THE TREATMENT OF TAXATION IN CAPITAL INVESTMENT APPRAISAL

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Discussion Paper No. 103

October 1986

Agricultural Economics Research Unit
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ISSN 0110-7720

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ACKNOWLEDGEMENTS

The Author would like to thank Prof. Barry Dent (Lincoln College) and Prof. Tom Dickinson (University of California, Chico) for their helpful comments on earlier drafts of this paper.

The work was carried out while the author (currently of Wye College, University of London) was visiting lecturer in the Farm Management and Rural Valuation Department, Lincoln College.

Preface

The allocation of resources to various forms of investment requires the use of effective methods of comparing the value of the investment options that are available. Net Present values and Internal Rates of Return are recognised as techniques which provide useful information for the resource allocation decision. However, the use of these techniques can become misleading where the effect of taxation is not included in the analysis. As the treatment of taxation effects causes the project evaluation to become rather complex, tax effects are often ignored. This Discussion Paper provides a derivation of the formulae which incorporate taxation in the project analysis. Tables of appropriate coefficients are provided which make the inclusion of tax effects much more manageable.

This Discussion Paper provides a very useful tool for project analysts. It is anticipated that investment decision making will be improved by the use of the techniques described. Within the agricultural sector in particular, the need for rigorous investment appraisal techniques is considerable, given the present low profitability of many existing investments.

J.G. Pryde
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1. INTRODUCTION

Investment appraisal techniques such as the net present value and the internal rate of return methods are frequently used to assess the worthwhileness of a capital investment. Both techniques are founded on the premise that \$1 now is worth more to a decision maker than \$1 (the future sum) at some time in the future, e.g. in a year's time. The reason for this is that the decision maker can take the \$1 now (or whatever sum of money is involved) and invest it wherever it will achieve the highest return or interest. In a year's time the original investment, plus the interest accruing to it, will be greater than the future sum.

Taking a simple example, if an investor is offered \$10,000 now and can invest it for one year at 15 per cent interest, then the investment will be worth \$11,500 (10,000 x 1.15) in 12 months' time. Obviously, this will be preferred to \$10,000 receivable in one year's time. However, if the investor is offered the choice of \$10,000 now and \$11,500 in 12 months, he will be indifferent between the two sums of money. We can say that \$10,000 is the present value of \$11,500 to be received in 12 months' time when the interest rate is 15 per cent.

The compound interest formula, $(1+r)^n$, was used in the above calculation. r is the interest rate, in this case 0.15, and n is the number of years for which the investment is made, in this case 1. Thus \$10,000 invested for one year was turned into:

$$\$10,000 \times (1+0.15)^1 = \$10,000 + \$1,500 = \$11,500.$$

Had the investment been for two years, the calculation would have become:

$$\$10,000 \times (1+0.15) \times (1+0.15) = \$10,000 \times (1+0.15)^2 = \$13,225.$$

In both cases we are assuming an annual compound interest rate of 15 per cent. Compounding tables are readily available which can be used to calculate the future value of any sum invested for a wide range of interest rates and years.

It is also possible to use the above formula to calculate how much needs to be invested in order to receive a given sum in a year's time. This is, of course, the present value of that future sum. In this case, the future sum is divided by $(1+r)^n$ or, more usually, multiplied by $1/(1+r)^n$. This latter is known as a discount factor and is used to find the present value of \$11,500 in one year's time at 15 per cent interest as follows:

$$\$11,500 \times 1/(1+0.15)^1 = \$11,500 \times 0.896 = \$10,000.$$

Once again discounting tables that can be used to calculate present values over a wide range of years and interest rates are readily available. Readers unfamiliar with discounting techniques should read an introductory text such as Lumby.

The internal rate of return method involves finding the discount rate at which the present value of the benefit stream is equal to the present value of the costs of the project. The internal rate of return can be perceived as the maximum interest rate that the project can withstand without making the investor worse off than if he did not undertake the project.

The net present value calculation can be expressed algebraically:

$$NPV = \sum_{i=1}^{n} \frac{Ni}{(1 + r)^{i}} - C \qquad (1)$$

Where NPV = Net Present Value;
Ni = Net income in year i;
C = Capital cost (assumed here to occur in year zero for simplicity);
r = The opportunity cost of capital; and
n = The life of the project.

If Ni is a constant annual cash flow or annuity, N, then this simplifies to:

$$NPV = Na_{n/r} - C$$

where $a_{n/r}$ = the annuity factor for a cash flow over n years at r% interest.

A number of factors will influence the outcome of an investment appraisal exercise including inflation, finance and taxation. While there can be no excuse for ignoring the effects of inflation in an investment appraisal the other two factors are frequently ignored. The rationale for this is that financing requirements and tax liability differ from business to business even though the projects under consideration are identical. Variations in the financing and tax situation will lead to variations in the results of the appraisal which have nothing to do with the intrinsic merit of the project. Excluding finance and tax enables an appraisal to be made of a project in general terms. This is termed general financial analysis.

Once a general financial analysis has been carried out and the project has been shown to be worthwhile in general terms, then the appraisal can be reworked incorporating the individual developer's specific finance requirements and tax situation. This is known as specific financial management.

Although cumbersome it is argued that this two stage approach is logical because the general financial analysis, which is relatively straightforward, can be used as a screening procedure before carrying out the more complex financial analysis only on these projects which have passed the initial screening. Great care must be exercised in deciding which projects to reject at this stage since the effects of differing marginal tax rates and depreciation allowances can render some apparently marginal projects worthwhile (e.g. Burrell et al).

The second stage of the assessment is often incorrectly omitted because of the complexities associated with the inclusion of tax payments and reliefs in the appraisal procedure. It is the purpose of this report to consider the different ways of dealing with taxation in investment appraisal and to present a set of tables that can be used to ease the calculation procedures. The inter-relationship between tax, inflation and finance in investment appraisal will also be considered.

2. TAXATION

Taxation complicates the appraisal of a capital investment in several ways. These are itemised below.

(i) The appropriate discount rate has to be chosen in order to calculate the present value of a cash flow. Theoretically, where there is a perfect capital market, i.e. access to unlimited funds and all other worthwhile investments have been undertaken, the discount rate to be used should be the perfect capital market interest rate - the rate at which the demand for funds exactly equals the supply of funds (Fisher). Where the individual pays income tax then the discount rate must be adjusted to allow for this (Merrett & Sykes). This is because interest paid on borrowed money by a business attracts relief from income tax, thereby reducing its cost to the borrower. Earnings from other investments are subject to income tax thereby reducing the opportunity cost of these funds. Even in the absence of a perfect capital market, e.g. where lending and borrowing rates differ, the principle of using the post-tax cost of borrowing as the opportunity cost of capital still applies (Hirshleifer).

(ii) The additional profit (or loss) generated by the project in each year is subject to income tax payments (or reliefs). The effect of tax on a cash flow stream is to reduce the size of the benefits if it is positive and to reduce the level of costs if it is negative.

(iii) Fiscal allowances (depreciation) are given on certain types of capital investment, e.g. machinery and equipment (which may be depreciated using the diminishing balance method) and buildings and works (which may be depreciated using constant annual allowances). These allowances will reduce the post-tax cost of the capital investment, with the size of the reduction depending on the marginal tax rate and the depreciation schedule. Higher marginal tax rates lead to greater reductions as do higher depreciation rates.

(iv) Where fiscal allowances are granted on the cost of a capital investment they are not necessarily related to the economic depreciation (fall in market value) of that investment. This is because governments use fiscal allowances to manipulate investments in the private sector. Investment is encouraged by granting tax relief in advance of economic depreciation, i.e. accelerated depreciation. The greater the acceleration, the greater the investment incentive. This incentive is compounded by higher marginal tax rates. The acceleration of allowances may apply to all types of capital investment or only to some depending on the government's priorities.

Where there is a divergence between the written down value of an asset and its economic value, any surplus over the written down value on disposal may be taxable and any shortfall may be allowable against tax.

(v) Certain capital assets do not qualify for tax relief, particularly non-depreciating assets such as land. Thus the tax system should not at first sight affect the cost of such assets. However, non-depreciating assets will often increase in money value in a period of inflation. This gain may be subject to taxation even if it is only a nominal gain. In other situations only the real gain, i.e. the gain over and above the gain caused by inflation will be taxed. Such capital gains taxes are frequently set at different rates from income taxes. Taxation of nominal gains will act as a disincentive to investment in this type of asset whereas failure to tax real gains will encourage investment. Currently (1985) capital gains are not taxable in New Zealand (Clark).

(vi) A progressive tax system has more than one rate of income tax - each successive slice of income is subject to a higher rate of tax. Frequently, these marginal tax rate bands are relatively narrow. This can make it difficult to predict the exact tax payments and reliefs that will accrue to a project, as the benefits may shift the operator's income to a higher tax 'bracket' or 'brackets'.

