How Workable are Net Discount Rates?

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The net discount rate, a concept sanctioned by the Supreme Court of Canada in the now-famous 1978 trilogy of damages cases, is shown by the author to introduce serious error into the process of calculating the present money value of lost future economic values in personal injury and wrongful death cases. The error typically understates the present money value and leads to inadequate damages awards. In situations involving the replacement of losses occurring over an extended number of years, successful plaintiffs may recover as little as one-half of their future losses. The error introduced by the net discount concept originates when the netting of growth rates and discount rates alters a critical fraction in the present value formula. The author demonstrates how the problem can be solved by using a serial calculation method.

L'auteur démontre que le taux d'escompte net, dont l'utilisation fut sanctionnée par la Cour suprême en 1978 dans la désormais célèbre trilogie d'arrêts rendus sur la question de l'évaluation des dommages futurs, peut produire de sérieuses erreurs dans l'évaluation, en valeurs actuelles, de pertes économiques à venir. Ainsi, ces valeurs actuelles seraient systématiquement sous-estimées, produisant ainsi des attributions inadéquates de dommages-intérêts. Par exemple, où une affaire exigerait qu'on évalue la valeur de pertes s'échelonnant sur une période étendue d'années, un demandeur pourrait se voir alloué un montant équivalant à la demie de ses pertes futures réelles. L'erreur se produirait lorsque l'évaluation de l'effet combiné des taux d'escompte et d'accroissement modifierait une fraction essentielle à la détermination exacte de la valeur présente. L'auteur présente une solution qui saurait pallier au problème en utilisant une méthode de calcul séquentiel.

Synopsis

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Introductiou

A discount rate is an important element in the calculation of the present money value of future economic damages in personal injury and wrongful death cases. These damage assessment calculations typically incorporate: (a) an original or current economic value, such as a pre-injury wage potential or current medical care costs, (b) the expected growth rate of the potential economic loss (including inflationary expectations), (c) the number of future time periods over which the loss is expected to persist, and (d) a discount rate.

Discounting is required to reduce future economic losses to equivalent present money value damage awards. For instance, a plaintiff who will incur an economic loss of $20,000 a year from now (*e.g.*, because of lost wages) will be satisfied with a damages award of less than $20,000 paid to him *today*. He can invest this lesser amount now so that it will be worth $20,000 by the end of the year. In this illustration the $20,000 future loss is a *future value*; the lesser amount with which the plaintiff is satisfied today is a *present value*. The financial device used to reduce future values to present values is the *discount rate*.

A number of recent articles have noted the recognition given by the Supreme Court of Canada to a net discount rate concept.[1] This concept was first applied by the Court in three cases decided together in January 1978 and collectively referred to as the *trilogy*.[2] The net discount rate is a rate determined by subtracting the anticipated rate of future inflation from the anticipated yield on appropriate investment securities. In the trilogy, the Supreme Court accepted the argument that inflationary expectations (then of 3.5% *per annum*) should be netted against currently available long term bond returns (then in excess of 10%) to produce a net discount rate (then of 7% *per annum*).

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[1] Dexter, Murray & Pollay, *Inflation, Interest Rates and Indemnity: The Economic Realities of Compensation Awards* (1979) 13 U.B.C. L. Rev. 298; Paterson, *Loss of Future Income In Actions for Damages* (1980) 26 McGill L.J. 114; Gibson, *Repairing the Law of Damages* (1978) 8 Man. L.J. 637; Braniff & Pratt, *Tragedy in The Supreme Court of Canada: New Developments in the Assessment of Damages for Personal Injuries* (1979) 37 U. T. Fac. L. Rev. 1; Feldthusen & McNair, *General Damages in Personal Injury Suits: The Supreme Court's Trilogy* (1978) 28 U.T. L.J. 381; Bissett-Johnson, *Damages for Personal Injuries — The Supreme Court Speaks* (1978) 24 McGill L.J. 316; McLachlin, *What Price Disability? A Perspective on the Law of Damages for Personal Injury* (1981) 59 Can. Bar Rev. 1; Connell, *Discount Rates — The Current Debate* (1980) 2 Advocates' Q. 138; Boyle & Murray, *Assessment of Damages: Economic and Actuarial Evidence* (1981) 19 Osgoode Hall L.J. 1.

