



PENSION FUND DYNAMICS

How does investment return uncertainty impact pension performance?

In this article I explain some of the dynamics faced by a pension fund as a result of the uncertainty in investment returns. The approach taken is a simulation of the operation of a simplified pension fund. The primary simplification in the simulation is to remove all uncertainty except that of investment returns. The number of plan members, when they join the plan, and when they retire, is known. The characteristics of the pension plan members are known so their contributions to and withdrawals from the pension plan are certain.

These simplifications may seem to eliminate all the interesting elements of running a pension plan and yet we find that there are interesting things to be learned from studying the impact of our single source of uncertainty. The main conclusion is that, in almost all circumstances, there is substantial risk in a pension plan. Who bears the risk depends on the structure of the plan.

DEFINED CONTRIBUTION PLANS

In the simplified defined contribution pension plan used in this simulation, employees contribute 15% of their earnings into the plan during a 40-year working career. The contributions are invested in a portfolio that is 60% equity and 40% fixed income. The target pension is 70% of the final salary. In about half the cases the investment return is adequate to produce the desired pension. However, in about 20% of the cases the resulting pension is less than three-quarters of the desired pension and, in about 5% of the cases, the result is less than half the desired amount.

DEFINED BENEFIT PLANS

The characteristics of the defined benefit are the same as those of the defined contribution plan. Employees contribute 15% of gross earnings into a portfolio that is 60% equity and 40% debt. The promised pension is 70% of final salary. The pension

population is stable with the number of active and retired members constant. The difference between the defined benefit and the defined contribution plans is that in the case of the defined benefit plan, the contribution rates are varied to ensure that there are sufficient assets to cover the pension promises. When investment returns are low, subsequent contribution rates are raised, and when investment returns are high contribution rates are reduced.

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are so high that contribution rates drop to zero. In these cases, unless there is some scheme that allows contributors to withdraw assets from the plan, the asset balance grows out of all proportion to the liabilities and the plan becomes self-funding. In the remaining 80% of the cases the contribution rate varies randomly between zero and 40% of earnings. The average contribution rate necessary is about 20% of earnings. If the pension assets were invested only in fixed income securities a contribution rate of about 20% of salary would be required.

CONCLUSION

The problem faced by pension plans is that their pension liabilities represent fixed claims. In the case of the defined benefit plan this is literally so, while in the case of the defined contribution plan the plan members certainly would prefer a low risk pension. When the fund invests in risky assets there is a fundamental mismatch between the risk of the assets and liabilities. The asset risk does not vanish; it is exhibited either in highly uncertain pensions or in uncertain contribution rates. ■