Calculating the Value of a Bond

My Student Number*

2002/12/22

The value of a bond is determined by three variables: N (the number of years to maturity), i (the prevailing interest rate) and D (the size of the dividend or coupon). It is convenient to separate the revenue from a bond into two parts: the dividends that you receive periodically and the 1,000 final payment.

If the interest rate is i, a payment of D, k years from now, is worth $D(1+i)^k$ now. The present value (at the time of purchase) of the N dividend payments is therefore the sum of the following geometric progression: $D(1/(1+i) + 1/(1+i)^2 + \cdots + 1/(1+i)^N) = D(1-(1+i)^{-N})/i$. The last 1,000 payment is worth (when you buy the bond) $1,000(1+i)^{-N}$.

The value of your bond—the sum of the values of the dividends and final payment—is given by the formula: $V = (D/i) + (1,000 - (D/i))(1+i)^{-N}$, where D is your annual dividend, i is the yield to maturity (or interest rate), N is the number of years to maturity and V is the bond's value on the date it is purchased.

*Morton Davis, *The Math of Money*, Springer-Verlag, 2001, p. 57.