(vii) A final problem is that tax reliefs and payments do not occur at the same time as the costs and returns that generate them. Generally they are lagged or delayed by at least one year from the point at which they are incurred. This reduces the present value of both tax reliefs and payments. This not only affects the cash flows, but will also affect the opportunity cost of capital and therefore the discount rate.

3. METHODS

There are a number of different methods of dealing with taxation in investment appraisal.

3.1 General Financial Appraisal

The first method is simply to ignore taxation. No tax is deducted from cash inflows, no tax relief is claimed for losses, capital expenditure is shown as and when it takes place and depreciation is not calculated. The discount rate is based on the gross (i.e., pre-tax) interest rate. This is the procedure adopted in the general financial appraisal of a project. If the investor does not earn sufficient income to make him liable to tax and the project does not increase his income so much that he does become liable to tax, then this approach is sufficient in itself to give an accurate appraisal of the project. No further refinements are required.

To illustrate the point consider an investment costing \$10,000 which is expected to generate an annual net cash flow of \$2,000. The life of the project is assumed to be ten years whereupon output will cease and the investment will have no value. The opportunity cost of capital, and therefore the discount rate, is 15 per cent. This may be appraised as follows:

	Cash Flow \$	Discount Factor (15%)	Present Value \$
Capital cost (year 0)	-10,000	1.00	-10,000
Annual net cash flow (years 1-10)	2,000	5.02[1]	10,040
Net present value			+ 40

[1] Annuity factor for 10 years at 15 per cent.

The analysis shows that the project is marginal both in a general sense and specifically for a zero rate taxpayer. However, since it is not obviously detrimental to the business it is worth consideration and should be subjected to further analysis.

3.2 Calculating the Cumulative Balance

The second approach is to set out the cash flows as in cash flow analysis. The tax liability (or relief) for each year is then calculated and deducted from (or added to) to cash flow in the relevant year. Although apparently simple this approach has a number of problems, not the least being that it is tedious and time consuming and liable to lead to arithmetic error. The major causes of error arise from the need to lag the payments and reliefs and the problem of dealing with non cash items such as depreciation. Depreciation does not appear in the annual cash flow and yet the tax relief on it must be included. Conversely the initial capital outlay on which the depreciation allowances are claimed does appear in the cash flow. Interest payments are also excluded from the cash flows but the tax relief in them must be included. Once these adjustments have been made the cumulative cash balance at the end of the project's life can then be discounted to its present value using the appropriate discount rate.

The example from the previous section will be used to illustrate this method. The investor is assumed to be paying tax at 33 per cent on his marginal income and the project is not expected to change this. As explained in Section 2 it is assumed that the opportunity cost of money is reduced as a result of tax relief on interest payments or, if the investment is from retained earnings, by tax payments on interest earned. The discount rate is reduced by (1-T/100) where T is the marginal tax rate expressed as a per cent. Since the marginal tax rate is 33 per cent the opportunity cost of capital is reduced to 15 x (1-33/100) or approximately 10 per cent. Tax relief is granted at 33 per cent of the capital cost of the investment and tax is charged at the same rate on net cash inflows. These calculations are set out below. Column A shows the annual net cash flow before tax. Column B shows the tax relief on the capital investment and the tax paid on the net cash flows. Column C shows the interest calculated on the outstanding balance in the preceding time period. Column D shows the tax relief on these interest payments. Column E, the outstanding balance, is the sum of the preceding four columns. For simplicity, it has been assumed that the tax reliefs and payments occur at the same time as the cash flows to which they relate.

Year	Cash Flow	Tax Relief/ Payments at 33%	Interest at 15%	Tax Relief on Interest at 33%	Outstanding Balance
	(A)	(B)	(C)	(D)	(E)
0	-10,000	3,300	0	0	- 6,700
1	2,000	- 660	-1,005	+ 332	- 6,033
2	2,000	- 660	- 905	+ 299	- 5,299
3	2,000	- 660	- 795	+ 262	- 4,492
4	2,000	- 660	- 674	+ 222	- 3,604
5	2,000	- 660	- 541	+ 178	- 2,627
6	2,000	- 660	- 394	+ 130	- 1,551
7	2,000	- 660	- 233	+ 77	- 367
8	2,000	- 660	- 55	+ 18	+ 936
9	2,000	- 660	+ 140	- 46	+ 2,370
10	2,000	- 660	+ 356	- 117	+ 3,949

The outstanding positive balance of $3,949 has a present value of $1,523 at 10 per cent discount. This represents the after-tax net present value of the project. It should be noted that when the balance becomes positive, interest accrues to the balance after deduction of tax.

Despite its complexity this approach does have the advantage of producing a cash flow profile which can be useful in identifying possible financing problems and it minimises the use of discounting tables to calculate the net present value of the project.

3.3 Net of Tax Cash Flows

The third method is to calculate the post-tax cash flows and the post-tax discount rate directly. This is done by multiplying both the annual cash flows and the discount rate by (1-T/100) where T is the marginal tax rate expressed as a per cent.

Once again it is assumed that an investment costing $10,000 which generates an annual cash flow of $2,000 for 10 years is being considered. The opportunity cost of capital is 15 per cent and the marginal tax rate is 33 per cent in every year. Tax reliefs on expenditure and payments on income are assumed to be immediate, i.e. they are incurred at the same time as the cash flow to which they relate.

The post-tax discount rate is found by multiplying the discount rate (15%) by (1-33/100). This gives rise to a post-tax discount rate of approximately 10 per cent. The annual cash flow is adjusted in an identical fashion. The initial investment is assumed to be eligible for tax relief, with depreciation allowed at 100 per cent in the year of purchase. The post-tax cash flow is then discounted at the post-tax discount rate to arrive at the net present value.

Post-tax discount rate: 15 x (1 - 0.33) = 10.05%.

		Cash Flow $	Discount Factor (10%)	Present Value $
Post-tax capital cost	-10,000 x (1-0.33) =	-6,700	1.00	- 6,700
Post-tax cash flow	2,000 x (1-0.33) =	1,340	6.14[1]	8,228
Net present value				+ 1,528

[1] Annuity factor for 10 years at 10 per cent.

This gives a virtually identical net present value, $1,528, to the previous method. The slight difference is due to the rounding error in using 10 per cent rather than 10.05 per cent as the discount factor. The cost of the project has been reduced from $10,000 to $6,700 and the annual cash flow has been reduced from $2,000 to $1,340 by the tax system. Overall the net present value has been improved in this instance by almost $1,500.

Expressed algebraically, the calculation of net present value in (1) has become:

$$NPV = (1 - t) \sum_{i=1}^{n} \frac{Ni}{(1 + r^*)^i} - (1 - t)\ C \qquad (2)$$

where t = the marginal tax rate T/100; and
r^* = the post-tax discount rate found by $r^* = (1 - t)r$.

As can be seen this is a relatively straightforward method but there are still problems. The major one is presented by the way in which relief is granted on the initial investment. Generally the initial investment cannot be fully written off for tax purposes immediately, but must be depreciated over a number of years at specific rates set by the government. In such cases it is necessary to calculate the present value of the depreciation allowances because it will be less than in the preceding example.

Assuming that the item has a first year depreciation allowance of 20 per cent and an allowance in the second and subsequent years of 10 per cent of the cost price then the present value of the depreciation allowance can be calculated as follows assuming immediate tax reliefs.

a Year	b Allowance	c Depreciation	d Tax Rate	e Tax Relief (c x d)	f Discount Factor (10%)	g Present Value (e x f)
0	20%	$2,000	.33	$660	1.00	$ 660
1–8	10%	$1,000	.33	$330	5.33(1)	$1,760
Present value of depreciation allowances						$2,420

(1) Annuity factor for eight years at 10 per cent

The net present value calculation now becomes:

		Cash Flow $	Discount Factor (10%)	Present Value $
Post tax capital cost –10000 + 2420	=	–7580	1.00	–7580
Post tax cash flow (2000 x (1 – 0.33))	=	1340	6.14(1)	8230
Net Present value				+ 650

(1) Annuity Factor for 10 years at 10 percent.

As can be seen, the fact that the depreciation is spread over a total of nine time periods, rather than being allowed immediately, has reduced the present value of the allowance from $3,300 to $2,420 and therefore increased the post tax capital cost from $6,700 to $7,580 with a consequent reduction in net present value from $1,528 to $650.

The net present value formula (2) is extended to the following form to allow for the delays in the receipt of the tax relief on the capital investment caused by the depreciation schedules.

$$NPV = (1 - t) \sum_{i=1}^{n} \frac{Ni}{(1 + r^*)^i} - C + t \sum_{i=0}^{n} \frac{di\ C}{(1 + r^*)^i} \qquad (3)$$

Where di = the percentage depreciation allowed in year i.

