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Can a Court Effectively Determine Discount Rates? An Economic Perspective

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CAN A COURT EFFECTIVELY DETERMINE DISCOUNT RATES: AN ECONOMIC PERSPECTIVE

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I. INTRODUCTION

Courts have fashioned various rules concerning the use of external economic factors such as inflation and future wage increases in order to guide the finder of fact in his or her determination of personal injury or wrongful death compensation awards.[1] In Section II of this article the author summarizes the basic components of these rules and examines some of the motivations behind their use. In Section III, the logic which underlies these court-adopted rules will be compared with what may be considered a "proper" economic model for determining the most accurate compensation awards. Section IV of the article examines studies by several economists which have suggested the use of damage

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1. Theoretically, a compensatory damage award should make a personal injury or wrongful death plaintiff whole again by placing the plaintiff into the position that he or she would have been in without the occurrence of the event which caused the injury. *See* Beaulieu v. Elliot, 434 P.2d 665, 670–71 (Alaska 1967). The problem with compensating such a plaintiff has traditionally been one of arriving at an adequate amount for the damage award. A compensatory damage award must reflect a lump sum figure which, when invested in government securities or other conservative investments, approximates the plaintiff's lost stream of future income. *See* Jones & Laughlin Steel Corp. v. Pfeifer, 462 U.S. 523, 534–37 (1983), *superseded by statute on other grounds as stated in* Eagle-Picher Indus. Inc. v. United States, 846 F.2d 888 (3d Cir. 1988). In general, there are two difficulties which are inherent in the process of damage award calculation. First, in order to determine an injured plaintiff's economic loss due to injury or death, it may be necessary to forecast the amount of future wage increases that would have been received by the injured party. Slesnick & Dolin, *The Impact of Inflation Upon Compensation Awards,* 8 U. DAYTON L. REV. 307, 307 (1983). This type of forecasting is difficult because accurate assessments of these figures depend upon predictions of unknown variables, namely, inflation and labor productivity. *Id.* at 307–08. The second problem with the compensation award calculation process is that such awards must be discounted to present value. As two commentators recently indicated:

> Discounting reduces the lost future income stream to present value by removing the interest income that the plaintiff could earn through investment. The idea is that the award plus the interest earned on the award should equal the future lost earnings that the plaintiff would have received had he or she not been injured.

Anderson & Roberts, *Economic Theory and the Present Value of Future Lost Earnings: An Integration, Unification and Simplification of Court Adopted Methodologies,* 39 U. MIAMI L. REV. 723, 732 (1985). As discussed in this article, the accurate calculation of a lump sum damage award involves a two-step process: (1) calculating future lost earnings based on a forecast of the average annual rate of growth in plaintiff's earnings; and (2) discounting this amount to present value using a forecasted average interest rate.

award calculation rules that would specify the value of external economic variables as a matter of law. Section V draws conclusions from the author's analysis of how a proper damage award calculation rule should be fashioned and the author's assessment of the economic literature discussed in Section IV. This final section also provides suggestions concerning the future use of compensation award rules by the courts.

II. Damage Award Calculation Rules

A. *Underlying Policies*

Courts have taken three policy goals into consideration when determining whether certain external economic variables should be introduced into judicial proceedings for the calculation of damage awards. The three policy goals are accuracy, efficiency, and predictability.[2] The first policy goal, accuracy, refers to whether the economic data that is to be introduced will lead to an accurate assessment of the loss incurred by the plaintiff.[3] The second policy goal, efficiency, concerns whether the data to be introduced will unduly complicate the proceeding.[4] The third policy goal, predictability, refers to the ability of the economist-expert witness to predict correctly the economy's future course and, by so doing, a damage award sum necessary to make the plaintiff whole again.[5]

B. *The Roles of the Expert and the Finder of Fact*

Historically, courts have espoused differing philosophies regarding the circumstances under which external economic data may be introduced. There have been basically three approaches toward the introduction of such evidence. The so-called "Traditional" approach would simply have the finder of fact ignore external economic variables such as inflation and productivity.[6] The justification for ignoring these vari-

2. Freeport Sulphur Co. v. S.S. Hermosa, 526 F.2d 300, 308–12 (5th Cir. 1976) (Wisdom, J., concurring). Commentators have also used the policy goals of accuracy, efficiency and predictability as touchstones against which to assess judicial approaches toward damage award calculation. *See generally* Note, *Tort Damages: The Adjustment of Awards for Future Earning Capacity to Compensate for Inflation and Increased Productivity:* Kaczkowski v. Bolubasz, 7 U. Dayton L. Rev. 139, 140 (1981); Note, *Future Inflation, Prospective Damages and the Circuit Courts*, 63 Va. L. Rev. 105, 108 (1977) [hereinafter Note, *Future Inflation*]; Note, *Considering Inflation in Calculating Lost Future Earnings*, 18 Washburn L.J 499, 500 (1979) [hereinafter Note, *Lost Future Earnings*].

3. *See* Note, *Future Inflation, supra* note 2, at 128–33 (discussing judicial approaches to damage award calculation in terms of each approaches' ability to accurately reflect a plaintiff's future economic loss).

4. *See id.* at 127.

5. *See id.* at 126–27.

6. *See* Johnson v. Penrod Drilling Co., 510 F.2d 234, 236–41 (5th Cir.) (en banc), *cert. denied sub nom.* Stevens v. Penrod Drilling Co., 423 U.S. 839 (1975) *and superseded by statute*

ables is that predictability is achieved by eliminating the somewhat speculative nature of these variables, and efficiency is attained by narrowing the relevant bounds of inquiry.[7] Another argument in support of this approach posits that inflation can be ignored, since historically its effects have been offset by similar trends in interest rates.[8]

A second view of the role of the fact finder and expert witness has been termed the "Middle Ground" approach.[9] This approach permits the finder of fact to consider inflation, productivity, and other economic variables, but it forbids the introduction of expert testimony to guide

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as stated in Eagle-Picher Indus. Inc. v. United States, 846 F.2d 888 (3d Cir. 1988); Williams v. United States, 435 F.2d 804, 807 (1st Cir. 1970); Sleeman v. Chesapeake & Ohio Ry., 414 F.2d 305, 307–08 (6th Cir. 1969); DeWeese v. United States, 419 F. Supp. 170, 172 (D. Colo. 1976), *modified,* 576 F.2d 802 (10th Cir. 1978); Schnebly v. Baker, 217 N.W.2d 708, 727 (Iowa 1974), *overruled in* Goetzman v. Wichern, 327 N.W.2d 742 (Iowa 1982) *and superseded by statute as stated in* Speck v. Litton Systems, Inc., 366 N.W.2d 543 (Iowa 1985); Hodkinson v. Parker, 70 S.D. 272, 277, 16 N.W.2d 924, 927 (1944), *overruled in* Anderson v. Lale, 88 S.D. 111, 216 N.W.2d 152 (1974) *and superseded by statute as stated in* Flagwet v. Smith, 367 N.W.2d 188 (S.D. 1985); *see also* Note, *Lost Future Earnings, supra* note 2, at 502 (describing the traditional approach as the "customary" judicial view).

7. *See* Johnson v. Penrod Drilling Co., 510 F.2d 234, 241 (5th Cir.) (en banc) (holding that "influence on future damages of possible inflation or deflation is too speculative a matter for judicial determination"), *cert. denied sub nom.* Starnes v. Penrod Drilling Co., 423 U.S. 839 (1975) *and superseded by statute as stated in* Eagle-Picher Indus. Inc. v. United States, 846 F.2d 888 (3d Cir. 1988); Hodkinson v. Parker, 70 S.D. 272, 277, 16 N.W.2d 924, 927 (1944) (use of future inflation is speculative because it is not certain that inflation will necessarily occur), *overruled in* Anderson v. Lale, 88 S.D. 111, 216 N.W.2d 152 (1974) *and superseded by statute as stated in* Flagwet v. Smith, 367 N.W.2d 188 (S.D. 1985).

8. *See Penrod,* 510 F.2d at 236; McWeeney v. New York, N.H. & H. Ry., 282 F.2d 34, 42–43 (2d Cir.) (Lumbard, C.J., dissenting), *cert. denied,* 364 U.S. 870 (1960); Stanley v. United States, 347 F. Supp. 1088, 1098 (D. Me. 1972), *vacated on other grounds,* 476 F.2d 606 (1st Cir. 1973); Frankel v. United States, 321 F. Supp. 1331, 1346 (E.D. Pa. 1970), *aff'd sub nom.* Frankel v. Heym, 466 F.2d 1226 (3d Cir. 1972).

Nominal interest rates and increases in wage rates contain premiums for inflation. Lenders demand such premiums in order to preserve the real return on their investment. For example, if the expected real return is 2% and the expected rate of inflation is 6%, the nominal rate of interest must be approximately 8% (2% plus 6%) in order to provide a real rate of return of 2%. In a similar manner, employees must receive an inflation premium in order to maintain expected increases in real wages. For a general discussion of the relationship between real and nominal rates of interest and wage increases, see Anderson & Roberts, *supra* note 1, at 729–31. Hence, some commentators have maintained that over the long run there is a positive relationship between interest rates, rates of inflation, and economic growth rates. *See id.* at 739–46 (using fifteen-year averages to demonstrate relatively stable and positive relationship between nominal interest rates, growth in earnings rates, and inflation rates). If the vitality of this argument is accepted, there would be little sense in a court's accounting for future rates of inflation, because the calculated lump sum of an inflated award would simply be discounted by an interest rate figure which would offset the inflated award. Courts which accept this notion have reasoned that a plaintiff will account for inflation by undertaking investment options which will protect him or her from the economy's inflationary tendencies. *See, e.g.,* McWeeney v. New York, N.H. & H. Ry., 282 F.2d at 42–43 (2d Cir.) (Lumbard, C.J., dissenting), *cert. denied,* 364 U.S. 870 (1960).

