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Duration, Systematic Risk, and Employee Valuation of Default-Free Pension Claims: Reply

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Two Premises

Niehaus's (1993) comment on my article in this journal on employee pension claims (Nader, 1990) holds that "the focus on pre-retirement valuation is misdirected." He advances arguments that support this view and he develops a two-period model that leads to conclusions different from mine. His model (supposedly properly) focuses on the retirement value of pension benefits.

Two widely accepted premises from economic and financial theory underlie my model. Niehaus's arguments, model, and conclusions are invalid because they are inconsistent with these theoretical premises.

Marketability Is Not a Condition for Valuation

The valuation of non-marketable assets that generate future income or benefit streams is an important problem in economics. In particular, discount rate determination for the valuation of such assets has long been a focus of economists' attention (Baumol, 1968; Johnson, 1970; Mayers, 1972; Trivoli, 1973; Oi, 1975; Lind, 1982). The non-marketability of certain assets—such as human capital—or the inadmissibility of such assets as collateral for borrowing does not in any way diminish the relevance or significance of undertaking a valuation of the streams generated by such assets. Such a valuation serves primarily to guide resource allocation among various alternatives, rather than to determine a selling price or collateral value for the asset. For this reason, the most appropriate time for the valuation is *before* an allocation decision or a trade-off among alternatives is made, and, hence, before the expected income stream from the asset is realized.

Viewing a pension claim as a non-marketable asset, my model for determining the employee's discount rate for valuing this claim is based on the above premise. Contrary to Niehaus's arguments, non-marketability or the inability to borrow against pension claims does not render irrelevant or

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insignificant the pre-retirement valuation of these claims by the employees. In fact, this valuation is relevant *because of* non-marketability. If it were possible to observe a market value for pension claims (as with bonds, stocks, and other marketable claims against the firm), then the discount rate would be implied by this observed value, and building a model to assess this rate would be pointless.

Furthermore, the valuation of pension claims is most relevant to employees *prior to* retirement, because it guides the trade-off between pension and wage compensation, which translates into a trade-off between consumption in the working years before retirement and consumption during retirement.[1] The evidence on the compensating differentials model (Nader, 1990) supports the notion that active employees recognize and engage in such a trade-off, while this trade-off may no longer exist for retirees because they have lost the bargaining position they had as wage earners. Thus, it is difficult to understand Niehaus's argument that employees are not likely to be concerned about the value of their pension claims prior to retirement.

The Appropriate Discount Rate Is an Equilibrium Expected Rate

Financial theory (e.g., Copeland and Weston, 1988) suggests that the appropriate discount rate for an uncertain stream is not a subjective rate selected or assumed by the evaluator. This is precisely the reason behind my dissatisfaction with the widespread use of a riskless discount rate assumption in pension claim valuation from the employees' perspective. Conceptually, the appropriate discount rate is an objective rate determined by reference to an *equilibrium* relationship (e.g., the Security Market Line), which captures the relevant risk characteristics of the stream being discounted. Furthermore, because this equilibrium discount rate is *expectational* (i.e., forward looking), in general, it is inappropriate to use some realized rate of return, at the beginning of or during the valuation period, to represent the equilibrium discount rate for the valuation.

In my model, the employee's discount rate for the pension claim is not given or assumed but is an unknown rate that can be determined by solving the model. The discount rate obtained in this manner is based on an equilibrium relationship (the Security Market Line, with beta expressed in terms of the pension claim's duration) and is expectational.

By contrast, Niehaus's (1993) conceptual premise is unclear. His analysis takes us back to square one: His first valuation equation arbitrarily uses a risk-free discount rate, r, which is precisely the problem I sought to resolve. Inexplicably, Niehaus's second valuation equation uses the *realized rate*, $r + \Delta$, as a discount rate.

Throughout his analysis, Niehaus seems to value periodic pension benefit accumulations at a realized rate of return. For this reason, his analysis is not

[1] My model can be applied to pension claim valuation by active as well as retired employees (see Nader, 1990, Table 1).

relevant for determining the *equilibrium* discount rate for the employee's *expected* stream of pension benefits. Niehaus's focus on pension accruals may reflect the belief that the "change in value [of pension benefit accruals] is the focus of Nader's (1990) analysis" (footnote 3). This, most emphatically, is not the focus of my analysis, which deals entirely with expectations, not accruals.

Other Sources of Disagreement

One additional reason I question the validity of Niehaus's claims is that his model omits key factors for pension claim valuation—such as actuarial adjustments, employee age, duration of the pension claim—or any measure of pension claim risk in relation to some economy-wide benchmark. His brief reference to systematic risk in his conclusion—"pension benefits are likely to have negative systematic risk"—is incorrect (as the Appendix below illustrates), because Niehaus defines systematic risk in terms of the volatility of the pension benefit stream during retirement. My model, by contrast, represents systematic risk by the duration-beta relationship (Nader, 1990, p. 628, equation [7]), correctly pertaining to the volatility of the present value of the expected pension benefit stream (equation [9]); see also Copeland and Weston, 1988, pp. 489-491).

Niehaus's definition of systematic risk may explain his interest in the wage-interest rate relationship and how it might affect the pension stream in retirement. This, however, is irrelevant for the volatility of the present value of the pension claim, as shown by the disappearance of the pension stream X from Equation (9) in Nader (1990).

These problems and the limited two-period time frame cast doubt upon Niehaus's model. Nader (1990) includes all of the relevant factors and illuminates their significance for determining the appropriate risk premium to use in valuing the pension claims of widely different employee cohorts.

Appendix

Based on two observations—that, in most scenarios, final salary, and hence the pension benefit stream based on it, "is likely to be positively related to interest rates" and "interest rates [and hence pension benefits] are negatively correlated with the market return"—Niehaus concludes that "pension benefits are likely to have negative systematic risk." The following example correctly defines systematic risk in terms of the present value of the pension benefits and illustrates that Niehaus's observations do not necessarily lead to his conclusion.

Suppose an employee expects pension benefits of $1,000 ten years from today (to be received as a lump sum or annuitized). At present, the interest rate (assuming this is the appropriate discount rate for the pension benefits) is 10 percent. Thus, the present value of the pension benefits is $385. Now suppose a fall in the return on the market portfolio occurs and is coupled with an increase in the interest rate to 11 percent, resulting in an upward adjustment of the employee's final salary expectations. As a result, the expected pension benefit is now $1,050. Although it is true that pension benefits are positively correlated to the interest rate and, hence, negatively correlated to the return on the market portfolio, this does not necessarily mean that the pension *claim*—which is the focus of Nader (1990)—is also negatively correlated to the return on the market portfolio and, hence, has negative systematic risk, as Niehaus suggests. The value of the pension claim is now $370, which suggests that this claim has positive systematic risk.

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