Note that in the absence of investment allowances $\sum_{i=0}^{n} di = 1$

It is important to note that no attempt has been made to allow for any delay in the incidence of tax payments and reliefs. In many, if not all, instances there will be such delays. The length of the delay will vary according to the point at which the cash flows occur within the financial year and the length of time between the end of the financial year and the finalisation of the tax accounts for that year. Delays of up to two years would not be considered abnormal.

These delays can be incorporated into the methods used in sections 3.2 and 3.3 but are rarely done so in practice because of the complexities of adjusting the tax rate and discount rate to allow for the effects of the lag upon them. These adjustments and a method of incorporating them in the investment appraisal are discussed in Section 3.4 below.

3.4 Special Tax Tables

A fourth method of dealing with tax is to use special tables which incorporate many of the calculations described in the previous section. A set of such tables for use under the current New Zealand tax laws is included in the Appendix. Details of their derivation are also given there. The tables can readily be adapted to allow for the lags in payment of tax that occur in reality. It should be remembered that these lags increase the post-tax discount rate (since tax relief on interest payments is delayed) and increase the post-tax cash flows (since payment of tax on the additional profits generated by the project are also delayed).

3.4.1 Post-Tax Discount Rate

The first step in using the tables is to find the suitably lagged post tax discount rate, r*. This will be determined by the pre tax nominal discount rate, the marginal tax rate+ and the lag in the payment of tax or receipt of tax relief (Franks and Hodges). It is given by the formula:

+Footnote: Table A has been drawn up for a range of tax rates rather than just those in operation at the time of writing as they are subject to change at short notice. The use of 5% steps was decided on because it is possible to interpolate between these steps without too much loss of accuracy, e.g. the factor for a 30 per cent tax rate is 10.5 and for a 35 per cent tax rate is 9.75. The factor for a 33 per cent tax rate is approximately three-fifths of the way between the two factors, i.e. 10.5 - 3/5 (10.5 - 9.75) = 10.05.

$$r^* = [1-t/(1+r^*)^q]m$$

where r^* is the post-tax discount rate;

t is the marginal tax rate;

q is the lag in tax payments, and

m is the nominal pre-tax discount rate.

r^* is found by iteration using the nominal pre-tax discount rate, m, as the starting value for r^*. This method has been used to create Table A which gives the post-tax discount rate, r^*, for a variety of marginal tax rates, pre-tax nominal discount rates and lags in tax payments. The values of r^* used in Table A are not exact as only the first two iterations have been carried out in calculating r^*. Further iterations were not felt to be necessary as they did not change the value of r^* after rounding. However, they are sufficiently accurate as the post-tax discount rates used in the remaining tables are also set at intervals of one half of one per cent. It will be noted from the tables that for a given pre-tax discount rate, as the lag increases, so the post-tax discount rate increases.

3.4.2 Post-Tax Capital Cost

The next step is to calculate the post-tax capital cost, i.e. the capital cost less the present value of the tax relief on that capital cost. The present value of the tax relief for a dollar invested can be found from Table B for investments subject to straight line depreciation schedules and Table C for investments subject to diminishing balance depreciation schedules. (The detailed derivation of these two tables is given in the Appendix). The tables allow for the range of investment allowances, (I%), first year allowances, (F%), and depreciation allowances - either diminishing balance, (D%), or straight line (S%), that are currently available. Inspection of Tables B and C will show that higher rates of depreciation result in higher present values for the tax reliefs and vice versa.

The post-tax nominal discount rate derived from Table A is used to select the appropriate present-value-of-tax-relief factor. This factor represents the appropriately discounted present value of the tax relief given for every dollar spent on an investment with that depreciation schedule. Again, examination of the tables will show that the present value falls as the discount rate rises. The final stage is to multiply the chosen factor by the total capital expenditure to give the present value of the tax relief and deduct this from the capital expenditure to give the net of tax cost of the investment.

3.4.3 Post-Tax Cash Flows

Next, the annual cash flows must be adjusted for tax to provide the post tax cash flow. This is done by multiplying the (constant) annual cash flow by the effective net of tax factor which is given in Table D. The effective net of tax factor, $(1-t^*)$, is given by

$$(1-t^*) = 1-t/(1+r^*)^q$$

where t^* is the effective marginal tax rate;

t is the marginal tax rate;

r^* is the post tax discount rate; and

q is the lag in tax payments.

This formula allows for the reduction in the present value of the tax due to the delay or lag in its payment. In the absence of any delay, the right hand side of the formula reduces to $(1-t)$, where $t = T/100$.

Finally, the post-tax cash flows are discounted at the post tax discount rate, derived from Table A, to arrive at their present value. The net of tax capital cost, derived using Tables B and C, is then deducted from the present value of the cash flows to give the net present value of the project.

3.4.4 An Example Without Tax Lags

The previous example can be appraised with the help of these tables. Using Appendix A, the 15 per cent pre-tax nominal discount rate is found to be equivalent to a 10 per cent post-tax discount rate for a 33 per cent tax rate when there is no delay in the payment of tax or receipt of relief. The post-tax cash flow can be calculated by multiplying it by $(1-t)$, i.e. 0.67, as was demonstrated in section 3.3. The present value of the depreciation allowance can be found by using Appendix Table B. The factor for a 10 per cent real discount rate and a depreciation schedule of 20 per cent in the first year (F%) and 10 per cent per annum straight line thereafter (S%) is found to be 0.7335. This is multiplied by t to give the post-tax value of the depreciation per dollar invested, i.e. 0.7335 x 0.33 = 0.242055. Since \$10,000 is being invested, the present value of the depreciation is \$2,421 and the net of tax cost of the investment is \$7,759. This can be summarised:

	Cash Flow $	Discount Factor (10%)	Present Value $
Post-tax capital cost =-10,000 + (10,000 x 0.7335 x 0.33)	-7,579	1.00	-7,579
Post-tax cash flow = 2,000 x 0.67	1,340	6.14(1)	8,230
Net present value			651

(1) Annuity factor for 10 years at 10 per cent

3.4.5 An Example With Tax Lags

It is a relatively simple matter to allow for a delay in tax. Using Appendix Table A, the post-tax discount rate for a 15 per cent pre-tax discount rate, a marginal tax rate of 33 per cent and a lag of two years is found to be 11 per cent by interpolation between 10.74 (35 per cent tax) and 11.39 (30 per cent tax). Thus the delay in payment of the tax has reduced the effective marginal tax rate and therefore increased the post-tax discount rate.

The present value of the tax payments and reliefs on the cash flows will be reduced by the delay in their payment. This is incorporated in the calculation by reducing the effective marginal tax rate which is used in the calculation of the post-tax cash flows. The appropriate adjustment is found by consulting Appendix Table D which contains discount factors set at half-yearly intervals for convenience. The appropriate discount factor for a post-tax discount rate of 11 per cent and a two year delay is 0.8116. This is multiplied by the marginal tax rate, 33 per cent, to give the effective marginal tax rate of 26.8 per cent. The annual pre-tax cash flows are therefore multiplied by (1-26.8/100) or 0.732 to convert them to post-tax cash flows.

The combined effect of the increased post-tax discount rate (11 per cent) and the decreased effective tax rate (26.8 per cent) is to alter the present value of the depreciation to 0.7146 x 0.268 = 0.1915 per dollar spent on the capital investment. The effective tax liability on the cash flow is reduced by the delay in payment of tax which increases the post-tax cash flow from $1,340 to $1,464, but this enlarged post-tax cash flow is now discounted at the higher post-tax discount rate of 11 per cent instead of 10 per cent. Once again this is summarised below:

	Cash Flow $	Discount Factor (11%)	Present Value $
Post tax capital cost = -10,000 + (10,000 x 0.7146 x 0.268)	-8,085	1.00	- 8,085
Post tax cash flow = 2,000 x 0.732	1,464	5.89(1)	8,622
Net present value			537

(1) Annuity factor for 10 years at 11 per cent.

Equation (3) is unchanged by these adjustments except that the effective rate, t*, replaces t.

3.4.6 Internal Rate of Return

The internal rate of return of the project can be calculated in the usual way for irregular cash flows (e.g. Lumby). The post-tax discount rate is increased by steps of, say, 5 per cent until a negative net present value is generated. The internal rate of return is found by interpolating between the two discount rates that generate the negative and positive net present values closest to zero. It is important to note that as the discount rate is increased so the present value of the tax allowances have to be recalculated for each iteration using Table B or C as appropriate. If there are tax lags, then the effective tax rate also has to be recalculated using Table D. The internal rate of return calculated in this way is post tax.

The internal rate of return of the project used as an example in this paper can be determined as follows. A post-tax discount rate of 15 per cent is chosen because the net present value is positive at 11 per cent. This gives an effective tax rate of 24.95 per cent with a marginal tax rate of 33 per cent lagged by two years. The present value of the depreciation allowances is .6487 x .2495 for every dollar invested, i.e. $1,619. The net of tax cost of the investment is therefore $8,832. The post-tax annual cash flow is $1,501, which has a present value of $7,533 at 15 per cent discount. The net present value is therefore -$849.

