

Liability Driven Investing in Charles River IMS

Liability Driven Investing (LDI) is growing in popularity and is increasingly provided as an ‘add-on’ mandate for fixed income and multi-asset managers. According to a review of 1,400 corporate, public, and endowment and foundation plans by Investment Metrics, corporate defined benefit plans have “aggressively incorporated a liability driven investing approach” since the beginning of 2014.^[1]

LDI workflows leverage existing Charles River Investment Management Solution (Charles River IMS) capabilities including Charles River Manager Workbench, analytics, security master creation with out-of-the box configurations, and streamlined setup to help minimize implementation time.

LDI Workflow Overview



Import
Liabilities



Calculate
Analytics
& Measure
Sensitivities



Manage Portfolio
of Assets &
Liabilities



Monitor
Compliance

LDI Workflow Support



Liability Benchmarks and Liability Mapping

Users can manage, monitor and mitigate asset portfolio risk relative to a set of nominal and/or inflation adjusted liabilities.



Analytics, Inflation Sensitivities and Liability Discounting

Liability valuations are calculated relative to the appropriate cash flows, curves (e.g., IRS curve) and spread. Rate and Inflation sensitivities are captured using flexible tenor set definitions.

Liability valuations can be performed relative to regulatory curves. From these valuations, spreads to market curves can be measured (e.g. spread to treasuries or swaps). Additionally, for managers with access to both real and nominal cash flows, Charles River will enable users to derive an implied term structure of inflation from real vs. nominal liabilities (e.g. liability implied inflation curve).

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The sets feature:

- Flexible tenor definitions
- Ability to generate interest rate and inflation sensitivities per tenor (i.e., KRDs, PV01 and IE01)*
- Calculation of implied inflation exposures for nominal bonds

At-a-glance PV01 comparison between assets and liabilities in Manager Workbench

| Security | PV01 by tenor | | | | | | | | | | | | | | |
|-----------------------|---------------|---------|----------|----------|----------|----------|-----------|-----------|-----------|----------|----------|----------|----------|---------|---------|
| | 6M | 1Y | 2Y | 3Y | 5Y | 7Y | 10Y | 15Y | 20Y | 25Y | 30Y | 35Y | 40Y | 45Y | 50Y |
| Positions Grand Total | (335) | 1,214 | 7,637 | 3,432 | 3,992 | 15,832 | (58,492) | (53,382) | 40,778 | 11,417 | 64,620 | (6,367) | (10,749) | (5,121) | (1,119) |
| LDI Demo | (335) | 1,214 | 7,637 | 3,432 | 3,992 | 15,832 | (58,492) | (53,382) | 40,778 | 11,417 | 64,620 | (6,367) | (10,749) | (5,121) | (1,119) |
| Assets | 1,109 | 5,869 | 18,792 | 31,400 | 54,901 | 89,079 | 45,244 | 75,452 | 143,815 | 91,409 | 109,889 | 14,114 | | | |
| Inflation Linked | 10 | 40 | 1,030 | 3,387 | 1,671 | 20,889 | 4,535 | 800 | 3,697 | 16,898 | 4,836 | | | | |
| Nominal | 1,099 | 5,829 | 17,762 | 28,013 | 53,230 | 68,191 | 40,709 | 74,652 | 140,118 | 74,511 | 105,053 | 14,114 | | | |
| Liabilities | (1,444) | (4,655) | (11,155) | (27,968) | (50,909) | (73,247) | (103,736) | (128,834) | (103,037) | (79,992) | (45,269) | (20,481) | (10,749) | (5,121) | (1,119) |
| Inflation Linked | (457) | (1,358) | (3,136) | (8,211) | (15,954) | (19,875) | (2,136) | | | | | | | | |
| Nominal | (987) | (3,297) | (8,019) | (19,757) | (34,955) | (53,372) | (101,601) | (128,834) | (103,037) | (79,992) | (45,269) | (20,481) | (10,749) | (5,121) | (1,119) |

Screenshots are for informative purposes only. No live data being used.



Portfolio Management, Optimization and Performance Attribution

The Charles River Manager Workbench enables users to efficiently manage a portfolio of assets against a set liabilities. Portfolio managers can interact with liability securities, calculate and manage funding ratios, and generate risk ladders including interest rates, inflation and cash flow shortfalls. This empowers managers to mitigate multiple dimensions of risk via hedging and targeting workflows, for example, hedging a position and determining funding ratio impact.

Managers can use optimization to determine appropriate hedge ratios and asset allocations using their preferred third-party optimizers directly from the Manager Workbench. Optimization capabilities include the ability to target KRD / PV01 tenors, and create an investible representation of liabilities that can be used throughout the product in a more meaningful way than liabilities alone (e.g. tracking error and attribution analysis).

