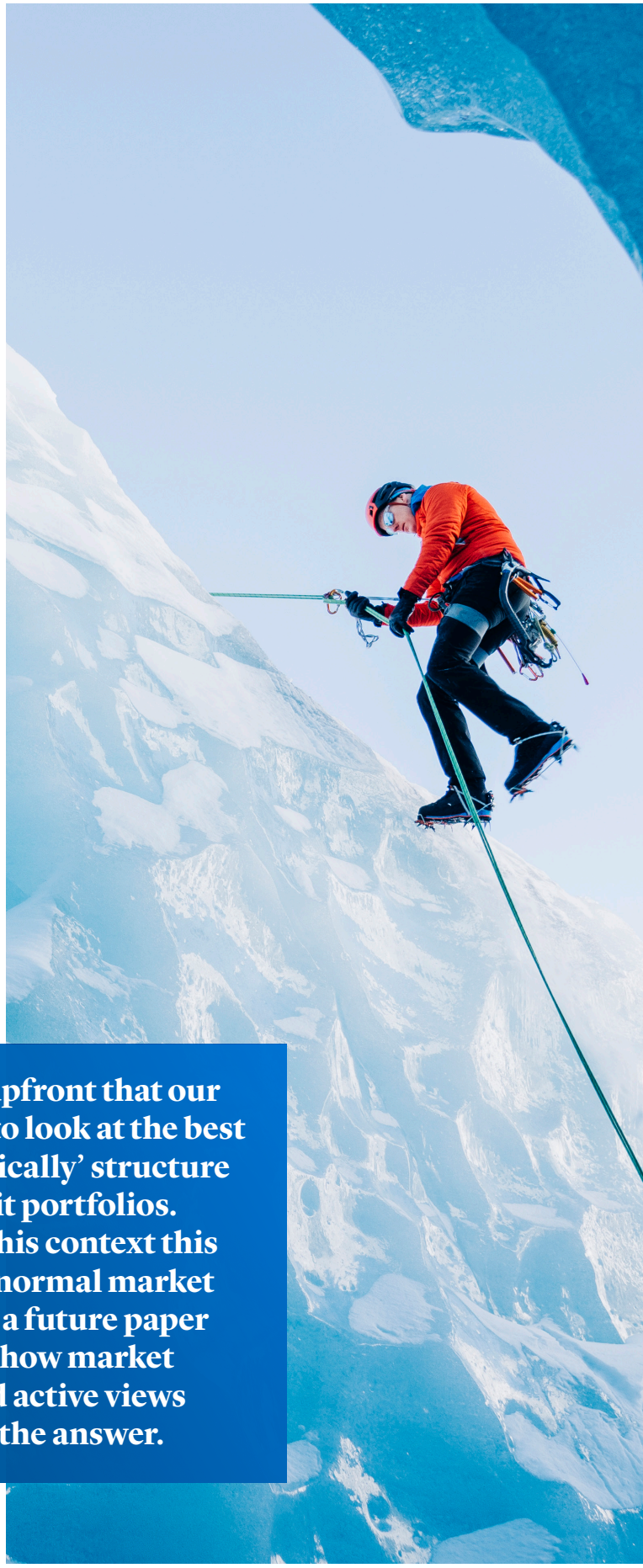
1. See our paper here
2. Credit default swaps (CDS) may also form a component of CDI strategies with index CDS offering liquidity benefits, for example. For simplicity we have restricted our analysis to corporate bonds in this paper.
3. An excellent blog by Andy Linz of LCP reaches similar conclusions, see here

LGIM

Paper structure

The remainder of this paper is split into five parts:

- In Part I, we introduce the balancing act involved in managing credit risks, and how CDI fundamentally differs from LDI.
- In Part II, we explain the key credit risks likely to matter to an endgame investor: reinvestment risk and downgrade and default risk. We combine them in a model to understand overall credit risk from the perspective of a DB pension scheme.
- In Part III we look at expected returns. Combining with Part II, we conclude that diversifying could improve overall efficiency versus a pure cashflow matching approach.
- In Part IV, we look at the potential influence (or non-influence) of longevity uncertainty, and other uncorrelated risks, on the CDI strategy. We are keen to emphasise that whilst 100% cashflow matching isn't necessarily the right answer, it should remain a key component of endgame strategies. The aim of Part IV is to explain that some common and sensible-sounding arguments made against matching do not necessarily stand up to scrutiny.
- Finally, in Part V, we finish with some practical aspects and FAQs. The basic principle explained in this paper means that diversifying into a range of shorter-dated instruments may help schemes pay pensions.



We highlight upfront that our analysis aims to look at the best way to 'strategically' structure endgame credit portfolios. Effectively in this context this means 'under normal market conditions'. In a future paper we investigate how market conditions and active views may influence the answer.

Part I: A balancing act

Cashflow matching involves lining up expected asset cashflows with expected liability cashflows. This assumes bonds will be held to maturity. This is a reasonable starting point for a CDI strategy that reduces reinvestment and early-sale risk.