The post-tax internal rate of return is calculated by interpolating between 11 per cent and 15 per cent, and is found to be 12.5 per cent (approx.) in this example. This should be compared with the post-tax opportunity cost of capital of the investor. The pre-tax internal rate of return is calculated by dividing the post-tax internal rate of return by (1-t*). Once again it should be noted that t* has to be recalculated because we are now assuming a post-tax discount rate of 12.5 per cent which will alter the effective tax rate when tax is lagged. t* is given by .33 x .79, i.e. 0.26.

In some cases it is possible to calculate the post-tax internal rate of return directly from the pre-tax internal rate of return by multiplying it by (1-t*). However this is only possible where 100 per cent depreciation is claimed immediately, i.e. both the capital cost and the cash flows are multiplied by (1-t*). This is not possible where the depreciation allowances are spread over several years because of the distorting effect of the lagged tax reliefs.

4. FINANCE AND TAXATION

So far in this paper it has been assumed that all the finance for the investment has come from one source. That is it is either all debt (borrowed), or all equity (own) capital and therefore a single interest rate applies. This situation also applies under perfect capital markets where all the different sources of finance, be they debt or equity, have an identical opportunity cost.

In reality the investor may be facing several different interest rates depending on his sources of finance and the earning potential of his investments. Providing that the investor has not exhausted all potential investment projects that will show a positive net present value at the market interest rate, then the return from his marginal investment will by definition exceed the market interest rate. The return from the marginal investment is therefore the opportunity cost of capital that should be used in the appraisal, even though this is different from the interest rate that has to be paid on borrowed money. Strictly the borrowed money has the same opportunity cost as the equity since it too can be invested in the marginal project and therefore earn the same return as the debt capital. However, it is frequently desirable to find out the benefit that will be generated on the equity capital if the project is undertaken. This can be done by adjusting the net cash flow before discounting it. This adjustment is made by deducting the loan and the associated payments of principal and interest from the cash flow before discounting. Thus the net capital expenditure will be reduced by the amount of the loan and will therefore reflect the amount of equity capital invested. The annual cash flows will also be reduced, but because only the principal repayments and the actual payment of interest are deducted, any surplus earnings on the borrowed money will be retained in the cash flow.

In this case, any earnings on debt capital over and above the interest paid on that debt are attributed to the equity capital. If the return from the project exceeds the cost of debt capital, then the net present value and internal rate of return (on the smaller equity capital) will be greater than if the finance adjustment is not made. Conversely, if the return from the project is less than the cost of the debt capital, then the net present value and internal rate of return will be lower. This is known as the gearing effect.

Taxation must be incorporated into the appraisal when the interest paid on the debt is allowable against other income for tax purposes. This can be accomplished either by adding back the tax relief on the interest payments on the debt to the cash flow, or, more directly, by calculating the interest payments on the debt on a post-tax basis before deducting them from the cash flow. This approach is demonstrated below.

Continuing with the previous example, the effect of a $5000 loan repayable in equal annual instalments over ten years at 12 percent interest pre-tax is assessed as follows. The loan is amortised at the post-tax interest rate of 12 x (1-33/100) = 8 per cent. This annual payment of $745 is deducted from the cash flows. The loan itself is a cash inflow and has the net effect of reducing the cash outflow involved when the project is undertaken. The calculation then becomes:

	Cash Flow $	Discount Factor (10%)	Present Value $
Post tax and finance capital cost = 7580 - 5000	-2580	1.00	-2580
Post tax and finance cash flow = 1340 - 745	595	6.14(1)	3656
Net present value			1076

(1) Annuity factor for 10 years at 10 per cent.

As can be seen the net present value of the project is increased because of the gearing effect.

The net present value equation (3) can be changed to incorporate this adjustment as follows:

$$NPV = (1-t)\sum_{i=1}^{n}\frac{Ni}{(1+r^*)^i} - C + t\sum_{i=0}^{n}\frac{di\ C}{(1+r^*)^i} + L - \sum_{i=1}^{n}\frac{Pi}{(1+r^*)^i}$$

$$- (1-t)\sum_{i=1}^{n}\frac{Zi}{(1+r^*)^i} \qquad (4)$$

Where L = Loan received (assumed to be in year zero);
Pi = Repayment of principal in year i; and
Zi = Payment of interest in year i.

The sum of the last three expressions equals zero when the loan interest rate equals the borrower's opportunity cost of capital, r*.

5. INFLATION AND TAXATION

Inflation causes considerable problems in investment appraisal and should be incorporated in both the general and specific financial analysis of a project. It is accepted that inflation can be dealt with either by inflating the cash flows in line with the expected rate of inflation and discounting at the nominal interest rate, or by calculating the cash flows in present day dollars and discounting at the real rate of interest. Both methods will reveal an identical net present value for the same project, but in the former method the internal rate of return will be expressed in nominal terms, while in the latter case it will be expressed in real terms (see Williams for an example).

The inclusion of taxation and finance under inflationary conditions leads to problems with the appraisal (Bergstrom & Sodersten). The tax reliefs granted on capital investments via depreciation are generally not received immediately upon making the expenditure but are spread over a number of years. This delay not only reduces their present value, as explained earlier, but also exposes them to the effects of inflation. When it is remembered that the effect of inflation is to reduce the purchasing power of a dollar then it can be seen that delaying the receipt of the tax reliefs will not only reduce their present value, but will also lead to a reduction in the bundle of goods that can be bought with the tax relief received in any given year. The further into the future the relief is received, the smaller the bundle of goods that may be bought with the relief in that year because of the increase in the nominal or money price of the goods due to inflation. Thus inflation directly reduces the present value of the tax reliefs on capital investment.

A similar situation arises with loans. Because the principal is repaid over several years, the repayments do not have the same purchasing power as the original loan. This is to some extent compensated for by interest rates which tend to increase as inflation increases and decrease as inflation decreases. These increased interest payments can be viewed as having two components: firstly an element to compensate the lender for the fall in purchasing power of his capital, and secondly an element (the real interest) to pay him for the use of that capital. Despite this the whole of the interest paid is available for tax relief. Thus high rates of inflation lead to high interest rates, which in turn increase the tax reliefs gained for any given marginal tax rate. If it is assumed that the real rate of interest is the 'true' interest rate and that this stays fairly constant in the long term irrespective of the rate of inflation then it can be seen that the greater the level of inflation the lower the post-tax real rate of interest will be. In fact the tax relief on the nominal interest may exceed the real interest. This causes negative real rates of interest; effectively the lender is paying the borrower to use his money. This makes many more investments profitable as the borrower is receiving a subsidy from the lender.

The previous example will be used to illustrate the effect of an expected inflation rate of 8 percent on the analysis. This rate of inflation implies that the real pre-tax rate of interest is 6.5 percent instead of the pre-tax discount rate of 15 per cent assumed so far.

Year	Cash Flow	Inflated Cash flow	Post Tax Cash Flow	Post Tax and Finance Cash Flow
0	-10000	-10000	-7580	-2580
1	2000	2160	1447	702
2	2000	2333	1563	818
3	2000	2519	1688	943
4	2000	2721	1823	1078
5	2000	2939	1969	1224
6	2000	3174	2126	1381
7	2000	3428	2296	1551
8	2000	3702	2480	1735
9	2000	3998	2679	1934
10	2000	4318	2893	2148
NPV	40	438	4549	4971
Interest Rate	15%	15%	15%	15%
Inflation Rate	0%	8%	8%	8%
Taxation Rate	0%	0%	33%	33%
Discount Rate	15%	15%	10%	10%

As can be seen the incorporation of an inflation rate of 8 per cent into the analysis by compounding the cash flows increases the net present value from \$40 to \$438 at the 15 per cent nominal discount rate. If the original uncompounded cash flow of \$2000 per annum had been discounted at the real rate of interest of 6.5 per cent, an identical net present value would have been derived.

When a 33 per cent tax rate is introduced the net present value of the post-tax cash flow rises to \$4549 compared to \$650 in section 3.3. Note that the discount rate used is the post-tax nominal interest rate of 10 per cent.

Finally, the effect of inflation on the project's cash flow after allowing for financing as illustrated in section 4 is to increase the net present value from \$1076 to \$4971.

The mathematical formula for the calculation of the net present value where the annual net cash flows are indexed in line with inflation is as follows:

$$NPV = (1-t)\sum_{i=1}^{n} \frac{Ni(1+f)^i}{(1+R^*)^i} - C + t\sum_{i=0}^{n} \frac{diC}{(1+R^*)^i} + L - \sum_{i=1}^{n} \frac{Pi}{(1+R^*)^i}$$

$$- (1-t) \sum_{i=1}^{n} \frac{Zi}{(1+R^*)^i} \qquad (5)$$

Where f = the anticipated rate of inflation.