[2] *Andrews* v. *Grand & Toy Alberta Ltd* [1978] 2 S.C.R. 229, (1978) 83 D.L.R. (3d) 452 [hereinafter cited to S.C.R.]; *Arnold* v. *Teno* [1978] 2 S.C.R. 287, (1978) 83 D.L.R. (3d) 609 [hereinafter cited to S.C.R.]; *Thornton* v. *Board of School Trustees of School District No. 57 (Prince George)* [1978] 2 S.C.R. 267, (1978) 83 D.L.R. (3d) 480. See also *Keizer* v. *Hanna* [1978] 2 S.C.R. 342, (1978) 82 D.L.R. (3d) 449.

The same concept has found acceptance, albeit not unanimous acceptance, in the United States as the so-called offset method.[3]

Other authors argue correctly that an analysis of historical data may suggest net discount rates different from the 7% *per annum* accepted by the Supreme Court in the trilogy.[4] Additional factors such as investment expenses and portfolio distribution effects have also been suggested as reasons for deductions from the gross investment return for the purpose of determining the appropriate net discount rate.[5]

In fact the net discount rate concept suffers from even more fundamental problems. This note demonstrates that the rate is a mathematically inaccurate approximation[6] and leads to substantial error in the determination of the present money value of future economic losses.

The errors introduced into the calculations by the net discount rate concept typically understate the present money value. When the present money value is understated, it follows that future economic losses cannot be made whole and, as a consequence, serious economic harm will be done to recipients of the understated judgment amounts. Given factors which are likely to occur in today's economy, understatements of present money value as small as 6% are shown to lead to shortfalls of almost 50% in the replacement of lost future values.

There is, however, a correct method for reducing forecasted future economic damages to present money values.[7] The correct method does not ignore the factors recognized by the Supreme Court and by the various authors, but combines them in a manner more likely to make the plaintiff economically whole. It is to be hoped that the courts will recognize this essential deficiency in the net discount rate concept and remedy it with the same regard for precision that was exhibited in the trilogy judgments.[8]

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[3] See *Feldman* v. *Allegheny Airlines, Inc.* 524 F.2d 384 (2d Cir. 1975); McCough, *Future Inflation, Prospective Damages and the Circuit Court* (1977) 63 Va L. Rev. 105; Wainscott, *Computation of Lost Future Earnings in Personal Injury and Wrongful Death Actions* (1978) 11 Indiana L. Rev. 647.

[4] Dexter, Murray & Pollay, *supra,* note 1, 301-6; Paterson, *supra,* note 1; Gibson, *supra,* note 1, 650-2; Braniff & Pratt, *supra,* note 1, 25-8; Feldthusen & McNair, *supra,* note 1, 393-401; McLachlin, *supra,* note 1, 25-6; Connell, *supra,* note 1; Rea, *Inflation, Taxation and Damage Assessment* (1980) 58 Can. Bar Rev. 280, 281-6; Boyle & Murray, *supra,* note 1, 3-7; K. Cooper-Stephenson & I. Saunders, *Personal Injury Damages in Canada* (1981) 269.

[5] McLachlin, *supra,* note 1, 27; Connell, *supra,* note 1, 145-6. Such deductions were made by Southey J. in *Julian* v. *Northern and Central Gas Corporation Ltd* (1978) 5 C.C.L.T. 148, 159-60 (Ont. H.C.) and were not challenged on appeal (1979) 31 O.R. (2d) 388 (C.A.).

[6] See *infra,* Part II especially Table 2.

[7] See *infra,* Part I especially Table 1 and note 19.