If investing purely in gilts, there is virtually no uncertainty in asset cashflows[4] and cashflow matching minimises risk relative to the liabilities. Broadly speaking, the expected return is the same no matter how you structure your portfolio,[5] but with cashflow matching you can avoid both reinvestment risk and early-sale risk. However, as we shall see, this approach to cashflow matching isn't necessarily ideal when it comes to corporate bonds.

Unlike gilts, cashflows from corporate bonds are uncertain because corporate bonds suffer from 'downgrade and default' (D&D) risk. Default risk reflects a chance that the bond doesn't pay the full contractual cashflows due to company insolvency. Downgrade risk is slightly more complicated and occurs if investors do not allow sustained degradation in the quality (or average credit rating) of their portfolio over time. This clearly reduces default risk but every rebalance from lower quality, higher yielding bonds to higher quality, lower yielding bonds reduces the cashflows the investor is promised. The longer the duration of the bond, the greater the downgrade loss. As a simple example, exchanging a zero-coupon bond for one yielding 1% less leads to a cashflow at maturity that is c.10% lower if the term is 10 years but c.18% lower if the term is 20 years.

When attempting to meet a liability cashflow there is a balancing act: rolling over shorter-dated bonds increases reinvestment risk but reduces downgrade losses. Figure 1 outlines the different risks these strategies may face in aiming to meet liability cashflows.

Pure cashflow matching makes sense if investing only in risk-free instruments and no active views are taken.

For credit, there is a balancing act between reinvestment and downgrade risks.

4. LPI and longevity risk complicate matters for liabilities
5. Assuming no active views on pricing (i.e. a market-consistent view is taken so you assume no term premium in rates and no inflation risk premium) and ignore swap spread
6. Other than due to uncertainty in the liability cashflows.
7. If the aim was simply to minimise risk one might eschew corporate bonds entirely and only use gilts and swaps

Of course, deciding how to invest isn't purely about risk.[7] Expected returns must be taken into consideration. Our analysis in part III suggests that rolling shorter-dated bonds has a similar expected return to holding a longer-dated bond, provided the investor controls for rating over the investment horizon. This means that by diversifying with shorter-dated credit of a similar credit rating one could achieve a very similar expected return, but with lower risk. However, we recognise that market conditions could influence this decision.

Figure 1: Risk components of short and long dated bonds for meeting liability cashflows

Roll shorter-dated bonds	Use long-dated bonds with contractual cashflows aligned with liabilities
Same downgrade probability (if strategy is rebalanced by rating)	
Lower downgrade losses	Higher downgrade losses
Same default risk (if strategy is rebalanced by rating)	
Higher reinvestment risk	Lower reinvestment risk
Ultimate return depends not only on current spreads but future spread levels.	'Locks in' a spread at outset. Investors may wish to consider if this is currently 'high' or 'low'.

Part II: Quantifying credit risks

Reinvestment risk

Cashflow matching credit benefits from minimal reinvestment risk. The rolling of short-dated credit, in contrast, can lead to significant reinvestment risk.

This may not be as great as you think, however. There is strong empirical evidence that credit spreads mean revert (see Figure 2). This makes sense, given they should be relatively range-bound, i.e. we would not expect them either to collapse to zero or explode towards infinity.

Indeed, history suggests that mean reversion is strong enough that the level of spreads at any point in time has no predictive value for the level of spreads five years later, as you can see from Figure 3.

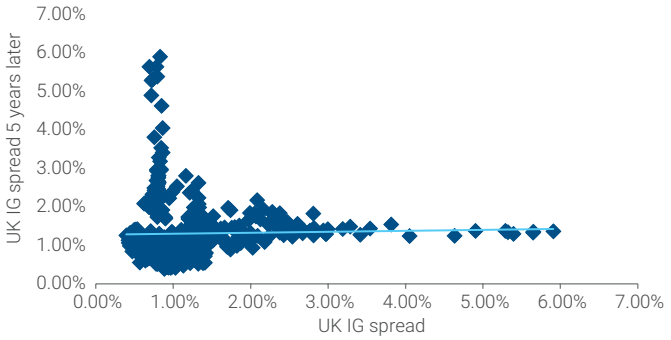
Figure 2: UK investment grade (IG) credit spread levels since 1980

Spreads are mean-reverting and range-bound

Source: Barclays Live, LGIM calculations at 30 June 2021.

Figure 3: UK IG spreads plotted against their value five years previously

Spread levels have no power to predict levels five years later



Source: LGIM calculations at 30 June 2021 based on the same data as for Figure 2.

This feature of spreads reduces credit reinvestment risk, i.e. the risk arising from investing at unknown spread levels in the future. If you reinvest enough times, you can be increasingly confident you will earn an average spread.

However, in our model we are careful not to understate the long-term risks of rolling credit. Although there is strong evidence that spreads mean should revert, exactly what they mean revert towards – the long-term average – is unknown. This means that the long-term annualised return[8] from rolling short-dated credit is not a sure thing over the long run.[9]

Rebalancing by rating

For simplicity, we assume the strategy is regularly rebalanced by rating. In practice CDI managers do not always rebalance in this way. However, the story our results would tell would be similar.[10]

Downgrade and default (D&D) risk

We now look at D&D risk, the other key component of risk in a CDI strategy.

