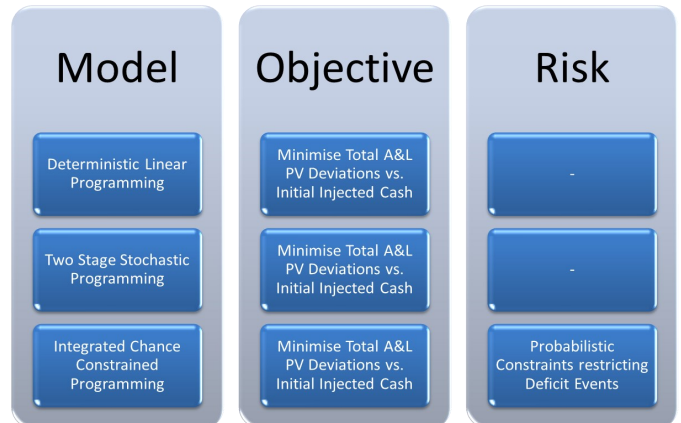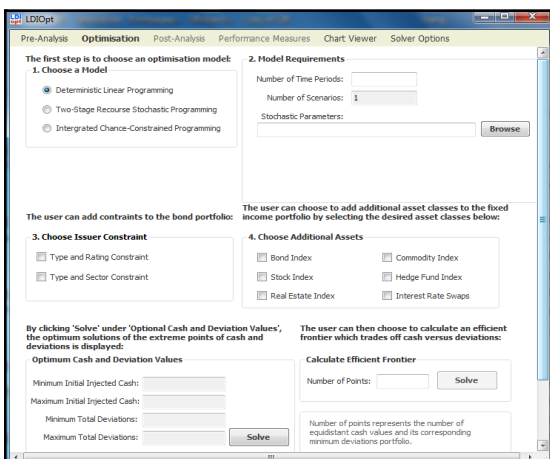# LDIOpt

Liability Driven Investment Optimisation

LDIOpt is an asset and liability management (ALM) optimisation modelling software for pension funds and life insurance companies. The tool enables the user to analyse their current investment portfolio, rebalance it to a new portfolio using advanced stochastic optimisation models which take into account future uncertainties about the assets and liabilities.

The way the underlying model works

Quantitative models have gained acceptance in recent years due to their theoretical basis and proven outperformance of other methods of investment management. The goal of the underlying optimisation models is to minimise initial injected cash while at the same time minimising total present value deviations between assets and liabilities. The optimal portfolio is made of fixed income assets and cash; optionally investments in indices such as a bond index, stock index, real estate index, commodity index or hedge fund index can be also introduced. It also offers the option to use overlay strategies with interest rate swaps.

Model	Objective	Risk
Deterministic Linear Programming	Minimise Total A&L PV Deviations vs. Initial Injected Cash	-
Two Stage Stochastic Programming	Minimise Total A&L PV Deviations vs. Initial Injected Cash	-
Integrated Chance Constrained Programming	Minimise Total A&L PV Deviations vs. Initial Injected Cash	Probabilistic Constraints restricting Deficit Events

Pre - Analysis

In preparation for applying the portfolio optimisation model, the user can analyse the asset universe and current portfolio. The pre-analysis window displays pie charts of the asset universe and the current portfolio by ratings and sectors. It also displays the current portfolio allocation by percentage of portfolio in bonds, market indices and swaps.
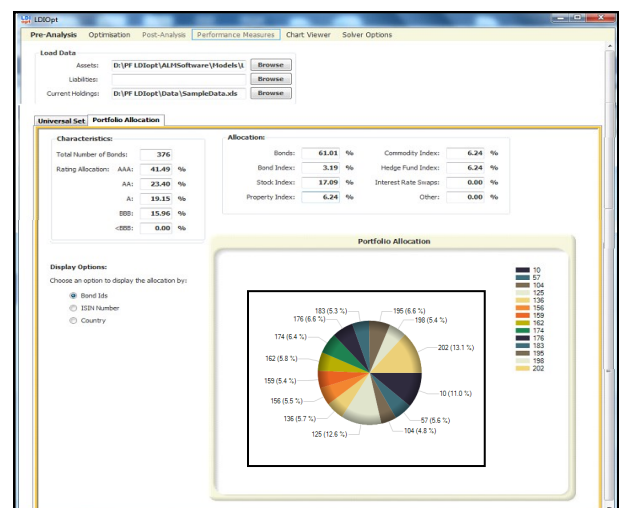
Optimisation

LDIOpt gives the option to choose from three mathematical programming models which are (i) deterministic linear programming (ii) two stage stochastic programming with recourse and (iii) integrated chance constrained programming. The optimum portfolio can be constrained by setting upper and lower limit for certain rating and from sectors for the fixed income bond portfolio.

