University of Dayton Law Review

Volume 8 | Number 2 Article 4

1982

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THE IMPACT OF INFLATION UPON COMPENSATION AWARDS

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I. INTRODUCTION

A major goal of tort law is to somehow make an injured party "whole"; that is, to put the injured party in the same position he was in before he suffered the injury. Primarily, this attempt to make an injured party whole comes in the form of financial compensation. The amount of compensation that will make a particular party whole depends on many factors: one such factor is the impact of inflation.

This article will examine the impact inflation has on future damage awards. It should be noted that this article is somewhat technical in its approach. However, the authors believe that a basic understanding of the fundamental principles of the role of inflation will aid the practitioner in his or her efforts to persuade a judge or jury to properly consider the impact of inflation when awarding damages to the injured client. As will be seen, a proper consideration of inflation should result in higher damage awards.[1]

To determine an injured party's economic loss due to injury or death, it is necessary to forecast both his future wage loss and the amount that could be earned from investing any lump sum award granted to him. Unfortunately, forecasting wages and interest rates is extremely difficult, largely because both are influenced by future rates of inflation.[2] If inflation increases, wages usually increase rapidly and interest rates rise to high levels. If the rate of inflation falls, wages

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1. For a survey of recent writings on the subject of economics in the law, see R. POSNER, ECONOMIC ANALYSIS OF LAW (1972); J. STEIN, DAMAGES AND RECOVERY: PERSONAL INJURY AND DEATH ACTIONS (1972); Sherman, *Projection of Economic Loss: Inflation v. Present Value*, 14 CREIGHTON L. REV. 723 (1981); Comment, *Future Inflation As A Factor In The Determination Of Damage Awards*, 12 U. TOL. L. REV. 369 (1981); Note, *Future Inflation, Prospective Damages, and the Circuit Courts*, 63 VA. L. REV. 105 (1977) [hereinafter cited as Note, *Future Inflation*]; Note, *Considering Inflation in Calculating Lost Future Earnings*, 18 WASHBURN L.J. 499 (1979).

2. Traditionally, many courts have not allowed expert testimony on future rates of inflation largely because forecasting inflation is considered speculative. *See, e.g.*, Story Parchment Co. v. Paterson Parchment Paper Co., 282 U.S. 555, 563 (1931); Yodice v. Koninklijke Nederlandsche Stoomboot Maatschappij, 443 F.2d 76 (2d Cir. 1971); Williams v. United States, 435 F.2d 804 (1st Cir. 1970); Buchalski v. Universal Marine Corp., 393 F. Supp. 246 (W.D. Wash. 1975).

usually rise at a relatively slow rate and interest rates will likewise be lower. If inflation progresses at a slow and consistent pace, which rarely happens, it would not present many difficulties.

Experts who are called upon to estimate the economic loss of injured parties have developed many techniques to account for inflation. One such technique which will be analyzed is to simply ignore inflation. As will be seen, under *certain restrictive assumptions*, it turns out that despite the close relationship between inflation, wages, and interest rates, inflation has no impact upon the size of the compensation award. However, this conclusion is valid only to the extent the assumptions made are reasonable. One of these assumptions, that taxes need not be considered, is unrealistic and not proper according to recent court decisions.[3] Once taxes are introduced into the analysis, we will see that inflation definitely has an impact upon the size of the compensation award. This article will also investigate how certain factors influence the quantitative effect of inflation upon the size of a compensation award.

II. LEGAL BACKGROUND

Traditionally, courts have been highly reluctant to consider the effects of inflation upon future damage awards because economic predictions were considered speculative.[4] The current trend, however, evidences an attempt to reconcile principles of tort law compensation with the debilitating effects of inflation.[5] Thus, it is apparent that the judiciary, in the interest of assuring the injured plaintiff full and adequate

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3. *See* Norfolk & Western Ry. v. Liepelt, 444 U.S. 490 (1980); Cazad v. Chesapeake & Ohio Ry., 622 F.2d 72, 76 (4th Cir. 1980); Nesmith v. Texaco, Inc., 491 F. Supp. 561, 563-64 (W.D. La. 1980); Oltersdorf v. Chesapeake & Ohio R.R., 83 Ill. App. 3d 457, 464, 404 N.E.2d 320, 325 (1980).

4. The traditional viewpoint is well stated by Professors Harper and James:

> Future trends in the value of money are necessarily unknown and so always render such damages speculative in a way we cannot escape. If the estimates represent a straight-line projection of present living costs, they will be frustrated by fluctuations either way. If prophecy of change is heeded, frustration will follow if no change, or the opposite change, occurs. When courts have consciously grappled with the problem they have either found all prophecy too speculative and so, perforce, have taken the equally speculative course of betting on a continuance of the status quo; or they have made intuitive and not always very wise judgments that present conditions represent a departure from some imaginary norm to which they think we shall rapidly return. It is not at all clear that courts would be willing to hear experts on the matter, or that they would get much real help if they did. For the most part the problem—which is inevitably present in every case of the future loss—is not analyzed and the present value of money is assumed to be the proper basis.

F. HARPER & F. JAMES, THE LAW OF TORTS § 25.11, at 1325-26 (1956) (footnotes omitted). *See, e.g.*, Sleeman v. Chesapeake & Ohio Ry., 414 F.2d 305, 307-08 (6th Cir. 1975); Hoffman v. Sterling Drug, Inc., 485 F.2d 132, 143-44 (3d Cir. 1973); *see generally* K. ROSENN, LAW AND INFLATION 220-34 (1982). *See supra* notes 1-2 and accompanying text.

5. *See* Kaczkowski v. Bolubasz, 491 Pa. 561, 565-66, 421 A.2d 1027, 1029 (1980).

compensation, is becoming more inclined to allow the fact-finder to consider the effects of inflation when calculating prospective damages.[6]

With some variations, the courts which allow consideration of inflation have developed two methods. The first, known as the middle ground approach, allows the fact-finder to consider the effects of inflation, but forbids expert testimony on the subject.[7] This approach is used primarily to avoid confusing the jury. It has been criticized, however, because it allows the jury to consider inflation without expert guidance.[8]

The more reasonable approach is the second method, which permits the fact-finder to receive expert testimony on the effects of inflation, and then adjust the damage award accordingly.[9] In allowing such testimony, the courts have examined and recognized the interrelationships between the discount rate,[10] inflation,[11] and the potential for in-

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6. *See, e.g.*, Norfolk & Western Ry. v. Liepelt, 444 U.S. 490 (1980); Culver v. Slater Boat Co., 688 F.2d 280 (5th Cir. 1982); Byrd v. Heinrick Schmidt Reederei, 688 F.2d 324 (5th Cir. 1982); Pfeifer v. Jones & Laughlin Steel Corp., 678 F.2d 453 (3d Cir. 1982); O'Shea v. Riverway Towing Co., 677 F.2d 1194 (7th Cir. 1982); Feldman v. Allegheny Airlines, Inc., 382 F. Supp. 1271 (D. Conn. 1974), *rev'd in part*, 524 F.2d 384 (2d Cir. 1975); Kaczkowski v. Bolubasz, 491 Pa. 561, 421 A.2d 1027 (1980).