Risk is a multi-faceted concept but in general arises as a combination of the probability of something undesirable happening and the magnitude of the impact should it occur. For the same credit rating, the probability of a downgrade is the same for a longer-dated bond as for a shorter-dated bond, but the loss on the longer-dated bond is higher. Cashflow matching credit has lower reinvestment risk than rolling short-dated credit but suffers higher downgrade losses should they occur.

Our models indicate that downgrade risk is broadly proportional to the duration of the credit assets (all else equal). This makes sense for a portfolio rebalanced by rating given that default risk is a relatively small component of D&D risk, and the impact of downgrade due to a fall in spread is roughly proportional to duration.

A powerful diversifier

Long-term returns on short-dated credit and cashflow-matching credit can be negatively correlated. This may sound strange, given both are credit. To understand how this is possible, note that in the long run all that matters for cashflow-matching credit are downgrades and defaults. If spreads widen the risk of these goes up, which is bad for cashflow-matching credit returns experienced. However, rolling credit is likely to benefit in this scenario: future returns are boosted because the strategy can reinvest at higher spreads. The converse applies should spreads narrow. This can lead to a negative correlation in returns and makes rolling short-dated credit a particularly powerful diversifier of cashflow-matching credit.

8. Over cash
9. In capturing this 'parameter uncertainty', we assume 90% confidence in our model that the level it ought to revert to lies between 0.9% and 1.8% pa.
10. We assume the CDI portfolio is rebalanced by rating. In general trustees are unlikely to allow sustained deterioration in the quality of their credit portfolio that could occur over long time periods. This may ultimately require some degree of rebalancing of the strategy by rating (notwithstanding that active managers will avoid forced sales), so it makes sense from that angle. One complicating feature of CDI in practice may be that whilst there is downward rating drift in credit in general, it could be that lower rated credits are rolling off before higher rated ones (as an example). This would offset this downward pressure on ratings and could, in effect, lead to the expectation of a stable credit rating over time, for the strategy without any need to sell downgraded bonds. However, downgrade risk isn't about what you expect to happen, but the uncertainty around it. Downgrade risk still exists and will be greater for longer dated bonds because if there are more downgrades than expected this will require relatively more rebalancing (or else that a riskier portfolio is held following the downgrade).

Credit spreads are strongly mean-reverting, which should reduce reinvestment risk, but some uncertainty remains as to the long-run average spread.

For our purposes and comparisons, assuming the CDI strategy is rebalanced by rating is reasonable.

Downgrade impact increases with the duration of corporate bonds.

For long horizons, there is a low or negative correlation between returns on cashflow matching credit and rolling short-dated credit.

Putting it together

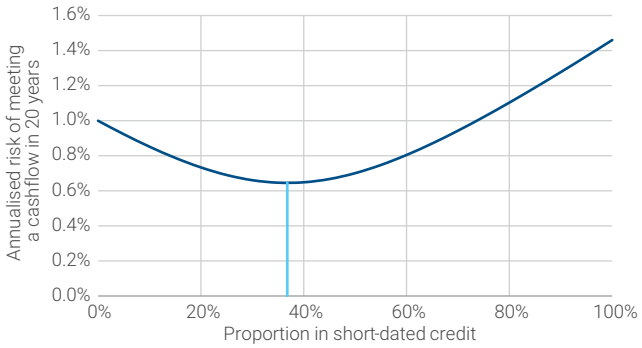
As an illustration, Figure 4 shows, based on our credit models, the potential benefits of mixing these two different strategies for meeting a liability cashflow in 20 years' time. The models allow for all the aspects discussed above.

As you can see, our models suggest that the sweet spot for minimising overall credit risk involves a substantial allocation to short-dated credit. The amount to diversify with short-dated credit depends on the time horizon. The longer the horizon, the higher a proportion to hold in short-dated credit. This is because cashflow-matching credit becomes relatively risky (compared with short-dated credit) the longer dated it is, due to the increased impact from downgrades. Figure 5 shows how the allocation to short-dated credit varies with the time until the cashflow. Of course, when the duration is short there is little distinction between cashflow-matching credit and short-dated credit.

These calculations only look at risk, but clearly expected returns also matter. If the expected return over gilts of this strategy is the same, then mixing with short-dated credit should be a better way of meeting cashflows. But is this true? In the next section we investigate.

Figure 4: Overall credit risk from mixing credit strategies

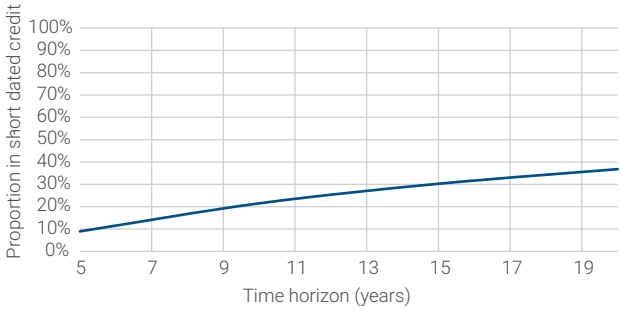
Diversifying cashflow matching credit with rolling short-dated credit can reduce risk



Source: LGIM calculations at 30 June 2021. Risk here is annualised volatility of cumulative returns over a 20 year horizon (when the liability cashflow is assumed due).

