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ASSET MANAGEMENT

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PROPER CASH-FLOW DISCOUNTING FOR PENSION FUND LIABILITIES

Financial Accounting Standards Board (FASB) Statements 87 and 88 have given rise to a great deal of confusion over the concept of discounting pension liabilities at market rates. Until recently, liabilities were frequently discounted at rates determined solely by actuaries, but now many pension sponsors use a variety of market rates—long bond rates, internal rates of return on the corresponding portfolio or duration-matched rates, among others. Unfortunately, few sponsors have a systematic, theoretically consistent approach to discounting liabilities.

Background

The FASB mandated the use of market rates as a standard in order to increase comparability, consistency and objectivity of the liability discounting process. By using market rates, different actuaries should achieve a higher degree of comparability when valuing pension liabilities of different firms. They should also achieve consistency in valuing liability streams over time. Furthermore, market rates serve as an anchor in liability valuation. They help to ensure that actuaries, pension sponsors and investment managers achieve objectivity in their pension liability measurement. Finally, discounting liabilities at market rates makes economic sense because there exists a market for these flows. Thus the use of market interest rates represents a truly important step in pension fund management.

If market interest rates solve all the pension investor's problems, then why is there still confusion? The confusion arises because there is no single "market interest rate." Different interest rates reflect differences in terms to maturity, various forms and sources of risk liquidity and tax considerations. FAS 87 specifies that, for liability discounting, pension sponsors may look at currently available and expected future returns on high-quality, fixed income securities to infer the appropriate market rate. That narrows down the specification of interest rates significantly, but does not completely clear up the question of the appropriate discount rate.

Identifying Appropriate Discount Rates

Actuaries use subjective probability estimates on scores of variables (including mortality, expected inflation and termination rates) in order to estimate expected values of pension liabilities. The cash flows estimated by the actuaries are essentially risk-free in the conventional finance sense, because they are subject only to interest rate risk and taxes. While taxes are a potentially important issue with investments, they can generally be ignored in the present context, because pension benefits are promised on a pre-tax basis and portfolio income is tax-exempt to the sponsor.

The task of the pension manager is thus essentially a matter of evaluating a series of pre-tax, risk-free cash flows. This can be accomplished in a number of ways. One method commonly employed for discounting liabilities is to use a 20-year or similar U.S. Treasury bond rate as the

discount rate. The argument in favor of this is that Treasury bonds are close to being risk-free and, furthermore, 20 years may be close to the weighted average life of the liabilities.

A problem with this method is that the rate used does not necessarily, and in most cases will not, correspond to the term of the liability being discounted. In fact, with a positively sloped yield curve, the use of a single rate tends significantly to undervalue the near-term and overvalue the long-term liabilities. The distortion becomes greater, the steeper the yield curve. In short, the use of the yield to maturity of a single security as a proxy for the rate to be used in discounting liabilities can result in serious valuation errors which may, in turn, distort investment allocation decisions on the asset side.

Pension liabilities may be discounted at the internal rate of return (IRR) on the portfolio backing the liabilities. This has the advantage of being a market rate. Also, as long as the assets are somehow matched against the liabilities, the rate represents a logical rate to associate with those liabilities.

The problem is that most portfolios are subject to more than just interest rate risk, whereas the liabilities have only interest rate risk. Corporate bonds, for example, have market risk exposure due to individual company risks. Many bonds, including Treasury bonds, have call or other features that push the yields away from what the discount rate on a simple risk-free cash flow should be. In general, this means that the discount rate will be higher than it should be, leading to a lower present value estimate of the pension obligations. This, in turn, leads to potential underfunding and under-hedging of the true pension liability.

Even if we were to use the IRR of an immunized portfolio of non-callable Treasury securities as our discount rate, we would still have a problem. The IRR is naturally sensitive to the timing of the portfolio's cash flows. To the extent the timing of the liabilities deviates from these, use of the IRR rate will distort the liability valuation.