9. *See* Johnson v. Sera, 521 F.2d 1289 (8th Cir. 1975); Riha v. Jasper Blackburn Corp., 516 F.2d 840 (8th Cir. 1975)

the finder of fact in his or her evaluation of such variables. Under the Middle Ground approach, jury members draw upon their own personal experiences regarding the effects of these economic variables.[10] The motivation behind this rule is one of efficiency.[11] That is, proponents of this method maintain that the admission of expert testimony regarding economic variables is often a time-consuming and confusing evidentiary process. While it may be argued that the layman's view of complex economic concepts will result in an extremely crude approximation of the necessary award figure, it should be noted that this approach is probably more accurate than not allowing the jury to draw upon any external economic variables at all.[12]

The modern trend is toward the adoption of the so-called "Evidentiary" approach, which allows for the introduction of expert testimony concerning relevant economic variables.[13] Proponents of the Evidentiary approach contend that economic forces which affect damage award calculations are not merely speculative; rather, such forces can be predicted by experts with a relatively high degree of accuracy.[14] Moreover, advocates of the Evidentiary approach have attacked the notion that jurors are able to predict future economic conditions accurately based upon their own personal experiences.[15] Overall, by allowing the introduction of expert testimony regarding external

10. Note, *Future Inflation*, *supra* note 2, at 108.

11. *Id.* (Middle Ground approach simplifies proceedings by excluding complex economic testimony).

12. *Id.*

13. Comment, *Future Inflation as a Factor in the Determination of Damages*, 12 U. TOL. L. REV. 369, 376 (1981) (noting that recent decisions indicate a growing dissatisfaction with the Traditional approach and that more courts are searching for methods which will permit the consideration of future inflation in the calculation of damage awards). The principal argument supporting the introduction of evidence about the effects of future inflation is that since the purchasing power of the dollar is likely to continue in its decline, the plaintiff's damage award will be understated unless the effects of inflation are taken into consideration. *See* United States v. English, 521 F.2d 63, 75 (9th Cir. 1975); Schnebly v. Baker, 217 N.W.2d 708, 727 (Iowa 1974), *overruled in* Goetzman v. Wichern, 327 N.W.2d 742 (Iowa 1982) *and superseded by statute as stated in* Speck v. Litton Systems, Inc., 366 N.W.2d 543 (Iowa 1985).

14. *See* Steckler v. United States, 549 F.2d 1372, 1377 (10th Cir. 1977); Reminga v. United States, 448 F. Supp. 445, 470 (W.D. Mich. 1978), *aff'd*, 631 F.2d 449 (6th Cir. 1980); Seaboard Coast Line Ry. v. Garrison, 336 So. 2d 423, 425 (Fla. Dist. Ct. App. 1976); Krohmer v. Dahl, 145 Mont. 491, 495, 402 P.2d 979, 981 (1965); Cords v. Anderson, 80 Wis. 2d 525, 529, 259 N.W.2d 672, 684 (1977); *see also* Comment, *supra* note 13, at 390–97.

15. Scruggs v. Chesapeake & Ohio Ry., 320 F. Supp. 1248, 1251 (W.D. Va. 1970) (testimony of expert will aid jury's conclusion concerning inflationary tendency of economy, since jury will account for such tendencies in any event); Krohmer v. Dahl, 145 Mont. 491, 495, 402 P.2d 979, 981 (1965) (expert testimony puts jury's consideration into accurate economic perspective); Tenore v. Nu Car Carriers, Inc., 67 N.J. 466, 475, 341 A.2d 613, 619–21 (1975) (without expert testimony jury's conclusion about damage award may be mere conjecture); *see also* United States v. English, 521 F.2d 63, 75–76 (9th Cir. 1975) (accepting Evidentiary approach and requiring introduction of economic evidence to be "supported by competent evidence").

economic considerations, the Evidentiary approach places a high degree of emphasis on accuracy, and much less emphasis on efficiency.[16]

If the Evidentiary approach is accepted by a given jurisdiction, a court must make a further determination as to which set of economic assumptions will govern the future calculation of damage awards.[17] There are several categories of economic assumptions that could be adopted. For example, a court could assume that the relationships between economic variables such as inflation and interest rates are fixed and predictable, and that the values of such variables are similarly fixed.[18] Clearly, a court which elected to accept such fixed values would preclude expert testimony regarding the expected future values of economic variables, since the variables themselves—and the interrelationships among variables—would be fixed as a matter of law. Another category of assumptions which some jurisdictions have adopted would allow for the introduction of expert economic predictions concerning a plaintiff's future work life, but would preordain the relevant variables to be considered and the existing economic relationships between those variables.[19] In addition, there are numerous other ways in which courts have incorporated economic data into the decision process for damage award calculations.[20]

III. A Comparison Between the "Correct" Model and Court-Adopted Approaches

A. *The "Correct" Economic Model*

As previously noted, there has been a great deal of controversy over which approach to damage calculation achieves the most equitable

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16. *See* Note, *Future Inflation, supra* note 2, at 108 (maintaining that the Evidentiary approach "admits expert testimony to maximize accuracy").

17. *See id.* at 110.

18. This view has been espoused by the Supreme Court of Alaska, and, thus, has come to be known as the "Alaska Rule." *See* Beaulieu v. Elliot, 434 P.2d 665, 671–72 (Alaska 1967). In *Beaulieu,* the Supreme Court of Alaska reasoned that inflation affected the plaintiff's rate of increase in lost earnings and the discount rate so that the two rates were presumed to be equal, and, therefore, offsetting. Hence, in an Alaska rule jurisdiction, a plaintiff's award can be easily computed by multiplying the number of expected years of future work by the plaintiff's salary in the year preceding the injury. Anderson & Roberts, *supra* note 1, at 724 n.3. However, the Alaska rule was held to be inapplicable under federal law by the United States Supreme Court. *See* Monessen S.W. Ry. v. Morgan, 108 S. Ct. 1837, 1844–46 (interim ed. 1988).

19. *See* Feldman v. Allegheny Airlines, 382 F. Supp. 1271, 1274 (D. Conn. 1974), *aff'd,* 524 F.2d 384 (2d Cir. 1975).

20. *See, e.g.,* Turcotte v. Ford Motor Co., 494 F.2d 173, 183 (1st Cir. 1974) (using "independent incorporation" method involving projections of decedent's lifetime earnings, deduction of lifetime expenses, and reduction of resulting sum to present value); Plastis v. United States, 288 F. Supp. 254, 277–78 (D. Utah) (constant $500 per year increase), *aff'd,* 409 F.2d 1009 (10th Cir. 1969); Brooks v. United States, 273 F. Supp. 619, 635 (D. S.C. 1967) (allocating 15% salary increase over plaintiff's expected work life).

outcome for the parties to a personal injury or wrongful death suit.[21] However, there is one basic economic model that the author and many other economists suggest is the "correct" approach for calculating damage awards.[22] It is essential to understand the relationships between the components of a "correct" method of determining awards from an economist's perspective in order to compare this method with other rules that have been utilized by courts. The following model assumes a one-period analysis[23] with no taxes.[24] The definition of terms is as follows:

E_0 = economic loss in period before trial,
E_1 = economic loss in the first period,
i = nominal interest rate in period 1,
w = nominal rate of wage increase in period 1,
p = rate of inflation in period 1.

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21. *See* Kaczkowski v. Bolubasz, 491 Pa. 561, 576, 421 A.2d 1027, 1035 (1980) (noting that there are a "myriad of ways" to incorporate economic data); Anderson & Roberts, *supra* note 1, at 724–25 (noting differences in methods incorporating economic data and the concomitant potential for confusion).

22. The author contends that a "correct" damage award calculation estimates future economic loss and then discounts these losses back to their present value assuming no fixed relationship between the two factors. For a general discussion of discounting future income streams to present value, see McCONNEL & BRUE, CONTEMPORARY LABOR ECONOMICS 70–84 (1989). However, it should be noted that several courts have declined to discount lump sum awards to present value. *See* Jackson v. United States, 526 F. Supp. 1149 (E.D. Ark. 1981), *aff'd without opinion,* 696 F.2d 999 (8th Cir. 1982); Letoski v. FDA, 488 F. Supp. 952 (M.D. Pa. 1979); Valdosta Hous. Auth. v. Finessee, 160 Ga. App. 552, 287 S.E.2d 569 (1981); Lamke v. Louden, 269 N.W.2d 53 (Minn. 1978); Southern Pacific Transp. Co. v. Fitzgerald, 577 P.2d 1234 (Nev. 1978).

23. A one-period analysis is used by the author in order to simplify the discussion. It should be noted, though, that the calculations involved in an actual personal injury or wrongful death case entail summing each of the periods analyzed after each has been discounted to present value at the prevailing interest rate for that period. Hence, the one-period equation discussed herein is expanded to entail the following:

$$A = \frac{E_1}{(1+i)} + \frac{E_2}{(1+i)^2} + \ldots + \frac{E_n}{(1+i)^n} = \sum_{j=1}^{n} \frac{E_j}{(1+i)^j}$$

A = Present value of future earnings,
E_j = Lost earnings in period j,
i = Relevant interest rate (discount rate).

24. The issue of taxes is omitted from the author's calculation of a "correct" economic baseline model for the sake of simplicity. However, there is a great deal of controversy regarding the issue of whether taxes should be accounted for in damage award calculations. *See* Burke & Rosen, *Taxes and Compensation for Lost Earnings: A Comment,* 12 J. LEGAL STUDIES 195 (1983). For examples of courts that have ignored the effect of future taxes on damage award calculations, see Vasina v. Grumman Corp., 492 F. Supp. 943 (E.D.N.Y. 1980), *aff'd,* 644 F.2d 112 (2d Cir. 1981); Plant v. Simmons Co., 321 F. Supp. 735 (D. Md. 1970). For examples of courts that have taken into account the effect of future taxes, see DeLucca v. United States, 670 F.2d 843 (9th Cir. 1982); Furumizo v. United States, 381 F.2d 965 (9th Cir. 1965).

