Beyond bonds

The role of enhanced credit in pension LDI

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About CIU

The Client Insight Unit (CIU) is a team of portfolio solutions specialists that partners with our institutional clients and consultants to help them solve their investment challenges. In addition to creating thought leadership like the annual peer analysis, the team leverages the power and breadth of our analytical platform, Aladdin®, for bespoke client engagements — offering tailored portfolio diagnostics to help clients make better informed decisions.

About LDI

BlackRock's dedicated Liability-Driven Investment (LDI) team collaborates closely with our portfolio management units spanning fundamental, systematic, index and alternatives platforms. Our LDI team offers defined benefit plan sponsors the power and flexibility of one of the most comprehensive fixed income businesses in the world, combined with proprietary asset-liability focused technology. By investing in people and technology, we deliver comprehensive solutions and insights across regions.

Introduction

Over the last few years, we have been working with pension plans on liability-hedging portfolio design which makes use of credit outside the typical corporate investment grade bonds. LDI is an approach most pension plans are using today, protecting their funded status by hedging interest rate and credit spread exposures embedded in the valuation of liabilities. Because corporate pension liability is based on high quality corporate bond yields, it follows that LDI portfolios comprise corporate debt as well as Treasury instruments as a hedge. We also see pension investors allocating to what we refer to as enhanced credit asset classes — debt instruments which may offer routine coupon or loan repayments and exposure to credit beta. Pension clients are looking for excess yield, diversification or may just have high conviction in asset classes like private credit which can provide both cash flow production and growth in complement to rates strategies.

In this paper, we consider a model plan's structure and how careful consideration of broad credit instruments can support its hedging and growth goals. We advocate for treating these assets as a custom spread completion portfolio around which a capital efficient rates hedging portfolio can be optimized.

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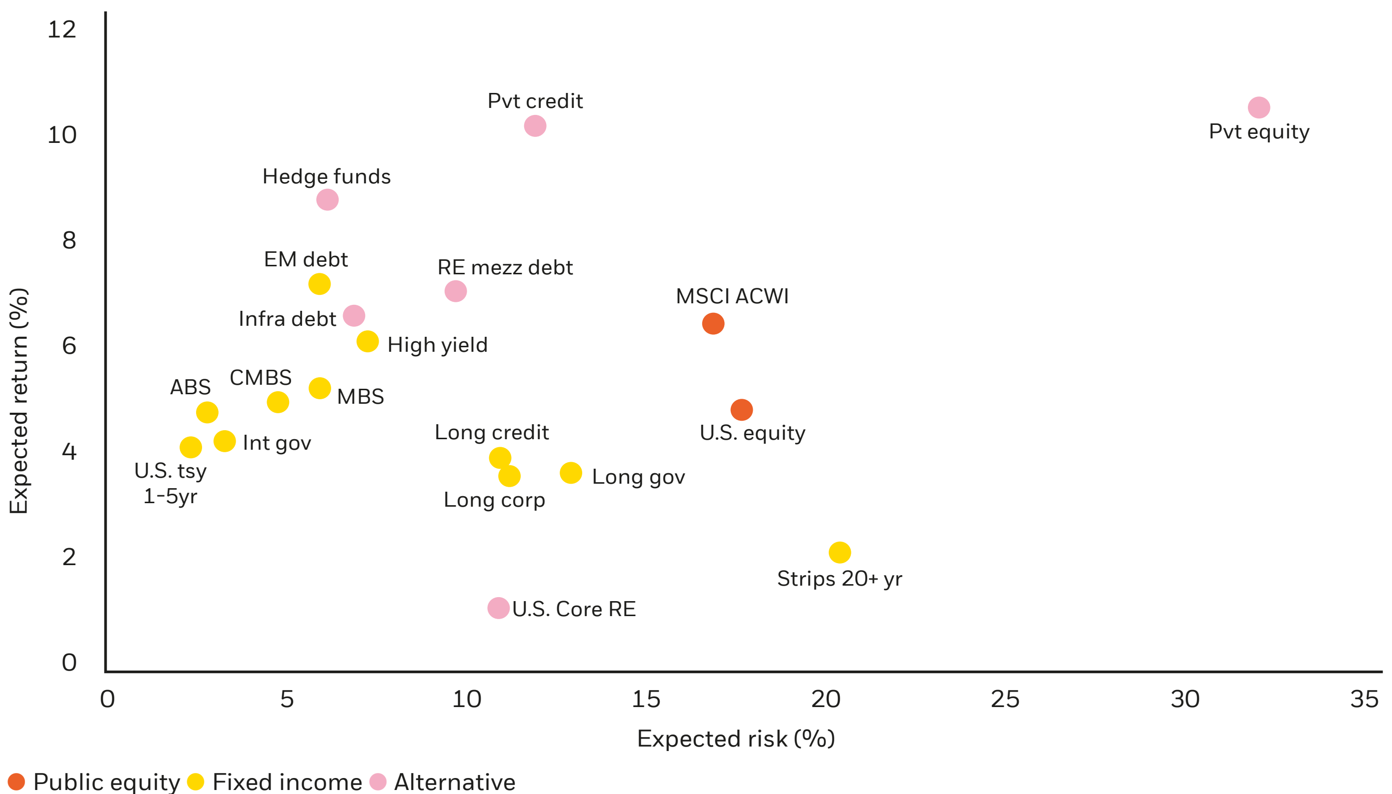
Benefits of enhanced credit

1. Expected return outlook. The addition of certain enhanced credit strategies can efficiently increase a plan's expected return on assets. For sponsors who are looking to continue growing their funded ratio, utilizing these asset classes over the long term can support the growth needs of the plan without abandonment of LDI risk principles.

