

D. WHAT'S THE POINT?

You went to law school thinking that you'll never see another math formula. What's the point of this math? Why do lawyers need to understand this?

The above mathematical exercises seem abstract and dry (and perhaps tedious), but the math is rich in meaning. Time value of money is the critical concept in the value of assets, such as corporations (or even lost earnings calculations to remedy a tort victim). In economics and business, the value of an asset, such as a corporation or the economic value of a person, is the amount of cash flow it is expected to generate *in the future*. Remember that the future is always uncertain, and that money in the future is always worth less than today's money. Therefore, the value of a thing is the expected future return discounted by *time* and *risk*.

Time value of money is not simply rote math calculations. The mathematical process and its underlying concept have deep significance in understanding the value of corporations and business transactions. Clients always think in terms of value and wealth creation. If business lawyers do not understand the concept of value—an issue that is always on the minds of business clients—they cannot function on a high level.



The economic value of an asset, such as a corporation, is measured by the amount of the free cash available to the capital providers of the firm (creditors and equityholders) after operating expenses are paid. The free cash flow is expected in the future, which means that these future values must be discounted to present value.

Economic Value = Future Cash Flow Discounted by Time and Risk

E. CASE APPLICATION

In Chapters 8 and 9, we will build up to a rigorous analysis of valuation in business transactions. In the meantime, below is a case on remedying a tort victim. An essential component of compensation is lost earnings, lost *future* earnings. What does time value of money have to do with tort law? Quite a lot, as Judge Richard Posner notes. In reading this case, think about the tort victim as an economic asset, which is the premise of the remedy structure: How is the asset valued?

O'Shea v. Riverway Towing Co.

677 F.2d 1194 (7th Cir. 1982)

POSNER, Circuit Judge.

This is a tort case under the federal admiralty jurisdiction. We are called upon to decide questions of contributory negligence and damage assessment, in particular the question—one of first impression in this circuit—whether, and if so how, to account for inflation in computing lost future wages.

On the day of the accident, Margaret O'Shea was coming off duty as a cook on a towboat plying the Mississippi River. A harbor boat operated by the defendant, Riverway Towing Company, carried Mrs. O'Shea to shore and while getting off the boat she fell and sustained the injury complained of. The district judge found Riverway negligent and Mrs. O'Shea free from contributory negligence, and assessed damages in excess of \$150,000.

The accident happened in the following way. When the harbor boat reached shore it tied up to a seawall the top of which was several feet above the boat's deck. There was no ladder. The other passengers, who were seamen, clambered up the seawall without difficulty, but Mrs. O'Shea, a 57-year-old woman who weighs 200 pounds (she is five foot seven), balked. According to Mrs. O'Shea's testimony, which the district court believed, a deckhand instructed her to climb the stairs to a catwalk above the deck and disembark from there. But the catwalk was three feet above the top of the seawall, and again there was no ladder. The deckhand told her that she should jump and that the men who had already disembarked would help her land safely. She did as told, but fell in landing, carrying the assisting seamen down with her, and broke her leg.

The more substantial issues in this appeal relate to the computation of lost wages. Mrs. O'Shea's job as a cook paid her \$40 a day, and since the custom was to work 30 days consecutively and then have the next 30 days off, this comes to \$7200 a year although, as we shall see, she never had earned that much in a single year. She testified that when the accident occurred she had been about to get another cook's job on a Mississippi towboat that would have paid her \$60 a day (\$10,800 a year). She also testified that she had been intending to work as a boat's cook until she was 70—longer if she was able. An economist who testified on Mrs. O'Shea's behalf used the foregoing testimony as the basis for estimating the wages that she lost because of the accident. He first subtracted federal income tax from yearly wage estimates based on alternative assumptions about her wage rate (that it would be either \$40 or \$60 a day); assumed that this wage would have grown by between six and eight percent a year; assumed that she would have worked either to age 65 or to age 70; and then discounted the resulting lost-wage estimates to present value, using a discount rate of 8.5 percent a year. These calculations, being based on alternative assumptions concerning starting wage rate, annual wage increases, and length of employment, yielded a range of values rather than a single value. The bottom of the range was \$50,000. This is the present value, computed at an 8.5 percent discount rate, of Mrs. O'Shea's lost future wages on the assumption that her starting wage was \$40 a day and that it would have grown by six percent a year until she retired at the age of 65. The top of the range was \$114,000, which is the present value (again discounted at 8.5 percent) of her lost future wages assuming she would have worked till she was 70 at a wage that would have started at \$60 a day and increased by eight percent a year. The judge awarded a figure—\$86,033—near the midpoint of this range. He did not explain in his written opinion how he had arrived at this figure, but in a preceding oral opinion he stated that he was "not certain that she would work until age 70 at this type of work," although "she certainly was entitled to" do so and "could have earned something"; and that he had not "felt bound by (the economist's) figure of eight per cent increase in wages" and had "not found the wages based on necessarily a 60 dollar a day job." If this can be taken to mean that he thought Mrs. O'Shea would probably have worked till she was 70, starting at \$40 a day but