[8] The trilogy did introduce several advances contributing to greater precision in the assessment of damages. First, the awards made in the cases were itemized rather than merely

I. Purpose of Present Money Valne Awards

Generally, the purpose of present money value awards for future economic losses is to provide a one-time immediate payment to compensate for expected future losses.[9] For example, if an individual is injured and becomes permanently unable to earn an income he may seek damages for lost prospective future wage earnings. An award, if justified by a finding of liability, would give the plaintiff a sum to invest now to replace the expected future lost wages. Ideally, the invested sum would produce an annual income that, together with the timely consumption of a portion of the body of the award, would equal exactly the amounts lost in future wages at the time they would have been earned.

For example, assume that in a particular case lost future wages are predicated in part upon the injured party's earnings history. This history shows wages of $9,090.91 in the income year immediately prior to the plaintiff's disability. The expected future yearly wages are forecast to be, successively, $10,000.00, $11,000.00 and $12,000.00 over a three year period.[10] Assuming that investment returns at the time are 15% *per annum*, the present money value of the lost future earnings is calculated to be $24,969.18.[11] The present money value in this case is calculated in a series of

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disclosed as a single amount. Second, the awards were actuarially calculated; future inflation rates and investment returns were taken into account. Despite the problems inherent in the net discount rate method, it is admittedly more precise than the previously used "Lord Diplock" approach, which assumed economically stable returns and ignored the possibility of inflation (see *Andrews* v. *Grand & Toy Alberta Ltd, supra*, note 2, 254-5).

[9] The role of the discount rate in calculating present money value awards was explained by Mr Justice Dickson in *Lewis* v. *Todd* [1980] 2 S.C.R. 694, 709-10, (1980) 115 D.L.R. (3d) 257: "It would be useful to recall precisely the function which the 'discount rate' is intended to serve. In the case of a fatal accidcnt the Court is endeavouring to compensate the dependents of the deceased for loss of a future stream of income which the dependents might have expected to receive but for the death of the deceased. As it is not open to a Court, in the absence of enabling legislation, to order periodic payments adjusted to future nceds, the dependents receive immediately a capital sum roughly approximating the present value of the income they would have received had the deceased survived." This one-time lump sum award has been widely criticized. See *Andrews* v. *Grand & Toy Alberta Ltd, supra,* note 2, 236-7, *per* Dickson J.; Fleming, *Damages: Capital or Rent?* (1969) 19 U.T.L.J. 295; Gibson, *supra,* note 1, 638; Braniff & Pratt, *supra,* note 1, 4-7; Feldthusen & McNair, *supra,* note 1, 418-25; McLachlin, *supra,* note 1, 13-7; McKellar, *Structured Settlements — A Current Review* (1981) 2 Advocates' Q. 389.

[10] *I.e.*, a 10% *per annum* growth rate is assumed.

[11] Calculated by the standard present value formula:

$$PV = \sum_{t=1}^{N} \left[\frac{\text{Future Value}}{(1+d)^t} \right]$$

where PV = Present value
t = Time period (1 through N)
N = Number of time periods = 3
d = Discount rate = 15%
Future value = $10,000 in t_1, $11,000 in t_2, $12,100 in t_3.

steps, each year in turn. These serial calculations are necessary since each year's future value is different in amount from the values in other years.

Table 1 illustrates how the lost future wages will be replaced by interest earned on the award at 15% *per annum* together with partial consumption of the award in each period. Note that in the first year the $24,969.18 investment fund will earn $3,745.38 in interest at the 15% *per annum* rate. Since the first year's forecasted lost wages are $10,000.00, this leaves a $6,254.62 shortfall to be made up by consumption of a portion of the investment fund. In the second year the remaining investment of $18,714.56 produces $2,807.18 in interest earnings. To make up the balance of the $11,000.00 forecasted lost wages for the second year an additional $8,192.82 of the investment fund must be consumed. At the beginning of the third and final year, only $10,521.74 of the investment fund remains. This amount is entirely consumed along with the year's interest of $1,578.26 to exactly replace the $12,100.00 of forecasted lost wages.