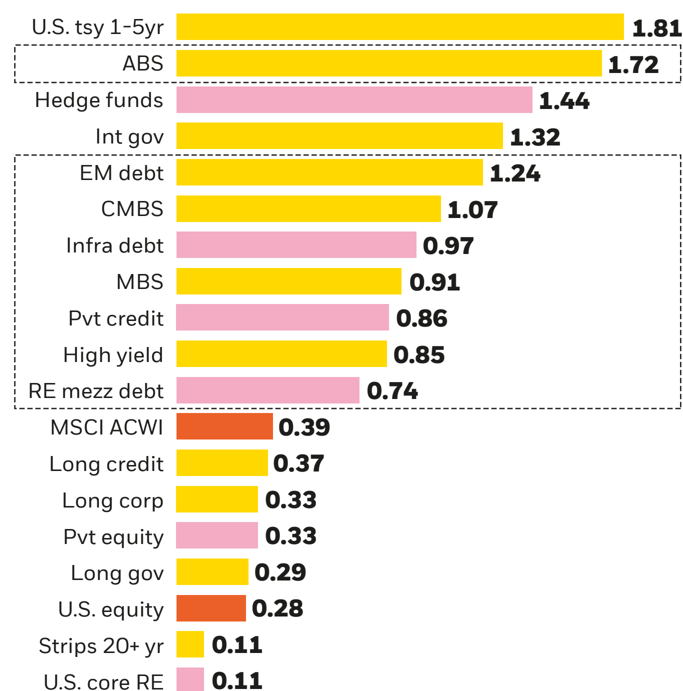
As a pension plan's funded status improves, liability driven investing becomes a more important part of its risk reduction strategy. This involves making large allocations to fixed income products with similar interest rate and credit spread exposures as the plan's liabilities. However, plans must continue to seek expected returns in excess of prevailing high quality corporate bond yields. This is due to ongoing expenses related to plan operations, the potential for demographic shifts which are not factored into the plan's liability, as well as asset downgrade/default headwinds. Sponsors generally address the need for higher returns by maintaining some exposure to growth assets even when plans become fully funded.

Figure 1. BlackRock's capital market assumptions (10-year outlook)



Source: BlackRock, as of November 2023 based on BlackRock's Capital Market Assumptions (CMA) and Aladdin. **Hypothetical performance does not guarantee future results.** All investing is subject to risk, including possible loss. Neither asset allocation nor diversification can guarantee profit or prevent loss. Hypothetical asset class returns are calculated net of asset class fees and expenses, as described in the capital market assumptions located in the Appendix. Returns also reflect the reinvestment of dividends, capital gains and interest but not the impact of taxes. Had that expense been deducted, results would be lower. **Note:** Any illustrations of hypothetical expected returns for these asset classes within a portfolio will be further reduced by deducting an advisory fee of 0.10%. There is no guarantee that the results shown will be achieved, and actual returns may be significantly higher or lower than the performance shown. The hypothetical returns and risks are based on criteria applied retroactively with the benefit of hindsight and knowledge of factors that may have positively affected its performance and cannot account for risk factors that may affect actual portfolio performance. In interpreting hypothetical results, one should take into consideration any inherent limitations and risks of the models used. Hypothetical results are for illustrative discussion purposes only and no representation is being made that any product or strategy will achieve results shown. Expected risk is calculated using the expected volatility assumptions. This asset class mapping is used for the ex-ante risk contribution and scenario analysis, as applicable. Risk: Monthly Constant Weighted (MTC model) with 276 monthly observations; 1 standard deviation; 1yr horizon. Indexes are unmanaged; direct investment is not possible. **Read CMA Modeling Assumptions, BlackRock Capital Markets Methodology and Limitations, and other disclosures in the Appendix.**

Figure 2. Risk adjusted return



See source below.*

2. Diversification benefits. Our analysis also shows that these enhanced credit asset classes can deliver diversification to the broader portfolio. This is especially important for large plans concerned about issuer concentration risk and investment grade supply and demand. With these pressures, it is useful to obtain credit beta from a broad array of sources. While the average asset life is lower than typical LDI credit holdings, enhanced credit deliver differentiated credit spread exposure that is positively correlated to the high-quality corporate bonds which underscore the valuation of plan liabilities. Each of the credit asset classes we cite delivers its own risk factors (fixed vs. floating rate exposure, average life, duration, currency, illiquidity premium, etc.) which offers differentiated performance across stress scenarios.

Figure 3. Correlation between Long Credit AA Index (as a proxy for liability credit spread exposure) to select credit indices

Asset class	Correlation to long credit AA spread
MBS	0.44
ABS	0.65
Investment grade CMBS	0.45
U.S. corporate high yield	0.80
EM debt	0.77

See source below.†

3. Liquidity profile. With careful planning, many of these enhanced strategies can support the liquidity needs of the plan as well. Across the spectrum of these asset classes, interest and principal repayments can be a part of the cash needed to pay plan benefits. For example, a mature private credit portfolio can be a source of liquidity, as over time funds in their harvest period may offset the cash deploying to newer vintage funds in their investment period. Certain enhanced credit vehicles are designed to offer routine liquidity (monthly/quarterly) up to a certain percentage, allowing for cash flow planning. Like all credit assets, enhanced credit strategies carry the risk of default, however this risk can be mitigated within structures by balancing seniority and credit quality of the debt.