The award, A, plus the interest earned on the award, iA, must equal the economic loss in period 1.[25] That is,

$$A + iA = E_1.$$

Furthermore, the plaintiff's economic loss in the first period, in order to accurately reflect actual loss, should equal the economic loss in the period before trial multiplied by the plaintiff's rate of wage increase for the same period. Hence,

$$E_1 = E_0(1 + w).$$

Combining these equations the following relationship holds:

$$1) \qquad A = \frac{E_1}{(1 + i)} = \frac{E_0(1 + w)}{(1 + i)}$$

where E_1 is divided by the term (1 + i), which discounts the loss in the first period to its present value.

The nominal values of i and w are related to real values in the following way:[26]

$$i = r + p + rp,$$
$$w = e + p + ep,$$

where r is the real rate of interest and e is the real rate of wage increase. These equations demonstrate that nominal variables contain premiums for inflation, which represent protection of the purchasing power of investments and wages respectively.[27]

Combining the equations discussed above, the following relationships hold:

$$A = \frac{E_0(1 + w)}{(1 + i)} = \frac{E_0(1 + e + p + ep)}{(1 + r + p + rp)}$$

$$2) \qquad A = \frac{E_0(1 + e)(1 + p)}{(1 + r)(1 + p)} = \frac{E_0(1 + e)}{(1 + r)}.$$

These formulas demonstrate that damage award calculation measures which use nominal variables i and w are equivalent to formulas

25. *See* Anderson & Roberts, *supra* note 1, at 732.

26. *See supra* note 8 (discussion of relationship between real and nominal variables); *see also* Anderson & Roberts, *supra* note 1, at 729–32.

27. For example, the term (p + rp) represents lender protection from inflation. Thus, if a lender is willing to loan money at a real interest rate of 5%, but expects inflation of 4%, the nominal rate charged to borrowers must be [.05 + .04 + (.04)(.05)] = 9.20%. The variable, rp, protects the purchasing power of the lender's interest, while the inflation term, p, protects the principal. Anderson & Roberts, *supra* note 1, at 730.

using real variables e and r. As long as these variables are defined correctly,[28] the two approaches are the same.

Economists have also reached the same results by using a model that calculates the differential discount rate. The differential discount rate model is mathematically and functionally equivalent to the methods described above, but the focus is upon utilizing a single number—the difference between the interest rate used to discount to present value and the forecasted rate of plaintiff's wage increase for the period under analysis.[29]

Using nominal variables to determine the differential discount rate, the following relationships hold:

$$A = \frac{E_0(1 + w)}{(1 + i)} = \frac{E_0}{\frac{1 + i}{1 + w}}$$

$$A = \frac{E_0}{1 + \frac{i - w}{1 + w}}.$$

And, if

$$d = \frac{i - w}{1 + w},$$

then

$$3) \qquad A = \frac{E_0}{(1 + d)}.$$

Hence, the plaintiff's award, A, is equal to the amount of economic loss in the period before trial divided by 1 plus the differential discount rate. The differential discount rate, d, is the rate consistent with equation 1) such that the growth in wage rates is zero. The differential discount rate derived herein will be referred to throughout the remainder of the article.

Putting these rules into perspective, consider a one-period example in which Plaintiff X faces a real interest rate in period 1 of 3%, a real

28. *Id.* at 738 (damage award calculation measures which use nominal rates, real rates, and the differential discount rate are equivalent, and will yield same results if their parameters are defined correctly and used consistently).

29. *See* Jones & Laughlin Steel Corp. v. Pfeifer, 462 U.S. 523, 541–43 (1983) (using 0% differential discount rate), *superseded by statute as stated in* Eagle-Picher Indus. Inc. v. United States, 846 F.2d 888 (3d Cir. 1988); Pierce v. New York Cent. Ry., 304 F. Supp. 44, 45–46 (W.D. Mich. 1969) (failing to discount differential between interest and wage increase rates).

rate of wage increase in period 1 of 1%, and a rate of inflation equal to 5%. Using the relationship described above one can see that

$$i = r + p + rp = .03 + .05 + (.03)(.05) = 8.15\% \text{ and}$$
$$w = e + p + ep = .01 + .05 + (.01)(.05) = 6.05\%.$$

By inserting these values for i and w into the equation discussed above, the value of the differential discount rate, d, during period 1 would be calculated as follows:

$$d = \frac{i - w}{1 + w} = 1.98\%.$$

This example will be used in the sections which follow as a baseline against which to judge various court-adopted damage award calculation rules.

B. *Court-Adopted Damage Award Calculation Rules: Do They Accurately Predict a Plaintiff's Future Income Stream?*

In *Johnson v. Penrod Drilling Co.,*[30] the Court of Appeals for the Fifth Circuit adopted a variation of the Traditional approach by prohibiting the consideration of future price inflation in determinations of the present value of economic damages.[31] Although the *Penrod* decision did not explicitly exclude real wage increases from consideration, it has often been interpreted as calling for such an exclusion.[32] In *Penrod,* the court utilized the nominal interest rate in discounting the

30. 510 F.2d 234 (5th Cir.) (en banc), *cert. denied sub nom.* Starnes v. Penrod Drilling Co., 423 U.S. 839 (1975), *overruled in* Culver v. Slater Boat Co., 688 F.2d 280 (5th Cir. 1982) (en banc). As indicated in the citation above, the rule promulgated by the *Penrod* court in 1975 was rejected by the Court of Appeals for the Fifth Circuit in 1985. Culver v. Slater Boat Co., 688 F.2d 280, 305 (5th Cir. 1982) (en banc) [Culver I]. It should also be noted, though, that the *Culver I* decision itself was later criticized by the Court of Appeals for the Fifth Circuit. *See* Culver v. Slater Boat Co., 722 F.2d 114 (5th Cir. 1983), *cert. denied,* 469 U.S. 819 (1984) [Culver II]. In *Culver II* the court of appeals adopted a method for forecasting wage increases which used a real growth rate and a method for discounting to present value which used the real interest rate. *Id.* at 123.

31. *Penrod,* 510 F.2d at 236 (maintaining that the true impact of price inflation is unpredictable and might foretell recession or depression as easily as an upward inflationary trend).

32. Landsea & Roberts, *Inflation and the Present Value of Future Economic Damages,* 37 U. MIAMI L. REV. 93, 107 (1982). The *Culver I* court stated that the *Penrod* standard

> has at times been so overwhelming that it has prohibited evidence that should have been allowed, such as evidence of likely wage increases based upon merit or productivity, either on a misreading of *Penrod* or a perceived (and sometimes actual) impossibility of separating out inflationary elements from admissible merit-productivity increases.

Culver I, 688 F.2d 280, 304 (5th Cir. 1982). However, the *Penrod* court merely held that "the influence on future damages of possible inflation or deflation is too speculative a matter for judicial determination," not that real wage increases were to be ignored altogether. *Penrod,* 510 F.2d plaintiff's award to present value.[33] If it is assumed that *Penrod* did not allow the fact finder to account for the rate of the plaintiff's future wage increases,[34] the rate of wage increase for the purpose of calculating plaintiff's damage award would be 0%, and the differential discount rate would be equal to the nominal rate of interest, based on the following calculation:

$$4) \qquad d = \frac{i - w}{1 + w} = \frac{i - 0}{1 + 0} = i.$$

If a reviewing court were to assess Plaintiff X's damages using the *Penrod* rule, the differential discount rate, d, would equal the nominal interest rate of 8.15%. The differential discount rate obtained under the *Penrod* rule is significantly greater than the correct value of d which was calculated to be 1.98% for Period 1. This example demonstrates that the *Penrod* rule will overstate the value of d and, thus, understate the proper size of Plaintiff X's damage award.[35]

It should be noted, though, that an application of the Traditional approach does not always result in an understatement of the award. For example, if the *Penrod* court had held that both wage increases and interest rates were to be ignored due to an inability to forecast the future values for these variables, then the differential discount rate would be 0%. Such reasoning would yield a differential discount rate which is much closer to the correct value of d, 1.98%, during period 1.

In fact, some courts have actually adopted a method which postulates that d equals 0%.[36] This assumption was made by the Supreme Court of Alaska in several cases including *Beaulieu v. Eliott,*[37] *State v. Guinn,*[38] and *State v. Harris.*[39] As such, this method has come to be known as the "Alaska" rule.[40] Under the Alaska rule, both real wage

33. *Penrod,* 510 F.2d at 237 (reasoning that calculated gross future earnings must be reduced to present value by use of prevailing interest rate at time of trial).

34. *See supra* note 32 and accompanying text.

35. Using a high nominal interest rate to reduce an award to present value, without accounting for future inflation, decreases the amount of a plaintiff's award. Anderson & Roberts, *supra* note 1, at 736.

36. *See* Beaulieu v. Elliot, 434 P.2d 665, 671 (Alaska 1967) (reasoning that inflation offsets the rate of interest which a prudent investor could be expected to make on a lump sum award, and, therefore, loss of future earning capacity should not be reduced to present value). *But see* Alaska Airlines, Inc. v. Sweat, 568 P.2d 916, 937 (Alaska 1977) (limiting *Beaulieu* to denial of admission of evidence of wage increases associated with inflation, as compared with merit increases which are reasonable and certain to occur).

37. 434 P.2d 665 (Alaska 1967).

38. 555 P.2d 530 (Alaska 1976).

39. 662 P.2d 946 (Alaska 1983).