Assuming that there are no transaction costs on the investment and no management costs after the investment was made (or alternatively considering the 15% *per annum* discount rate to be an investment return net of these expenses), it can be seen that the investment of the serially-calculated award at the 15% *per annum* rate produces enough income, along with the timely consumption of parts of the award, to provide a future payments stream exactly equal to the plaintiff's forecasted lost wage stream.

II. Methodological Error in the Use of Net Discount Rates

Net discount rates, as defined by the Supreme Court in the trilogy, are being used today to assess the present value of damages in the types of situations illustrated above.[12] The example given in Part I implicitly assumed a 10% wage growth rate *per annum* [13] and explicitly cited a 15% *per annum* gross discount rate. This results in a 5% *per annum* net discount rate.

In brief, the net discount method treats the lost future wage stream as an annuity [14] to be discounted at the net discount rate. The usual form of present

[12] See *Lewis* v. *Todd*, *supra*, note 9.

[13] See *supra*, note 10.

[14] An annuity is generally defined as a stream of equal payments occurring at regular intervals.

TABLE 1
SERIAL METHOD

A damages award calculated by the serial method and investment income at 15% exactly replaces lost future wages:

(1) Year	(2) Investment Fund Opening Balance	(3) Interest Earned On Fund Balance [15% × Col. (2)]	(4) Lost Wages	(5) Consumption of Fund Balance Required to Replace Lost Wages [Col. (4) − Col. (3)]	(6) Investment Fund Closing Balance [Col. (2) − Col. (5)]
1	$24,969.18	$3,745.38	$10,000.00	$6,254.62	$18,714,56
2	18,714.56	2,807.18	11,000.00	8,192.82	10,521.74
3	10,521.74	1,578.26	12,100.00	10,521.74	0

value equation for an annuity is then employed [15] rather than separate serial calculations for each year as was done in Part I.

The assumption implicit in this procedure is that discounting an annuity by a net discount rate will produce a present value award equivalent to that obtained in the preceding example with separate serial calculations. This assumption is incorrect. To further understand the error inherent in the net discount method, consider the situation when the method is used to determine the present money value of the lost wage stream discussed earlier. In that case the income in the last year preceding the disability was $9,090.91. This becomes the annual annuity amount to be discounted at the net discount rate of 5% (D_M = 15% and g = 10%) for a 3 year period. The net discount-annuity method determines the present money value to be $24,756.80.[16] Note that this present value is approximately 1% less than the present money value as determined previously by the serial calculation method under the same basic assumptions (D_M = 15%, g = 10%, W_A = $9,090.91 and n = 3 years) in Part I.[17]

Table 2 demonstrates the incompatability of the two methods of present value calculation. In Table 2 an investment of $24,756.80 (the net discount-annuity present value) is made at a yield of 15% *per annum* and the income is consumed along with portions of the investment to produce amounts necessary in an attempt to replace the forecasted lost wages. In the third year the income plus the remaining balance of the investment fund is insufficient to replace the forecasted $12,100.00 annual wage. The shortfall is $323.00 or nearly 3% of the forecast income for that year.

The reason for the understatement is that the net discount rate concept incorrectly combines the gross discount rate with the wage growth rate. This imprecision thereby alters a critical fraction created in the present value formula when the growth factor is divided by the discounting factor.[18]

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[15] Present money value of an annuity:

$$PV_A = \frac{W_A}{D_R}\left[1 - \frac{1}{(1 + D_R)^N}\right]$$

where PV_A = Present value of annuity
W_A = Wage in income year immediately prior to plaintiff's disability. In the example of Part I it was $9,090.91.
D_R = Net discount rate = 5%.
N = Number of time periods = 3.

[16] Calculated by formula contained in note 15.

[17] See *supra*, note 11.