It should be remembered that R^* is the post tax nominal discount rate. In order to discount at the real rate of interest it is necessary to deflate R^*. In the absence of tax the real rate of interest is given by the following equation:

$$r = [(1 + R) / (1 + f)] - 1 \qquad (6)$$

The post tax real rate r^* is calculated in a similar manner.

$$r^* = [(1 + R^*) / (1 + f)] - 1 \qquad (7)$$

Rearranging (7) we have

$$(1 + R^*) = (1 + r^*) (1 + f) \qquad (8)$$

Substituting into equation (5) we have:

$$NPV = 1-t \sum_{i=1}^{n} \frac{Ni}{(1+r^*)^i} - C + t \sum_{i=0}^{n} \frac{diC}{(1+r^*)^i(1+f)^i} + L - \sum_{i=1}^{n} \frac{Pi}{(1+r^*)^i(1+f)^i}$$

$$-(1-t) \sum_{i=1}^{n} \frac{Zi}{(1+r^*)^i(1+f)^i} \qquad (9)$$

It is evident from equation (9) that using real rates of discount avoids the need to inflate the annual cash flows, but leads to the problem of having to 'double discount' the depreciation, principal and interest payments by both the post-tax real rate of interest and the rate of inflation.

6. DISPOSAL VALUES AND TAXATION

The disposal of an asset may cause a problem if the economic value (the value realised on sale) is different from the written down value used for tax purposes. Again a number of courses of action may be followed. The choice of option will depend on prevailing tax laws.

The asset may continue to be depreciated and the disposal value added to income and taxed as such. This is the simplest approach, with the revenue from the sale being added to the cash flow in the year in which it is estimated to occur.

A more complex approach is to calculate the written down value at the projected date of sale and the anticipated resale value. If the resale value is greater than the written down value then depending on current tax laws a tax liability may occur. If the resale value is lower than the written down value for tax purposes then the loss may be set against other income if this is allowed.

This latter approach can be expressed in the following manner and added to the RHS of equation (3).

$$\frac{D}{(1 + r^*)^n} - pt \frac{\left[E - (C - \sum_{i=0}^{n} di)\right]}{(1 + r^*)^n} - qt_1 \frac{(D - C)}{(1 + r)^n}$$

Where D = The anticipated disposal value of the asset

E = A dummy: E = D if $D < C$

E = C if $D > C$

t = The marginal tax rate

t_1 = The appropriate rate of capital gains tax

P = A dummy: p = 0 if the depreciation recovered is not assessable

p = 1 if the depreciation recovered is assessable

q = A dummy: q = 1 if $D > C$

q = o if $D < C$

7. CONCLUSION

As has been demonstrated, the incorporation of tax complicates investment analysis. The difficulties are increased because of the large number of different depreciation schedules that are used. Each schedule generates a different present value of tax relief per dollar invested. Consequently some capital investments have a lower post tax cost than others. This has implications for investment decisions.

Further complications arise because the tax laws of any one country are not immutable and are subject to sudden change at the behest of politicians. Frequently these changes are made on a piecemeal basis in reaction to a particular set of circumstances. An example might be the introduction of investment allowances or accelerated depreciation allowances for investment in new machinery. These could be introduced either to help counter a shortage of rural labour or to stimulate the demand for machinery and increase employment in the manufacturing industry. Frequently, however, these special allowances continue long after the circumstances that created the need for them have changed. The net effect is to produce a complex set of rules that lead to distortions in the allocation of resources within and between industries. The majority of these distortions are frequently unintended and usually unrecognised. That there are considerable variations in tax laws between countries is an indication of the importance of political pressures as opposed to economic logic in the development of tax rules. Readers who are interested in the distorting effect of such tax rules may care to read the paper by Burrell et al (op.cit.).

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APPENDIX

Derivation of Tables B and C

The calculation of the post-tax present value of a capital allowance is as follows:

Where the asset is depreciated for tax purposes as a fixed proportion of its cost price then the following formula is used:

$$P = t\,(G + F + S\,a_{n/r^*})$$

Where P = The present value of the tax relief;

t = the marginal tax rate;

G = percentage investment allowance;

F = percentage first year allowance;

S = subsequent years allowance; and

$a_{n/r}$= the present value of an annuity factory for n years at r* %

t, G, F and S are all expressed as decimals.

This formula arises in the following manner. Each $1 of depreciation reduces the cost of the investment by the tax relief thereon at rate t. In the first year, assumed initially to be at the time of purchase of the asset, the cost is reduced by t(G + F). In each subsequent year the cost is reduced by tS until the asset is written off. This benefit stream is converted to its present value using the relevant annuity factor at the post tax discount rate.

Where the asset is written off by the diminishing balance method, the formula is more complex.

$$P = t\left[(G + F) + \frac{S(1 - F)}{(1 + r^*)} + \frac{S(1 - F)(1 - S)}{(1 + r^*)^2} \;\ldots\ldots\; \frac{S(1 - F)\,(1 - S)^{n-1}}{(1 + r^*)^n}\right]$$

This can be rewritten as:

$$t\left\{(G + F) + \frac{S(1 - F)}{1 - S}\left[\frac{(1 - S)}{(1 + r^*)} + \frac{(1 - S)^2}{(1 + r^*)^2} + \ldots\ldots + \frac{(1 - S)^n}{(1 + r^*)^n}\right]\right\}$$

If we set $\dfrac{1}{1 + k} = \dfrac{(1 - S)}{(1 + r^*)}$ where $k = \dfrac{(r^* + S)}{(1 - S)}$

Then the formula reduces to:

$$t\left[(G + F) + \frac{S(1 - F)}{1 - S}\,(an/k)\right]$$

The cost of the asset is reduced by $t(G + F)$ per doller spent. The written down value of the asset for tax purposes is the initial cost less the initial allowance F ie $(1 - F)$. At the end of the first year the book value is further reduced by the proportion S of the written down value $(1 - F)$. The present value of the reduced tax liability is therefore:

$t\,S(1 - F) \,/\, (1 + r^*)$ at the end of the first year.

The written down value becomes $S(1 - F)(1 - S)$ at the end of the second year and so on until it is $S(1 - F)(1 - S)^{n-1}$ in the nth and final year.

Use of Tables : Summary

Information required :	pre-tax discount rate	e.g. 20%
	marginal tax rate	e.g. 35%
	lag in tax payments	e.g. 18 months
	depreciation schedule	e.g. 20% first year, 10% diminishing balance

1. To calculate the post-tax discount rate use Appendix Table A.

Select that part of Table A with the appropriate marginal tax rate. For the above parameters the post-tax discount rate is 14.3 per cent. This may be rounded to 14 per cent.

2. To calculate the effective tax rate use Appendix Table D.

Multiply the marginal tax rate by the appropriate discount factor. In this example the factor for a post tax discount rate of 14 per cent and a tax lag of 18 months is 0.8216. The effective tax rate is therefore 0.35 x 0.8216 = 0.2875 or 28.75 per cent. Where there is no delay in tax payments this stage is omitted, as the effective tax rate remains at 35 per cent.

3. To calculate the present value of the depreciation allowances use Appendix Table B (for straight line depreciation) or Table C (for diminishing balance depreciation).

Where the tax relief is delayed, as in this example, the delay is incorporated in the effective tax rate so no further adjustment is required. The present value of the depreciation allowance is 0.6639 per dollar invested when there is a 14 per cent post tax discount rate and a 100 per cent tax rate. This factor is multiplied by the effective tax rate 0.2875, as calculated in (2). The present value of the tax relief is therefore 0.1909 per dollar invested. The total present value of the tax relief is found by multiplying the total investment by 0.1909 (in this example). The present value of the tax relief is then deducted from the capital cost to give the post-tax capital cost.

4. To calculate the post-tax cash flows.

Multiply the cash flows by (1-t*) where t* is the effective tax rate. In this case the cash flows are multiplied by 1-0.2875 or 0.7125. Where there is no delay in tax payments the effective tax rate equals the marginal tax rate in this case 35 per cent.