40. *See, e.g.,* Anderson & Roberts, *supra* note 1, at 723–24. The rule has also been utilized in Jones & Laughlin Steel Corp. v. Pfeifer, 678 F.2d 453 (3d Cir. 1982),

increases and real interest rates are equal to 0%. Based upon a desire to allow evidence on economic variables while still mitigating the potential for jury confusion, the Alaska Supreme Court assumed that both real wage increases and real interest rates were equal to zero, so that nominal wage increases and nominal interest rates were equal to each other—and in turn—equal to the rate of inflation.[41] Hence,

$$5) \quad d = \frac{i - w}{1 + w} = 0.$$

Of all the court-determined rules reviewed in this article, the Alaska rule is the only one which actually specifies a particular value for d. Courts adopting rules similar to the Alaska rule place a high degree of emphasis on efficiency—awards are easy to compute—and predictability—the value of d is always 0%. Furthermore, some empirical studies of economic trends would seem to indicate that the utilization of the Alaska rule has resulted in damage awards that are, for the most part, fair and accurate.[42]

The main criticism of the Alaska rule is that it is not accurate in all circumstances.[43] When the real rate of interest is greater than the real rate of wage increase (as in Plaintiff X's case) the computed award will be excessive.[44] On the other hand, by ignoring all individual productivity increases such as merit raises and promotions which are not part of a written contract,[45] the Alaska rule may tend to underestimate the true value of a plaintiff's future wage increases and, therefore, underestimate the amount of the plaintiff's damage award.

The Alaska rule was modified by the Pennsylvania Supreme Court in *Kaczkowski v. Bolubasz*.[46] The so-called "Pennsylvania" rule posits

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vacated, 462 U.S. 523 (1983).

41. *See supra* note 8.

42. Carlson, *Economic Analysis v. Courtroom Controversy— The Present Value of Future Earnings*, 62 A.B.A. J. 628 (1976); Formuzis & O'Donnell, *Inflation and the Valuation of Future Economic Losses*, 38 MONT. L. REV. 297 (1977); Franz, *Simplifying Future Lost Earnings*, 13 TRIAL 34 (1977).

43. Landsea & Roberts, *supra* note 32, at 107 (finding that the Alaska method may lead to substantial errors in present value, since nominal growth and discount rates are seldom actually equal); *see also* Coyne, *Present Value of Future Earnings: A Sensible Alternative to Simplistic Methodologies*, 49 INS. COUNS. J. 25, 31 (1982); Maher, *Estimating Future Earnings Loss: Misinterpretation and Faulty Logic*, 15 TRIAL 39, 41 (1979); Mukatis & Widicus, *Toward Just Compensation of the Total Offset Method of Valuing Lost Future Earnings Awards and The United States Supreme Court Methods*, 59 TEMP. L.Q. 1131, 1151–52 (1986).

44. Landsea & Roberts, *supra* note 32, at 110–11.

45. *See Harris*, 662 P.2d at 948 (limiting admission of evidence of wage increases to those which are "certain and predictable").

46. 491 Pa. 561, 421 A.2d 1027 (1980). In *Kaczkowski*, the Pennsylvania Supreme Court determined that future damage award calculations could include expert testimony regarding the effects of future projected productivity increases and inflationary trends on plaintiff's lump sum

that damage awards need not be reduced to present value,[47] and that real interest rates should be set at 0% for the purposes of determining damage awards. Thus, given the real interest rate r is zero,

$$i = r + p + rp = p.$$

That is, the nominal rate of interest equals the rate of inflation.

The Pennsylvania rule, however, specifically allows for real increases in labor productivity.[48] Hence, the formula for calculating the differential discount rate under the Pennsylvania rule is as follows:

$$d = \frac{i - w}{1 + w} = \frac{p - (e + p + ep)}{1 + w} = \frac{- e\,(1 + p)}{1 + w}.$$

Plaintiff X would face a differential discount rate of —.99% under the Pennsylvania rule.[49] By contrast, the correct method of calculation delineated above would entail a value of d derived in the following manner:

$$d = \frac{i - w}{1 + w} = \frac{(r - e)\,(1 + p)}{1 + w}.$$

As long as a plaintiff faces a real rate of interest which is greater than 0%, the Pennsylvania rule will provide a lower value of d and an inflated award in comparison to the correct calculation of the variable as expressed earlier. Thus, in comparison with the correct formula, the Pennsylvania rule properly incorporates the possibility of real wage increases by not specifying a value for e, but it fails to account for the possibility of real interest rates that are positive.

In *Feldman v. Allegheny Airlines*,[50] the Second Circuit Court of Appeals attempted to account for the effect of inflation by focusing upon real values of interest rates and wage rate increases rather than nominal values.[51] What the appellate court did is best demonstrated by redefining the differential discount rate, d, in real rather than nominal terms. Recall from equation 2) that the present value of future loss can

award. *Id.* at 583, 421 A.2d at 1037.

47. *Id.*

48. *Id.*

49. Plaintiff X's differential discount rate under the Pennsylvania rule is calculated as follows:

$$\frac{-.01(1 + .05)}{1 + .0605} = -.99\%.$$

50. 524 F.2d 384 (2d Cir. 1975).

51. *Id.* at 388.

be expressed as

$$A = \frac{E_0 \ (1 + e)}{(1 + r)}.$$

It is relatively easy to show that an equivalent expression for A is

$$A = \frac{E_0}{1 + \frac{r - e}{1 + e}}.$$

If we define the differential discount rate as

$$d = \frac{r - e}{1 + e},$$

then

$$A = \frac{E_0}{1 + d}.$$

It should be noted that this is the same expression that appeared in equation 4) earlier in the text. Thus, the differential discount rate can be expressed in real or nominal terms,

$$d = \frac{i - w}{1 + w} = \frac{r - e}{1 + e}.$$

In *Feldman,* the court assumed that the rate of increase in real wages, e, was zero, which is precisely the assumption made in the Alaska cases. However, the *Feldman* court deviated from the Alaska method by setting the real rate of interest not equal to zero but equal to (i — p). Hence, the differential discount rate calculated under the *Feldman* rule is obtained in the following manner:

$$6) \qquad d = \frac{r - e}{1 + e} = \frac{(i - p) - 0}{1 + 0} = (i - p) .$$

Using the *Feldman* rule, the value of d would be 3.15% in Plaintiff X's case.[52] However, using the correct value of d, as determined above, would yield a differential discount rate of 1.98%. This analysis demonstrates that jurisdictions which use the *Feldman* rule may be undercompensating injured plaintiffs because the value of d may be over-

52. Plaintiff X's differential discount rate under the *Feldman* rule is calculated as follows:

$$\frac{(.0815 - .05) - 0.0}{1 + 0.0} = 3.15\%.$$

stated. That is, the value of d under the *Feldman* rule will be overstated if the plaintiff's real rate of future wage increases is any positive percentage, rather than the judicially assumed 0%.[53] Furthermore, the real rate of interest is slightly overstated under the *Feldman* rule.[54]

Some courts have also applied a modification of the *Feldman* court's original formulation which entails: (1) setting the plaintiff's future wage increase rate equal to 0%; and (2) discounting the damage award to present value using a discount rate that is derived by subtracting the nominal rate of wage increase from the nominal interest rate.[55] The differential discount rate for the "Modified" *Feldman* rule would be calculated in the following manner:

$$7) \quad d = \frac{r - e}{1 + e} = \frac{(i - w) - 0}{1 + 0} = (i - w).$$

In Plaintiff X's case, the differential discount rate would equal 2.1% under the Modified *Feldman* rule.[56] This figure closely approximates the 1.98% figure that was derived earlier using the correct method. It should be noted that the discount rate, as calculated under the Modified *Feldman* rule, will always be very close to the discount rate calculated under the correct rule. This can be seen most clearly by expressing d in nominal rather than real terms:

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53. Referring to the denominator of equation 6), one can see that if e is greater than 0, the denominator will be larger than it was under the *Feldman* rule, and it will more closely approximate d's correct value. Thus, so long as there is a positive growth in real wages, the *Feldman* rule will overestimate the value of d and, consequently, underestimate the present value of the future loss, A.

54. This is because the *Feldman* rule incorrectly defines the real rate of interest as (i — p) when in fact, the correct expression is derived in the following manner, starting with equation 2):

$$i = r + p + rp$$
$$i = r(1 + p) + p$$
$$i - p = r(1 + p).$$

Therefore,

$$r = \frac{i - p}{1 + p}.$$

As the equations above demonstrate, the value of r will be slightly overstated when the *Feldman* rule is used, since the correct method of deriving its value utilizes the term (1 + p) in the denominator. *See* Anderson & Roberts, *supra* note 1, at 735 n.51; Landsea & Roberts, *supra* note 32, at 117 n.32.

55. *See, e.g., Culver I,* 688 F.2d 280, 295–97 (5th Cir. 1982).

56. Plaintiff X's differential discount rate under the Modified *Feldman* Rule is calculated as follows:

$$\frac{(.0815 - .0605) - 0}{} = 2.1\%$$

$$d \doteq \frac{i - w}{1 + w}.$$

The only difference between the formula which yields the correct value and the Modified *Feldman* rule is the expression (1 + w) in the denominator of the former. Thus, the Modified *Feldman* rule will either undercompensate or overcompensate the plaintiff by a small amount,[57] depending upon whether the term (i — w) is a positive or negative number.

The "Real Rate" rule, a further modification on the *Feldman* rule, entails reducing nominal wage increases and interest rates by the rate of inflation in order to obtain the real rate of interest and the rate of wage increases.[58] Calculations of the differential discount rate under the Real Rate rule may be made as follows:

$$8)\quad d = \frac{r - e}{1 + e} = \frac{(i - p) - (w - p)}{1 + (w - p)} = \frac{(i - w)}{1 + (w - p)}.$$

For Plaintiff X, the value of d under the Real Rate rule is 2.08%.[59] Compared to the correct value of 1.98%, the value of d under the Real Rate rule is somewhat high, and, thus, the award will be somewhat low. The variation between value discerned under the Real Rate rule and the correct value is attributable to the inclusion of the term "— p" in the denominator of the Real Rate equation. However, as with the Modified *Feldman* approach, this difference is negligible.

IV. The Search for the Golden Rule: Should Courts Assume a Value for the Differential Discount Rate?

Several economists have suggested that courts should assume a given differential discount rate value, instead of allowing the trier of fact to hear evidence from which a value for d could be obtained.[60] Generally, these advocates of a specified value for d believe that the efficiency and predictability of such a method far outweigh the heightened accuracy that might be achieved by deriving the differential discount rate on a case by case basis.[61]

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57. *See* Landsea & Roberts, *supra* note 32, at 114–17.