7. *See* Note, *Future Inflation, supra* note 2, at 119-22. The middle ground approach has been described as follows:

> Courts following the middle ground approach permit the fact-finder to consider the effects of inflation and increased productivity on lost future earnings but forbid expert testimony on either subject. The middle ground approach achieves the policy goal of efficiency by conserving judicial resources through the elimination of burdensome economic testimony. Additionally, accuracy is sought by drawing upon the jury's common experience with inflation.

Note, *Tort Damages: The Adjustment of Awards for Lost Future Earning Capacity to Compensate for Inflation and Increased Productivity*, 7 U. DAYTON L. REV. 139, 141 (1981) (footnotes omitted). *See also, e.g.*, Johnson v. Serra, 521 F.2d 1289 (8th Cir. 1975); Riha v. Jasper Blackburn Corp., 516 F.2d 840 (8th Cir. 1975); Bach v. Penn Cent. Transp. Co., 502 F.2d 1117 (6th Cir. 1974), *explained in* Morvant v. Construction Aggregates Corp., 570 F.2d 626, 631-32 (6th Cir. 1978).

8. Note, *Future Inflation, supra* note 2, states "[s]peculation by the fact-finder, of course, is no more accurate than speculation by the experts." *Id.* at 122.

9. Various species of the so-called evidentiary approach have been developed. *Id.* Compare the following cases: Culver v. Slater Boat Co., 688 F.2d 280 (5th Cir. 1982) (allowing factual economic and labor data and expert testimony); Feldman v. Allegheny Airlines, Inc., 382 F. Supp. 1271 (D. Conn. 1974) (allowing offset of discount rate and prospective inflation), *rev'd in part*, 524 F.2d 384 (2d Cir. 1975); Kaczkowski v. Bolubasz, 491 Pa. 561, 421 A.2d 1027 (1980) (presumption that inflation equals future interest rates with offsetting factors); District of Columbia v. Barriteau, 399 A.2d 563 (D.C. 1979) (competent evidence of reasonable inflation rate allowed); and Beaulieu v. Elliott, 434 P.2d 665 (Alaska 1967) (presumption that discount rate offsets inflation rate).

10. *See* Chesapeake & Ohio Ry. v. Kelly, 241 U.S. 485 (1916). In describing the discount rate, Posner states:

> Where an accident disables the victim from working for some period into the future, courts, rather than ordering the defendant to make periodic payments during the period of disability (analogous to alimony payments), order him to pay the victim a lump sum equal

creases in future wages.[12]

A clear indication that the judiciary is willing to consider the effects of inflation can be seen in the Fifth Circuit. As recently as 1981 the Fifth Circuit, in *Culver v. Slater Boat Co.*[13] and *Byrd v. Heinrich Schmidt Reederei*,[14] refused to allow expert testimony on the effects of inflation. Despite *dicta* by the United States Supreme Court apparently favoring such testimony,[15] the court followed its decision in *Johnson v.*

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in value to the expected future stream of earnings. They do not make the mistake of computing the lump sum by simply multiplying the amount of the periodic payment by the number of periods during which the victim is expected to remain disabled. This method of computation would overcompensate the victim, because at the end of the period he would have received not only an amount equal to the sum of the periodic payments, but interest on that sum, which he would not have received had payment been made periodically rather than in a lump at the outset. The lump sum should be equal to the price that the victim would have had to pay in order to purchase an annuity calculated to yield the periodic payment for the expected duration of the disability, and no more.

R. POSNER, *supra* note 1, at 79. *See also* J. STEIN, *supra* note 1, § 172.

11. One author states:

The term 'inflation' is often used loosely in English to mean anything from pomposity to increases in money, income and profits. For the purposes of this book, inflation is used to refer either to a sustained rise in an economy's general level of prices or to a corresponding fall in the domestic purchasing power of an economy's currency. This working definition implies that inflation is a dynamic process in which the aggregate level of prices is moving upward over time while the purchasing power of money is in corresponding decline. It does not mean that all prices are moving upward uniformly, nor even that all prices are moving upward. It does mean that an economy is undergoing inflation when it presently costs more to purchase a representative sample of goods than it cost in the past.

K. ROSENN, *supra* note 4, at 3 (footnote omitted).

12. *See* Henderson, *The Consideration of Increased Productivity and the Discounting of Future Earnings to Present Value*, 20 S.D.L. REV. 307 (1975). Four major factors influence the rate of increase in income: "(1) the educational attainment of participants prior to their entry into the labor market; (2) the influence of age upon the earnings of participants over their life cycle; (3) the significance of productivity and growth; and (4) the impact of inflation." *Id.* at 312 (footnote omitted).

13. 644 F.2d 460 (5th Cir. 1981), *overruled on reh'g en banc*, 688 F.2d 280 (1982).

14. 638 F.2d 1300 (5th Cir. 1981), *overruled on reh'g en banc*, 688 F.2d 324 (1982).

15. In Norfolk & Western Ry. v. Liepelt, 444 U.S. 490 (1980), the Court stated:

Admittedly there are many variables that may affect the amount of a wage earner's future income-tax liability. The law may change, his family may increase or decrease in size, his spouse's earnings may affect his tax bracket, and extra income or unforeseen deductions may become available. *But future employment itself, future health, future personal expenditures, future interest rates, and future inflation are also matters of estimate and prediction.* Any one of these issues might provide the basis for protracted expert testimony and debate. But the practical wisdom of the trial bar and the trial bench has developed effective methods of presenting the essential elements of an expert calculation in a form that is understandable by juries that are increasingly familiar with the complexities of modern life. We therefore reject the notion that the introduction of evidence describing a decedent's estimated after-tax earnings is too speculative or complex for a jury.

Id. at 494 (footnote omitted) (emphasis added).

In fact, although the *Byrd* court noted the favorable *dicta* of *Liepelt*, it did not consider it as authority overruling *Penrod*. *See* 638 F.2d at 1308.