Figure 5: The right mix depends on the time horizon

The proportion in short-dated credit that minimises overall credit risk increases with the time horizon



Source: LGIM calculations at 30 June 2021.

Part III: Expected returns

We are interested in the expected returns of the strategies we considered earlier. Does rolling shorter-dated credit have a lower expected return than a rebalancing longer-dated credit of the same rating?

Term premium

To investigate we need to delve into the world of 'term premia'. A term premium is the difference between what you get for locking up your money in 'risk-free' instruments (usually developed market sovereign bonds) for an extended period versus what you would get if you rolled over short-term instruments (or cash) for the same length of time. For example, for gilts the term premium over 10 years would be the difference between the 10-year spot yield today minus the return you would expect for sitting in cash for the next 10 years instead.

Many academic papers and studies now point to no term premium on developed market government bonds[11] but is the same true for credit?

Credit term premium

This is trickier and needs more care to define. We're not interested in the risk-free component[12] – that's the 'regular' term premium above. Rather, we're interested in the excess returns, i.e. returns over risk free, that you expect to earn as compensation for taking on credit risk. How does investing in long-dated corporate credit compare with rolling shorter-dated credit?

When making this comparison, it's important to control for credit quality because the quality of a 'buy-and-hold' strategy is likely to degrade over time. We need to assume the long-dated strategy is rebalanced to maintain the same rating throughout the investment horizon to make a fair comparison. Accordingly, our definition for a credit term premium is the difference in expected returns of the following two numbers:

The sweet spot for minimising overall credit risk involves a substantial allocation to short-dated credit.

To understand the merits of different investment strategies, assessing expected returns is crucial.

In defining a credit term premium, it is crucial to control for credit quality.

(1) The expected excess return (relative to risk-free bonds) on a corporate bond that matures at the end of the horizon and is rebalanced by rating (so if it is downgraded, then the bond is sold and replaced with a higher quality bond of identical maturity).

(2) The expected excess return (relative to cash) on rolling short-dated credit of the same rating, over the same horizon.

A reasonable estimate

Our approach was to examine the following two components:

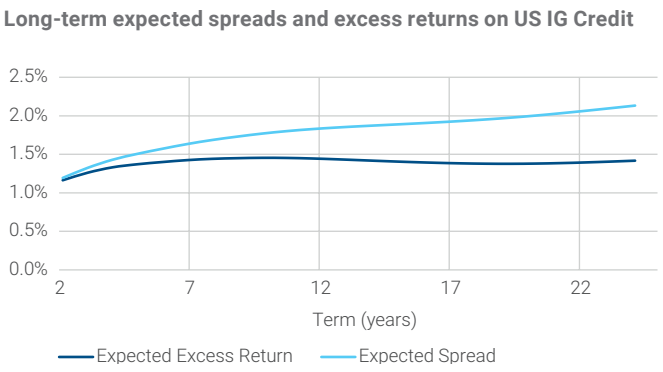
- On average, what do credit spread curves by rating look like?
- On average, what are the transitions between credit ratings each year?

Given these two ingredients, we can estimate the annual change in market value of a promised cashflow. There's upward pressure simply due to the cashflow getting closer (it's discounted by one less year) and typically also from spreads being lower at shorter maturities. These generate what are called 'carry' and 'roll-down' returns respectively. It's the roll-down aspect that leads to the possibility of a credit term premium.

However, we must not neglect transitions; there's downward pressure on returns from a tendency towards downgrades and higher spreads. And, crucially, the impact of downgrades is bigger the longer dated the cashflow is. Quantifying these 'pressures' is where a model can help. Figure 6 shows our results for investment-grade US credit. These calculations are based on US curves[13] from Thomson Reuters covering the period February 2007 to June 2021, typical splits[14] of IG credit by rating over the same period and long-term transition matrices from Moody's.

The calculation assumes the average credit curve is static, allowing us to calculate average carry and roll-down returns. It also assumes transitions occur in line with their long-term average each year, allowing us (in combination with the spread data) to calculate downgrade and default impacts.

Figure 6: The absence of a credit term premium



Source: Thompson Reuters, Moody's, LGIM calculations at 30 June 2021. Past performance is not a guide to the future. Assumptions, opinions and estimates are provided for illustrative purposes only. There is no guarantee that any forecasts made will come to pass.

Analysis

As can be seen in Figure 6, other than a modest upward slope at low terms, expected excess returns are relatively flat, consistent with no credit term premium. There are two reasons for this potentially counter-intuitive result. First, although the credit term structure is sometimes steep, it is not as steep once you average over periods that include downturns when the spread curve can invert. Second, the return on longer-dated credit is impacted more by downgrades.

