SOME ISSUES CONCERNING RISK ADJUSTMENTS IN DAMAGE CALCULATIONS

by

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In an otherwise illuminating discussion concerning inflation-indexed bonds, Ireland in a recent issue of this Journal presents several arguments that we believe are misleading and inaccurate[1]. Specifically, he claims that discounting projected earnings with an interest rate that includes a premium to account for the possibility of default is incorrect. Since damage calculations, generally, include reductions for probabilities that the individual will not survive, be a labor force participant or be employed, using a non-default free interest rate would be a form of double counting the risks that the worker would not have earned projected incomes.

Ireland also differentiates between default risk and inflation risk explaining that default risk contains only a downside risk since a bond never pays more than the scheduled amount. Inflation risk, however, has both an upside and a downside risk in that future inflation may be greater or less than expected. Ireland then makes the claim that the present value calculation would be unaffected by the inclusion of inflation risk since the upside and downside variances are equal. Increasing inflation risk increases the variance without changing the expected value of the result. With default risk, however, since the distribution is truncated, a change in the risks of the negative outcomes will reduce the expected rate of return and the present value of the asset.

We believe the accuracy of these statements to be questionable and we are, furthermore, unsure as to the relevance of some of these assertions. We present our arguments in what follows

Ireland argues that the reason one should not use a discount rate containing a premium for possible default is that since damage calculations already include a reduction of future earnings for the probabilities of not surviving, not being in the labor force or not being employed, this would be double counting. Once the forensic economist has reduced projected earnings to account for the probabilities that the victim might not earn the projected income in the future, one should not use a non-default free interest rate to further reduce the present value of future earnings. Using a non-default free interest rate reduces the present value to account for the future uncertainties that have already been accounted for by reducing the projected earnings. Thus, it is a form of double counting.

There are a number of problems with this argument. First, the risks of not earning projected income in the future and the risk of default on the bonds are not necessarily equivalent. While it is true that the probability of default along with the probabilities of non-survival, non-participation in the labor force and unemployment are superficially equivalent in that they are all downside risks which can only lead to a reduction of the

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[1] See Thomas R. Ireland, "Forensic Implications of Inflation Adjusted Bonds," Litigation Economics Digest, Summer, 1997, Vol.II, No. 2, pp 92-102.

future cash flows, it is, nevertheless, not necessarily true that the size of the probabilities or the states of nature in which they occur are the same. Therefore, reducing projected earnings by the appropriate probabilities is not equivalent to raising the interest rate to incorporate the probability of default. They should be treated as separate issues.

Second, even if the risks were equivalent, reducing the future earnings flow by the probabilities of non-survival, non-participation in the labor force and unemployment has still not resolved all the uncertainties associated with projecting future cash flows. For example, one factor that might influence the projection of earnings growth would be the growth of future productivity. Typically, no adjustment is made to recognize the uncertainty of future productivity growth by reducing projected earnings as we do for non-survival non-participation and unemployment. One could reasonably argue that the basis for employing a non-risk free discount rate would be to account for this uncertainty.

Third, and most importantly, even if one ignores any additional uncertainties associated with future earnings growth (i.e., productivity) and even assuming that using a non-risk free discount rate to discount future earnings is equivalent to reducing future earnings by the probabilities of non-survival, non-participation in the labor force and unemployment, theoretically, one should still not use a risk free discount rate to discount future earnings. It is a well known proposition in finance that only certainty equivalents are discounted with risk free interest rates[2]. Multipling future earnings by the probabilities of non-survival, non-participation in the labor force and unemployment simply converts projected future earnings into expected values, not certainty equivalents. Consider two cash flows. One flow is risk free while the other cash flow is risky. Assume that the values in the risk free cash flow are equal to the expected values of the risky flow. Clearly, if a market exists for each of these cash flows, the market would not value them equally. The cash flow with the risky values will have a market price (present value) below the cash flow with the non-risky values. This is another way of stating that the market discounts the risky flow with a larger discount rate than the risk free cash flow. Therefore, when the forensic economist reduces the projected earnings of the victim by the probabilities of non-survival, non-participation in the labor force and unemployment, the resulting projection of future earnings should still be discounted by a non-risk free discount rate. Since the resulting projection of future earnings after adjustment by the probabilities is simply an expected value of future earnings the appropriate discount rate is some non-risk free discount rate.