4. Customization. Depending on the type of implementation, certain enhanced credit asset classes can add complexity to the portfolio. More specifically, private markets fees, benchmarking, contracting and governance can be more complex than their public market equivalents. However, the plan is compensated for this complexity by the fact that these investments can be customized to express the plan's risk appetite, tax and regulatory requirements and conviction around investment themes, such as sustainability. Partnering with an LDI manager, the hedging portfolio can be optimized around this custom credit exposure.

Click **here** to read about BlackRock's outlook on private debt.

* **Figure 2: Source:** BlackRock, as of November 2023 based on BlackRock's Capital Market Assumptions (CMA) and Aladdin. **Hypothetical performance does not guarantee future results.** All investing is subject to risk, including possible loss. Neither asset allocation nor diversification can guarantee profit or prevent loss. Hypothetical asset class returns are calculated net of asset class fees and expenses, as detailed at the end of the presentation. Returns also reflect the reinvestment of dividends, capital gains and interest but not the impact of taxes. Had that expense been deducted, results would be lower. **Note:** Any illustrations of hypothetical expected returns for these asset classes within a portfolio will be further reduced by deducting an advisory fee of 0.10%. There is no guarantee that the results shown will be achieved, and actual returns may be significantly higher or lower than the performance shown. The hypothetical returns and risks are based on criteria applied retroactively with the benefit of hindsight and knowledge of factors that may have positively affected its performance and cannot account for risk factors that may affect actual portfolio performance. In interpreting hypothetical results, one should take into consideration any inherent limitations and risks of the models used. Hypothetical results are for illustrative discussion purposes only and no representation is being made that any product or strategy will achieve results shown. Expected risk is calculated using the expected volatility assumptions. This asset class mapping is used for the ex-ante risk contribution and scenario analysis, as applicable. **Risk:** Monthly Constant Weighted (MTC model) with 276 monthly observations; 1 standard deviation; 1yr horizon. Indexes are unmanaged; direct investment is not possible. **Read CMA Modeling Assumptions, BlackRock Capital Markets Methodology and Limitations, and other disclosures in the Appendix.**

† **Figure 3: Source:** BlackRock, as of November 2023. Expected risk is defined as annual expected volatility and is calculated using data derived from portfolio asset class mappings, using the Aladdin portfolio risk model. This proprietary multi-factor model can be applied across multiple asset classes to analyze the impact of different characteristics of securities on their behaviors in the marketplace. In analyzing risk factors, the Aladdin portfolio risk model attempts to capture and monitor these attributes that can influence the risk/return behavior of a particular security/asset. **Risk:** Monthly Constant Weighted (MTC model) with 276 monthly observations; 1 standard deviation; 1yr horizon. There is no guarantee that the risk model results will be achieved, and actual results may be significantly higher or lower than shown. Hypothetical risk results shown are for illustrative purposes only and no representation is being made that any account, product or strategy is likely to achieve the risk shown. Benchmark information is shown for informational purposes. Benchmark indexes are unmanaged; direct investment is not possible. **Read the Risk Factor Glossary and the Asset Class Mappings slides and other disclosures Appendix.**

Implications on LDI portfolio structuring

We believe there are advantages to looking at LDI hedging goals and enhanced credit assets in an integrated manner. Constructing a liability driven strategy involves evaluating the risks inherent in a plan's liabilities and pinpointing interest rate and credit spread exposures which can be effectively hedged with a given level of capital. Attention is paid to how the LDI assets complement other assets in the portfolio, and how the portfolio is expected to perform in times of stress. Portfolio construction through an LDI lens would focus on these important elements:

