Invesco Vision Case Study 7: Cash flow driven investing

Creating cash flow matched portfolios

In this example we examine how to create a buy-and-hold portfolio that can defease a pre-specified set of liabilities. We assume six cash flow payments that span 6 years. We also assume that the investible universe is comprised of the defined maturity (DM) corporate bond ETFs as well as some hypothetical, similarly structured Treasury blocks. Solving this problem requires the use of the cash flow optimizer.

In the upper panel of Figure C7a, we can see the efficient frontier in the context of this problem. By definition, the frontier is relative, while the axes demonstrate the key trade-offs: the portfolio relative cost versus the portfolio quality.*The first thing to notice is that the efficient frontier slopes downward, becoming cheaper as we reduce the overall rating. This is expected, as a lower quality portfolio will have a higher yield, being able to produce the desired cash flows at a lower cost. A second thing to notice is that the highest quality portfolio on the frontier has a cost that is marginally higher than the present value of the liabilities. This should also come as no surprise, as the cash flows generated by the investible blocks do not perfectly align with the liability cash flows. This leads to some drag as we re-invest any mismatches at the cash rate.

The lower panel of Figure C7a shows the composition of the frontier. All the way to the left with AAA quality is a portfolio comprised entirely of Treasuries. As one would expect, as we relax the rating constraint, moving to the right, the portfolio allocations gradually shift from all Treasuries to all maturity defined strategy. This allows the portfolio to become cheaper. Another thing to notice is the sequence by which blocks of various maturities are transitioned. The first Treasury blocks to be replaced by maturity defined corporates are the longest maturity ones. This is because the longest maturity blocks have the biggest impact on the overall cost of the portfolio.

In Figure C7b, we compare the asset cash flows to the required cash flows for the selected lowest rated portfolio. As expected, given the discrete nature of the investible blocks, the annual cash flows do not appear to be perfectly aligned. However, the cumulative cashflows, shown on the right of the figure, indicate that at no time was there a cash flow deficit. This is at the core of the optimization algorithm where we ensure that we never need to sell any assets to defease the liabilities.

Finally, for non-fixed income assets, any expected cash flows can also be included in the analysis and visualized in different colors. For example, if equities were included, their dividend yield would be part of the analysis. Furthermore, other more ambiguous income generating assets can also be added based on user specified income generation estimates.

* In this example, we discounted the cash flows using the Treasury curve to derive the portfolio relative cost.

Figure C7a: Cash flow driven investing

Cost versus quality frontier

Construction

Covariance: Long (8y)
Reference: Absolute
Method: Cash Flow Match

Display

Covariance: Long (8y)
Reference: Absolute
Lower section: Weights

Info

Currency: USD
Date: 08-31-2018

Run

Efficient frontier

Relative cost (%)
101
100
99
98
97
Selected portfolio
Aaa Aa1 Aa2 Aa3 A1 A2 A3 Baa1 Baa2 Baa3
Portfolio rating

Factor analysis

Isolated Risk
Benchmark
Rates
Inflation
Credit
Equity
Commodity
Private
Hedge Fund
Specific Risk
Real Estate
Currency
Total
0 1 2 3
Isolated risk (%)

Frontier weights

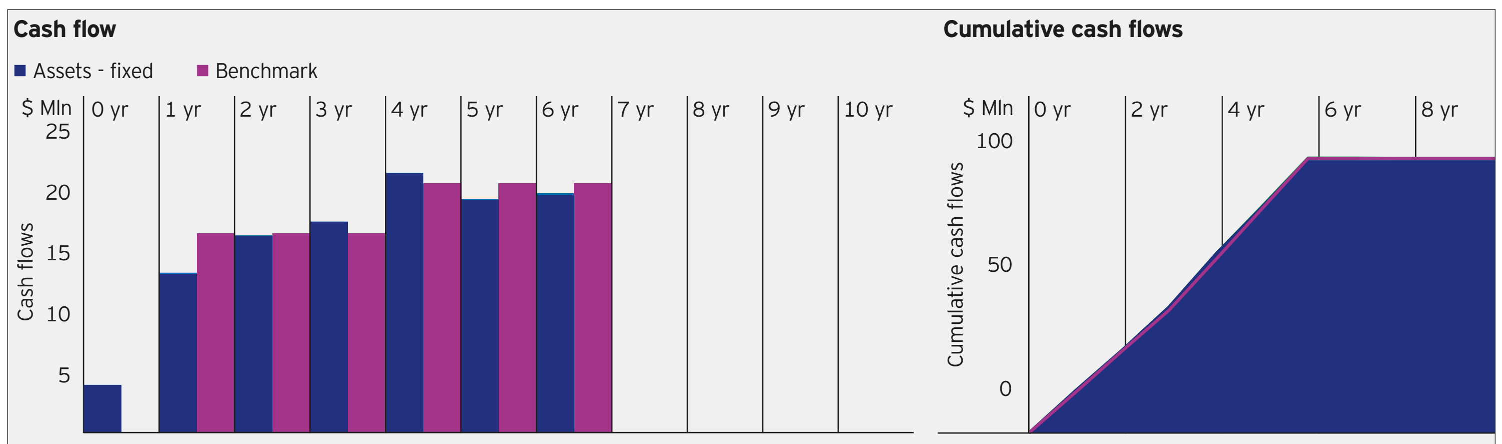
Weight (%)
100
80
60
40
20
0
Aaa Aa1 Aa2 Aa3 A1 A1 A3 Baa1 Baa2 Baa3
Portfolio rating

Weights details

Asset
DM 2025
DM 2024
DM 2023
DM 2022
DM 2021
DM 2020
DM 2019
T 2025
T 2024
T 2023
T 2022
T 2021
T 2020
T 2019
USD
0 20 40 60 80 100
Weight (%)

Figure C7b: Cash flow driven investing

Cash flow analytics



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