There are other reasons to suspect the credit term premium should be zero:

- Most academic papers and studies now point to no term premium on developed market government bonds.[15] Conceptually, it would be strange to allow for a credit term premium whilst having no term premium on rates.
- We suspect strong institutional demand for long-dated credit (from insurers and pension funds) could be suppressing long-dated credit spreads, particularly in the UK.

Our analysis suggests there is at best a modest credit term premium at low durations. On average, higher spreads at longer durations only just compensate for larger downgrade losses.

The absence of a credit term premium allows us to focus on risk in devising an efficient strategy.

11. See 'The Term Premium Conundrum,' Neuberger Berman, March 2019
12. We assume LDI is used, if necessary, so that all rates and inflation risks are hedged
13. We choose to focus on the US for greater consistency with transition matrices and because it is a large market, so curves are likely to be more reliable
14. The key result – that there appears to be no credit term premium - is not sensitive to our exact assumptions on the split of IG credit by rating. Purely for illustration we assumed a 10%/30%/30%/30% split across AAA/AA/A/BBB.
15. See 'The Term Premium Conundrum,' Neuberger Berman, March 2019.

Factoring in liability hedging

For the vast majority of DB pension schemes, their CDI portfolios form part of their liability hedge and heavily interact with the LDI portfolio. As such, one has to factor in the return implications of differing credit allocations on the LDI portfolio. We have briefly summarised some of the key considerations below:

- Funding cost: Capital allocated to longer-dated investment grade credit can be used to reduce leverage within the LDI portfolio. Therefore one has to consider the cost of leverage (for example the repo rate) when making investment decisions.

- Hedging foreign currency and interest rate exposure: There are many benefits to investing in overseas bonds for CDI investors. Most investors look to hedge the overseas currency exposure and interest rate exposure of these investments. This can lead to a pick up or detract from return depending on z-spread and cross currency basis levels.

- Collateral requirements: In line with above, decisions made about corporate bond allocations also effect the derivatives used by a pension scheme. This has a resulting impact on the amount of collateral that is required and therefore may lead to an opportunity cost if it restricts how a scheme can invest.

The above factors vary with market conditions and by scheme but can impact on the relative attractiveness of different types of credit.

Overall, in the light of our analysis, strategically we do not generally expect a higher return on rebalanced longer-dated credit than rolling shorter-dated credit of the same rating. However, unusual market conditions could lead to a good reason to deviate from this neutral stance. The upshot is that a focus on risk is enough to decide which CDI strategy to adopt out of the options we considered

Part IV: The influence of longevity uncertainty (and other uncorrelated risks)

This paper argues that 100% cashflow matching is unlikely to be the right answer, even though we believe it should form a key component of endgame strategies. However, there are other arguments against cashflow matching that are less fair. Indeed, debates on the merits of CDI often include a mention of longevity uncertainty. Common claims regarding the influence of longevity risk include:

(1) Attempting to cashflow match is pointless in the presence of longevity risk.

(2) Unhedged longevity risk encourages investment risk taking as a 'buffer' against longevity risk.

Both claims are dubious.[16] The second claim usually stems from the observation that the impact on overall risk depends on whether the scheme is already exposed to longevity risk. A simple example is shown in Figure 7.

In the presence of longevity risk, the marginal impact from investment risk is reduced (here from 1.5% to 0.5%), thanks to diversification, whereas the impact on expected return would be unaffected. 'Bang for your buck' therefore appears greater (here tripled) in the presence of longevity risk.

Figure 7: The impact of uncorrelated longevity uncertainty

Volatility p.a.	Longevity risk	Investment risk	Overall risk	Marginal impact of investment risk
No longevity risk	0.0%	1.5%	1.5%	1.5%-0.0% = 1.5%
With longevity risk	2.0%	1.5%	$\sqrt{2.0\%^2+1.5\%^2}=2.5\%$	2.5% - 2.0% = 0.5%

Source: March 2022. For illustrative purposes only.

16. The message is slightly nuanced in that choosing not to hedge longevity risk is a rewarded form of risk-taking, which should be sized commensurately with other forms of rewarded risk-taking. It could be that an investor is acting inconsistently by not sizing the risks right but the answer to the problem is not to change risk appetite (which ought to be exogenous) but rather hedge more or less of longevity risk.
17. Maximisation of quadratic utility.
18. Please see here for a discussion.

The idea that uncorrelated uncertainty encourages taking more investment risk is questionable. Uncorrelated uncertainty does not necessarily affect the relative attractiveness of strategies.

However, it's important not to jump to conclusions. By itself, such a calculation can be misleading because of another very important factor at play: as overall risk increases, investors generally become less tolerant of further increases in overall risk. Under standard assumptions[17], disutility (unhappiness) caused by risk goes with the square of the volatility, which is called variance. This means that the higher volatility is already, the more an incremental increase in volatility hurts. In our example, volatility increasing from 1.5% to 2.5% is a smaller change than moving from 0.0% to 1.5%, but we can check that the increase in variance is the same either way. Indeed, here the increases in variance are $2.5\%^2 - 2.0\%^2$ and $1.5\%^2 - 0\%^2$, which both equal 0.0225%. The two effects (bang for buck but reduced tolerance for more risk) cancel out.