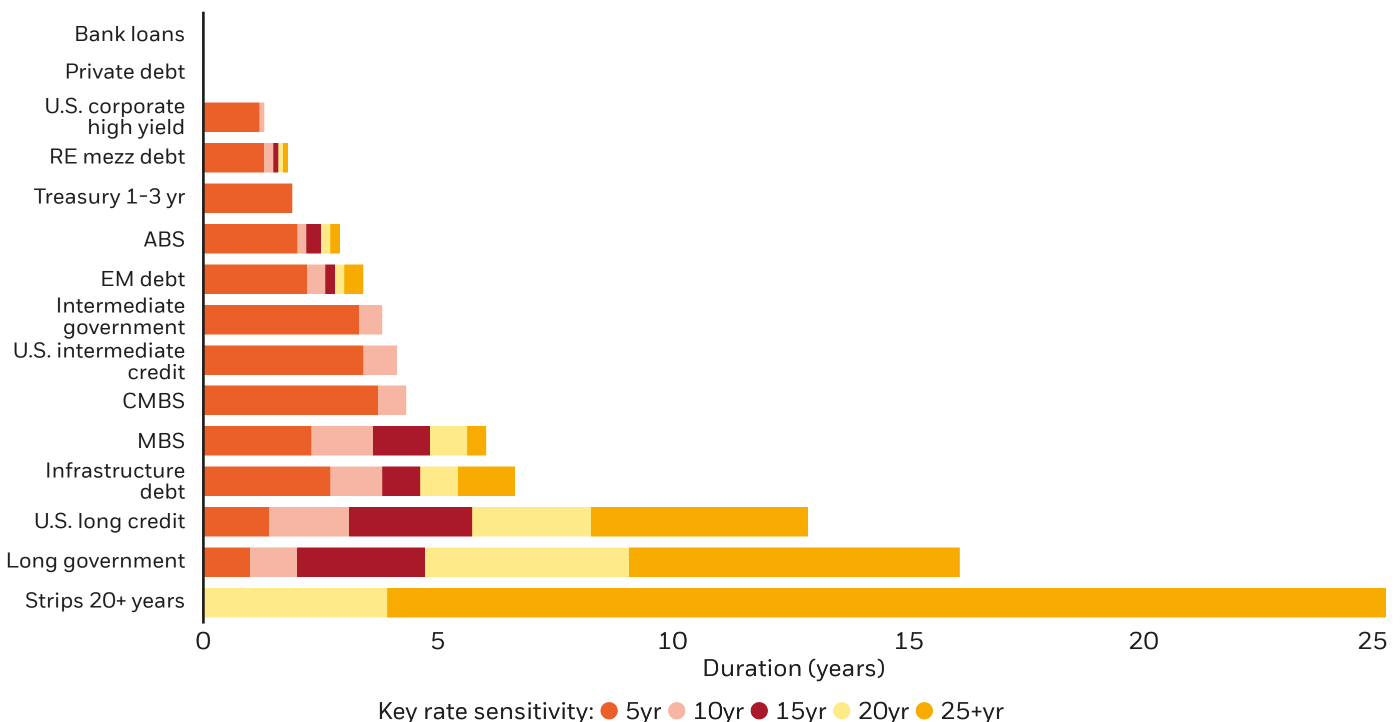
1. Key rate duration (KRD) hedging. It is important to consider how well hedged the plan is in the event of steepening and flattening of the yield curve, especially given recent rate volatility. In the past year alone, the curve has borne several shocks to the shape of the yield curve which has affected the funded status of plans whose hedging strategy was concentrated at one end of the yield curve.

Certain of these enhanced credit strategies deliver duration to the portfolio which support KRD hedging. Specifically, fixed rate instruments such as mortgages, RE debt or infra debt can provide relevant rate exposure at the short end of the curve while contributing yield and diversification.

2. Capital efficiency. For most pension plans there is an ongoing need for growth opportunities to close funding gaps and anticipate future demographic shifts and expenses of the plan. Capital efficient instruments must be employed to protect the plan against rate and spread risk, while out-earning the liability. The use of STRIPS and derivative rate instruments can support the rate hedging objective while freeing up capital for credit strategies which can enhance yield and increase the credit spread hedge. Specifically, Portfolio 4 in the case study on the next page illustrates how adding levered Treasuries to the portfolio allows the plan to improve its hedge ratio, match the plan's key rate duration profile and free up capital to invest in higher yielding credit strategies.

3. Collateral requirements. With the use of synthetic instruments comes the need for managing collateral so the plan will not become a forced seller of its growth assets in times of stress. By modeling stress events which may constrain liquidity, the LDI manager can assess minimum levels of cash and marginable instruments which must be maintained to support the leverage in the portfolio. Specifically for plans which maintain exposure to private assets, cash needs of the synthetic rate overlay must be considered alongside potential capital calls and ongoing benefit payments. These studies can inform pacing and balancing illiquid exposure with more liquid credit assets.

Figure 4. Duration profile of liability-aware asset classes



Source: BlackRock, Bloomberg, Morningstar data as of October 2023.

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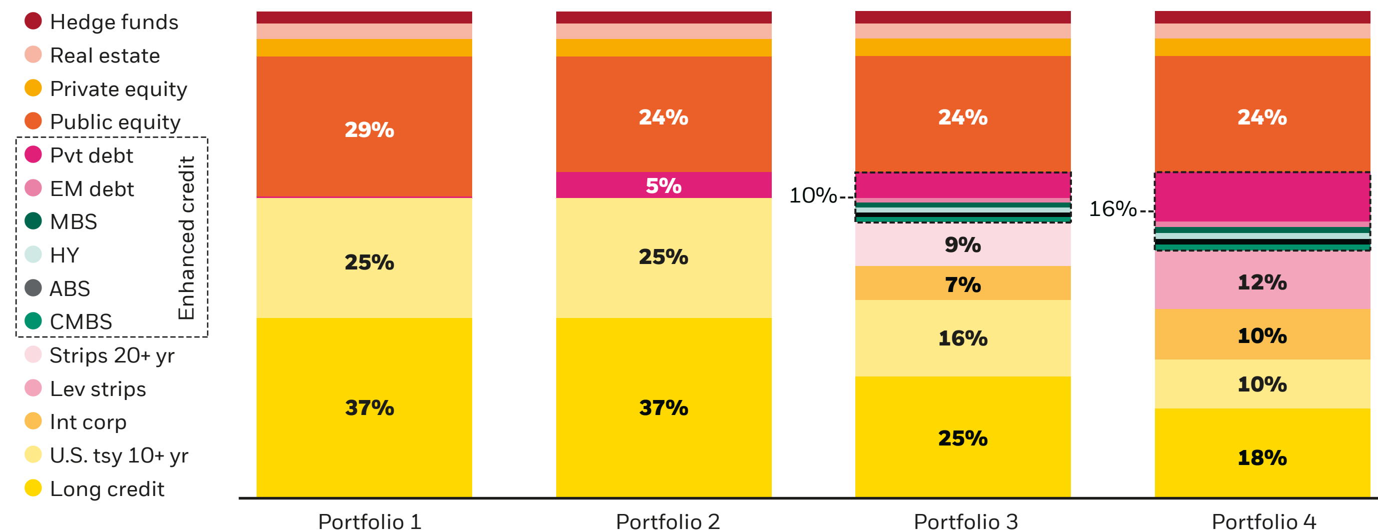
Case study