Ireland could have argued that the discount rate derived from the pricing of risky bonds is not the appropriate rate with which to discount adjusted projected earnings since the implied discount rate on these bonds is associated with the maximum values paid on the bonds and not the expected values. It would be inappropriate to employ a discount rate that is derived from the pricing of the maximum values of a cash flow to discount a cash flow whose values are not maximum values but rather expected values. But conceding this point does not imply that the relevant discount rate is a risk free rate. The court's decision in this matter is not based on economic principles[3].

Ireland differentiates in his paper between inflation risk and default risk explaining

[2] For example, see A. A. Robicheck and S. C. Myers, Optimal Financing Decisions, Prentice Hall, Inc., 1965, pp 18-19.

[3] The case cited by Ireland is *Jones & Laughlin v. Pfeifer 1035.ct 2541* (1983).

that default risk contains only a downside risk since a bond never pays more than the scheduled amount. Inflation risk, however, has both an upside and a downside risk in that future inflation may be greater or less than expected. Ireland then makes the claim that the present value calculation would be unaffected by the inclusion of inflation risk since the upside and downside variance are equal. Increasing inflation risk increases the variance without changing the expected value of the result. With default risk, since the distribution is truncated, a change in the risks of the negative outcomes will reduce the expected rate of return and the present value of the asset.

In our opinion, both of Ireland's arguments are incorrect. First, Ireland's argument that since the bond never pays more than the scheduled amount there is only a downside risk with respect to default is irrelevant. A bond that is subject to a probability of default can become more or less risky without changing the expected return as Ireland argued with respect to inflation risk. This is easy to show using Ireland's example with respect to the probability of default. His example assumes an 8 percent return with probability of .8. He, furthermore, assumes that the bonds offer returns of 6, 4, 2 and 0 percent each with a probability of 5 percent. A simple calculation of the expected return and variance shows an expected return of 7.0 percent and a variance of 5.00. Now consider the same potential returns of 8, 6, 4, 2 and 0 percent. However, now assume that the probabilities of attaining these returns are .75, .133333, .05, 0, and .066667, respectively. The expected value of the returns is still 7.0 percent, however the variance of the returns has now decreased to 4.60333. Thus, even though the bonds cannot pay more than the scheduled amount on the bonds, nevertheless, the bonds have a lower risk with respect to default. A risk averse individual would prefer the bonds with the lower variance of returns, ceteris paribus, and they should, therefore, sell for a higher price in the market.

The second argument made by Ireland is also incorrect. If there is a change in the "variance" of inflation without affecting the expected return on the bonds, there clearly will be a change in the value of the bonds. The value of the bonds are not only affected by the expected rate of inflation. The value is also subject to the "variance" of the inflation rate. This is also true with respect to default risk. The value of the bond is subject not only to expected default but also to the "variance" associated with default.

As a general proposition, the nominal rate of interest on treasury securities consists of three components, the real rate of interest, the expected rate of inflation and the inflation risk premium[4]. Often the inflationary risk premium is incorporated in the real rate of interest. However, the point to be made is that any changes in the riskiness of the inflation rate, independent of any changes in the expected inflation rate will affect the nominal interest rate and, thus affect the market value of outstanding bonds. In a similar fashion, any change in the riskiness of default (even with no change in the expected return) will cause the value of the bond to change and, thus cause a change in the implied discount rate.

[4] This is most explicitly stated in Jeffrey M. Wrase, "Inflation-Indexed Bonds: How Do They Work?" Business Review, July-August, 1997, pp. 3-16. Also see John Cambell and Robert Shiller, "A Scorecard for Indexed Government Debt," National Bureau of Economic Research Working Paper 5587, May 1996.