[18] The fraction in question shows up as part of the standard formula for the present value of a *particular* future year's wage, where the wage is growing at rate g from an initial amount of W_A:

$$\text{Present Money Value} = \frac{W_A (1 + g)^N}{(1 + D_M)^N}$$

TABLE 2
NET DISCOUNT-ANNUITY METHOD

A damages award calculated by the net discount-annuity method and investment income at 15% does not replace lost future wages:

(1) Year	(2) Investment Fund Opening Balance	(3) Interest Earned on Fund Balance [15% × Col. (2)]	(4) Lost Wages	(5) Consumption of Fund Balance Required to Replace Lost Wages [Col. (4) − Col. (3)]	(6) Investment Fund Closing Balance [Col. (2) − Col. 5]
1	$24,756.80	$3,713.52	$10,000.00	$6,286.48	$18,470.32
2	18,470.32	2,770.55	11,000.00	8,229.45	10,240.87
3	10,240.87	1,536.13	12,100.00	10,563.87	(323.00)

The differences of 1% in the total present value and 3% in the final year's wage replacement sum may not seem overly significant in that they are relatively small compared to the total damages award. Two observations may be made at this point. First, in this instance and in many other possible circumstances the differences are small and the results are reasonable approximations of the true present value calculated by the serial method. However, as shown above, the net discount-annuity present value approximations are not mathematically accurate calculations. In inflationary times the calculations systematically undercompensate the plaintiff. There can be little excuse for a court resorting to an inaccurate approximation when absolute accuracy is possible with the serial method. It cannot even be argued that the net discount-annuity method is easier to apply — the serial method formula can be reduced to an equally convenient one-step calculation.[19] Perhaps more significant is that the net discount-annuity method is sometimes a poor approximation. Table 3 shows the percentage by which the net discount-annuity method

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In this formula N refers to the particular future year and D_M refers to the gross discount rate. Note that the fraction $(1 + g)^N$ divided by $(1 + D_M)^N$ combines elements of both the growth rate and the discount rate. In the net discount rate method this growth/discount fraction is changed to: $1/(1 + D_R)^N$. Here the net discount rate, D_R, incorrectly combines the growth and discount processes into one variable. Below, the values of these two versions of the growth/discount fraction are compared for various time periods under the assumptions of a growth rate, g, of 10% and a gross discount rate, D_M, of 15%:

Value of Single Year Growth/Discount Fraction

Year	Net Discount-Annuity Method	Serial Method	Difference as a Percentage of Serial Value
1	.952	.957	0.5%
5	.784	.801	2.2
10	.614	.641	4.2
20	.377	.411	8.3
40	.142	.169	16.0

It can thus be seen that substantial individual year present value errors result from the use of the net discount-annuity method.

[19] Present money value with serial calculations:

$$PV_S = \frac{W_I}{D_R}\left[1 - \frac{(1 + g)^N}{(1 + D_M)^N}\right]$$

PV_S = Present value calculated by serial method
W_I = Lost wage in first future period [or wage in income year immediately prior to plaintiff's disability multiplied by $(1 + g)$]
g = Growth rate in wages
D_M = Gross market discount rate
N = Number of time periods
D_R = $D_M - g$

understates the present value as compared to the serial method for various combinations of gross discount rates, growth rates and number of years of economic loss. From the Table a number of generalizations can be made.

TABLE 3
UNDERSTATEMENT OF PRESENT MONEY VALUE CAUSED BY USE OF THE NET DISCOUNT-ANNUITY METHOD*

(A) With a 15% *per annum* gross discount rate:

Gross Discount Rate	15%	15%	15%	15%	15%	15%
Growth Rate	14%	12%	10%	8%	6%	4%
Net Discount Rate	1%	3%	5%	7%	9%	11%
Number of Years of Economic Loss						
10	0.66%	1.63%	2.20%	2.38%	2.23%	1.77%
20	1.24	2.95	3.82	3.99	3.60	2.75
30	1.78	4.11	5.12	5.16	4.49	3.31
40	2.32	5.13	6.15	5.96	5.02	3.60
50	2.83	6.02	6.94	6.50	5.32	3.74