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 5.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.48	.48	.48	.48	.48
1	.95	.95	.95	.95	.95
1.5	1.43	1.43	1.43	1.43	1.43
2	1.90	1.90	1.90	1.90	1.90
2.5	2.38	2.38	2.38	2.38	2.38
3	2.85	2.85	2.85	2.86	2.86
3.5	3.33	3.33	3.33	3.33	3.34
4	3.80	3.80	3.81	3.81	3.81
4.5	4.28	4.28	4.28	4.29	4.29
5	4.75	4.76	4.76	4.77	4.77
5.5	5.23	5.23	5.24	5.25	5.25
6	5.70	5.71	5.72	5.72	5.73
6.5	6.18	6.18	6.19	6.20	6.21
7	6.65	6.66	6.67	6.68	6.69
7.5	7.13	7.14	7.15	7.16	7.17
8	7.60	7.61	7.63	7.64	7.65
8.5	8.08	8.09	8.11	8.12	8.14
9	8.55	8.57	8.59	8.60	8.62
9.5	9.03	9.05	9.06	9.08	9.10
10	9.50	9.52	9.54	9.56	9.58
11	10.45	10.48	10.50	10.53	10.55
12	11.40	11.43	11.46	11.49	11.52
13	12.35	12.39	12.42	12.45	12.49
14	13.30	13.34	13.38	13.42	13.46
15	14.25	14.30	14.34	14.39	14.43
16	15.20	15.25	15.31	15.35	15.40
17	16.15	16.21	16.27	16.32	16.37
18	17.10	17.17	17.23	17.29	17.35
19	18.05	18.13	18.20	18.26	18.32
20	19.00	19.08	19.16	19.23	19.30
21	19.95	20.04	20.13	20.20	20.27
22	20.90	21.00	21.09	21.18	21.25
23	21.85	21.96	22.06	22.15	22.23
24	22.80	22.92	23.02	23.12	23.21
25	23.75	23.88	23.99	24.10	24.19
26	24.70	24.84	24.96	25.07	25.17
27	25.65	25.80	25.93	26.05	26.15
28	26.60	26.76	26.90	27.02	27.13
29	27.55	27.72	27.87	28.00	28.12
30	28.50	28.68	28.84	28.98	29.10

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 10.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.45	.45	.45	.45	.45
1	.90	.90	.90	.90	.90
1.5	1.35	1.35	1.35	1.35	1.35
2	1.80	1.80	1.80	1.81	1.81
2.5	2.25	2.25	2.26	2.26	2.26
3	2.70	2.70	2.71	2.71	2.72
3.5	3.15	3.16	3.16	3.17	3.17
4	3.60	3.61	3.61	3.62	3.63
4.5	4.05	4.06	4.07	4.08	4.08
5	4.50	4.51	4.52	4.53	4.54
5.5	4.95	4.96	4.98	4.99	5.00
6	5.40	5.42	5.43	5.45	5.46
6.5	5.85	5.87	5.89	5.90	5.92
7	6.30	6.32	6.34	6.36	6.38
7.5	6.75	6.77	6.80	6.82	6.84
8	7.20	7.23	7.25	7.28	7.31
8.5	7.65	7.68	7.71	7.74	7.77
9	8.10	8.13	8.17	8.20	8.23
9.5	8.55	8.59	8.63	8.66	8.70
10	9.00	9.04	9.08	9.12	9.16
11	9.90	9.95	10.00	10.05	10.09
12	10.80	10.86	10.92	10.97	11.03
13	11.70	11.77	11.84	11.90	11.96
14	12.60	12.68	12.76	12.83	12.90
15	13.50	13.59	13.68	13.76	13.84
16	14.40	14.50	14.60	14.70	14.79
17	15.30	15.42	15.53	15.63	15.73
18	16.20	16.33	16.45	16.57	16.68
19	17.10	17.25	17.38	17.51	17.63
20	18.00	18.16	18.31	18.45	18.58
21	18.90	19.08	19.24	19.39	19.53
22	19.80	19.99	20.17	20.33	20.49
23	20.70	20.91	21.10	21.28	21.44
24	21.60	21.83	22.03	22.22	22.40
25	22.50	22.74	22.97	23.17	23.36
26	23.40	23.66	23.90	24.12	24.32
27	24.30	24.58	24.84	25.07	25.28
28	25.20	25.50	25.77	26.02	26.24
29	26.10	26.42	26.71	26.97	27.21
30	27.00	27.34	27.65	27.93	28.18

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 15.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % — LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.43	.43	.43	.43	.43
1	.85	.85	.85	.85	.85
1.5	1.28	1.28	1.28	1.28	1.28
2	1.70	1.70	1.71	1.71	1.71
2.5	2.13	2.13	2.13	2.14	2.14
3	2.55	2.56	2.56	2.57	2.57
3.5	2.98	2.98	2.99	3.00	3.01
4	3.40	3.41	3.42	3.43	3.44
4.5	3.83	3.84	3.85	3.86	3.87
5	4.25	4.27	4.28	4.30	4.31
5.5	4.68	4.69	4.71	4.73	4.75
6	5.10	5.12	5.14	5.17	5.19
6.5	5.53	5.55	5.58	5.60	5.63
7	5.95	5.98	6.01	6.04	6.07
7.5	6.38	6.41	6.44	6.48	6.51
8	6.80	6.84	6.88	6.91	6.95
8.5	7.23	7.27	7.31	7.35	7.39
9	7.65	7.70	7.75	7.79	7.84
9.5	8.08	8.13	8.18	8.23	8.29
10	8.50	8.56	8.62	8.68	8.73
11	9.35	9.42	9.49	9.56	9.63
12	10.20	10.29	10.37	10.45	10.53
13	11.05	11.15	11.25	11.34	11.43
14	11.90	12.02	12.13	12.23	12.34
15	12.75	12.88	13.01	13.13	13.25
16	13.60	13.75	13.89	14.03	14.16
17	14.45	14.62	14.78	14.93	15.08
18	15.30	15.49	15.67	15.84	16.00
19	16.15	16.36	16.56	16.74	16.92
20	17.00	17.23	17.45	17.65	17.84
21	17.85	18.10	18.34	18.56	18.77
22	18.70	18.98	19.23	19.48	19.70
23	19.55	19.85	20.13	20.39	20.63
24	20.40	20.72	21.03	21.31	21.57
25	21.25	21.60	21.93	22.23	22.51
26	22.10	22.48	22.83	23.15	23.44
27	22.95	23.35	23.73	24.07	24.39
28	23.80	24.23	24.63	25.00	25.33
29	24.65	25.11	25.54	25.93	26.28
30	25.50	25.99	26.44	26.85	27.22

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 20.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.40	.40	.40	.40	.40
1	.80	.80	.80	.80	.80
1.5	1.20	1.20	1.20	1.21	1.21
2	1.60	1.60	1.61	1.61	1.61
2.5	2.00	2.00	2.01	2.01	2.02
3	2.40	2.41	2.41	2.42	2.43
3.5	2.80	2.81	2.82	2.83	2.84
4	3.20	3.21	3.23	3.24	3.25
4.5	3.60	3.62	3.63	3.65	3.66
5	4.00	4.02	4.04	4.06	4.08
5.5	4.40	4.42	4.45	4.47	4.49
6	4.80	4.83	4.86	4.88	4.91
6.5	5.20	5.23	5.27	5.30	5.33
7	5.60	5.64	5.68	5.71	5.75
7.5	6.00	6.04	6.09	6.13	6.17
8	6.40	6.45	6.50	6.55	6.59
8.5	6.80	6.86	6.91	6.96	7.02
9	7.20	7.26	7.32	7.38	7.44
9.5	7.60	7.67	7.74	7.80	7.87
10	8.00	8.08	8.15	8.22	8.30
11	8.80	8.89	8.98	9.07	9.16
12	9.60	9.71	9.82	9.92	10.02
13	10.40	10.53	10.65	10.77	10.89
14	11.20	11.35	11.49	11.63	11.76
15	12.00	12.17	12.33	12.49	12.64
16	12.80	12.99	13.17	13.35	13.52
17	13.60	13.81	14.02	14.22	14.41
18	14.40	14.64	14.87	15.09	15.30
19	15.20	15.46	15.72	15.96	16.19
20	16.00	16.29	16.57	16.84	17.09
21	16.80	17.12	17.43	17.72	17.99
22	17.60	17.95	18.28	18.60	18.90
23	18.40	18.78	19.14	19.48	19.80
24	19.20	19.61	20.00	20.37	20.71
25	20.00	20.45	20.87	21.26	21.63
26	20.80	21.28	21.73	22.16	22.55
27	21.60	22.12	22.60	23.05	23.47
28	22.40	22.95	23.47	23.95	24.39
29	23.20	23.79	24.34	24.85	25.32
30	24.00	24.63	25.21	25.76	26.25