Penrod Drilling Co.,[16] where it held "the influence on future damages of possible inflation or deflation is too speculative a matter for judicial determination."[17] In 1982, however, the Fifth Circuit granted rehearings *en banc* in both *Culver*[18] and *Byrd*.[19] The court overruled both decisions, as well as *Penrod* which had been the cornerstone of the circuit's steadfast refusal to consider inflation.[20] The Fifth Circuit's abrupt change appears to have been influenced by the *dicta* of the Supreme Court in *Norfolk & Western Railway v. Liepelt*,[21] as well as by criticism from commentators[22] and other courts.[23] In addition, the court recognized what it perceived to be the tremendous injustice of blindly following *Penrod's* absolute prohibition against considering inflation.[24] Consequently, the *Culver* court stated:

> Spiraling inflation during the years since *Penrod* has indirectly led to much of the criticism of our 1975 opinion. . . . The problem with *Penrod* is not primarily its spectacular unfairness in periods of extremely high inflation. To the contrary, the danger of *Penrod* lies in its unwillingness to consider the effect of inflation on future wages at all. *Penrod* stands for the inflexible proposition that triers of fact should not consider inflation or deflation at all, whether high or low or nonexistent, in predicting wage loss. At the same time, defendants are freely allowed to show the highest inflation-induced interest rates available on relatively safe investments. Unfortunately, any evidence of the fact that wages will likely increase to combat the eroding effects of inflation remains eclipsed by the Court-declared spectre of *speculation*.
>
> What we seek, in response to criticism from both within and without the Circuit, is fairness with regard to the presentation of economic data by either side in the legal controversies that our federal courts face.[25]

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16. 510 F.2d 234 (5th Cir.), *cert. denied*, 423 U.S. 839 (1975), *overruled*, Culver v. Slater Boat Co., 688 F.2d 280 (5th Cir. 1982).

17. 510 F.2d at 241.

18. 688 F.2d 280 (5th Cir. 1982).

19. *Id.* at 324.

20. *See, e.g.*, Davis v. Hill Eng'g, Inc., 549 F.2d 314 (5th Cir. 1977); Menard v. Penrod Drilling Co., 538 F.2d 1084 (5th Cir. 1976); Sincere Navigation Corp. v. United States, 529 F.2d 744 (5th Cir. 1976); Lacaze v. Olendorff, 526 F.2d 1213 (5th Cir. 1976); Canal Barge Co. v. Griffith, 513 F.2d 911 (5th Cir.), *cert. denied*, 423 U.S. 840 (1975); Standefer v. United States, 511 F.2d 101 (5th Cir. 1975); Robertson v. Douglas S.S. Co., 510 F.2d 829 (5th Cir. 1975); Law v. Sea Drilling Corp., 510 F.2d 242 (5th Cir. 1975).

21. *See supra* note 15 and accompanying text.

22. 688 F.2d at 294-95.

23. *Id.* at 292-93. The *Culver* court discussed Doca v. Marina Mercante Nicaraguense, S.A., 634 F.2d 30 (2d Cir. 1980), *cert. denied*, 450 U.S. 971 (1981); Taenzler v. Burlington N., 608 F.2d 796 (8th Cir. 1979); Feldman v. Allegheny Airlines, Inc., 524 F.2d 384 (2d Cir. 1975); Johnson v. Serra, 521 F.2d 1289 (8th Cir. 1975).

24. 688 F.2d at 288-92.

25. *Id.* at 295 (footnotes omitted).

The court then went on to analyze several methods of dealing with inflation,[26] concluding with an invitation to the trial court to fashion some methodology that would tackle, rather than avoid, the problem of inflation.[27]

For purposes of this article, the *Culver* decision is important not for its methodology, but rather for the proposition that courts must take an active role in dealing with the effects of inflation. The *Penrod* approach is no longer acceptable due to modern sophistication in economic forecasting. The decision in *Culver* affirmatively shows the abandonment of the *Penrod* approach and a current judicial recognition of the interrelationships of various economic factors which can affect the size of a damage award. In view of this recognition, the attorney must be aware of such relationships, and scrutinize the various factors in order to mold an economically feasible damage package.

III. DEALING WITH INFLATION BY ASSUMING IT AWAY

As the previous discussion indicates, the inability of economic experts to agree on their forecasts created a great deal of controversy in the courts over the estimation of both future rates of wage increases and future interest rates. However, a time series examination for both rates of wage increases and interest rates shows that these two series move up and down together, largely because of changes in the rate of inflation. Therefore, one can reasonably assume that the differential between the rate of wage increases and interest rates is constant, even though the absolute numbers vary, and for that reason inflation does not matter. The following Table can be used to illustrate the point.

26. *Id.* at 295-306. The court reviewed the approaches taken in Feldman v. Allegheny Airlines, Inc., 524 F.2d 384 (2d Cir. 1975) and Beaulieu v. Elliott, 434 P.2d 665 (Alaska 1967).

27. 688 F.2d at 310-11.

TABLE I

	Low Inflation Rate			High Inflation Rate		
Period of Loss	Value of $10,000 Growing at 6% per year	Present Value Discount Rate of 4%	Present Value Discount Rate of 6%	Value of $10,000 Growing at 12% per year	Present Value Discount Rate of 10%	Present Value Discount Rate of 12%
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	$10,000			$10,000		
1	10,600	$10,192	$10,000	11,200	$10,182	$10,000
2	11,236	10,388	10,000	12,544	10,366	10,000
3	11,910	10,588	10,000	14,049	10,555	10,000
4	12,625	10,792	10,000	15,735	10,747	10,000
5	13,382	10,999	10,000	17,623	10,942	10,000
6	14,185	11,211	10,000	19,738	11,142	10,000
7	15,036	11,426	10,000	22,107	11,345	10,000
8	15,938	11,646	10,000	24,760	11,550	10,000
9	16,895	11,870	10,000	27,731	11,761	10,000
10	17,908	12,098	10,000	31,058	11,973	10,000
		$111,210	$100,000		$110,563	$100,000

If it is assumed that the initial wage was $10,000, that wages rise at a rate of 6%, that the discount rate is also 6%, and the period of loss is 10 years, the present value of future losses is $100,000.[28] However, if the discount rate is lowered to 4%, the award increases to $111,210. A lower discount rate yields a higher award because the interest generated from the award is lower. If instead, the rate of inflation has accelerated so that wages increase at a 12% rate, the present value of a 10-year future loss, given a discount rate of 12%, is $100,000. If the discount rate is lowered to 10%, the present value is $110,563.

The conclusion that can be drawn from Table I is that if the discount rate is the same as the rate of wage increases, the present value of the future loss is the same as the current loss regardless of the actual values used. Even if there is a difference between the rate of wage increases and the discount rate, if the differential is held constant the present values are essentially the same.[29] By maintaining a constant differential between increases in wage rates and discount rates, the size of the award will be unaffected as the absolute value of the numbers move up or down.

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28. For discussions of the principles involved in projecting future wage losses and discounting them back to present value, see Fabozzi & Weitz, *Discounting and the Determination of Economic Damages*, 11 TRIAL LAW. Q. 39 (1976); Fitzgerald, *Economic Loss in Wrongful Death: Principles of Evaluation*, 44 INS. COUNS. J. 427 (1977); Lebrenz & Kreidle, *The Present Value of Lost Wages—Explanation and Application*, 64 ILL. B.J. 424 (1976).

29. This is not a rounding error. In most cases, the actual size of the award does go down very slightly as the absolute numbers involved get larger.