Below we consider an illustrative pension plan (Portfolio 1) which is 104% funded with 62% of assets in liability hedging fixed income and 38% allocated to equity and other growth strategies. The illustrative portfolios show how including enhanced credit assets could help the plan reduce surplus risk and enhance expected return in incremental steps.

Figure 5. Portfolio comparison: asset allocation



Portfolio	Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4
Expected portfolio return	5.6%	5.7%	5.8%	6.1%
Expected portfolio risk	9.6%	9.4%	8.9%	9.8%
Expected surplus risk	5.6%	5.1%	4.9%	4.5%
Return/surplus risk	1.01	1.12	1.18	1.34
Interest rate hedge ratio	75.0%	77.0%	75.0%	84.0%

Portfolio 1 has the average portfolio allocation of the top 200 U.S. Corporate defined benefit pension plans. **Source:** BlackRock, as of November 2023 based on BlackRock's Capital Market Assumptions (CMA) and Aladdin. **Hypothetical performance does not guarantee future results.** All investing is subject to risk, including possible loss. Neither asset allocation nor diversification can guarantee profit or prevent loss. Hypothetical returns are net of all fees and expenses, including an advisory fees of 0.10% which represents the highest advisory fee for the institutional client type. **For additional information on the asset class level fees, please see the Capital Market Assumption slide in the Appendix.** Returns also reflect the reinvestment of dividends, capital gains and interest but not the impact of taxes. Had that expense been deducted, results would be lower. There is no guarantee that the results shown will be achieved, and actual returns may be significantly higher or lower than the performance shown. The hypothetical returns and risks are based on criteria applied retroactively with the benefit of hindsight and knowledge of factors that may have positively affected its performance and cannot account for risk factors that may affect actual portfolio performance. In interpreting hypothetical results, one should take into consideration any inherent limitations and risks of the models used. Hypothetical results are for illustrative discussion purposes only and no representation is being made that any product or strategy will achieve results shown. Expected risk is calculated using the expected volatility assumptions. The asset class mapping is used for the ex-ante risk contribution and scenario analysis, as applicable. **Risk:** Monthly Constant Weighted (MTC model) with 276 monthly observations; 1 standard deviation; 1yr horizon. Indexes are unmanaged; direct investment is not possible. **Read CMA Modeling Assumptions, BlackRock Capital Markets Methodology and Limitations, and other disclosures in the Appendix.**

Conclusion

Many plans are already investing in enhanced credit assets, taking advantage of the diversification, expected return and customization benefits. These assets are impactful to the plan's surplus risk due to their spread awareness and in some cases, duration profile. Most pension plans also maintain an LDI strategy which uses the fixed income allocation to hedge against interest rate and credit spread volatility, typically using corporate bonds and Treasury instruments. As plans consider the next stage of risk management, they are asking questions about how their return-seeking and liability-hedging asset allocations should evolve. Rather than increasing the hedge at the expense of prospective growth, the next step of the plan's glidepath may involve allocating to asset classes which can support both goals. An LDI manager can provide an integrated strategy which delivers customized credit exposure, interest rate hedging and capital efficiency.

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Before joining BlackRock, Emojoy was an investments director within UPS's pension investments group, overseeing operations, compliance and accounting for $54 billion invested on behalf of the UPS U.S. pension plans. Emojoy also served as UPS's corporate actuary, with responsibilities for strategic planning and forecasting for the company's compensation and benefit programs. Before her time at UPS, Emojoy led the retirement benefits function for Koch Industries and its portfolio companies, selecting DB and DC vendors and investments and building benefit delivery systems to support Koch's growing scale.

Emojoy is an Associate of the Society of Actuaries and Enrolled Actuary, having earned these designations during her time as an actuarial consultant at Mercer and Willis Towers Watson. Emojoy holds an MBA from the Georgia Institute of Technology as well as a BA in Mathematics from Northwestern University. Emojoy serves on the board for the Boys and Girls Club of Metro Atlanta, with a passion for helping youth build better futures.

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He joined CIU from Bank of America Merrill Lynch where he was a part of their quantitative portfolio strategies group. He was responsible for developing data-driven analytics to help grow the bank's commercial credit portfolio.

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She joined CIU from the Analytics and Quantitative Solutions team within the Aladdin Business where she focused on providing portfolio analytics solutions to the Aladdin client base and delivering BlackRock's investment and technology expertise to Insurance, Pension and Asset Management clients. She started in BlackRock as a member of the client analytics team covering Insurance clients in North America and Bermuda.