(B) With a 10% *per annum* gross discount rate:

Gross Discount Rate	10%	10%	10%	10%
Growth Rate	9%	7%	5%	3%
Net Discount Rate	1%	3%	5%	7%
Number of Years of Economic Loss				
10	0.44%	1.00%	1.15%	0.94%
20	0.83	1.81	2.01	1.58
30	1.20	2.52	2.70	2.04
40	1.56	3.15	3.24	2.36
50	1.91	3.69	3.66	2.57

* Relative Understatement = $(PV_S - PV_A)/PV_S$

where PV_S = Present value calculated by serial method
PV_A = Present value calculated by net discount-annuity method.

First, as would be expected, longer time periods result in greater distortion. The maximum percentage understatement found occurs at fifty years — the longest time period calculated on the Table. The hardest hit by the inaccuracies of the net discount rate concept will be the young plaintiff whose life expectancy has not been reduced significantly by the disability suffered.[20] Second, the understatement caused by the net discount-annuity method is greater when the gross discount rate is high. This can be seen by comparing figures in (A), where a 15% *per annum* gross discount rate was assumed, with those in (B), based on a 10% rate. This holds true even when the net discount rate is identical (*e.g.*, the understatement is greater when the net discount rate is 1% if this 1% is the result of a gross discount rate of 15% and a growth rate of 14%, rather than 10% and 9% respectively). Thus, in long periods of high interest rates, damage awards calculated under the net discount rate method will be understated more seriously.

Third, when growth rates approach the gross discount rate (*i.e.*, when net discount rates approach zero) the relative understatement caused by the net discount rate method is minimized. Recent economic literature suggests that conditions leading to this result are rather commonplace.[21] Finally, when the growth rate moves down from the gross discount rate (*i.e.*, when the net discount rate grows larger) the relative understatement at first increases, then decreases as the growth rate approaches zero. Table 3 shows that the approximation of present value afforded by the net discount-annuity method varies from one set of circumstances to another, and that in some cases it produces understatements of almost 7% from the true figures.

III. Impact of the Error Indnced By Use of Net Discount Rates

Though a 7% understatement in the present value damages award may strike some observers as of little consequence,[22] it does amount to a deficiency of over $40,000 on a total award of $600,000[23] — not an insignificant amount.

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[20] One fund for the provision for future care of an infant plaintiff, Diane Teno, was calculated on the basis of 57 years, see *Arnold* v. *Teno*, *supra*, note 2, 335.

[21] Ibbotson & Sinquefield, *Stocks, Bonds, Bills and Inflation: Year-by-Year Historical Returns (1926-1974)* (1976) 49 J. Bus. U. Chi. 11, 40; Ibbotson & Sinquefield, *Stocks, Bonds, Bills and Inflation: Updates* (1979) 35 Financial Analysts J. 40, 43.

[22] Especially given the imprecision inherent in the estimation of gross investment rates, inflation rates and the level of economic losses themselves.

[23] The average amount awarded for pecuniary damages in the trilogy was $586,183.

Even more serious, however, is the effect this understatement in present value has on future values. The present value understatement leads to shortfalls of much larger proportions in the replacement of future losses because of the cumulative effect of the loss of interest that would otherwise accrue[24] on the present value shortfall. For example, in the illustration given in Table 2, the $323.00 future value shortfall is a greater proportion of the total future wage loss of $33,100.00 (the total of the Column (4) amounts) than the present value understatement of $212.38 is of the correct present value of the loss, $24,969.18.

