Invesco Vision Case Study 6: Liability driven investing

LDI solutions for UK defined benefit plans

Working with UK defined benefit plans has many similarities, as well as some differences, compared to US and other global oriented liability exercises. On the similarity side, we still need two key ingredients: 1) the projected cash flows and 2) the discount curves used to value them. Regarding the more unique characteristics, UK DB plans will also include inflation-linked cash flows in addition to the typical nominal cash flows as dictated by the UK pension system. To address this, we allow for both types of cash flows and also introduce the corresponding required real rate curves.

Figure C6a shows the liability worksheet where we can enter both nominal and inflation linked cash flow streams. We then need to select the corresponding discount curves. In most situations this will be the nominal and real Gilt curves. In addition, and mostly for research purposes, we introduce a "multiplier" option that can be used to scale the relative magnitude of the two types of cash flows. For UK plans, the specific risk component is not relevant since the discount curves are based on sovereign yield curves that are not susceptible to the credit migration risks associated with the US corporate discount curves.

The right portion of the upper panel of Figure C6a summarizes all of the resulting factor risks. As can be seen, the liabilities have both nominal and real rate exposure with no credit exposure or specific risk associated with them. Drill in capabilities allow us to further analyze the liability exposures in terms of nominal and real key rate durations. In this example, the liabilities have more real rate risk than nominal rate risk. This is primarily driven by the longer duration of the real cash flows. The lower panel depicts the underlying cash flows including their future values and present values. Future values are further decomposed into those originating from the nominal cash flow and the real cash flows. Since the real cash flows are expected to grow with inflation, a "real cash flow expected inflation" component needs to also be added and is computed based on break-even rates. Finally, the analytics section of the lower panel summarizes the key liability characteristics. The analytics are presented separately for each type of cash flow. For example, the yield of the nominal cash flows is 1.65% while the real yield of the inflation-linked cash flows is -1.59%. Similarly, the duration of the nominal cash flows is 13.6 years while the duration of the inflation-linked cash flows is 17.2 years.

With the liabilities fully modeled, in Figure C6b we look at how we can create efficient portfolios relative to the liabilities themselves. In this example, we create a simple asset universe comprised of the Intermediate Gilt Index, the Long Gilt Index, the Inflation linked Gilt index and MSCI UK equities. Observing the underlying asset allocation along the frontier we notice that the lowest risk solution is comprised of a blend of Long Gilts, Intermediate Gilts and inflation linked Gilts. This should come as no surprise as the optimizer seeks to most closely match the liability exposures with the provided blocks. It is of interest to note is that the lowest risk solution has lower tracking error than what we saw in the US plan case. This is driven by the discount curve not including a spread exposure, making it easier to more closely match liabilities. Finally, as we move along the efficient frontier we gradually see the Intermediate Gilt block is phased out. This is a direct result of the optimizer opting for more duration in the Long Gilt block as the overall allocation to fixed income is moved into equity. It is important to note that in a more real-world situation, derivatives such as interest and inflation swaps could be used to further improve the depicted efficient frontier.

Figure C6a: Liability-driven investing – UK defined benefit plan
Liability analytics