58. *See Culver I,* 688 F.2d at 295–97.

59. Under the Real Rate rule Plaintiff X's differential discount rate is calculated as follows:

$$\frac{(.0815 - .0605)}{1 + (.0605 - .05)} = 2.08\%.$$

60. Anderson & Roberts, *supra* note 1, at 871; Mukatis & Widicus, *supra* note 43, at 1153.

61. *See* Mukatis & Widicus, *supra* note 43, at 1153 (specifying a value for growth and discount rates makes damage award calculation method "easy to use, accurate and conceptually

Economists W. Albert Mukatis and Wilbur Widicus have suggested that courts adopt a 2.5% growth rate and a 1% discount rate, as a matter of law.[62] However, Mukatis and Widicus suggest that parties should be allowed to introduce evidence of how a plaintiff's particular situation may differ from the stated values.[63] For instance, evidence could be introduced regarding the likelihood of the plaintiff's future merit raises or career path changes, as well as evidence concerning the rates of future wage trends in a particular industry.[64]

Professors Gary Anderson and David Roberts have also advocated the use of a stated value for the differential discount rate.[65] They suggest a differential discount rate of —.5%.[66] Anderson and Roberts base this suggestion upon an empirical analysis which demonstrates that the after-tax differential discount rate is relatively stable over time, and that the suggested —.5% benchmark rate would have produced fair and accurate awards in extremely disparate economic periods and across different industries.[67] Although the Anderson-Roberts study posits that courts should use the benchmark rate, like the Mukatis-Widicus study it would allow for the admission of evidence regarding special circumstances such as the growth trends of a given industry, or the economic future of an atypical plaintiff.[68]

Yet, there are several problems with the Mukatis-Widicus and

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62. *Id.* Mukatis and Widicus do not express their variables' stated values in terms of a differential discount rate, but one may be obtained in the following manner:

$$d = \frac{r - e}{1 + e} = \frac{.01 - .025}{1 + .025} = \frac{-.015}{1.025} = -1.46\%.$$

Mukatis and Widicus chose the 1% discount rate from the suggested damage award calculation formulas outlined by the United States Supreme Court in Jones & Laughlin Steel Corp. v. Pfeifer, 462 U.S. 523 (1983), *superseded by statute as stated in* Eagle-Picher Indus. Inc. v. United States, 846 F.2d 888 (3d Cir. 1988). The *Jones & Laughlin* Court determined that trial courts facing Longshoremen and Harbor Workers' Compensation Act cases could decline to account for future inflation and discount a plaintiff's award using a real interest rate of between 1% and 3%. *Id.* at 548–49.

Professors Mukatis and Widicus derived the 1% discount rate and the 2.5% wage growth rate from a computer simulation which compared damage award calculations by applying actual historical data to both the total offset model and the *Jones & Laughlin* model. *See* Mukatis & Widicus, *supra* note 43, at 1148–52. The economists determined that use of the 1% real discount rate, and a 2.5% growth rate most closely approximated the award values that would have actually been necessary to compensate an average worker who invested the award in one-year Treasury bills and reinvested every year at the interest rate effective during the period in question. *Id.* at 1150.

63. Mukatis & Widicus, *supra* note 43, at 1153.

64. *Id.*

65. *See* Anderson & Roberts, *supra* note 1, at 870–71.

66. *Id.* at 871.

67. *Id.* at 857–70.

68. *Id.* at 871.

Anderson-Roberts "stated value" studies. First, both studies limit their empirical analyses to periods spanning from World War II to the present.[69] The problem with this type of analysis is that the time period studied may not necessarily reflect future economic environments and clearly does not reflect all time periods in the United States economy from a historical perspective.[70] Indeed, the differential discount rate varied significantly from World War II to the present and would have yielded wide disparities between an award with perfect foresight and an award using a stated value.[71] Furthermore, given the fact that interest rates have increased in recent years relative to wage rate increases, the 1% discount rate and the 2.5% real growth rate suggested by the Mukatis-Widicus study would have resulted in an overcompensation of plaintiffs in many cases.[72]

A second problem with the stated value studies is that the assumed investment portfolio used to generate award figures for these studies may not be applicable to the average plaintiff. Both studies assume that

69. *See id.* at 857 (using computer model to calculate correct present value awards for "various numbers of consecutive years of lost earnings during the 1952–1982 period"); Mukatis & Widicus, *supra* note 43, at 1156 (examining fifteen-year periods between 1940 and 1984).

70. *See* Schilling, *Estimating the Present Value of Future Income Losses: An Historical Simulation 1900–1982*, J. RISK & INS., Mar. 1985, at 103–14 (noting that empirical studies which use a limited period of analysis "lack generality in that they cover only a single 20–25 year period in the United States economy, a period that may neither be typical of the more distant past nor predictive of the future").

71. The Mukatis-Widicus study investigated fifteen-year periods from 1940–1984, examining for instance, the fifteen-year period between 1940 and 1954, the fifteen year period between 1941 and 1955, and so forth, until the last period studied, 1970 through 1984. *See* Mukatis & Widicus, *supra* note 43, at 1151–53, 1156. The authors measured the difference between an award calculated with "perfect foresight," and an award calculated under the *Jones & Laughlin* 1% approach, for each of the 31 fifteen-year periods described above. *Id.* The mean percentage differential was calculated to be —1.2%, and from this finding, the authors concluded that the *Jones & Laughlin* 1% approach was a viable option for a stated discount rate, when combined with a 2.5% growth rate. *Id.* at 1153. However, the — 1.2% mean difference is extremely deceiving. The Mukatis and Widicus calculations demonstrate that the 1% method undercompensated plaintiffs as much as 35.8% in the early periods, and overcompensated plaintiffs as much as 13.8% in the later periods. *See id.* at 1153. Furthermore, in the last five periods studied, the mean difference was 10.5%. *See id.* Hence, although a stated discount rate may perform well on average, it is clear that stated values for economic variables, if accepted by courts as a matter of law, may overcompensate or undercompensate plaintiffs in the short run.

72. *See* COUNCIL OF ECONOMIC ADVISORS, U.S. GOVERNMENT PRINTING OFFICE, ECONOMIC REPORT OF THE PRESIDENT 358, 391 (1989) [hereinafter ECONOMIC REPORT OF THE PRESIDENT]. Between 1953 and 1977, the average rate of increase in private, nonfarm hourly earnings was 5.04%, while the average interest rate on 10-year United States Treasury Bonds was 5.26%. *Id.* The difference between these rates is .22%. In contrast, between 1978 and 1987, wages increased 5.51% while the interest rate on 10-year government bonds was 10.64%, a difference of 5.13%. *Id.* Awards calculated under the Mukatis and Widicus approach, would employ a 1.5% differential of real wage growth over the real discount rate. Thus, during the 1978 to 1987 period, awards calculated under the Mukatis and Widicus approach would have significantly overcompensated plaintiffs.

a plaintiff would invest his or her award in short term United States securities, rolled over every period.[73] The authors of these studies suggest that such a portfolio would minimize a plaintiff's financial risk and would create a hedge against inflation.[74] More importantly, from an economist's point of view, the assumption of an investment in a short-term portfolio allows for a simple computation of a perfect-foresight damage award.

It could be argued, though, that investment in a short-term securities portfolio might not be the best course of action for a plaintiff who has received a large damage award.[75] Several commentators have recommended that a plaintiff should not be locked-in to a short-term investment portfolio.[76] There is little doubt that a successful plaintiff who

73. *See* Anderson & Roberts, *supra* note 1, at 855–56; Mukatis & Widicus, *supra* note 43, at 1142–43. Anderson and Roberts' description of the investment process is instructive:

> An accurate present value award allows the plaintiff, through "relatively safe" government securities, to replicate future after-tax lost earnings over the period of loss. Different government securities of varying maturities offer different yields and risks, therefore, the correct award depends upon the plaintiff's investment strategy. In this study, the plaintiff adopts a short term "roll over" strategy in which he invests and reinvest the award exclusively in one-year Treasury notes. The plaintiff immediately invests the entire award in one-year notes, and at the end of each successive year the investment fund increases by the amount of that year's after-tax interest income and decreases by the amount of that year's after-tax lost earnings. The plaintiff then reinvests the balance of the investment fund in one-year Treasury notes. After these adjustments for the last year of lost earnings, the balance of the investment fund is zero.

Anderson & Roberts, *supra* note 1, at 855–56.

Mukatis and Widicus rationalize the use of short-term Treasury Bills for several reasons. To begin, the authors prefer short term Treasury Bills to long term government securities because in order to replicate a plaintiff's income stream a portion of the securities must be sold, and, "[t]here is no guarantee . . . that periodic sales of these securities will be free of the risk of loss because of rising market interest rates." Mukatis & Widicus, *supra* note 43, at 1142–43. In contrast, the authors note that Treasury Bills have little financial and interest rate risk, and do not require brokerage fees. *Id.* The authors admit, however, that "absolute levels of return will vary over time as inflation expectations and monetary policy change." *Id.*

74. *See* Anderson & Roberts, *supra* note 1, at 856; Mukatis & Widicus, *supra* note 43, at 1143.

75. As an example, consider a person who was injured in 1981. In 1981 interest rates on United States securities were in the range of 14%, regardless of maturity. *See* ECONOMIC REPORT OF THE PRESIDENT, *supra* note 72, at 390. Interest rates were not expected to remain at such high levels, and in fact, they declined sharply in the years following 1981. *See id.* (reporting, for example, that in 1987 three-month and six-month United States securities yields were set at 5.82% and 6.05%). Hence, if a successful plaintiff were to have sought the advice of an investment advisor in 1981, it is highly unlikely that such an advisor would have suggested placing the entire amount of the award in short-term securities. A profit-maximizing investment advisor would by no means have suggested the Anderson and Roberts or Mukatis and Widicus methods of "rolling over" investment securities during such an unstable period. For instance, a half-million dollar award invested in six-month Treasury securities in 1981 would have provided an income of $68,500.00, while the same amount invested in 1986 would have yielded $30,150.00. *See id.* (based upon reported rates of six-month Treasury bills in 1981 and 1986 at 13.7% and 6.03% respectively).