A similar conclusion has been drawn by other writers. One such author has noted:

> This is where my proposal enters. The two major areas of contention are the rate at which earnings are projected to grow and the discount rate used in computation of present values. . . .
>
> . . . .
>
> [A] reasonable procedure in computing the present values of future earnings is to let the discount rate exactly offset any projected economy-wide wage increases. . . .
>
> For our man earning $10,000, Column 4 in Table 1 provides the solution for the present-value problem. $310,000 is the answer *no matter how much inflation one projects into the future.*[30]

One year later, another writer proposed essentially the same rule, noting:

> Close and consistent relationships between growth in earnings and rates of interest (discount) allow us to simplify the method of estimating the present value of future earnings. . . . This simplified method can be used to develop two separate approaches.
>
> . . . .
>
> 'Approach One' holds that the rate of growth in earnings exceeds the rate of discount by approximately 1%. . . .
>
> . . . .
>
> 'Approach Two' holds the rate of growth in earnings equal to the rate of discount. Future earnings do not need to be increased nor discounted under this approach. . . .
>
> . . . .
>
> *The major advantages of both approaches is that they reduce the need for forecasting inflation and its effect on future earnings.*[31]

However, not all commentators agree with these conclusions. According to one empirical investigation, it is not appropriate to assume that wages rise at the same rate as the level of interest rates.[32] Rather, the rate of increase in wages earned in the private sector is about 1.4% higher, on average, than a portfolio of short-term government securities.[33]

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30. Carlson, *Economic Analysis v. Courtroom Controversy: The Present Value of Future Earnings*, 62 A.B.A. J. 628, 630-31 (1976) (emphasis added). The table in Carlson's article was for a time period of 31 years; hence, 31 x $10,000 = $310,000. *Id.* at 629.

31. Franz, *Simplifying Future Lost Earnings*, TRIAL MAG., Aug. 1977, at 34, 36-37 (emphasis added) (footnote omitted).

32. Formuzis & O'Donnell, *Inflation and the Valuation of Future Economic Losses*, 38 MONT. L. REV. 297, 299 (1977).

33. Formuzis and O'Donnell recommended such a portfolio as superior to investing in long-term bonds. *Id.* at 304.

> The rate of wage growth should not be assumed to equal the rate of discount when the evidence shows it to be 1.4 percentage points above it. *Our method does not require a forecast of future inflation.* Our method is also consistent with the most recent court decision and we have shown in a number of statistical tests that it produces "fair" present worth amounts projected over future periods, where the rate of inflation is taken as an unknown factor.[34]

In sum, all three of the above observations concluded that if the differential between the rate of wage increases and interest rates is close and constant, inflation would have no significant impact upon the award. The only disagreement appears to be with the size of the differential that should be used.

IV. THE EFFECT OF INFLATION WHEN TAXES ARE CONSIDERED

The conclusions presented in the preceding section, that inflation could safely be ignored, were based on the premise that taxes need not be considered. However, that premise is not always valid.[35] Certainly, a compensation award where taxes are not being considered can be very different from an award where taxes are incorporated.[36] The focus of

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34. *Id.* at 303 (emphasis added) (footnote omitted).

35. In Norfolk & Western Ry. v. Liepelt, 444 U.S. 490 (1980), the Supreme Court held it was error to exclude a jury instruction on the effects of income taxation on future earnings in an action under the Federal Employers' Liability Act (FELA). *Id.* at 498.

In reviewing the implications of *Liepelt*, one commentator noted:

> Addressing the evidentiary question, the *Liepelt* majority reasoned that the measure of recovery in an FELA wrongful death action is the amount of money that the decedent would have contributed to the support of his family if he had survived. The Court noted that income taxes reduce the amount of money that a wage-earner can contribute to the support of his family. After-tax income, rather than gross income, therefore, provides the more realistic measure of the pecuniary loss to the decedent's survivors.

Note, *Income Taxation and the Calculation of Tort Damage Awards: The Ramifications of* Norfolk & Western Railway v. Liepelt, 38 WASH. & LEE L. REV. 289, 291-92 (1981) (footnotes omitted) [hereinafter cited as Note, *Tort Damage Awards*].

In Gulf Offshore Co. v. Mobil Oil Corp., 453 U.S. 473 (1981), the Court was asked to decide whether a state court, adjudicating a cause of action arising under the Outer Continental Shelf Lands Act (OCSLA), committed error in excluding an instruction on the taxation of potential damages. The Court noted that the OCSLA directs that state laws apply as long as they are not inconsistent with federal laws. *Id.* at 487. The case was remanded with directions for the state court to first determine whether state law required the instruction to be given. If it did not, the court was then to determine whether the state law had been displaced by the rule in *Liepelt*. *Id.* at 488.

36. *See* Bassett, *The Impact of Income Taxes on Damage Awards in Personal Injury Trials*, 12 INT'L SOC'Y OF BARRISTERS Q. 301 (1977). Bassett points out that the introduction of taxes need not lower the value of the award for several reasons. First, Congress has periodically adjusted tax rates so that an individual will not necessarily be in a higher tax bracket as their income rises. Second, not only are there taxes on future income, but taxes must be paid on the returns from the invested award. Third, some of the economic loss, such as fringe benefits, is not taxable. *Id.* at 304-05, 307, 311. *See generally* Yorio, *The Taxation of Damages: Tax and Non-Tax Policy Considerations*, 62 CORNELL L. REV. 701 (1977); Comment, *Income Tax Effects on*

this section is on the impact of inflation upon the size of the award when taxes are incorporated, even if the differential between the rate of wage increases and interest rates is held constant.

Inflation would not have an impact upon the real tax burden on income if our tax system was totally indexed. "An inflation-free, or indexed, income tax system is one that imposes the same real tax burden on a particular amount of real before-tax income regardless of the rate of inflation."[37] Our tax system, however, is not fully indexed. Inflation alters the real tax burden by its effect on both the tax rates and the taxable base upon which those tax rates are applied. The impact of inflation upon tax rates primarily relates to the fact that the tax brackets are fixed in nominal terms and only adjusted periodically by Congress. Inflation's impact upon the tax base arises because the tax system does not take into account the difference between inflationary and noninflationary changes in the value of assets.

This situation implies two points about the size of compensation awards. First, because our federal tax system is progressive, inflation will force individuals into higher tax brackets. This is familiarly known as "bracket creep," and would effect both the estimated future lost income due to injury or death and the income arising from investment of the award. The higher the rate of inflation, the more pronounced bracket creep becomes. Second, even if tax rates were indexed so that bracket creep did not occur,[38] the tax system does not properly account for the effect of inflation upon the declining real value of the award. One commentator has made an important point concerning the effects of inflation upon taxes as a function of the source of income:

> 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 overstated if a deduction is not allowed for that component of the return that merely maintains the purchasing power of initial net worth.[39]

Personal Injury Recoveries, 30 LA. L. REV. 672 (1970); Note, *Tort Damage Awards, supra* note 35.