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Appendix

Capital market and modeling assumptions

	Asset description	BlackRock proxy	Alpha assumption	Model fee	Expected risk	Expected return
	U.S. tsy 1-5yr	BBG Barc Treasury 1-5 Yr Index	-	-0.1%	2.4%	4.3%
	U.S. corp 1-5yr	BBG Barc US Corporate 1-5 years Index	-	-0.1%	2.5%	5.0%
	Int corp	BBG Intermediate Corporate Index (1-10 Years)	-	-0.1%	3.9%	5.2%
	Int gov	BBG Barc Intermediate Government Index	-	-0.1%	3.3%	4.3%
	U.S. tsy 10+ yr	BBG Barc Treasury 10+ Yr Index	-	-0.1%	13.1%	3.8%
	Long corp	BBG Long Corporate Index	-	-0.1%	11.3%	3.8%
	Long credit	BBG Barc US Long Credit Index	-	-0.1%	11.0%	4.0%
	U.S. agg	BBG Barc U.S. Aggregate Index	-	-0.1%	5.1%	4.8%
	Strips 20+ yr	BBG Barc Strips 20+ Years Index	-	-0.2%	20.5%	2.3%
Enhanced credit	MBS	BBG Barc MBS Index	-	-0.1%	6.0%	5.5%
	CMBS	BBG CMBS Investment Grade Index	-	-0.5%	4.8%	5.1%
	ABS	BBG Barc ABS Index	-	-0.5%	2.8%	4.8%
	High yield	BBG Barc US Corp High Yield 2% Issuer Capped Index	-	-0.4%	7.3%	6.3%
	EM debt	JP Morgan CEMBI Broad Diversified Index	-	-0.5%	6.0%	7.4%
	Pvt credit	BlackRock Proxy – Direct lending – Lincoln Senior Debt Index	2.2%	-3.1%	12.0%	10.3%
	RE mezz debt	BlackRock Proxy – Real estate mezzanine debt unhedged	2.2%	-1.2%	9.8%	7.2%
	Infra debt	BlackRock Proxy – EDHEC infra300 Debt Index	0.9%	-0.3%	6.9%	6.7%
	U.S. core RE	BlackRock Proxy – US Core Real Estate – NCREIF ODCE Index	0.8%	-0.9%	10.9%	1.2%
	Pvt equity	BlackRock Proxy – US Buyout Private equity – eFront Insights Research US Buyout Private Equity Index	5.7%	-4.7%	32.2%	10.7%
	Hedge funds	BlackRock Proxy – HFRI global fund weighted Index	3.3%	-2.0%	6.2%	8.9%
	U.S. equity	MSCI Developed – US Gross TR Index	-	-0.1%	17.7%	5.0%
	MSCI ACWI	MSCI All Country World Net TR Index	-	-0.2%	17.0%	6.6%

Source: BlackRock, as of November 2023. Expected asset class returns shown are net of asset class fees and expenses and reflect the reinvestment of dividends and capital gains, but do not reflect the impact of taxes. Had those expenses been included, returns would be lower. Expected returns are net of fees but include an alpha assumption for certain asset classes listed in the alpha assumption column. **Expected return assumptions are hypothetical and are not a guarantee of future results**. The representative indices listed above may differ from those that are publicly available, but the underlying methodology and assumptions are consistent. **Note:** Hypothetical portfolio expected returns shown in the presentation also include the deduction of an advisory fee of 0.10%, which represents the highest advisory fee for the institutional client type. BlackRock expected return information is based on BlackRock's long-term capital market assumptions as of November 2023 which are subject to change. Capital market assumptions contain forward-looking information that is not purely historical in nature. They should not be construed as guarantees of future returns. The projections in the chart above are based on BlackRock's proprietary long-term capital markets assumptions (10+ years) for risk and geometric return (above) and correlations between major asset classes. These asset class assumptions are passive only and do not consider the impact of active management. The assumptions are presented for illustrative purposes only and should not be used, or relied upon, to make investment decisions. The assumptions are not meant to be a representation of, nor should they be interpreted as BlackRock's investment recommendations. Allocations, assumptions, and expected returns are not meant to represent BlackRock performance. Long-term capital markets assumptions are subject to high levels of uncertainty regarding future economic and market factors that may affect actual future performance. Ultimately, the value of these assumptions is not in their accuracy as estimates of future returns, but in their ability to capture relevant relationships and changes in those relationships as a function of economic and market influences. Please note all information shown is based on assumptions, therefore, exclusive reliance on these assumptions is incomplete and not advised. The individual asset class assumptions are not a promise of future performance. Indexes are unmanaged and used for illustrative purposes only and are not intended to be indicative of any fund's performance. It is not possible to invest directly in an index.

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BlackRock capital market assumptions methodology and limitations

BlackRock Capital Market Assumptions
This information is not intended as a recommendation to invest in any particular asset class or strategy or as a promise of future performance. Note that these asset class assumptions are passive, and do not consider the impact of active management. All estimates in this document are in U.S. dollar terms unless noted otherwise. Given the complex risk-reward trade-offs involved, we advise clients to rely on judgment as well as quantitative optimization approaches in setting strategic allocations to all the asset classes and strategies.

References to future returns are not promises or even estimates of actual returns a client portfolio may achieve. Assumptions, opinions and estimates are provided for illustrative purposes only. They should not be relied upon as recommendations to buy or sell securities. Forecasts of financial market trends that are based on current market conditions constitute our judgment and are subject to change without notice. We believe the information provided here is reliable, but do not warrant its accuracy or completeness. This material has been prepared for information purposes only and is not intended to provide, and should not be relied on for, accounting, legal, or tax advice.