The first claim, that cashflow matching is pointless in the face of high longevity uncertainty, suffers from similar problems (even if it strengthens this paper's argument in favour of diversifying into shorter-dated credit). As a simple example, a 20-year cashflow that is equally likely to be £90 or £110 as determined by a coin toss would have the same PV01 (i.e. sensitivity of the present value to a 0.01% change in interest rates) as a certain cashflow of £100.

This is not to say that longevity risk has no influence at all on strategy. Provided the pricing is sensible, it may be worth looking to hedge some of the risk using longevity swaps or a buy-in could make sense.[18] Our analysis also ignores costs – we discuss these in the next section.

Part V: Practical aspects/FAQs

What about transaction costs?

Eagle-eyed readers may have noticed that our analysis ignored costs. There are a few competing factors when it comes to comparing short-and long-dated credit[19] making it challenging to estimate costs in general, given in Figure 8. On balance we don't think it is unreasonable to treat expected costs as similar for short and long-dated strategies. Consistent with my findings, my colleague James MacIntrye-Ure from our active credit team has written about how they prefer short-dated UK credit over longer-dated corporate bonds, which you can be read here.

Figure 8: a comparison of cost drivers

Short-dated credit	Long-dated credit
Must be rolled/reinvested multiple times over the investment horizon, incurring costs each time	In the absence of substantial downgrades and if contractual cashflows line up with liability cashflows should not require reinvestment or early sale.
Not rebalanced by rating as it is better to simply allow downgraded bonds to mature	Rebalanced by rating (if a sustained deterioration in credit quality isn't tolerated)
Relatively low transaction costs	Relatively high transaction costs
If there is an unexpected cashflow demand then unless it is required immediately, you may be able to just wait a short period until the bonds mature	A tightly matched strategy with relatively little liquidity faces a risk of forced sales if there are unexpected cashflow demands. Although we argued in Part IV that uncorrelated risks shouldn't take the shine off cashflow matching as much as you might think, there are potential disadvantages in terms of costs.

What's so special about short-dated credit?

For relatively low return targets we believe it is difficult to beat the risk efficiency of investment grade short-dated credit and this outweighs the diversification benefits of multi-asset diversification (which should be optimal at higher return targets). As Antti Ilmanen explains in his book [20] 'Expected Returns', short-dated credit bonds have given very attractive reward-risk ratios, particularly for high rated bonds. Levered arbitrageurs cannot remove this opportunity because of the financing rates they face.

In a liability driven context, the 'golden source' of the strong diversification between long-run returns on rolling short-dated credit and cashflow-matching credit is that a 'high-spread path' over the investment horizon is generally bad for the latter but good for the former. For simplicity we focused on investment grade UK credit in our model but the logic also applies to currency-hedged international credit, including emerging market hard currency debt. It can also work, albeit to a lesser extent, with:

19. We have focussed on corporate bonds but a further complication is that CDI strategies might also invest in credit default swaps, which are more liquid, as an alternative to corporate bonds.
20. 'Expected returns – an investor's guide to harvesting market rewards'. Antti Ilmanen, The Wiley Finance Series, 2011.

Cashflow matching isn't perfect, but don't throw the baby out with the bathwater.

- High yield bonds for the rolling strategy. For low duration instruments, the impact of downgrades (with an associated increase in spreads), is smaller, so credit quality may be less of a concern. We know of some schemes balancing high-rated long-dated credit with lower-rated shorter-dated credit.

- Private short-dated credit.

- Medium-dated credit: so long as the duration is shorter than for CDI there will still be a diversification benefit, although it will be weaker.

This is useful to bear in mind, particularly given that the public short-dated sterling IG universe is quite small. The 1-3Y non-gilt market is only around £100bn in size.

Of course long-dated credit is also has its supply challenges. The point of our analysis shows that schemes' opportunity sets can be expanded. Moving away from pure matching is no sin and can boost efficiency if done so in moderation.

In a crisis scenario, shouldn't we rely on active managers to judge how to rebalance between short and long-dated credit?