37. Aaron, *Inflation and the Income Tax: An Introduction*, in INFLATION AND THE INCOME TAX 5 (H. Aaron ed. 1976).

38. The Economic Recovery Tax Act of 1981, Pub. L. No. 97-34, 95 Stat. 172 (to be codified in scattered sections of Title 26), provides that for taxable years beginning after 1984, tax rates will be automatically adjusted to the consumer price index to prevent the phenomenon of bracket creep. *Id.* § 104, 95 Stat. at 188.

39. Brinner, *Inflation and the Definition of Taxable Personal Income*, in INFLATION AND

These points can be made clearer through the use of an extended example. Let us define the following terms:

A = Initial award
P_0 = Price index at the beginning of the period (assumed to equal one)
P_1 = Price index at end of period
p = Inflation rate

The rate of inflation is equal to the rate of change in prices, that is, the change in purchasing power. This is described mathematically as follows:

$$p = \frac{P_1 - P_0}{P_0}$$

(For example, if $P_1 = 1.10$, then $p = \frac{1.1 - 1.0}{1.0} = 10\%$).

The wealth at the end of the period will be composed of the wealth at the beginning of the period plus the amount of interest earned on the wealth invested. (This assumes that no wealth is used for current consumption.)

i = money rate of interest
$W_n = A + iA$ = wealth at end of period. (That is, wealth at the end of the period equals wealth at the beginning of the period, (A), plus income generated during the period, (iA)).

However, a dollar at the end of the period is not worth as much as a dollar at the beginning of the period due to the decrease in purchasing power. The end of period wealth must be adjusted for the decrease in purchasing power to arrive at real purchasing power.

$$W_r = \text{end of period wealth adjusted for inflation} = \frac{W_n}{P_1}$$

To apply these factors let us assume a person is granted a $500,000 award, there are no taxes, the inflation rate, p, is 0%, and the money rate of interest, i, is 3%. Under these assumptions the wealth at the end of the period is equal to the beginning wealth, $500,000, plus the interest on the invested wealth, $15,000 (3% x $500,000), for a total of $515,000. Since the rate of inflation is 0%, real wealth at the end of the period, W_r, is also $515,000.

Finally, the real rate of return, r, is equal to the change in real wealth, $W_r - A$, divided by the amount of the initial award.

THE INCOME TAX 125 (H. Aaron ed. 1976).

$$r = \frac{W_r - A}{A} = \frac{15,000}{\$500,000} = 3\%$$

In this case, the real and money rates of return are equal.

Now assume the rate of inflation rises to 4%. The money rate of interest that will yield a real return of 3% is 7.12%.[40] At 7.12%, the wealth at the end of the period will be the initial award, $500,000, plus the amount of interest on the invested award, $35,600 (7.12% x $500,000), for a total amount of $535,600.

Since the inflation rate is 4%, the price level at the end of the period is 1.04 times the beginning price level. Thus, real wealth at the end of the period is the ending wealth divided by the ending price level, and is equal to $515,000.

$$W_r = \frac{W_n}{P_1} = \frac{\$535,600}{1.04} = \$515,000$$

The initial award and the real ending wealth are the same as the previous example; therefore, the real rate of return, 3%, is the same.

$$r = \frac{\$515,000 - \$500,000}{\$500,000} = \frac{15,000}{\$500,000} = 3\%$$

Table II presents the same information for inflation rates of 4%, 8%, and 12% to yield a real return of 3%.

40. The following formula can be utilized to determine the required value of *i*, where *i* is the money rate of interest, p is the rate of inflation, and r is the real rate of return:
i = r + p + rp. Thus,

p	*i*
0%	3.00% = 3% + 0% + (3% x 0%)
4%	7.12% = 3% + 4% + (3% x 4%)
8%	11.24% = 3% + 8% + (3% x 8%)
12%	15.36% = 3% + 12% + (3% x 12%)

TABLE II

One Year Returns on $500,000 under Various Rates of Inflation

Rate of Inflation	(1) p = 0%	(2) p = 4%	(3) p = 8%	(4) p = 12%
1. Money Interest Rate (*i*)	3.0%	7.12%	11.24%	15.36%
2. No Taxes				
a. Wealth at end of period (W_n)	$515,000	$535,600	$556,200	$576,800
b. Real wealth at end of period (W_r)	$515,000	$515,000	$515,000	$515,000
c. Real rate of return (r)	3.0%	3.0%	3.0%	3.0%
3. Taxes*—No Indexing				
a. After tax wealth at end of period	$513,365	$528,030	$539,364	$549,130
b. After tax real wealth at end of period	$513,365	$507,721	$499,411	$490,295
c. Average tax rate	10.9%	21.26%	29.95%	36.02%
d. After tax real rate of return	2.67%	1.54%	-0.12%	-1.94%
4. Taxes*—Indexed Tax Brackets				
a. After tax wealth at end of period	$513,365	$528,254	$540,331	$550,787
b. After tax real wealth at end of period	$513,365	$507,937	$500,306	$491,774
c. Average tax rate	10.9%	20.63%	28.43%	33.87%
d. After tax real rate of return	2.67%	1.59%	0.06%	-1.65%
e. Money interest rate required so that after tax real rate equals 2.67%	3.0%	9.03%	17.18%	26.87%
f. Beginning balance required so that real after tax wealth equals $513,365	$500,000	$505,345	$513,159	$521,924

*1980 tax tables were utilized

The presentation thus far has not considered taxes. In introducing taxes into this analysis, several assumptions will be made. We will assume that the family unit is married, has no children, does not itemize

deductions, and the only source of income is the return on the invested award. Additionally, the 1980 tax tables are used.

If taxes are not indexed, the family's economic condition deteriorates as the rate of inflation increases. After-tax wealth increases with higher rates of inflation, but real after tax wealth falls, as does the real after tax rate of return. Part of the return which would have maintained the real wealth is now being used to pay taxes. In the previous example, if the rate of inflation is 4%, $35,600 would be earned in interest to provide a real return of 3%. Using the above assumptions, $7,570 will be paid in taxes, which leaves an after tax end of period wealth of $528,030. This will give a real rate of return of only 1.54%, a substantial decrease in the original real rate of return of 3%. This effect is compounded at higher rates of inflation, as illustrated in Table II.

If taxes are indexed so that bracket creep does not occur, the family's economic condition still deteriorates, but not as fast. A smaller part of the return which would have maintained the real wealth is now being used to pay taxes. In the above example, if the rate of inflation is 4%, $35,600 would be earned in interest to provide a real return of 3%. With the same assumptions, $7,346 will be paid in taxes, which leaves an after tax end of period wealth of $528,254. This will give a real rate of return of 1.58%, still a substantial decrease in the original real rate of return. This effect is illustrated in Table II.[41]

In order to achieve a real rate of return of 2.67% (the real after tax rate of return at 0% inflation), when the rate of inflation is 4%, the money rate of interest must be 9.03%. At 8% inflation the required rate of return is 17.18%, and 26.87% at a 12% rate of inflation. Unfortunately, these required rates are generally unattainable under normal market conditions. What is evident is that indexing tax rates is better than no indexing at all, but higher rates of inflation still cause a decline in real net returns. This is because the tax base itself has not been fully indexed—only the tax rate.