The shortcomings of the first two alternatives suggest a third alternative: Discount the liabilities along the Treasury yield curve. Because we are considering only Treasury issues, there is no credit risk present. Also, if only "current" or "on-the-run" (OTR) Treasury issues are considered (as is typically the case), call risk is eliminated, because the Treasury is currently not issuing callable bonds. By using OTR Treasuries, we have also minimized liquidity risk, as these are the most liquid bonds traded. Finally, by discounting along the yield curve, this method associates the maturities of the assets with those of the liabilities. This, then, would seem to be an appropriate method for discounting a stream of "riskless" liabilities. Unfortunately, it fails on one point.

Discounting along the yield curve associates the maturities of the assets and liabilities. As pointed out above, however, the Treasury bond yield to maturity is an average rate incorporating the pricing of cash flows from coupon payments as well as the final principal payment. The liabilities, by contrast, are represented as a series of individual future cash flows. What we need is a set of rates that eliminates all but interest rate risk yet corresponds to a series of single future cash flows. Two alternatives exist.

STRIPS

STRIPS (Separate Trading of Registered Interest and Principal of Securities) are created by separating the coupon and principal payments from a Treasury coupon bond. These securities thus provide the only vehicle by which an investor can effectively lock up a single future cash

flow with certainty (i.e., risklessly). They are traded in a very large and liquid market (though not as liquid as the Treasury coupon market) and provide an objective, readily accessibly measure for discounting liabilities.

While STRIPS possess very little liquidity risk, this risk is still priced and results in a slight increase in the yield demanded by investors. Because we wish to price only interest rate risk, the incorporation of this liquidity premium in discounting will slightly understate the value of the liabilities. The discrepancy, although minor, can be adjusted for directly by observing STRIPS' bid-ask spreads. These spreads will vary with volatility levels and technical factors, but an average or normal spread can be closely approximated. STRIPS rates adjusted to account for bid-ask spreads would seem to provide an appropriate proxy for the "riskless" rates we are looking for. However, one concern with the approach remains.

Supply and demand factors in the STRIPS market cause discrepancies between STRIPS rates and the theoretical spot rates. Because of their ability to substitute for T-bills, STRIPS in the short end of the market tend to trade richer than we would expect. Similarly, STRIPS in the very long (28-30 year) maturity range tend to trade rich. This is a result of the high demand for these securities by investors needing their long duration and high interest rate sensitivity. But technical factors play a role in all markets; witness, for example, the hump in the 20-year area of the Treasury curve.

Spot Rates

Another method of obtaining single-period, risk-free rates is to use Treasury market information to estimate theoretical "spot" rates. Based on a hypothetical, pure discount security, these estimates of the yield-maturity relationships in the Treasury market are adjusted to take account of callability, liquidity, tax and other effects. In theory, these spot rates are precisely what we are after. However, some practical concerns must be addressed.

The first concern is objectivity. The theory behind spot rate estimation is very straightforward, but differences arise in practical application. Of primary importance are differences in the methods employed to account for the various effects we wish to eliminate, particularly the effect of callability. Such differences will naturally lead to discrepancies between various spot rate estimates and between the resulting liability valuations. If different models are theoretically consistent, however, these differences should be minor.

Another problem concerning objectivity exists, however. Because the applied term structure models are proprietary in nature, they are not readily observable by all market participants.

Were we able, through divine intervention, to obtain actual spot rates, as opposed to estimates, we would still have a problem, because these rates are not actually available in the market. In theory, we could obtain these rates by ***perfectly*** cash-matching the liability stream. Even if this perfect match were possible, the associated transaction costs would prove prohibitive.

In practice, these spot rates are obtained by matching the key characteristics (present value, duration, convexity) of the asset and liability streams. Attempts may also be made to control for more complex, non-parallel, term-structure movements. In any case, the results realized on the

assets will not equal those predicted by the spot rates. Thus spot rates are not truly riskless in the sense that our ability to obtain these rates depends on our ability to "immunize" the liability stream. If the immunization is set up properly, however, this problem is a very minor one.

The Problem with Long Liabilities

We have concluded that the appropriate method for discounting liabilities is to use single-payment, riskless rates corresponding to each respective liability projection. A problem arises, however, when we consider liabilities beyond 30 years, because there exists no corresponding asset market with this maturity.