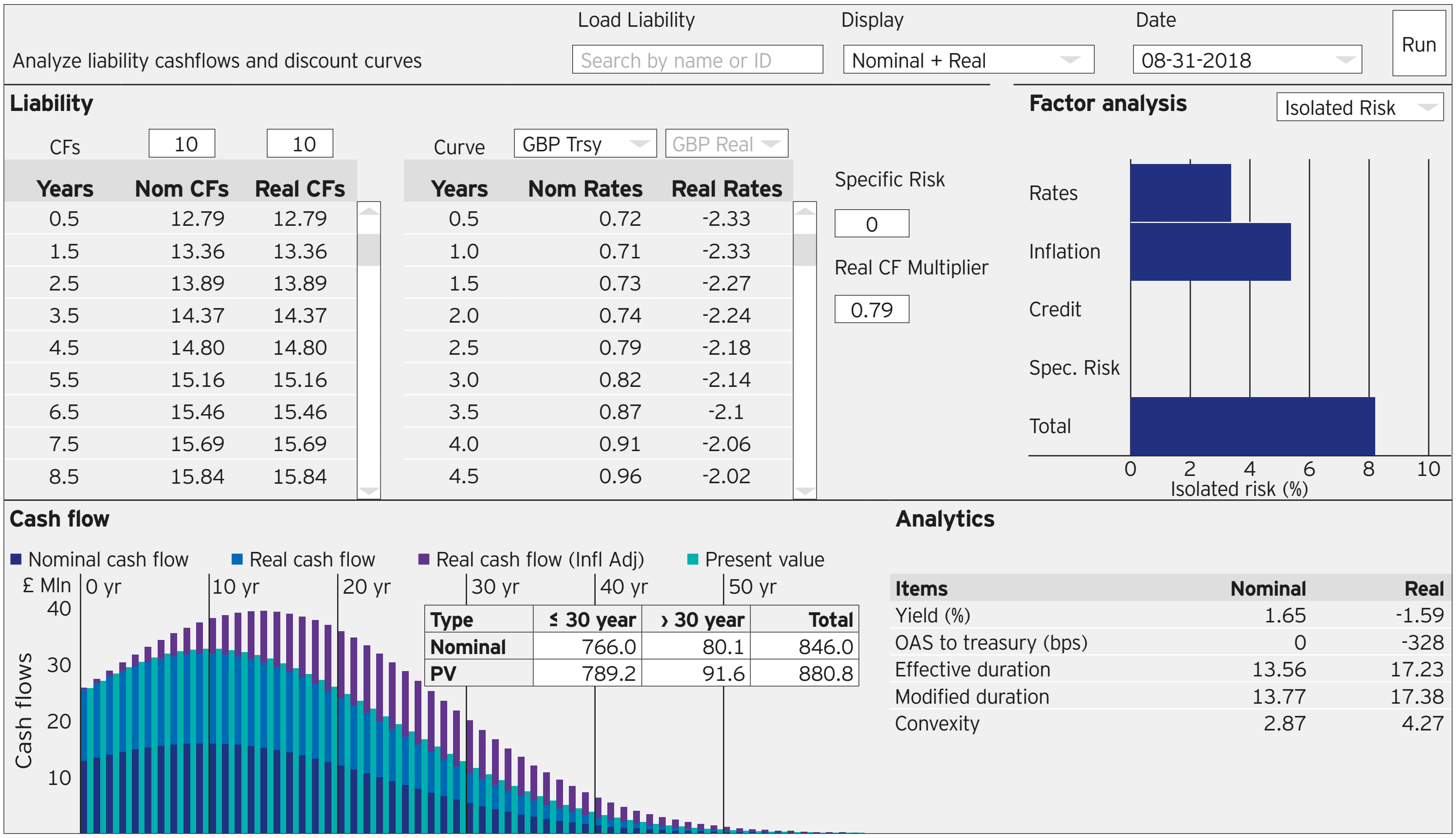
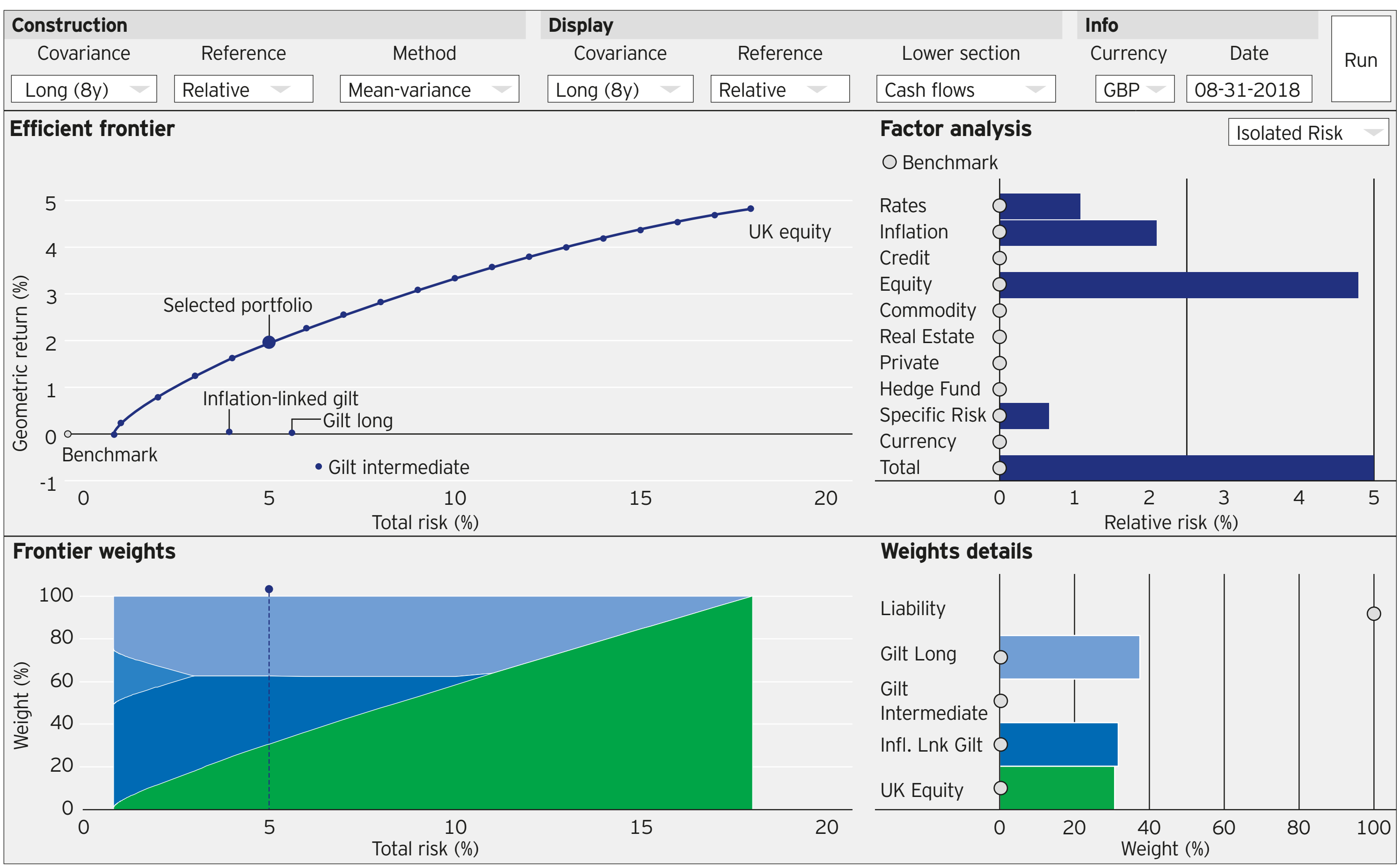


Figure C6b: Liability-driven investing – UK defined benefit plan
Liability relative efficient frontier



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