For most injured plaintiffs, the projected future economic loss grows in real value. That is, it is assumed wages grow at a rate faster than the rate of inflation. If it is assumed that the award to be given to a plaintiff needs to be large enough to achieve equality between the real after tax wealth at the end of the period and the after tax real wealth position achieved when the rate of inflation is zero (in the above example, this value is $513,635), the higher the rate of inflation the higher the initial award must be. For a rate of inflation of 12%, the initial award is actually higher than the after tax real position—a result that is not surprising considering that the after tax real return on an invest-

41. *See infra* Technical Appendix I at 328.

ment at 12% inflation is actually negative (-1.64%). In sum, the rate of inflation may have a profound impact upon the size of an award designed to compensate future economic loss, because the higher the rate of inflation, the lower the after tax real return on investment. This causes the anticipated award to be larger, given that the projected future economic losses are usually assumed to be growing in real terms over time.[42]

V. The Quantitative Impact of Inflation

The quantitative impact of inflation upon compensation awards can be determined through a number of mathematical simulations. The specific assumptions used in the simulations run by the authors were:

1. The family unit was a married couple with no dependents.
2. The rate of wage increase was 2% higher than the rate of inflation, and the level of interest rates was 1% higher than the rate of inflation.[43]
3. 1980 tax tables were utilized. No itemized deductions, outside sources of income, or extraordinary expenses were assumed.
4. No state or local taxes were considered.
5. Tax rates were indexed according to the rate of growth in wages. That is, a person's tax rate would stay fixed despite the fact that his or her wages would grow over time. This assumption reflects post-World War II experience in the United States.[44]
6. The deduction for dividends was ignored.
7. Fringe benefits were ignored.

Notice the second assumption implies that as the rate of inflation increases, the rate of wage increases and the level of interest rates will increase by a fixed amount. One can argue that the differentials between the inflation rate and the other two factors (2% for wage rate increases and 1% for interest rates) are not correct; but as long as these differentials remain reasonably close and constant as the rate of inflation varies, the results that follow would not be significantly altered.

The simulations analyzed three variables: (1) the rate of inflation; (2) initial wage loss; and (3) the time period for the lost income. Sixty-four simulations were run, each with a different combination of rate of inflation, initial wage loss, and time period.

The data was divided according to different levels of the initial wage loss, and is set forth in Table III.

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42. *See infra* Technical Appendix II at 329-30.

43. *See infra* Technical Appendix III at 331-32.

44. Although indexing tax rates to the growth in wages differs from the earlier assumption that tax rates were indexed to the rate of inflation, using either assumption would produce similar conclusions concerning the impact of inflation upon compensation awards.

TABLE III

Wage Loss = $5,000

Rate of Inflation	Years 10	20	30	40
0%	$52,805	$111,078	$175,385	$246,349
4%	52,695	110,630	176,510	254,707
8%	52,594	112,604	188,304	286,563
12%	52,584	117,149	206,000	341,485

Wage Loss = $15,000

Rate of Inflation	Years 10	20	30	40
0%	$141,148	$296,911	$468,802	$658,988
4%	141,111	304,897	503,497	753,473
8%	143,617	326,290	587,335	1,011,655
12%	147,416	358,808	743,049	1,577,630

Wage Loss = $25,000

Rate of Inflation	Years 10	20	30	40
0%	$221,180	465,261	735,615	1,038,265
4%	222,931	488,188	821,580	1,268,630
8%	229,279	538,905	1,032,585	1,911,054
12%	237,830	622,007	1,425,308	3,370,748

Wage Loss = $35,000

Rate of Inflation	Years 10	20	30	40
0%	$292,034	$614,436	$973,925	$1,377,357
4%	296,185	654,567	1,120,943	1,759,204
8%	306,635	742,408	1,478,912	2,855,011
12%	321,087	884,378	2,150,530	5,316,797

If the initial wage loss is $15,000, inflation is forecast at 8%, and there are 20 years of lost wages, then the compensatory award should be $326,290. The calculated awards for other initial wages, rates of inflation, and years of lost wages are given in the Table. However, it is somewhat difficult to determine the precise impact of inflation by looking at absolute dollars.

Table IV shows the percentage-ratio of the award, given the various rates of inflation, to the award with a zero inflation rate. Again, if the initial wage loss is $15,000, inflation is forecast at 8%, and the number of years of lost wages is 20, then the compensatory award should be 109.9% of the award if the inflation rate was zero. Figure 1 graphically depicts the ratios expressed in Table IV.

TABLE IV

Wage Loss = $5,000

Rate of Inflation	Years 10	20	30	40
4%	99.8%	99.6%	100.6%	103.4%
8%	99.6%	101.4%	107.2%	116.3%
12%	99.6%	105.5%	117.5%	138.6%

Wage Loss = $15,000

Rate of Inflation	Years 10	20	30	40
4%	100.0%	102.7%	107.4%	114.3%
8%	101.7%	109.9%	125.3%	153.5%
12%	104.4%	120.8%	158.5%	239.4%

Wage Loss = $25,000

Rate of Inflation	Years 10	20	30	40
4%	100.8%	104.9%	111.7%	122.2%
8%	103.7%	115.8%	140.4%	184.1%
12%	107.5%	133.7%	193.6%	324.6%

Wage Loss = $35,000

Rate of Inflation	Years 10	20	30	40
4%	101.4%	106.5%	115.1%	128.4%
8%	105.0%	120.8%	151.8%	207.3%
12%	109.9%	143.9%	220.8%	386.0%