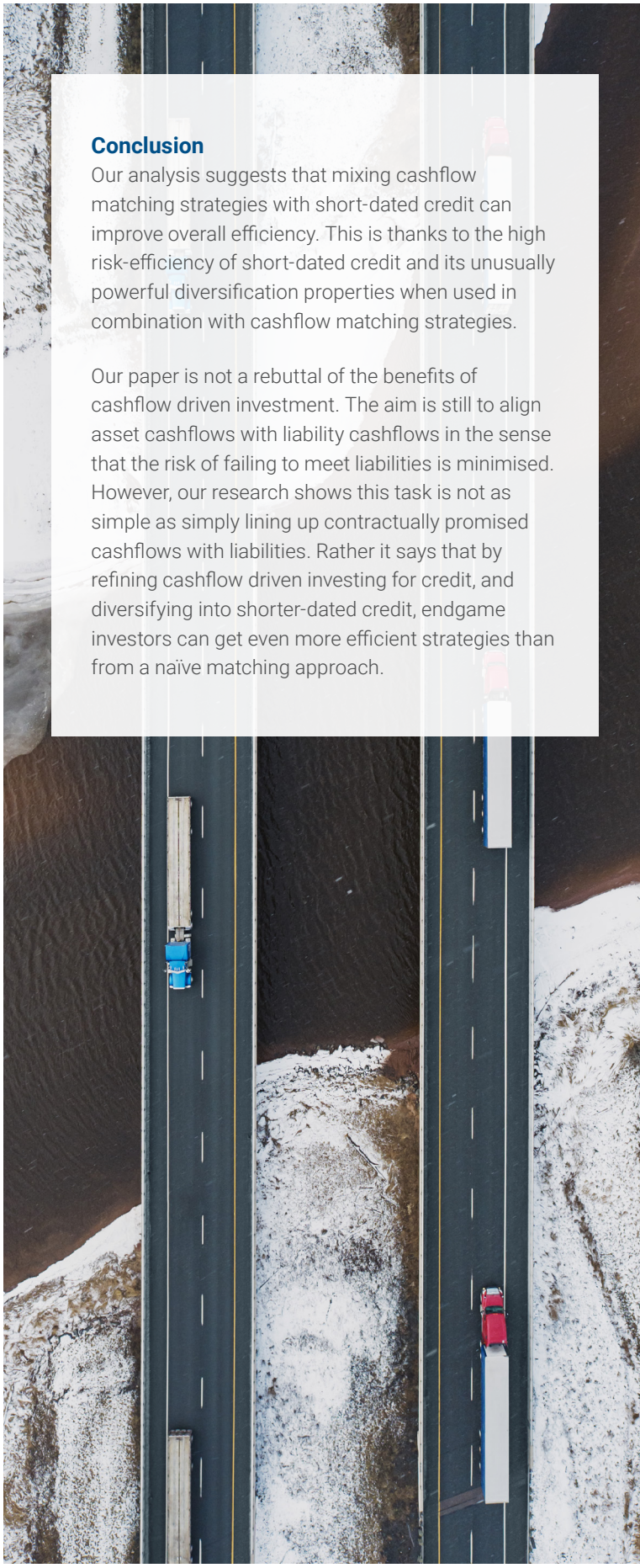
Our paper takes no view on how the relative attractiveness of short and long-dated credit may change (or not) during the cycle. Rather it may help set a strategic asset allocation that makes the most of diversification in a liability driven context. The choice of how and when to rebalance, or how to deviate from a strategic allocation is a decision for active managers that may or may not generate alpha.

Rolling short-dated credit could require more in LDI: could this be a problem?

This could be an issue for insurers who are tightly matched and hold relatively little in LDI. However it is less of an issue for most DB schemes in the endgame who typically hold more in cash and LDI and will not have any issues with collateral.

How should portfolios evolve through time?

Our analysis shows that the proportion of the credit portfolio in matching assets should increase as the liability cashflows get closer. One way to think of this is as 'cashflow aware' strategies evolving into cashflow matching ones as the scheme matures.



Conclusion

Our analysis suggests that mixing cashflow matching strategies with short-dated credit can improve overall efficiency. This is thanks to the high risk-efficiency of short-dated credit and its unusually powerful diversification properties when used in combination with cashflow matching strategies.

Our paper is not a rebuttal of the benefits of cashflow driven investment. The aim is still to align asset cashflows with liability cashflows in the sense that the risk of failing to meet liabilities is minimised. However, our research shows this task is not as simple as simply lining up contractually promised cashflows with liabilities. Rather it says that by refining cashflow driven investing for credit, and diversifying into shorter-dated credit, endgame investors can get even more efficient strategies than from a naïve matching approach.

Appendix: Arguments for and against CDI

In the table below we have outlined the main arguments for and against CDI.

Potential benefit	Potential criticism	Comment on criticism
Investors can exploit the 'credit spread puzzle' – credit spreads are much wider than traditional economics can explain. Investors who hold bonds to maturity can potentially take advantage of this with relatively little risk or drag from transaction costs.	There is a choice between targeting excess returns with multi-asset or credit spreads. A heavy tilt towards credit reduces multi-asset diversification.	This is valid concern but needs to be balanced against the efficiency benefits outlined to the left.
Linked to the above, pull-to-par effects lead to mean reversion of credit returns. In equity markets, mean reversion is far more elusive – its existence is a hotly debated topic in academia.	If investors could trigger a buy-out instantaneously, it is debateable whether de-risking as funding levels improve makes sense,[21] as there would be no risk of trapped surplus. If high excess returns are targeted even at high funding levels, this challenges the benefit of CDI.	The reality is that such instantaneous buyout is not possible and that in practice, trustees are likely to reduce their return targets as funding positions improve.
Corporate bonds are of finite term, whereas equities are a 'perpetual' asset. This means that even if dividend payments were highly predictable, so the equity exposure behaves like a perpetual corporate bond, equity would still not be ideal for meeting the liability cashflows. This is because of huge price risk at the point that they eventually must be sold.	Uncertainty in liability cashflows reduces the benefits of matching. Long-term liability cashflows are sometimes portrayed as little more than 'actuarial guesses'.	Uncertainty in liability cashflows does not make lining up cashflows a bad idea. Indeed, in Part IV of this paper we find that the presence of uncorrelated uncertainty should, under reasonable assumptions, have little impact on the relative attractiveness of different strategies.
CDI may reduce the risk of 'forced sales,' which can be a concern for cashflow negative schemes. This assumes markets can be inefficient (otherwise there is never a bad time to sell).	The risks of investing in credit are underplayed.	We agree it is important to fully understand the various risks involved in credit investing and that they are balanced appropriately; this is what this paper is about.
As insurers invest in a similar way to a CDI strategy, the assets held can often help hedge movements in buy-out and buy-in pricing.	Lags and other complexities mean there is an imperfect relationship between credit spreads and annuity pricing.[22]	Some degree of correlation is better than nothing.