76. Such commentators have determined that it is more realistic to purchase a mix of short

is the recipient of a large damage award should seek the advice of an experienced investment analyst. Such investment advisors generally advocate diversification in portfolio management, rather than the use of a single investment tool such as one-year Treasury bills.

Thus, the assumption of a short-term portfolio is a flaw in the both the Mukatis-Widicus and Anderson-Roberts studies. The actual value of the differential discount rate, as it effects a plaintiff-investor, will vary depending upon whether the plaintiff's portfolio consists of short-term, long term, or a mix of maturities. In fact, in most instances the modern, financially sophisticated, plaintiff's portfolio will itself change from period to period. Hence, in reality, applying a stable differential discount rate may not yield the accurate results which its proponents suggest.[77]

A third major problem with the stated value studies concerns the the effects of taxation.[78] The Mukatis-Widicus study does not consider the effect of taxes on a plaintiff's damage award.[79] The Anderson-Rob-

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and long-term securities at present interest rates which offer a fixed yield at readily-definable points in the future. *See generally* Fulmer & Geraghty, *The Appropriate Discount Rate To Use In Estimating Financial Loss,* 1982 FIC Q. 263; Lewis, *The Role Of The Discount And Reinvestment Rate In Calculating Future Economic Loss,* 1984 FIC Q. 223.

77. *But see* Mukatis & Widicus, *supra* note 43, at 1142 (noting that courts have assumed that plaintiff-investors undertake safe investments because "[i]mputing a sophisticated knowledge of investments produces an inequity because the injured party is forced to accept more risk, thereby reducing the tortfeasor's liability").

78. Most courts do not permit consideration of the effects of taxation on a plaintiff's lump sum damage award because they consider future tax rates and tax brackets to be highly speculative. *See, e.g.,* Varlack v. SWC Caribbean, Inc., 550 F.2d 171, 177–78 (3d Cir. 1977); New York Cent. Ry. v. Delich, 252 F.2d 522, 527 (6th Cir. 1958); Vasina v. Grumman Corp., 492 F. Supp. 943, 944–45 (E.D.N.Y. 1980). *But see* Norfolk & W. Ry. v. Liepelt, 444 U.S. 490, 493–94 (1980) (requiring consideration of tax exclusion for damage awards under federal law); Turcotte v. Ford Motor Co., 494 F.2d 173, 184–86 (1st Cir. 1974) (allowing admission of expert economist's testimony concerning future effect of taxes); Cox v. Northwest Airlines, Inc., 379 F.2d 893, 896 (7th Cir.) (assuming plaintiff's current tax rates will remain constant over time), *cert. denied,* 389 U.S. 1044 (1967); Roselli v. Hellenic Lines, Ltd., 524 F. Supp. 2, 4 (S.D.N.Y. 1980) (allowing consideration of nontaxability of damages); Great W. Food Packers, Inc. v. Longmont Foods Co., 636 P.2d 1331, 1333 (Colo. App. 1981) (granting trial judge discretion regarding the admission of economic evidence such as the effect of taxes on a damage award). Taxes have a potential impact upon an accurate assessment of plaintiff's lump sum award, because of two conflicting tax considerations. Damage awards are not taxable to the plaintiff in the year of receipt. *See* I.R.C. § 104(a) (Supp. 1988). However, a damage award is designed to replicate taxable income. Therefore, a plaintiff may receive a windfall if taxes are not accounted for in the calculation of his or her lump sum award.

An additional tax problem is whether courts should consider the effect of taxes on a plaintiff's invested award. A few courts have reasoned that tax liability on a lump sum damage award's earnings should be taken into account. DeLucca v. United States, 670 F.2d 843, 846 (9th Cir. 1982); Hollinger v. United States, 651 F.2d 636, 642 (9th Cir. 1981); McWeeney v. New York, N.H. & H. Ry., 282 F.2d 34, 37 (2d Cir.), *cert. denied,* 364 U.S. 870 (1960).

79. Mukatis & Widicus, *supra* note 43, at 1142.

erts study does account for the impact of taxes,[80] and it defines the after-tax differential discount rate, d*, as follows:[81]

$$d^* = \frac{i^* - w^*}{1 + w^*},$$

i^* = after-tax nominal rate of interest
w^* = after-tax nominal rate of wage increase

If it is assumed that taxes are indexed to the rate of inflation and wages also grow at this rate (implying that real wage growth is zero), then a plaintiff's pre-tax and after-tax wage rate increases would be equal.[82] Yet, income from the invested award may be affected by the rate of inflation. In fact, the average tax rate on interest income will rise as the rate of inflation increases.[83] According to one author:

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80. Anderson & Roberts, *supra* note 1, at 850 (authors' primary objective was to determine magnitude and stability of after-tax differential discount rate over time).

81. *Id.* at 853.

82. The purpose of indexing is to ensure that an individual who receives wage increases equal to the rate of inflation will not be forced into a higher tax bracket and, thus, required to pay a higher percentage of income in the form of taxes. As an example, consider the following hypothetical tax brackets. For simplicity, personal exemptions and deductions are ignored.

Taxable Income	Tax Rate
$0 to $20,000	10%
$20,000 to $40,000	20%
$40,000 to $60,000	30%

If in a particular year a person has taxable income of $19,000, taxes would be .1($19,000) = $1,900. After-tax income is $17,100.

Suppose that in the following year both wages and prices rise 20%. Without indexing, total taxes on income equal to $22,800 would be as follows:

$$T = .2(22{,}800 - 20{,}000) + .1(20{,}000) = \$2{,}560.$$

After-tax income is $20,240, a rise of 18.36% (from $17,100 to $20,240). This is less than the rise in pre-tax wages.

But if indexing did exist, all the tax brackets would be adjusted upwards by 20%.

Taxable Income	Tax Rate
$0 to $24,000	10%
$24,000 to $48,000	20%
$48,000 to $72,000	30%

A taxable income of $22,800 would now pay a tax equal to $2,280 and would result in after-tax income of $20,520, a rise of 20% (from $17,100 to $20,520).

83. Assume that a person has $200,000 to invest. The rate of inflation, p, is zero and the real rate of interest, r, is 3%. Thus, the nominal rate of interest is also 3%. Finally, the tax brackets are as follows:

Taxable Income	Tax Rate
$0 to $20,000	10%
$20,000 to $40,000	20%
$40,000 to $60,000	30%

It is important to recognize that the taxes levied on wages are distorted by inflation only because the system of progressive tax rates and nonindexed exemptions, deductions, and rate brackets is progressive. In contrast, the measurement of capital income is currently distorted in two respects during inflation. First, capital income shares with wages the arbitrary inflation-induced increases associated with a progressive tax structure. Second, the contribution of capital to taxable capacity is over-

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Interest income equals .03($200,000) = $6,000, so that the average tax paid is .1($6,000) = $600. Also note that the after-tax income of $5,400 plus the $200,000 initial investment implies that the person's after-tax wealth is $205,400, since no inflation occurred during the period.

Now assume that the rate of inflation accelerates to 20%. According to equation 3) of the text, the nominal rate of interest would be

$$i = r + p + rp = .03 + .20 + (.03)(.20) = 23.6\%.$$

Interest income is .236($200,000) = $47,200. If the tax brackets are not indexed, taxes are

$$\begin{aligned} T &= .3(47{,}200 - 40{,}000) + .2(40{,}000 - 20{,}000) + .1(20{,}000) \\ &= 2{,}160 + 4{,}000 + 2{,}000 = \$8{,}160. \end{aligned}$$

The average tax rate has climbed from 10% to 8,160/47,200, or 17.28%. After-tax wealth is the original $200,000 plus after-tax income of ($47,200 — $8,160) = $39,040, or $239,040. But this wealth, after adjusting for a 20% rate of inflation, is worth only 239,040/1.2 = $199,200 (adjustment for inflation requires dividing by 1 plus the rate of inflation of 20%), which is less than the original investment.

Even if the tax brackets are indexed, the average tax rate will climb. With a 20% rate of inflation, indexed tax brackets would be

Taxable Income	Tax Rate
$0 to $24,000	10%
$24,000 to $48,000	20%
$48,000 to $72,000	30%.

Total taxes paid are

$$\begin{aligned} T &= .2(47{,}200 - 24{,}000) + .1(24{,}000) \\ &= 4640 + 2{,}400 = \$7{,}040 \end{aligned}$$

The average tax rate is 7,040/47,200 or 14.91%. This is less than the rate with no indexing, but still higher than the tax rate if no inflation exists. After-tax wealth is $240,160, but only $200,133 after adjusting for inflation. This is less than the comparable figure if no inflation had occurred.

In general, the higher the rate of inflation, the higher the tax rate. As explained in the text, inflation not only pushes interest income into higher tax brackets, since interest rates tend to rise when inflation accelerates, but inflation also lowers the purchasing power of the asset.

Tax rates would remain constant only if the tax system reduced taxable income by the decline in the purchasing power of the asset. In our example, the initial investment of $200,000 has declined 20% in value to $160,000. This loss of $40,000 would then be deducted from total income of $47,200 so that taxable income equals $47,200 — $40,000 or $7,200. Total taxes are

$$T = .10(7{,}200) = 720.$$

After-tax income is $47,200 — $720 = $46,480. After-tax wealth is $246,480, while after-tax wealth adjusted for inflation is 246,480/1.2 = $205,400. Note that such an adjustment would fully preserve the inflation-adjusted wealth of the investor, since this is precisely the sum that will be arrived at if no inflation exists. Unfortunately, tax laws in the United States do not allow for stated if a deduction is not allowed for that component of the return that merely maintains the purchasing power of initial net worth.[84]

This point is best illustrated with an example. Consider a personal injury victim who has an expected working life of one year in 1985.[85] The individual is married and files a joint return. The victim's loss in the year before the trial was $500,000.[86] The real rate of wage increase is 0%. That is, nominal wages rise at a rate equal to the rate of inflation. In addition, assume that the real rate of interest is 3%.