As shown in Table 4, when losses occur over an extended number of years and the gross discount rate is high, the understatement of present value caused by the use of the net discount method creates a very large shortfall in the replacement of future lost wages. For example, at an 8% growth rate, 15% gross discount rate, and 40 year period of economic loss, the present value damage award is understated by 5.96%.[25] However, in that case the insufficient award dooms the plaintiff to a recapture of only 51% of lost *future* wages — a shortfall of 49%.[26]

It should be noted, however, that this 49% shortfall in dollar value does *not* mean correspondingly that the plaintiff will not be receiving payments for the last 49% of the years of his 40 year period of economic loss. In fact, his losses will be replaced fully for 31 years of the 40 year period, and partially replaced in the 32d year. Because the growth rate results in geometrically increasing annual payment amounts, the last 8 and a fraction years (*i.e.* just over 20% of the years) account for 49% of the total future dollar loss.

An examination of the shortfall in future values presented in Table 4 dramatizes clearly the inadequacy of the net-discount method. It is submitted that the focus on future value shortfalls (as opposed to the relatively smaller present value understatements shown in Table 3) is justified since the object of present value discounting is to arrive at present money values which compensate for all lost potential future values. Large shortfalls, such as are illustrated in Table 4, are particularly troublesome because full compensation is now the rule in the assessment of pecuniary damages.[27] The net discount approach is clearly not an acceptable method of calculation.

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[24] Theoretically at the gross discount rate.

[25] See Table 3, *supra*.

[26] Even this figure is conservative in that it does not compensate the plaintiff for the lost opportunity cost of future funds not collected due to the net discount method's initial understatement of present value.

[27] *Andrews* v. *Grand & Toy Alberta Ltd*, *supra*, note 2, 240-2.

TABLE 4
SHORTFALL IN FUTURE REPLACEMENT VALUE PAYMENT AMOUNTS CAUSED BY USE OF THE NET DISCOUNT-ANNUITY METHOD*

(A) With a 15% *per annum* gross discount rate:

Gross Discount Rate	15%	15%	15%	15%	15%	15%
Growth Rate	14%	12%	10%	8%	6%	4%
Net Discount Rate	1%	3%	5%	7%	9%	11%
Number of Years of Economic Loss						
10	1.15%	2.92%	4.00%	4.43%	4.24%	3.43%
20	3.55	9.17	12.57	13.92	13.53	11.28
30	7.63	19.34	26.44	29.58	29.18	25.43
40	13.46	32.81	44.19	49.09	48.86	43.68
50	20.47	48.22	62.54	67.86	67.00	60.81

(B) With a 10% *per annum* gross discount rate:

Gross Discount Rate	10%	10%	10%	10%
Growth Rate	9%	7%	5%	3%
Net Discount Rate	1%	3%	5%	7%
Number of Years of Economic Loss				
10	0.66%	1.51%	1.77%	1.46%
20	1.82	4.20	4.95	4.13
30	3.69	8.64	10.25	8.82
40	6.40	14.97	18.15	16.20
50	9.91	23.33	28.77	26.44

* Shortfall = Deficiency in future value calculated by net discount-annuity method as a percentage of total future value loss. [E.g., in terms of the illustration in Table 2: $323 divided by $33,100 × 100].

Conclusion

The 1978 trilogy of personal injury cases introduced major advances in damage assessment techniques. Unfortunately, the cases also marked the Supreme Court's acceptance of the net discount rate — a concept with considerable common sense appeal.

However, the net discount rate has been shown to be an inaccurate approximation of the combined effect of gross discount rates and economic growth factors, as used in present value calculations. In inflationary times, use of the net discount rate will systematically undercompensate the plaintiff, conceivably up to 7% of the present value damages award to which he is entitled. The present value error leads in turn to a shortfall of even larger proportions in the replacement of future lost values, to the extent that plaintiffs could conceivably recover as little as 50% of their future losses.

Fortunately there is a correct procedure for reducing future economic damages to present money values — the serial method of calculation presented herein. This method takes into account all the factors recognized by the Supreme Court in the trilogy and applies them in a mathematically correct fashion. Furthermore, the serial method is just as easy to apply as the net discount rate approach. It is to be hoped that the courts will, in the future, adopt the more accurate method.