There are various arguments for and against CDI

21. See our blog here
22. Albeit 'price locks' are sometimes available that can mitigate this to an extent

Contact us

For further information about LGIM, please visit lgim.com or contact your usual LGIM representative

Key risks

Past performance is not a guide to the future. The value of an investment and any income taken from it is not guaranteed and can go down as well as up, you may not get back the amount you originally invested. Assumptions, opinions and estimates are provided for illustrative purposes only. There is no guarantee that any forecasts made will come to pass. It should be noted that diversification is no guarantee against a loss in a declining market.

No party shall have any right of action against Legal & General in relation to the accuracy or completeness of the Information, or any other written or oral information made available in connection with this publication. Any investment advice that we provide to you is based solely on the limited initial information which you have provided to us. No part of this or any other document or presentation provided by us shall be deemed to constitute 'proper advice' for the purposes of the Investment Intermediaries Act 1995 (as amended). Any limited initial advice given relating to professional services will be further discussed and negotiated in order to agree formal investment guidelines which will form part of written contractual terms between the parties. The Information has been produced for use by a professional investor and their advisors only. It should not be distributed without our permission.

The risks associated with each fund or investment strategy are set out in this publication, its KIID, the relevant prospectus or investment management agreement (as applicable) and these should be read and understood before making any investment decisions. A copy of the relevant documentation can be obtained from your Client Relationship Manager.

Confidentiality and limitations:
Unless otherwise agreed by Legal & General in writing, the Information in this document (a) is for information purposes only and we are not soliciting any action based on it, and (b) is not a recommendation to buy or sell securities or pursue a particular investment strategy; and (c) is not investment, legal, regulatory or tax advice. Any trading or investment decisions taken by you should be based on your own analysis and judgment (and/or that of your professional advisors) and not in reliance on us or the Information. To the fullest extent permitted by law, we exclude all representations, warranties, conditions, undertakings and all other terms of any kind, implied by statute or common law, with respect to the Information including (without limitation) any representations as to the quality, suitability, accuracy or completeness of the Information.

Any projections, estimates or forecasts included in the Information (a) shall not constitute a guarantee of future events, (b) may not consider or reflect all possible future events or conditions relevant to you (for example, market disruption events); and (c) may be based on assumptions or simplifications that may not be relevant to you. The Information is provided 'as is' and 'as available'. To the fullest extent permitted by law, Legal & General accepts no liability to you or any other recipient of the Information for any loss, damage or cost arising from, or in connection with, any use or reliance on the Information. Without limiting the generality of the foregoing, Legal & General does not accept any liability for any indirect, special or consequential loss howsoever caused and, on any theory, or liability, whether in contract or tort (including negligence) or otherwise, even if Legal & General has been advised of the possibility of such loss.

Third party data:
Where this document contains third party data ('Third Party Data'), we cannot guarantee the accuracy, completeness or reliability of such Third-Party Data and accept no responsibility or liability whatsoever in respect of such Third-Party Data. Publication, amendments and updates:

We are under no obligation to update or amend the Information or correct any errors in the Information following the date it was delivered to you. Legal & General reserves the right to update this document and/or the Information at any time and without notice. Although the Information contained in this document is believed to be correct as at the time of printing or publication, no assurance can be given to you that this document is complete or accurate in the light of information that may become available after its publication. The Information may not take into account any relevant events, facts or conditions that have occurred after the publication or printing of this document.

Telephone recording:
As required under applicable laws Legal & General will record all telephone and electronic communications and conversations with you that result or may result in the undertaking of transactions in financial instruments on your behalf. Such records will be kept for a period of five years (or up to seven years upon request from the Central Bank of Ireland (or such successor from time to time)) and will be provided to you upon request.

In the United Kingdom and outside the European Economic Area, it is issued by Legal & General Investment Management Limited, authorised and regulated by the Financial Conduct Authority, No. 119272. Registered in England and Wales No. 02091894 with registered office at One Coleman Street, London, EC2R 5AA.

Authorised and regulated by the Financial Conduct Authority. Legal & General Investment Management does not provide advice on the suitability of its products or services. Ultimate holding company - Legal & General Group plc.

D003285