The outputs of the assumptions are provided for illustration purposes only and are subject to significant limitations. "Expected" return estimates are subject to uncertainty and error. Expected returns for each asset class can be conditional on economic scenarios; in the event a particular scenario comes to pass, actual returns could be significantly higher or lower than forecasted. Because of the inherent limitations of all models, potential investors should not rely exclusively on the model when making an investment decision. The model cannot account for the impact that economic, market, and other factors may have on the implementation and ongoing management of an actual investment portfolio. Unlike actual portfolio outcomes, the model outcomes do not reflect actual trading, liquidity constraints, fees, expenses, taxes and other factors that could impact future returns.

BlackRock 10-year asset return and long-term volatility assumptions
Five-year and long-term equilibrium annualized return assumptions are in geometric terms. Return assumptions are total nominal returns. Return assumptions for all asset classes are shown in unhedged terms, with the exception of global ex-US treasuries. We use long-term volatility assumptions. We break down each asset class into factor exposures and analyze those factors' historical volatilities and correlations over the past 20 years. We combine the historical volatilities with the current factor makeup of each asset class to arrive at our forward-looking assumptions. This approach takes into account how asset classes evolve over time. Example: Some fixed income indices are of shorter or longer duration than they were in the past. Our forward-looking assumptions reflect these changes, whereas a volatility calculation based only on historical monthly index returns would fail to capture the shifts. We have created BlackRock proxies to represent asset classes where historical data is either lacking or of poor quality. Expected return estimates are subject to uncertainty and error. Expected returns for each asset class can be conditional on economic scenarios; in the event a particular scenario comes to pass, actual returns could be significantly higher or lower than forecasted. The geometric return, sometimes called the time-weighted rate of return, takes into account the effects of compounding over the investment period. The arithmetic return can be thought of as a simple average calculated by taking the individual annual returns divided by the number of years in the investment period.

Index returns are for illustrative purposes only and do not represent any actual fund performance. Index performance returns do not reflect any management fees, transaction costs or expenses. Indexes are unmanaged and one cannot invest directly in an index. Past performance does not guarantee future results.

Important information

All investing is subject to risk, including possible loss of money invested. **Past performance is not a guarantee of future results.** Neither asset allocation nor diversification can guarantee profit or prevent loss.

Equities may decline in value due to both real and perceived general market, economic, and industry conditions. Investments in value securities involve the risk that the market's value assessment may differ from the manager and the performance of the securities may decline. Investing in securities of smaller companies tends to be more volatile and less liquid than securities of larger companies. Investing in distressed companies (both debt and equity) is speculative and may be subject to greater levels of credit, issuer and liquidity risks, and the repayment of default obligations contains significant uncertainties; such companies may be engaged in restructurings or bankruptcy proceedings. Investing in foreign denominated and/or domiciled securities may involve heightened risk due to currency fluctuations, and economic and political risks, which may be enhanced in emerging markets. Investments in companies engaged in mergers, reorganizations or liquidations may involve special risks as pending deals may not be completed on time or on favorable terms. High-yield, lower-rated, securities involve greater risk than higher-rated securities; portfolios that invest in them may be subject to greater levels of credit and liquidity risk than portfolios that do not. Derivatives may involve certain costs and risks such as liquidity, interest rate, market, credit, management and the risk that a position could not be closed when most advantageous. Investing in derivatives could lose more than the amount invested. Two main risks related to fixed income investing are interest rate risk and credit risk. Typically, when interest rates rise, there is a corresponding decline in the market value of bonds. Credit risk refers to the possibility that the issuer of the bond will not be able to repay the principal and make interest payments. The principal on mortgage- or asset-backed securities may normally be prepaid at any time, which will reduce the yield and market value of these securities. Income from municipal bonds may be subject to state and local taxes and at times the alternative minimum tax.

Risks associated with Private Markets: Investments in private markets are typically illiquid and investors seeking to redeem their holdings can experience significant delays and fluctuations in value. Direct co-investing can involve risks, including but not limited to individual company risk, availability of investments, risk of loss, illiquidity, no near-term cash flow, lack of diversification, key personnel risk, leverage risk, asset valuation risks, political and market risks, tax risks and currency risks.

Risks Associated with Private Equity: Private equity investments are speculative and involve a high degree of risk. An investor could lose all or a substantial amount of his or her investment. Interests in private equity investments are illiquid and there is no secondary market nor is one expected to develop for interests in such investments or any fund offered or sponsored; there are also significant restrictions on transferring private equity investments. Private equity investments experience volatile performance and private equity funds are often concentrated and lack diversification and regulatory oversight. Private equity funds have high fees and expenses (including "carried interest") that will reduce such investments' returns and a private equity investment or a fund offered or sponsored may invest in other funds which themselves charge management fees and carried interest (typically, 20% of the net profits generated by the fund and paid to the manager). A private equity investor has an ongoing financial commitment to make contributions to such funds, is subject to severe consequences in cases of default and may have to recontribute distributions to private equity investments. Investors in certain jurisdictions and in private equity funds generally may be subject to pass-through tax treatment on their investment. This may result in an investor incurring tax liabilities during a year in which the investor does not receive a distribution of any cash from the fund.