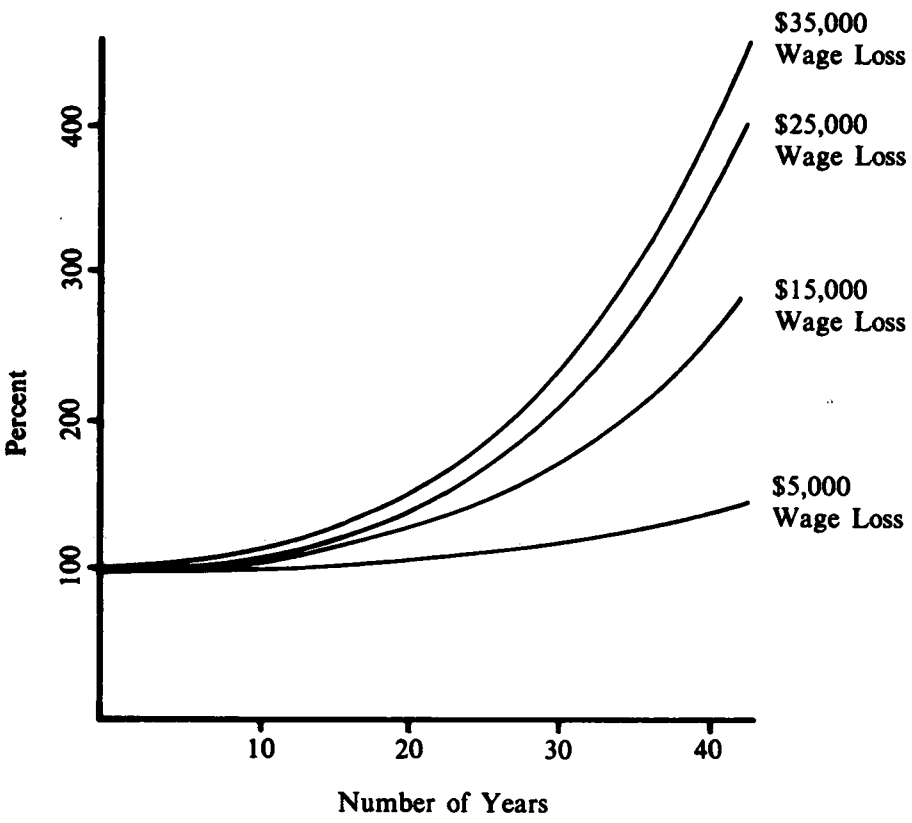

Figure 1. The percentage ratio of awards at 12% inflation to awards at 0% inflation.

Over a short period of time the awards do not vary greatly. However, with large initial wage losses over an extended period of time the curve climbs steeply, evidencing a dramatic increase in the award required to keep pace with inflation.

There are two conclusions which can be drawn from the data. First, for a given initial wage loss, as the relevant time period increases, the impact of inflation becomes more pronounced. This is true because for longer periods of anticipated wage loss, other things being equal, the award is generally larger. A larger award, by yielding a larger gross income, implies that higher rates of inflation will have a greater debilitating effect upon the real return on investment. From a practical point of view, this conclusion means that an error in the forecast of inflation is less important when the loss is for a few years. For example, if the initial wage loss is $25,000 and the forecast for the rate of inflation is zero (when in reality future inflation is going to be 12%), an

award would be off by only 7.5% if the loss is for 10 years, but a startling 224.6% if the loss is for 40 years.

The second conclusion is that for a given time period of loss, the impact of inflation is greater with higher initial wage losses. In general, the higher the initial wage loss is, the larger the compensation award will be. Large awards yield higher gross returns, which result in low, or perhaps negative, real returns on investment. This second conclusion means that an error in the forecast of inflation is less important if the initial wage loss is small. For example, if the number of years of lost wages is 20 and the inflation rate is forecast at 0% (when the forecast should have been 12%), the error would be 5.5% when the initial wage loss is $5,000, but, it would be 43.9% when the initial wage loss is $35,000.[45]

VI. Concluding Comments

In calculating the amount of compensatory awards, several points must be considered. First is whether taxes will be included in the calculation. If taxes can be ignored, then inflation has no impact upon the size of the award, provided, the differential between the rate of wage increases and the interest rate is close and constant over time.[46] If taxes are included in the calculation, inflation does have an impact upon the size of the award. If the wage loss is small, and the number of years of lost wages is small, then the impact of inflation may be small enough to justify excluding it from consideration. As an example, assume that the high and low estimates of the rate of inflation are 8% and 4% respec-

45. A third conclusion is that there is interaction between the initial wage loss, years of lost wages, and the rate of inflation. For a given value of initial wage loss, the impact of inflation increases with more years of lost wages. This can be seen by the upward sloping curves in Figure 1. An interesting question is whether the changing impact of inflation as the number of years of lost wages increases is influenced by the given initial wage loss. If the curves rise at different rates in Figure 1, then the interaction of all three variables is present.

The larger the initial wage loss, the more rapidly the curves rise. For example, for the curve representing a wage loss of $5,000, the impact of inflation varies between no impact for 10 years of lost wages and 39% for 40 years of lost wages. On the other hand, if the wage loss is $35,000, the impact of inflation upon the award is 10% for 10 years of lost wages and 286% for 40 years of lost wages.

46. It is possible that this assumption is no longer reasonable. From late 1979 until the present (Dec. 1982), interest rates have consistently been higher than the rate of increase in wages. Prior to 1979, the opposite was generally true. Some believe that high rates of inflation create more uncertainty in financial markets. A risk premium is added on top of the inflation premium so that interest rates are higher than would be expected if one looked at the inflation rate alone. Perhaps that is why in July of 1982 interest rates were 3% to 4% higher than the increase in wage rates — a situation that is historically unprecedented.

The implication is that even if taxes are ignored, inflation can affect the size of the compensatory award if the rate of inflation *systematically* affects the differential between the level of interest rates and the rate of increase in wages.

tively. If the initial wage loss is $5,000 and 10 years of wages are lost, the difference between the awards calculated at 4% and at 8% will not be significant. However, if the initial wage loss is $35,000 and 40 years of wages are lost, the difference between the calculated awards is substantial (the 8% award is 61% greater than the 4% award).[47]

A second point is, given that inflation does have a significant impact upon compensation awards, how should it be considered in determining the size of the award? A number of options are available. First, the lawyer can present his or her estimate for the compensation award given the rate of inflation that is most likely to occur. For example, it might be felt that there is equal probability the rate of inflation will be higher or lower than 6%; therefore, an inflation rate of 6% is assumed.

Another possibility is to compute the award assuming an inflation rate that is lower than present expectations. Since the award should rise with higher rates of inflation, this approach biases the award downward. This may be a desirable and conservative courtroom strategy. It also conforms to the belief that the high rates of inflation experienced in the last few years will not last forever, and that the rate of inflation must come down to "reasonable" levels.[48]

Finally, a high and low estimate of the inflation rate can be made to calculate a range of possible outcomes. As this approach is often used when estimating work-life expectancy, future wages, and future fringe benefits, there is no reason that a variety of inflation rates cannot

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47. The following table shows the percentage-ratio of an award assuming 8% inflation to an award assuming 4% inflation.

TABLE V

	Number of Years	Initial Wage Loss	Percentage-ratio of Award Given 8% Inflation to Award Given 4% Inflation
1.	10	5,000	100.0%
2.	20	5,000	101.7%
3.	10	$15,000	101.7%
4.	20	$15,000	107.0%
5.	30	$25,000	125.7%
6.	40	$25,000	150.6%
7.	30	$35,000	131.9%
8.	40	$35,000	161.3%

48. There is yet another advantage in assuming a low rate of inflation. If one forecasts a high rate of inflation, then wages also rise rapidly. But if the time period under consideration is long, estimated wage losses can grow to enormous sizes. For example, if the initial wage loss is $20,000, the time period is 30 years, and the rate of increase is 10%, the loss in year 30 is $348,998. Such sums are often difficult for juries to comprehend. However, if we assume a lower rate of inflation so that wages rise by only 5%, the loss in year 30 is only $86,438. This is a large number, but only 4.5 times present wages compared to 17.5 times present wages when wages are rising at a 10% rate.

be analyzed.