Standard measures of performance against liability benchmarks can be calculated to determine the impact of spread, interest and inflation rate changes on the LDI portfolio. Excess returns versus liability benchmarks can be attributed between active manager positioning and portfolio positioning to provide insight into performance drivers. Managers can also view performance comparisons between assets and liabilities.



Scenario Analysis, Regulatory Reporting and Compliance

Charles River Scenario Analysis supports the ability to shift the market factors that are relevant to liabilities (e.g., interest rates, inflation and spreads). Shifts are applied to all relevant curves, liability, and asset attributes in order to obtain a scenario specific set of valuations, returns, analytics and cash flows. Managers can also validate hedges under stressed conditions before constructing and executing the hedge.

From a fund management perspective, this allows a portfolio manager to:



View funding and hedge ratios subject to various economic environments



Perform cash ladder analysis relative to their liabilities



Analyze changes in valuations and sensitivities subject to regime changes

Modeling cash flow scenarios

| Scenario Cash flows | | | | | | |
|-------------------------------|-------------------|-------------------|----------------|--------------------|--------------------|--------------------|
| Baseline Horizon on 4/10/2022 | | | | | | |
| Security | Principal | Income | Reinv Int | Cash Rcvd | Bmk Liability | Shortfall/Surplus |
| Positions Grand Total | 63,000,000 | 39,428,805 | 988,518 | 103,417,323 | 111,995,895 | (8,578,572) |
| LDI Demo | 63,000,000 | 39,428,805 | 988,518 | 103,417,323 | 111,995,895 | (8,578,572) |
| 6/30/2020 | 0 | 4,688,985 | 88,500 | 4,777,485 | | 4,777,485 |
| Assets | 0 | 4,688,985 | 88,500 | 4,777,485 | | 4,777,485 |
| 9/30/2020 | 0 | 5,417,857 | 91,988 | 5,509,845 | 7,719,359 | (2,209,514) |
| Assets | 0 | 5,417,857 | 91,988 | 5,509,845 | | 5,509,845 |
| Liabilities | | | | | 7,719,359 | (7,719,359) |
| 12/31/2020 | 21,000,000 | 4,688,985 | 332,539 | 26,021,524 | 37,252,670 | (11,231,146) |
| Assets | 21,000,000 | 4,688,985 | 332,539 | 26,021,524 | | 26,021,524 |
| Liabilities | | | | | 37,252,670 | (37,252,670) |

For stress testing, liabilities can be proxied or used in factor scenarios if factor exposures are available. The deterministic scenario set known as New York 7 (NY7) used for the SOA Asset Adequacy Analysis is supported. Templates are provided to streamline regulatory reporting requirements for Solvency II, S&P convexity risk and AM Best.

Charles River's end-to-end compliance engine enables compliance rules to be based on portfolio level analytics, tenors and funding ratio.

Glide Path Support

Asset owners may use a dynamic de-risking asset allocation strategy, or "glide path", to gradually shift out of return-seeking strategies that rely on equity exposure into liability-hedging long duration fixed income strategies. Glide path workflows are supported to help managers determine the appropriate asset allocations as plan funding status changes.

"Time Travel"

Charles River archives liability data as a time series, allowing managers to recalculate liabilities for a prior month end and compare them to current values. Time series comparisons can be made of assets relative to liabilities, and analytics can be replayed interactively for any desired date.

Productivity Enhancements

Ongoing productivity enhancements streamline LDI workflows in Charles River IMS:

Expanded visualization capabilities
enable user to chart sensitivities of both assets and liabilities as the same bar.

Liability cash flows can be imported
from third-party actuarial vendors into Charles River IMS.

Screenshots are for informative purposes only. No live data being used.

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(Statistics as of February 2021)

Learn more at [crd.com](https://www.crd.com)

[1] <https://www.institutionalinvestor.com/article/b1bb58zfmgy72b/Fresh-Insights-on-Liability-Driven-Investing>

*KRD (Key Rate Duration): measures how the value of a security or portfolio changes at a specific maturity point along the entirety of the yield curve. When keeping other maturities constant, the key rate duration can be used to measure the sensitivity in a security's price to a 1% change in yield for a specific maturity.

PV01: the change in present value of an asset or liability for a 1 basis point change in the nominal yield curve used to value the asset or liability (usually the swap curve)

IE01: the change in present value of an asset or liability for a 1 basis point change in the implied inflation curve used to value the asset or liability (usually the RPI zero-coupon curve).

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