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 25.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.38	.38	.38	.38	.38
1	.75	.75	.75	.75	.75
1.5	1.13	1.13	1.13	1.13	1.13
2	1.50	1.50	1.51	1.51	1.51
2.5	1.88	1.88	1.89	1.89	1.90
3	2.25	2.26	2.27	2.27	2.28
3.5	2.63	2.64	2.65	2.66	2.67
4	3.00	3.01	3.03	3.04	3.06
4.5	3.38	3.39	3.41	3.43	3.45
5	3.75	3.77	3.80	3.82	3.84
5.5	4.13	4.15	4.18	4.21	4.24
6	4.50	4.53	4.57	4.60	4.63
6.5	4.88	4.91	4.95	4.99	5.03
7	5.25	5.29	5.34	5.38	5.43
7.5	5.63	5.68	5.73	5.78	5.83
8	6.00	6.06	6.12	6.17	6.23
8.5	6.38	6.44	6.51	6.57	6.63
9	6.75	6.82	6.90	6.97	7.04
9.5	7.13	7.21	7.29	7.37	7.45
10	7.50	7.59	7.68	7.77	7.85
11	8.25	8.36	8.47	8.57	8.68
12	9.00	9.13	9.26	9.38	9.50
13	9.75	9.90	10.05	10.19	10.34
14	10.50	10.67	10.84	11.01	11.17
15	11.25	11.45	11.64	11.83	12.02
16	12.00	12.23	12.45	12.66	12.87
17	12.75	13.00	13.25	13.49	13.72
18	13.50	13.78	14.06	14.33	14.58
19	14.25	14.56	14.87	15.17	15.45
20	15.00	15.35	15.68	16.01	16.32
21	15.75	16.13	16.50	16.85	17.19
22	16.50	16.92	17.32	17.70	18.07
23	17.25	17.70	18.14	18.56	18.95
24	18.00	18.49	18.96	19.42	19.84
25	18.75	19.28	19.79	20.28	20.73
26	19.50	20.07	20.62	21.14	21.63
27	20.25	20.86	21.45	22.01	22.52
28	21.00	21.66	22.29	22.88	23.43
29	21.75	22.45	23.12	23.75	24.33
30	22.50	23.25	23.96	24.63	25.24

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 30.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.35	.35	.35	.35	.35
1	.70	.70	.70	.70	.70
1.5	1.05	1.05	1.05	1.06	1.06
2	1.40	1.40	1.41	1.41	1.42
2.5	1.75	1.76	1.76	1.77	1.78
3	2.10	2.11	2.12	2.13	2.14
3.5	2.45	2.46	2.48	2.49	2.50
4	2.80	2.82	2.83	2.85	2.87
4.5	3.15	3.17	3.19	3.21	3.23
5	3.50	3.53	3.55	3.58	3.60
5.5	3.85	3.88	3.91	3.94	3.97
6	4.20	4.24	4.27	4.31	4.35
6.5	4.55	4.59	4.64	4.68	4.72
7	4.90	4.95	5.00	5.05	5.10
7.5	5.25	5.31	5.37	5.42	5.48
8	5.60	5.67	5.73	5.80	5.86
8.5	5.95	6.02	6.10	6.17	6.24
9	6.30	6.38	6.47	6.55	6.63
9.5	6.65	6.74	6.83	6.93	7.02
10	7.00	7.10	7.20	7.30	7.40
11	7.70	7.82	7.95	8.07	8.19
12	8.40	8.55	8.69	8.83	8.98
13	9.10	9.27	9.44	9.61	9.77
14	9.80	10.00	10.19	10.39	10.58
15	10.50	10.73	10.95	11.17	11.39
16	11.20	11.46	11.71	11.96	12.20
17	11.90	12.19	12.47	12.75	13.03
18	12.60	12.92	13.24	13.55	13.85
19	13.30	13.66	14.01	14.35	14.69
20	14.00	14.39	14.78	15.16	15.53
21	14.70	15.13	15.56	15.97	16.37
22	15.40	15.87	16.34	16.79	17.22
23	16.10	16.61	17.12	17.61	18.08
24	16.80	17.36	17.91	18.44	18.94
25	17.50	18.10	18.70	19.27	19.81
26	18.20	18.85	19.49	20.10	20.68
27	18.90	19.60	20.28	20.94	21.56
28	19.60	20.35	21.08	21.78	22.44
29	20.30	21.10	21.88	22.63	23.32
30	21.00	21.86	22.69	23.48	24.21

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 35.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.33	.33	.33	.33	.33
1	.65	.65	.65	.65	.65
1.5	.98	.98	.98	.98	.99
2	1.30	1.30	1.31	1.31	1.32
2.5	1.63	1.63	1.64	1.65	1.65
3	1.95	1.96	1.97	1.98	1.99
3.5	2.28	2.29	2.30	2.32	2.33
4	2.60	2.62	2.64	2.65	2.67
4.5	2.93	2.95	2.97	2.99	3.02
5	3.25	3.28	3.31	3.33	3.36
5.5	3.58	3.61	3.64	3.68	3.71
6	3.90	3.94	3.98	4.02	4.06
6.5	4.23	4.27	4.32	4.37	4.42
7	4.55	4.60	4.66	4.72	4.77
7.5	4.88	4.94	5.00	5.07	5.13
8	5.20	5.27	5.34	5.42	5.49
8.5	5.53	5.61	5.69	5.77	5.85
9	5.85	5.94	6.03	6.12	6.21
9.5	6.18	6.28	6.38	6.48	6.58
10	6.50	6.61	6.72	6.84	6.95
11	7.15	7.28	7.42	7.56	7.69
12	7.80	7.96	8.12	8.28	8.44
13	8.45	8.64	8.82	9.01	9.20
14	9.10	9.32	9.53	9.75	9.97
15	9.75	10.00	10.25	10.50	10.74
16	10.40	10.68	10.96	11.24	11.52
17	11.05	11.37	11.68	12.00	12.31
18	11.70	12.05	12.41	12.76	13.11
19	12.35	12.74	13.14	13.53	13.91
20	13.00	13.43	13.87	14.30	14.72
21	13.65	14.13	14.60	15.08	15.54
22	14.30	14.82	15.34	15.86	16.36
23	14.95	15.52	16.09	16.65	17.19
24	15.60	16.22	16.83	17.44	18.02
25	16.25	16.92	17.58	18.24	18.86
26	16.90	17.62	18.34	19.04	19.71
27	17.55	18.32	19.10	19.85	20.56
28	18.20	19.03	19.86	20.66	21.42
29	18.85	19.74	20.62	21.47	22.28
30	19.50	20.45	21.39	22.29	23.15

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 40.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE %				
	LAG IN PAYMENT OF TAX (YEARS)				
	.00	.50	1.00	1.50	2.00
.5	.30	.30	.30	.30	.30
1	.60	.60	.60	.60	.60
1.5	.90	.90	.91	.91	.91
2	1.20	1.20	1.21	1.21	1.22
2.5	1.50	1.51	1.52	1.52	1.53
3	1.80	1.81	1.82	1.83	1.84
3.5	2.10	2.11	2.13	2.14	2.16
4	2.40	2.42	2.44	2.46	2.48
4.5	2.70	2.72	2.75	2.77	2.80
5	3.00	3.03	3.06	3.09	3.12
5.5	3.30	3.34	3.37	3.41	3.45
6	3.60	3.64	3.69	3.73	3.78
6.5	3.90	3.95	4.00	4.05	4.11
7	4.20	4.26	4.32	4.38	4.44
7.5	4.50	4.57	4.63	4.70	4.77
8	4.80	4.88	4.95	5.03	5.11
8.5	5.10	5.19	5.27	5.36	5.45
9	5.40	5.50	5.59	5.69	5.79
9.5	5.70	5.81	5.92	6.03	6.14
10	6.00	6.12	6.24	6.36	6.49
11	6.60	6.74	6.89	7.04	7.19
12	7.20	7.37	7.54	7.72	7.90
13	7.80	8.00	8.20	8.41	8.62
14	8.40	8.63	8.87	9.11	9.35
15	9.00	9.26	9.53	9.81	10.08
16	9.60	9.90	10.21	10.52	10.83
17	10.20	10.54	10.88	11.23	11.58
18	10.80	11.18	11.57	11.96	12.34
19	11.40	11.82	12.25	12.69	13.11
20	12.00	12.46	12.94	13.42	13.89
21	12.60	13.11	13.64	14.16	14.68
22	13.20	13.76	14.33	14.91	15.47
23	13.80	14.41	15.04	15.66	16.27
24	14.40	15.06	15.74	16.42	17.08
25	15.00	15.72	16.45	17.18	17.89
26	15.60	16.37	17.17	17.95	18.71
27	16.20	17.03	17.89	18.73	19.54
28	16.80	17.69	18.61	19.51	20.37
29	17.40	18.36	19.33	20.29	21.21
30	18.00	19.02	20.06	21.08	22.06