Table 1 in the Appendix demonstrates how plaintiff's damage award increases as the rate of inflation increases. As shown in column (6), the value of the after-tax differential discount rate, d*, declines as the required award in column (2) increases. Given the assumptions described above, the pre-tax value of d, shown in column (7), is a constant 3%, based upon the numbers given. However, this example demonstrates that if economic conditions lead to a constant pre-tax value of d, different rates of inflation can alter the after-tax differential discount rate, d*. In short, this occurs because the after-tax rate of interest, i*, will always be different than the pre-tax rate of interest, i. Thus, although the Anderson-Roberts study infers that d* and d have been stable over time,[87] the example above demonstrates that there is a potential for significant fluctuations in d*.

Not only can changes in the economy influence d* and, hence, the size of the award, but the particular characteristics of an individual plaintiff's economic circumstances are also extremely important. Specifically, any change that tends to increase interest income will, in turn, increase the tax rate on this income, lower the after-tax rate of interest i*, and—according to the formula—lower the value of d*.

One such characteristic is the initial wage loss. Using the example above, Table 2 in the appendix demonstrates a hypothetical situation involving a rate of inflation of 8% and initial wage losses of $250,000, $500,000, and $1,000,000. Table 2 indicates that as the plaintiff's initial loss increases (and interest income rises), i* falls and d* falls. That is, in situations where the initial loss is large the award will have to be discounted less to compensate for the heavier tax rate that is placed upon interest income.

Furthermore, a longer expected worklife may increase the size of

84. Brinner, *Inflation and the Definition of Taxable Income*, in INFLATION AND THE INCOME TAX 121, 125 (1976).

85. The example assumes the use of 1985 tax rates.

86. An unrealistically large economic loss figure is utilized by the author for illustrative purposes.

87. *See* Anderson & Roberts, *supra* note 1, at 872; Mukatis & Widicus, *supra* note 43, at 1142, 1153.

the award and lower the value of d*. This situation is demonstrated by Table 3(A) in the appendix. The assumptions are the same as presented in Table 1, except that the real rate of increase in wages is 2% instead of 0%, and the real rate of interest is 1% instead of 3%. The initial wage loss is assumed to be $25,000. Changing these assumptions does not affect the basic conclusions.

Reading down the columns in Table 3(A), the results illustrate that the size of the award increases with the rate of inflation. Moreover, reading across the rows demonstrates that the longer the plaintiff's expected working life, the greater the amount of the award must be. Table 3(B) demonstrates the values of d* given the award figures generated in Table 3(A). It should be noted that the value of d* declines as the plaintiff's expected working life increases. This change is relatively small for the lower rates of inflation investigated. However, it is clear that d* may fluctuate significantly if the plaintiff's expected working life and the initial size of the award are taken into account. Hence, the Anderson-Roberts hypothesis that d* is relatively stable over time is not necessarily true.

A fourth problem with the stated value studies analyzed herein is that both studies investigated average members of a hypothetical population.[88] Compensation awards, however, are given to individual plaintiffs with particular circumstances and unique needs. Economist Thomas Coyne analyzed the efficacy of the Alaska rule, but his comments regarding studies based on average plaintiffs apply with equal validity to any rule that fixes the differential discount rate.[89] Coyne stated:

> The approach is appealing in its simplicity but it cannot be supported empirically. Moreover, it overlooks essential wage adjustments that should be made for *each* individual. Averages serve a worthwhile purpose when there are no specific data for the case being analyzed. One must remember that averages are generalizations and as such are lacking in specificity; this reason alone may be cause enough to reject them in present value analysis. In wrongful death or injury cases, there is *always* a specific individual. . . . Neither the plaintiff, the defense, nor their respective attorneys can afford to set the discount rate equal to the projected rate of increase in average annual earnings within the aggregate economy for the sake of simplifying courtroom presentations.[90]

Two final problems with the stated value studies are: (1) they fail to recognize that a plaintiff's real rate of wage increase may change

88. Anderson & Roberts, *supra* note 1, at 855; Mukatis & Widicus, *supra* note 43, at 1141.
89. Coyne, *supra* note 43, at 26–27, 29.
90. *Id.* at 29; *see also* M[illegible]her, *supra* note 43, at 41.

over time; and (2) they fail to account for wage rate changes across different industries. The following illustration demonstrates the inaccuracies that may be caused by such problems.[91] Consider a railroad worker who was injured in early 1989. Assume that the worker's compensation in 1988 was $40,249. Assume further that the worker's expected worklife is 10 years. In order to determine an accurate award, it would be necessary to predict future rates of wage increases and interest rates. For the examples investigated, it was assumed that a prudent investor would purchase government securities with maturities ranging from 1 to 10 years at an interest rate of 9%.

However, a court facing such a damage calculation would have little or no guidance concerning the rate of plaintiff's future wage increases without an expert's forecast. Tables 4, 5, and 6 in the appendix indicate what the required damage award would be, given three different assumed wage rate increases.

Table 4 assumes a conservative rate of increase, 2.25%. The beginning balance was calculated to be $287,974.29. This sum would be invested and would earn $25,917.69 in interest in the first period. The economic loss in period 1 is simply the initial loss, plus the rate of wage increase. That is,

$$\$40{,}429 + (.0225)\ (\$40{,}429) = \$41{,}154.60.$$

The ending balance is the sum of the beginning balance and interest income, minus economic loss. Hence, for period 1, the ending balance is equal to

$$\$287{,}974.29 + \$25{,}917.69 - \$41{,}154.60 = \$272{,}737.38.$$

The beginning balance of period 2 is the same as the ending balance for period 1. At that point, the process repeats itself for the remaining periods. The award is designed so that the ending balance falls to zero (or as close as possible) and and so that the initial award represents the

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91. The example assumes an economic climate which would be faced by a nonsupervisory employee of a Class I railroad. Historically, the wages of such an employee have risen faster than the average aggregate wage increase rate. *See* Bureau of Economic Statistics, Inc., The Handbook of Basic Economic Statistics 59 (Nov. 1987) [hereinafter Basic Economic Statistics]. In addition, until 1984, wages for railroad employees had risen at least as fast as the interest rates on United States securities. *See id.*; Economic Report of the President, *supra* note 72, at 390. Since 1984, though, wages only rose at approximately 2.25% per year. *See* Basic Economic Statistics, *supra*, at 59. During this time period, interest rates on ten-year United States government securities were 8.9%, while the consumer price index rose 3.23%. Economic Report of the President, *supra* note 72, at 373, 390. Considering the decline in demand for railroad services, it is difficult to predict how many years the rate of wage increases will remain depressed. Hence, the changes in the railroad industry, which are a function of consumer demand for the service, are an excellent example of a situation in which a stated value of d will produce an inaccurate award over time.

present value of estimated future economic losses.

Tables 4 and 5 assume wage increase rates of 2.25% and 5% respectively.[92] The required award calculated in Table 5 ($329,000) is 14.4% higher than the required award calculated in Table 4. Table 6 assumes a rate of wage increase of 10%, and would require an award which is 47% larger than the award generated in Table 4.

It should be noted that several of the economists cited in this article have suggested a static, negative differential discount rate—where the wage rate increase is larger than the interest rate.[93] Considering the 9% interest rate utilized in the examples above, a negative differential discount rate would be possible only if future wage increases in the railroad industry climb above 9%, or interest rates fall drastically. Although either event is possible, neither is likely in the near future.

V. Summary and Conclusion

The trend today in most courts is to allow evidence concerning economic variables such as inflation, productivity, and taxes.[94] In an effort to cope with this additional workload, many courts have introduced rules which specify, to various degrees, the relationships between different economic variables.[95] Some, such as the Modified *Feldman* rule,[96] are very loose in their restrictions. They require only that inflation, real interest rates, and real rates of wage increase be analyzed in a logical manner.[97] Economists could hardly object to such rules. Unfortunately, they also require that independent forecasts of relevant variables be made. In this regard, the Modified *Feldman* rule does not meet the requirements of efficiency and predictability to the same degree as some of other rules discussed in this article.

The Pennsylvania rule, by contrast, places a restriction on one variable.[98] For this rule, the real rate of interest is set equal to zero with no restriction on the real rate of wage increase.[99] This method is probably more predictable and efficient than the Modified *Feldman* rule, but keeping one variable constant will often bias the award.[100]

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92. The 5% rate is used by the Social Security Administration in forecasting future funding needs through the year 2060. Board Of Trustees, Federal Old Age And Survivors Insurance And Disability Insurance Trust Funds, 100th Cong., 2d Sess., Annual Report 33–36 (Comm. Print 1988) [hereinafter, OASDI Annual Report].

93. *See* Anderson & Roberts, *supra* note 1, at 871; Mukatis & Widicus, *supra* note 43, at 1153.

94. *See supra* notes 13–20 and accompanying text.

95. *See supra* notes 17–20 and accompanying text.

96. *See supra* notes 50–54 and accompanying text.

97. *Id.*

98. *See supra* notes 46–49 and accompanying text.

99. *Id.*

100. *See supra* note 49 and accompanying text.

Finally, some rules specify a particular value for the differential discount rate.[101] The Alaska rule is of this type, as are the rules recommended by the authors of the two studies discussed in Section IV. A rule which specifies the value of the differential discount rate is probably the most efficient and predictable. However, as the author has demonstrated in this article, such rules may be sorely lacking in accuracy.[102] Perhaps, the most persuasive argument against those rules which specify a value for d is that there are too many instances in which a stated value does not accurately reflect the "correct" award sum. Hence, while d for the entire economy may be stable over time, a stated value utilized in all circumstances may either overcompensate or undercompensate a given plaintiff.