moving up from there at six rather than eight percent a year, the economist's estimate of the present value of her lost future wages would be \$75,000.

We come at last to the most important issue in the case, which is the proper treatment of inflation in calculating lost future wages. Mrs. O'Shea's economist based the six to eight percent range which he used to estimate future increases in the wages of a boat's cook on the general pattern of wage increases in service occupations over the past 25 years. During the second half of this period the rate of inflation has been substantial and has accounted for much of the increase in nominal wages in this period; and to use that increase to project future wage increases is therefore to assume that inflation will continue, and continue to push up wages. Riverway argues that it is improper as a matter of law to take inflation into account in projecting lost future wages. Yet Riverway itself wants to take inflation into account—one-sidedly, to reduce the amount of the damages computed. For Riverway does not object to the economist's choice of an 8.5 percent discount rate for reducing Mrs. O'Shea's lost future wages to present value, although the rate includes an allowance—a very large allowance—for inflation.

To explain, the object of discounting lost future wages to present value is to give the plaintiff an amount of money which, invested safely, will grow to a sum equal to those wages. So if we thought that but for the accident Mrs. O'Shea would have earned \$7200 in 1990, and we were computing in 1980 (when this case was tried) her damages based on those lost earnings, we would need to determine the sum of money that, invested safely for a period of 10 years, would grow to \$7200. Suppose that in 1980 the rate of interest on ultra-safe (i.e., federal government) bonds or notes maturing in 10 years was 12 percent. Then we would consult a table of present values to see what sum of money invested at 12 percent for 10 years would at the end of that time have grown to \$7200. The answer is \$2318. But a moment's reflection will show that to give Mrs. O'Shea \$2318 to compensate her for lost wages in 1990 would grossly undercompensate her. People demand 12 percent to lend money risklessly for 10 years because they expect their principal to have much less purchasing power when they get it back at the end of the time. In other words, when long-term interest rates are high, they are high in order to compensate lenders for the fact that they will be repaid in cheaper dollars. In periods when no inflation is anticipated, the risk-free interest rate is between one and three percent. Additional percentage points above that level reflect inflation anticipated over the life of the loan. But if there is inflation it will affect wages as well as prices. Therefore to give Mrs. O'Shea \$2318 today because that is the present value of \$7200 10 years hence, computed at a discount rate—12 percent—that consists mainly of an allowance for anticipated inflation, is in fact to give her less than she would have been earning then if she was earning \$7200 on the date of the accident, even if the only wage increases she would have received would have been those necessary to keep pace with inflation.

There are (at least) two ways to deal with inflation in computing the present value of lost future wages. One is to take it out of both the wages and the discount rate—to say to Mrs. O'Shea, "we are going to calculate your probable wage in 1990 on the assumption, unrealistic as it is, that there will be zero inflation between now and then; and, to be consistent, we are going to discount the amount thus calculated by the interest rate that would be charged under the same assumption of zero inflation." Thus, if we thought Mrs. O'Shea's real (i.e., inflation-free) wage rate would not rise in the future, we would fix her lost earnings in 1990 as \$7200 and, to be

consistent, we would discount that to present (1980) value using an estimate of the real interest rate. At two percent, this procedure would yield a present value of \$5906. Of course, she would not invest this money at a mere two percent. She would invest it at the much higher prevailing interest rate. But that would not give her a windfall; it would just enable her to replace her lost 1990 earnings with an amount equal to what she would in fact have earned in that year if inflation continues, as most people expect it to do. (If people did not expect continued inflation, long-term interest rates would be much lower; those rates impound investors' inflationary expectations.)