To summarize, the steps that should be taken when considering the impact of inflation are as follows:

1. If taxes are not considered, inflation can usually be ignored.
2. If the parameters (such as amount of wage loss and number of years of lost wages) are sufficiently low, then inflation may not have a significant impact.
3. Once inflation is to be considered, there are several strategies that are available.
   a. Use a single rate of inflation equal to the average expected future rate of inflation.
   b. Use a single rate of inflation that is lower than current expectations to bias the award downward.
   c. Use several rates of inflation to calculate high and low estimates of the award.

The best strategy to use will depend upon the relevant legal environment and the practical considerations for the particular case.[49]

49. Many other options are actually available. As an example, it can be assumed that inflation would be high for the first few years, but then would gradually fall to some lower rate. Thus, it is not necessary to assume that the rate of inflation is constant throughout the relevant time period.

Technical Appendix I

To show the reader how these numbers are derived, consider the computation of the after tax real rate of return with indexing, given a rate of inflation, p, equals 12%.

Gross Income = Balance of award remaining x Money interest rate
= $500,000 (.1536)
= $76,800

The tax at this level of income, (using 1980 tax tables) after adjustment for 12% inflation, is $26,013. Thus,

Disposable Income = Gross Income - Taxes
= $76,800 - $26,013
= $50,787

Further,

After tax wealth at end of period = $500,000 + $50,787

After tax real wealth at end of period $= \frac{\$550,787}{P_1}$

$= \frac{\$550,787}{1.12}$

= $491,774

After tax real rate of return $= \frac{\$491,774 - \$500,000}{\$500,000}$

= -1.65%

Technical Appendix II

A fully indexed tax system would have to make adjustments for the effect of inflation upon tax rates and the tax base. For example, consider the situation in Table II where the rate of inflation equals 12%. Let us define the following terms:

- A = initial award (assumed equal to \$500,000)
- i = money rate of interest (since inflation equals 12%, then money rate of interest equals 15.36%, from Table II)
- Y_g = gross income which is equal to the initial award times the money rate of interest (Ai)
- Y_t = taxable income
- Y_d = disposable income
- P_0 = price index at beginning of period (assumed equal to one)
- P_1 = price index at end of period (since inflation equals 12%, this will be 1.12)

If we assume there are no capital gains or losses, then a proper definition of the taxable base which takes into account the declining real value of assets held is

$$Y_t = Y_g + A(1 - P_1/P_0).$$

That is, taxable income equals income derived from the assets held minus any decline in the value of the assets due to inflation. In this example,

$$\begin{aligned} Y_t &= \$500{,}000\ (.1536) + \$500{,}000\ (1 - 1.12/1.00) \\ &= \$76{,}800 + \$500{,}000\ (-.12) \\ &= \$16{,}800 \end{aligned}$$

Because the award lost \$60,000 in real purchasing power, taxable income is reduced by the \$60,000—from \$76,800 to \$16,800.

After adjusting the tax brackets for a 12% rate of inflation, the tax on \$16,830 (given a married couple, no children, no itemization of deductions, and using 1980 tax rates) is \$1,830. Thus,

$$\begin{aligned} Y_d &= Y_g - \text{Taxes} \\ &= \$76{,}800 - \$1{,}830 \\ &= \$74{,}970 \end{aligned}$$

$$\text{After tax wealth at end of period} = \$500{,}000 + \$74{,}970 = \$574{,}970$$

$$\text{After tax real wealth at end of period} = \frac{\$574{,}970}{P_1}$$

$$= \frac{\$574{,}970}{1.12}$$

$$= \$513{,}366$$

The result is an after tax real return of 2.67%; the same return that was obtained when the inflation rate was 0%. Hence, defining taxable income in the manner indicated fully indexes the tax system. Changes in the rate of inflation would have no impact on real rates of return.

Technical Appendix III

These differentials between inflation, rate of increase in wages, and interest rates approximate post-World War II experience in the United States for wages covering the private, nonfarm sector and interest rates on U. S. Government Bonds.

Mathematically, assumption 2 states that

$$W = p + 2\%$$
$$i = p + 1\%$$

Given:

W = rate of increase in wages
i = money interest rate
p = rate of inflation

In the above case, 1% is the real rate of interest, r, which equals the money rate of interest when inflation is 0%. More generally, then:

$i = r + p$

Using this, the debilitating effect of taxes on after tax real rates of return is easily shown. If t is the marginal tax rate on capital income, the after tax rate is

$$(1 - t)i = (1 - t)(r + p)$$
$$= r - tr + p - tp$$

The after tax real return, r_n, is the after tax return minus the rate of inflation, or

r_n = after tax real return
$= (1 - t)i - p$
$= (r - tr + p - tp) - p$
$= r - tr - tp$
$= r(1 - t) - tp$

When inflation is 0%, r_n is equal to $r(1 - t)$. But when the inflation rate is positive, the after tax real return falls by the factor tp.

As an example, suppose the real return on investments given no inflation is 3%. Further, assume that the marginal tax rate, t, is 0.4, then:

$$r_n = r(1 - t) - tp$$
$$= 3\%(1 - .4) - .4p$$
$$= 1.8\% - .4p$$

The variation of the after tax yield due to changes in the rate of inflation is shown in the following table.

Rate of inflation p	After tax real rate of return $r_n = 1.8\% - .4p$
0.0%	1.8%
1.5%	1.2%
3.0%	0.6%
4.5%	0.0%
6.0%	-0.6%
12.0%	-3.0%

The above results will be modified to the extent interest rates reflect the debilitating effect inflation has on after tax real rates of return. As an extreme case, assume that market rates of interest are such that real after tax returns are preserved irrespective of the inflation rate. Recall that $r_n = i(1 - t) - p$.

If r_n is assumed constant at a value of $r(1 - t)$, which is the after tax real rate of return when $p = 0\%$, then,

$$\begin{aligned} r(1 - t) &= i(1 - t) - p \\ r(1 - t) + p &= i(1 - t) \\ r + \frac{p}{(1 - t)} &= i \end{aligned}$$

The implications are that market rates of interest rise faster than the rate of inflation, and real after tax rates of return are unaffected by changes in the rate of inflation—even when taxes are considered.

Again, if $r = 3\%$ and $t = .4$, the following table shows market rates of interest if taxes are not incorporated (column (2)) and if they are incorporated (column (3)) for different rates of inflation. Note that column (3) adjusts i so that after tax real return remains equal to $3\%(1 - .4) = 1.8\%$.

Rate of inflation	$i = r + p$	$i = r + \frac{p}{(1 - t)}$
0.0%	3.0%	3.0%
1.5%	4.5%	5.5%
3.0%	6.0%	8.0%
4.5%	7.5%	10.5%
6.0%	9.0%	13.0%
12.0%	15.0%	23.0%