Additional Private Equity Risks
Limited Regulatory Oversight: Since private equity funds are typically private investments, they do not face the same oversight and scrutiny from financial regulatory entities such as the Securities and Exchange Commission ("SEC") and are not subject to the same regulatory requirements as regulated investment companies, (i.e., open-end or closed-end mutual funds) including requirements for such entities to provide certain periodic pricing and valuation information to investors. Private equity offering documents are not reviewed or approved by the SEC or any US state securities administrator or any other regulatory body. Also, managers may not be required by law or regulation to supply investors with their portfolio holdings, pricing, or valuation information. **Strategy Risk:** Many private equity funds employ a single investment strategy. Thus, a private equity funds may be subject to strategy risk, associated with the failure or deterioration of an entire strategy. **Use of Leverage and Other Speculative Investment Practices:** Since many private equity fund managers use leverage and speculative investment strategies such as options, investors should be aware of the potential risks. When used prudently and for the purpose of risk reduction, these instruments can add value to a portfolio. However, when leverage is used excessively and the market goes down, a portfolio can suffer tremendously. When options are used to speculate (i.e., buy calls, short puts), a portfolio's returns can suffer and the risk of the portfolio can increase. **Valuations:** Further there have been a number of high- profile instances where private equity fund managers have mispriced portfolios, either as an act of fraud or negligence. **Limited Liquidity:** Investors in private equity funds have limited rights to transfer their investments. In addition, since private equity funds are not listed on any exchange, it is not expected that there will be a secondary market for them. Repurchases may be available, but only on a limited basis. A private equity fund's manager may deny a request to transfer.

Risks Associated with Private Credit
Risks associated with an investment in a private credit strategy (the Strategy) include, but are not limited to, the following: (i) the Strategy is speculative and its investments are subject to a risk of total loss, (ii) the performance of the Strategy may be volatile, (iii) the general partner of the Strategy will retain ultimate authority over the Strategy's assets and investment decisions, (iv) there are restrictions on the ability of investors to withdraw capital and on the transferability of investor ownership interests in the Strategy, (v) the fees and expenses of the Strategy may offset any profits of the Strategy, (vi) investing the Strategy may involve complex tax structures and delays in distributing important tax information, (vii) the Strategy is not subject to the same regulatory requirements as mutual funds. Investors should also be aware that as a global provider of investment management, risk management and advisory services to institutional and retail clients, BlackRock engages in a broad spectrum of activities. Although the relationships and activities of BlackRock may help offer attractive opportunities and service to the Strategy, such relationships and activities create certain inherent conflicts of interest between BlackRock and the Strategy and/or the Strategy's investors. Further risks associated with the Strategy include, but are not limited to, the following: i.) Credit & Interest Rate risk ii.) Risks associated with high-yield, non-investment-grade debt securities ("high-yield bonds" or "junk bonds"); iii) Derivatives; iv) Foreign/International Markets; and v) Emerging market risk.

Risks Associated with Infrastructure
Infrastructure Funds invest exclusively or almost exclusively in equity or debt, or equity or debt related instruments, linked to infrastructure assets. Therefore, the performance of an Infrastructure Fund may be materially and adversely affected by risks associated with the related infrastructure assets including: construction and operator risks; environmental risks; legal and regulatory risks; political or social instability; governmental and regional political risks; sector specific risks; interest rate changes; currency risks; and other risks and factors which may or will impact infrastructure and as a result may substantially affect aggregate returns. Investments in Infrastructure assets are typically illiquid and investors seeking to redeem their holdings in an Infrastructure Fund can experience significant delays and fluctuations in value.

Risk Associated with Hedge Funds
An investment in a hedge fund is speculative and includes a high degree of risk, including the risk of a total loss of capital. A hedge fund is illiquid, subject to significant restrictions on transfer and investors should be aware that they may be required to bear the risks associated with holding such investment for an indefinite period of time. Investors should carefully review the confidential private placement memorandum and other offering documents for the hedge fund strategy prior to making an investment decision. Any investment decision with respect to a hedge fund should be made solely on the definitive and final version of the private placement memorandum, the governing agreements, subscription agreements and other ancillary documents.

Risks Associated with Real Estate
Funds that invest in real estate or property invest exclusively or almost exclusively in equity or debt, or equity or debt related instruments. Therefore, in addition to risks associated with investment in such equity or debt instrument, the performance of the real estate fund may be material and adversely affected by risks associated with the related real estate assets. Past performance of funds investing in real estate are not indicative of the performance of the real estate market as a whole and the value of real property will generally be a matter of a valuer's opinion rather than fact. The value of any real estate investment may be significantly diminished in the event of a downturn in the real estate market. Real estate investments are subject to many factors including adverse changes in economic conditions, adverse local market conditions and risks associated with the acquisition, financing, ownership, operation, and disposal of real estate.

Aladdin Portfolio Risk Analysis: Charts and graphs provided herein are for illustrative purposes only. Neither BlackRock nor the Aladdin portfolio risk model can predict a portfolio's risk of loss due to, among other things, changing market conditions or other unanticipated circumstances. The Aladdin portfolio risk model is based purely on assumptions using available data and any of its predictions are subject to change. For BlackRock products, data about the specific underlying holdings are used when applying the Aladdin risk model. For third party funds, BlackRock uses underlying holdings, or in certain cases, determines appropriate proxies for relevant holdings using a combination of Morningstar and other publicly available data sources. Product specific inputs are typically based on the latest disclosed data, which may be lagged.

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