An alternative approach, which yields the same result, is to use a (higher) discount rate based on the current risk-free 10-year interest rate, but apply that rate to an estimate of lost future wages that includes expected inflation. Contrary to Riverway's argument, this projection would not require gazing into a crystal ball. The expected rate of inflation can, as just suggested, be read off from the current long-term interest rate. If that rate is 12 percent, and if as suggested earlier the real or inflation-free interest rate is only one to three percent, this implies that the market is anticipating 9-11 percent inflation over the next 10 years, for a long-term interest rate is simply the sum of the real interest rate and the anticipated rate of inflation during the term.

Either approach to dealing with inflation is acceptable (they are, in fact, equivalent) and we by no means rule out others; but it is illogical and indefensible to build inflation into the discount rate yet ignore it in calculating the lost future wages that are to be discounted. That results in systematic undercompensation, just as building inflation into the estimate of future lost earnings and then discounting using the real rate of interest would systematically overcompensate.

Applying our analysis to the present case, we cannot pronounce the approach taken by the plaintiff's economist unreasonable. He chose a discount rate—8.5 percent—well above the real rate of interest, and therefore containing an allowance for inflation. Consistency required him to inflate Mrs. O'Shea's starting wage as a boat's cook in calculating her lost future wages, and he did so at a rate of six to eight percent a year. If this rate had been intended as a forecast of purely inflationary wage changes, his approach would be open to question, especially at the upper end of his range. For if the estimated rate of inflation were eight percent, the use of a discount rate of 8.5 percent would imply that the real rate of interest was only .5 percent, which is lower than most economists believe it to be for any substantial period of time. But wages do not rise just because of inflation. Mrs. O'Shea could expect her real wages as a boat's cook to rise as she became more experienced and as average real wage rates throughout the economy rose, as they usually do over a decade or more. It would not be outlandish to assume that even if there were no inflation, Mrs. O'Shea's wages would have risen by three percent a year. If we subtract that from the economist's six to eight percent range, the inflation allowance built into his estimated future wage increases is only three to five percent; and when we subtract these figures from 8.5 percent we see that his implicit estimate of the real rate of interest was very high (3.5-5.5 percent). This means he was conservative, because the higher the discount rate used the lower the damages calculated.

If conservative in one sense, the economist was most liberal in another. He made no allowance for the fact that Mrs. O'Shea, whose health history quite apart from the accident is not outstanding, might very well not have survived—let alone survived

and been working as a boat's cook or in an equivalent job-until the age of 70. The damage award is a sum certain, but the lost future wages to which that award is equated by means of the discount rate are mere probabilities. If the probability of her being employed as a boat's cook full time in 1990 was only 75 percent, for example, then her estimated wages in that year should have been multiplied by .75 to determine the value of the expectation that she lost as a result of the accident; and so with each of the other future years. The economist did not do this, and by failing to do this he overstated the loss due to the accident.

Although we are not entirely satisfied with the economic analysis on which the judge, in the absence of any other evidence of the present value of Mrs. O'Shea's lost future wages, must have relied heavily, we recognize that the exactness which economic analysis rigorously pursued appears to offer is, at least in the litigation setting, somewhat delusive. Therefore, we will not reverse an award of damages for lost wages because of questionable assumptions unless it yields an unreasonable result. We cannot say the result here was unreasonable. If the economist's method of estimating damages was too generous to Mrs. O'Shea in one important respect it was, as we have seen, niggardly in another.

JUDGMENT AFFIRMED.

QUESTIONS

1. How important is an understanding of the process of discounting to a tort lawyer's work?
 2. In what way did the economist err in calculating lost earnings?
 3. Why was this error harmless in that it did not constitute reversible error?
 4. The court mentions two ways to deal with the problem of inflation. What are these two methods? Why are they equivalent?
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