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Demos on request

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Asset Classes

The user has the option to invest in bonds, indices and /or make use of an overlay strategy using interest rate swaps. By simply ticking the boxes the additional asset classes are considered when solving for an optimum portfolio. By default, LDIopt considers only bonds and cash for selecting optimal portfolio. The user can input the maximum cash to be borrowed at each time step. Also portfolio can be constrained by maximum and minimum unit of bonds, indices and interest rate swaps.

Post - Analysis

After portfolio optimisation the user can analyse the allocated portfolio. Users may choose any efficient frontier point (see the diagram) and can display the optimum portfolio by all sectors and rating. Selling and buying details of the bond, indices is also shown for portfolio rebalancing. Also users can see the graph for borrowing and lending for each time period. The cash inflow and outflow streams for the optimised portfolio are also plotted. Net present values of the asset and liabilities for all efficient frontier points are also plotted on the time scale.
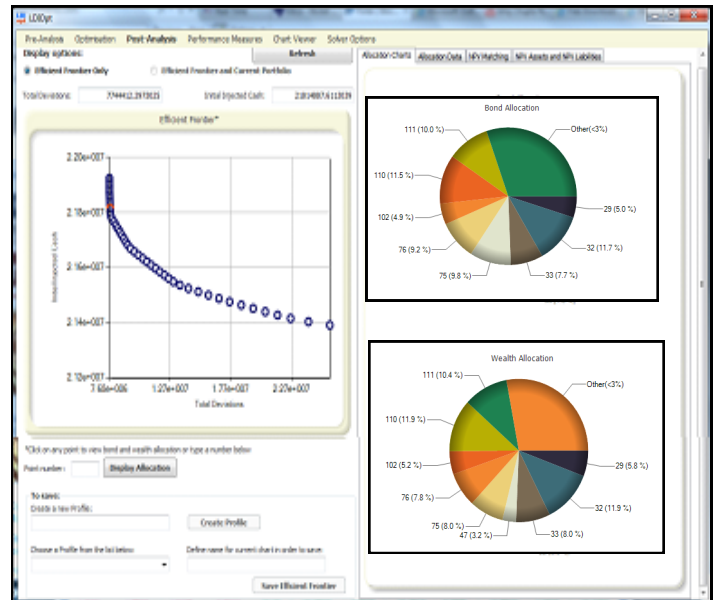
Performance Measures

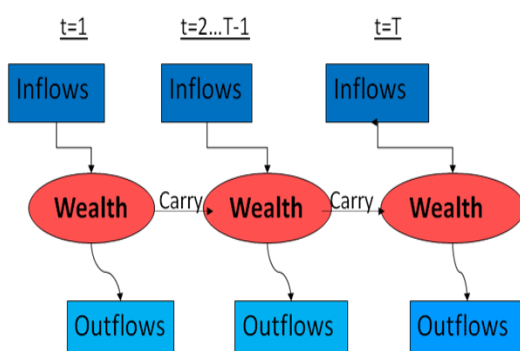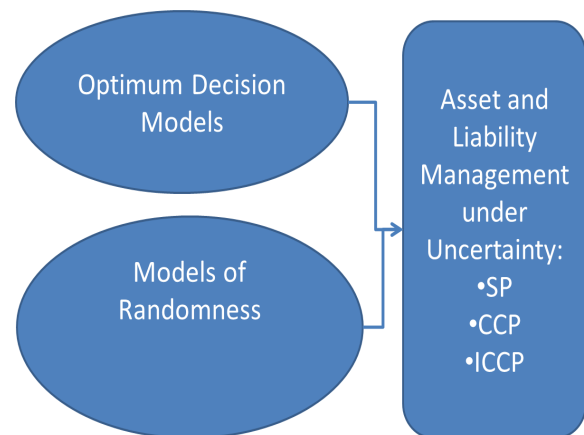The performance of any portfolio can be evaluated using different measures.

We use the most common ones:

From academia:

1. Solvency ratio
2. Funding ratio
3. Standard Deviation or tracking error
4. Sharpe ratio
5. Jensen Index

From industry practice:

1. Sortino ratio
2. Treynor ratio
3. Information ratio
4. M-Square Alpha

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