This author's recommendation is that a rule such as the Modified *Feldman* rule should be followed by the courts. This type of rule does not specify preordained values for economic variables. It requires that the expert witness make predictions concerning inflation, productivity, and interest rates based on the particular case under consideration. Once these forecasts are made, the rule can then be invoked to insure that the variables fit together in accordance with accepted economic theories. As an example, if in a particular case it is believed that nominal wage rates will rise at a 5% annual rate, nominal interest rates will average 8%, and the rate of inflation will be 4%, then the Modified *Feldman* rule would require that the award be computed based upon an increase in real wage rates equal to 1% (5% — 4%) and real interest rates equal to 4% (8% — 4%).

Admittedly, the Modified *Feldman* approach has some drawbacks of its own. Such a rule will obviously be less efficient and predictable than a rule which specifies a value for d. Furthermore, if an expert witness is not particularly adept at forecasting economic variables, then the estimated award may not provide proper compensation and the *Feldman* rule's ability to generate accurate awards will be placed in doubt. In many cases it may take an almost uncanny degree of foresight in order to predict a wage trend such as the hypothetical worker's situation discussed above.

Moreover, such a rule may be less accurate than a rule which specifies a value for d, because it allows too much leeway for the courts. Some commentators have suggested that courts may be baffled and overwhelmed by economic data or testimony.[103] A final problem

101. *See supra* notes 37–45, 61–68 and accompanying text.

102. *See supra* notes 69–93 and accompanying text.

103. Courts have been aware of the possibility of unduly complicating trials with economic forecasting data. *See, e.g.*, Monessen S.W. Ry. v. Morgan, 108 S. Ct. 1837, 1846 (interim ed. 1988) (permitting judge's guidance of jury in difficult computations of present value); Doca v.

with the Modified *Feldman* approach is that trends in earnings change relatively slowly, while the discount rate may change somewhat rapidly. For example, in February of 1980, the yield on 6-month Treasury bills was 12.72% and the yield on 10-year United States government securities was 12.38%.[104] By June of 1980, these rates had fallen to 7.21% and 10.58% respectively.[105] There would have been great difficulty in predicting that the present value of future losses would change so greatly in such a short a period of time. Since court cases are often delayed for several months, the expert witness may be in the embarrassing position of having to change his or her estimate of the award by substantial amounts.

Yet, although the Modified *Feldman* approach may have problems of its own, on balance, it is the most accurate method of computing a compensatory damage award. This is particularly true considering the fact that there may be a wide disparity in different plaintiffs' individual situations and circumstances. Consider a person in a declining industry, who will only work for another 5 years, and who does not have a history of steady employment. Utilizing general economic trends is not the best approach for determining such an individual's damage award. On the other hand, focusing exclusively on the specifics implies that the proceedings will become more complex, and ignores the fact that most economic variables will usually tend towards national averages over a sufficient period of time.[106]

In this regard, one commentator has proposed that both current and long-term trends be taken into account in calculating damage awards.[107] Such a method could have been utilized in the case discussed at the end of Section IV. In addition to assuming a rate of increase in wages equal to the current figure of 2.25%, one could gradually increase this towards the projected national average of 5%. Such a method may be more accurate than projecting a fixed rate of 2.25% (or 5%) over the entire estimated work life. Furthermore, workers in a particular industry do have the option of switching jobs if wages remain depressed. Hence, in this regard their wages in the long run may approximate the average worker's rate of wage increase.

In the end, it may be useful to look at plaintiff's current situation

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Marina Mercante Nicaraguense, S.A., 634 F.2d 30, 39 (2d Cir. 1980) (noting that the "average accident trial should not be converted into a graduate seminar in economic forecasting").

104. *See* ECONOMIC REPORT OF THE PRESIDENT, *supra* note 72, at 390.

105. *Id.*

106. *See* Anderson & Roberts, *supra* note 1, at 739–50 (demonstrating relatively stable long-term relationships between nominal interest and growth rates, real interest and growth rates, and wage growth rates over different occupations).

107. Corboy, *The Impact of Economic Theory on the Determination of Damages in a Wrongful Death Case*, 20 FORUM 606, 625 (1985).

as one possible scenario which could be presented for the finder of fact's consideration. This would require use of the Modified *Feldman* rule with the expert witness using his or her best judgment in predicting the future values of relevant economic variables. Then an alternative scenario which reflects long-term projections of the economic variables might be also presented to the finder of fact.

This article has demonstrated that a court's adoption of a static differential discount rate may lead to an inaccurate calculation of a plaintiff's damage award. As discussed above, a viable alternative may be to account for the plaintiff's specific economic circumstances, as well as general future economic trends, and present these to the trier of fact for consideration. Proponents of a stated value of d have recommended specific differential discount rates ranging from —1.46% to 0.0%. No published rule has recommended a positive differential discount rate, since all of the studies to date conclude that wage rates will increase at least as fast as the level of interest rates.[108] However, data projections by the Social Security Administration predict a value of d equal to .48%.[109] In the final analysis, the expert witness may be forced to choose his or her own value of d which reflects general economic conditions as well as the circumstances involved in plaintiff's specific case.

108. *See* Anderson & Roberts, *supra* note 1, at 870–72; Mukatis & Widicus, *supra* note 43, at 1153.

109. *See* OASDI ANNUAL REPORT, *supra* note 92, at 34.

VI. Appendix

Table 1

(1)	(2)	(3)	(4)	(5)	(6)	(7)
P	A	i	i*	w=w*	d*	d
0%	$262730	3.00%	2.90%	0.00%	2.90%	3.00%
4	264147	7.12	6.44	4.00	2.35	3.00
8	265996	11.24	9.77	8.00	1.63	3.00
12	268314	15.36	12.85	12.00	0.76	3.00

P = Rate of Inflation
A = Computed Award
i = Pre-Tax Rate of Interest
i* = After-Tax Rate of Interest
w=w* = Pre and After-Tax Rate of Wage Increase
d* = After-Tax Differential Discount Rate
d = Pre-Tax Differential Discount Rate
Initial Wage Loss = $500000
Number of Years = 1

Table 2

Initial Wage Loss	Award	After-Tax Interest Rate	After-Tax Differential Discount Rate
	A	i*	d*
$250000	$142287	10.33%	2.15%
500000	265996	9.77	1.63
1000000	479188	8.93	0.86

Rate of Inflation = 8%

Table 3(A)

Rate of Inflation	Years			
	10	20	30	40
0%	$221180	$465261	$735615	$1038265
4	222931	488188	821580	1268630
8	229979	538905	1032585	1911054
12	237830	622007	1425308	3370748

Initial Wage Loss = $25000

Rate of Increase in Real Wage Rates = 2%

Real Rate of Interest = 1%

Entries of Table 3(A) are the computed awards given different rates of inflation and expectation of working life.

Table 3(B)

Rate of Inflation	Years			
	10	20	30	40
0%	-0.96%	-0.97%	-0.98%	-1.00%
4	-1.11	-1.41	-1.64	-1.88
8	-1.60	-2.28	-2.94	-3.54
12	-2.23	-3.49	-4.63	-5.59

Initial Wage Loss = $25000

Rate of Increase in Real Wage Rates = 2%

Real Rate of Interest = 1%

Entries of Table 3(B) are the after-tax differential discount rate, d*, given the awards as presented in Table 3(A).

Table 4

Period	Beginning Balance	Discount Rate	Interest Income	Economic Loss	Ending Balance
1	$287974.29	0.09	$25917.69	$41154.60	$272737.37
2	272737.37	0.09	24546.36	42080.58	255203.16
3	255203.16	0.09	22968.28	43027.39	235144.05
4	235144.05	0.09	21162.96	43995.51	212311.50
5	212311.50	0.09	19108.03	44985.41	186434.13
6	186434.13	0.09	16779.07	45997.58	157215.62
7	157215.62	0.09	14149.41	47032.53	124332.49
8	124332.49	0.09	11189.92	48090.76	87431.66
9	87431.66	0.09	7868.85	49172.80	46127.71
10	46127.71	0.09	4151.49	50279.19	0.01

Initial Economic Loss	$40249.0000
Discount Rate	9%
Rate of Wage Increase	2.25%

Table 5

Period	Beginning Balance	Discount Rate	Interest Income	Economic Loss	Ending Balance
1	$329573.07	0.09	$29661.58	$42261.45	$316973.20
2	316973.20	0.09	28527.59	44374.52	301126.26
3	301126.26	0.09	27101.36	46593.25	281634.38
4	281634.38	0.09	25347.09	48922.91	258058.56
5	258058.56	0.09	23225.27	51369.06	229914.77
6	229914.77	0.09	20692.33	53937.51	196669.59
7	196669.59	0.09	17700.26	56634.38	157735.47
8	157735.47	0.09	14196.19	59466.10	112465.56
9	112465.56	0.09	10121.90	62439.41	60148.05
10	60148.05	0.09	5413.32	65561.38	0.00

Initial Economic Loss	$40249.00
Discount Rate	9%
Rate of Wage Increase	5%

Table 6

Period	Beginning Balance	Discount Rate	Interest Income	Economic Loss	Ending Balance
1	$423368.49	0.09	$38103.16	$44273.90	$417197.75
2	417197.75	0.09	37547.80	48701.29	406044.26
3	406044.26	0.09	36543.98	53571.42	389016.83
4	389016.83	0.09	35011.51	58928.56	365099.78
5	365099.78	0.09	32858.98	64821.42	333137.34
6	333137.34	0.09	29982.36	71303.56	291816.15
7	291816.15	0.09	26263.45	78433.91	239645.68
8	239645.68	0.09	21568.11	86277.31	174936.49
9	174936.49	0.09	15744.28	94905.04	95775.74
10	95775.74	0.09	8619.82	104395.54	0.01

Initial Economic Loss	$40249.00
Discount Rate	9%
Rate of Wage Increase	10%