A monotonically increasing or decreasing term structure, flattening rapidly in the long end, would enable us to extrapolate the curve out beyond 30 years. Livingston has shown that the term structure should behave such that yield curves flatten in the longer end.(*) Higher-order price-yield relationships suggest, however, that the curve cannot flatten completely in equilibrium. Arbitrage arguments can be used to show that, with an upward-sloping term structure, a flattening in the long end would, at some point, lead to a decrease in spot rates as a function of maturity. Similarly, an inverted term structure can never completely flatten in equilibrium. But this effect is relatively minor and very difficult to quantify. Use of the 30-year, single-payment discount rate to value liabilities beyond 30 years would thus seem appropriate.

An alternative to this solution is suggested by the fact that corporations (primarily utilities) issue debt out to 40 years. By observing and measuring the risk characteristics of utilities with less than 30 years to maturity, and extrapolating these relationships to utilities in the 30 to 40-year area, we may obtain spot rate estimates. Of course, this method assumes these relationships are either constant or deviate systematically across maturities. It also leaves us with the question of what to do with liabilities beyond 40 years (though alternative methods of discounting liabilities out this far will have very little effect on the valuation of the total liability stream). Given this, as well as the above discussion on term structure flattening in the long end, we would suggest using the 30-year, risk-free single payment for valuing liabilities beyond 30 years.

(*) M. Livingston, "Flattening of Bond Yield Curves,"
Journal of Financial Research, Spring 1987, pp. 17-24

Conclusion

In determining the appropriate rate to use for discounting liabilities, we have focused on the accumulated portion (ABO) of the pension obligation. Pension obligations that will be incurred in the future are subject to a great deal of non-interest-rate uncertainty, much of which can be offset by investments in non-fixed-income securities. But the accumulated portion of the pension liability is relatively predictable. Furthermore, the uncertainty that does exist results from uncertainty associated with the underlying actuarial projections and assumptions, which cannot be readily hedged in the market. From a market perspective, then, these cash flows should be considered riskless. The appropriate method for discounting them (i.e., the method that eliminates all but interest rate risk from the valuation) is one that uses single-period, risk-free rates (i.e., rates adjusted for credit, callability, liquidity and other risk premiums).

While we have espoused the use of risk-free rates in liability valuation, we have said nothing about the asset side of the equation. A perfect cash match using non-callable Treasury securities is the only riskless way to hedge a set of liabilities. In fact, there are very few circumstances under which a perfect cash match would be appropriate, but such a strategy represents the true risk-free posture; any deviations from it (e.g., immunization, investments in callables, corporates, other investments) subject the pension plan to additional risk, for which it should be compensated. In this sense, a perfect cash match represents the appropriate benchmark for gauging asset allocation and overall pension fund hedging decisions.

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Emad is the Managing Partner and Chief Executive Officer of Vanderbilt Avenue Asset Management LLC. Vanderbilt's client base includes Multi-national Corporations, Public Funds, Foundations/Endowments, and Taft Hartley accounts.

Previously, Emad was Chairman of Institutional Business at Pioneer Investments. Pioneer investments has more than $300 Billion in assets under management. The parent of Pioneer, UniCredit S.p.A., is the largest bank in Italy and the second largest bank in Europe. Pioneer had purchased Vanderbilt Capital Advisors, of which Emad was the founder and Chief Executive Officer.

Emad has had numerous articles published in professional and academic journals such as The Journal of Forecasting, The American Economist and The Journal of Fixed Income. He is a Board member of The National Investment Company. Emad was a member of the Board of Advisors of the Pacific Institute, The Advisory Committee of Fulcrum Global Partners, The Chief Executive Officers Club and formerly a board member of The Foreign Policy Association. He also served on the Board of Directors of the University of Albany Foundation, NextGen Healthcare Inc., The Park Avenue Bank, AA Bank and The New Providence Fund and Associates LP.

Emad is an FINRA Arbitrator. He is also a member of the National Association for Business Economists and The Economic Club of New York. Emad served as an adjunct professor at the University of Kansas and St. John's University.

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