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 45.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % — LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.28	.28	.28	.28	.28
1	.55	.55	.55	.55	.55
1.5	.83	.83	.83	.83	.84
2	1.10	1.10	1.11	1.11	1.12
2.5	1.38	1.38	1.39	1.40	1.41
3	1.65	1.66	1.67	1.68	1.70
3.5	1.93	1.94	1.96	1.97	1.99
4	2.20	2.22	2.24	2.26	2.28
4.5	2.48	2.50	2.53	2.55	2.58
5	2.75	2.78	2.81	2.84	2.88
5.5	3.03	3.06	3.10	3.14	3.18
6	3.30	3.34	3.39	3.44	3.48
6.5	3.58	3.63	3.68	3.74	3.79
7	3.85	3.91	3.97	4.04	4.10
7.5	4.13	4.19	4.27	4.34	4.41
8	4.40	4.48	4.56	4.64	4.73
8.5	4.68	4.76	4.86	4.95	5.05
9	4.95	5.05	5.15	5.26	5.37
9.5	5.23	5.34	5.45	5.57	5.69
10	5.50	5.62	5.75	5.88	6.02
11	6.05	6.20	6.35	6.51	6.68
12	6.60	6.78	6.96	7.15	7.34
13	7.15	7.36	7.57	7.80	8.02
14	7.70	7.94	8.19	8.45	8.71
15	8.25	8.53	8.81	9.11	9.41
16	8.80	9.11	9.44	9.78	10.12
17	9.35	9.70	10.07	10.45	10.84
18	9.90	10.30	10.71	11.14	11.56
19	10.45	10.89	11.35	11.83	12.30
20	11.00	11.49	12.00	12.52	13.04
21	11.55	12.09	12.65	13.23	13.80
22	12.10	12.69	13.31	13.94	14.56
23	12.65	13.29	13.97	14.65	15.33
24	13.20	13.90	14.63	15.38	16.11
25	13.75	14.51	15.30	16.10	16.89
26	14.30	15.12	15.98	16.84	17.69
27	14.85	15.73	16.65	17.58	18.49
28	15.40	16.34	17.34	18.33	19.29
29	15.95	16.96	18.02	19.08	20.11
30	16.50	17.58	18.71	19.84	20.93

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 50.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.25	.25	.25	.25	.25
1	.50	.50	.50	.50	.51
1.5	.75	.75	.76	.76	.76
2	1.00	1.01	1.01	1.02	1.02
2.5	1.25	1.26	1.27	1.27	1.28
3	1.50	1.51	1.52	1.53	1.55
3.5	1.75	1.77	1.78	1.80	1.81
4	2.00	2.02	2.04	2.06	2.08
4.5	2.25	2.28	2.30	2.33	2.36
5	2.50	2.53	2.56	2.60	2.63
5.5	2.75	2.79	2.83	2.87	2.91
6	3.00	3.05	3.09	3.14	3.19
6.5	3.25	3.30	3.36	3.42	3.47
7	3.50	3.56	3.63	3.69	3.76
7.5	3.75	3.82	3.89	3.97	4.05
8	4.00	4.08	4.16	4.25	4.34
8.5	4.25	4.34	4.44	4.54	4.64
9	4.50	4.60	4.71	4.82	4.93
9.5	4.75	4.86	4.98	5.11	5.24
10	5.00	5.13	5.26	5.40	5.54
11	5.50	5.65	5.81	5.98	6.15
12	6.00	6.18	6.37	6.57	6.78
13	6.50	6.71	6.94	7.18	7.42
14	7.00	7.25	7.51	7.78	8.07
15	7.50	7.78	8.09	8.40	8.73
16	8.00	8.32	8.67	9.03	9.39
17	8.50	8.86	9.25	9.66	10.08
18	9.00	9.41	9.85	10.30	10.77
19	9.50	9.95	10.44	10.95	11.47
20	10.00	10.50	11.04	11.61	12.18
21	10.50	11.05	11.65	12.27	12.90
22	11.00	11.61	12.26	12.94	13.63
23	11.50	12.16	12.88	13.62	14.36
24	12.00	12.72	13.50	14.31	15.11
25	12.50	13.28	14.13	15.00	15.87
26	13.00	13.85	14.76	15.70	16.63
27	13.50	14.41	15.40	16.41	17.41
28	14.00	14.98	16.04	17.12	18.19
29	14.50	15.55	16.69	17.84	18.98
30	15.00	16.12	17.34	18.57	19.78

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 55.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.23	.23	.23	.23	.23
1	.45	.45	.45	.45	.46
1.5	.68	.68	.68	.68	.69
2	.90	.90	.91	.92	.92
2.5	1.13	1.13	1.14	1.15	1.16
3	1.35	1.36	1.37	1.38	1.40
3.5	1.58	1.59	1.61	1.62	1.64
4	1.80	1.82	1.84	1.86	1.88
4.5	2.03	2.05	2.08	2.10	2.13
5	2.25	2.28	2.31	2.35	2.38
5.5	2.48	2.51	2.55	2.59	2.64
6	2.70	2.75	2.79	2.84	2.89
6.5	2.93	2.98	3.03	3.09	3.15
7	3.15	3.21	3.28	3.34	3.42
7.5	3.38	3.45	3.52	3.60	3.68
8	3.60	3.68	3.77	3.86	3.95
8.5	3.83	3.92	4.01	4.12	4.22
9	4.05	4.15	4.26	4.38	4.50
9.5	4.28	4.39	4.51	4.64	4.77
10	4.50	4.63	4.76	4.91	5.05
11	4.95	5.10	5.27	5.44	5.62
12	5.40	5.58	5.78	5.99	6.21
13	5.85	6.06	6.30	6.54	6.80
14	6.30	6.55	6.82	7.11	7.41
15	6.75	7.04	7.35	7.68	8.03
16	7.20	7.53	7.88	8.26	8.66
17	7.65	8.02	8.42	8.85	9.30
18	8.10	8.51	8.97	9.45	9.95
19	8.55	9.01	9.52	10.06	10.61
20	9.00	9.51	10.08	10.67	11.29
21	9.45	10.01	10.64	11.30	11.97
22	9.90	10.52	11.20	11.93	12.67
23	10.35	11.03	11.78	12.57	13.37
24	10.80	11.54	12.36	13.22	14.09
25	11.25	12.05	12.94	13.87	14.82
26	11.70	12.56	13.53	14.54	15.55
27	12.15	13.08	14.12	15.21	16.30
28	12.60	13.60	14.72	15.89	17.05
29	13.05	14.12	15.32	16.57	17.81
30	13.50	14.65	15.93	17.27	18.59

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 60.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE %				
	LAG IN PAYMENT OF TAX (YEARS)				
	.00	.50	1.00	1.50	2.00
.5	.20	.20	.20	.20	.20
1	.40	.40	.40	.40	.40
1.5	.60	.60	.61	.61	.61
2	.80	.80	.81	.81	.82
2.5	1.00	1.01	1.02	1.02	1.03
3	1.20	1.21	1.22	1.23	1.25
3.5	1.40	1.41	1.43	1.45	1.46
4	1.60	1.62	1.64	1.66	1.68
4.5	1.80	1.82	1.85	1.88	1.91
5	2.00	2.03	2.06	2.10	2.13
5.5	2.20	2.24	2.28	2.32	2.36
6	2.40	2.44	2.49	2.54	2.59
6.5	2.60	2.65	2.71	2.77	2.83
7	2.80	2.86	2.93	2.99	3.07
7.5	3.00	3.07	3.14	3.22	3.31
8	3.20	3.28	3.36	3.46	3.55
8.5	3.40	3.49	3.59	3.69	3.80
9	3.60	3.70	3.81	3.93	4.05
9.5	3.80	3.91	4.03	4.17	4.30
10	4.00	4.12	4.26	4.41	4.56
11	4.40	4.55	4.72	4.90	5.09
12	4.80	4.98	5.18	5.40	5.62
13	5.20	5.41	5.65	5.90	6.17
14	5.60	5.85	6.12	6.42	6.74
15	6.00	6.28	6.60	6.95	7.31
16	6.40	6.72	7.09	7.48	7.90
17	6.80	7.17	7.58	8.03	8.50
18	7.20	7.61	8.08	8.58	9.11
19	7.60	8.06	8.58	9.15	9.74
20	8.00	8.51	9.09	9.72	10.38
21	8.40	8.96	9.61	10.30	11.03
22	8.80	9.42	10.13	10.89	11.69
23	9.20	9.88	10.65	11.49	12.36
24	9.60	10.34	11.19	12.10	13.04
25	10.00	10.80	11.73	12.72	13.74
26	10.40	11.27	12.27	13.35	14.44
27	10.80	11.73	12.82	13.98	15.16
28	11.20	12.21	13.38	14.62	15.88
29	11.60	12.68	13.94	15.27	16.62
30	12.00	13.16	14.50	15.93	17.36

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 65.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % — LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.18	.18	.18	.18	.18
1	.35	.35	.35	.35	.35
1.5	.53	.53	.53	.53	.54
2	.70	.70	.71	.71	.72
2.5	.88	.88	.89	.90	.91
3	1.05	1.06	1.07	1.08	1.09
3.5	1.23	1.24	1.25	1.27	1.29
4	1.40	1.42	1.44	1.46	1.48
4.5	1.58	1.60	1.62	1.65	1.68
5	1.75	1.78	1.81	1.84	1.88
5.5	1.93	1.96	2.00	2.04	2.08
6	2.10	2.14	2.19	2.24	2.29
6.5	2.28	2.32	2.38	2.44	2.50
7	2.45	2.51	2.57	2.64	2.71
7.5	2.63	2.69	2.77	2.84	2.93
8	2.80	2.88	2.96	3.05	3.15
8.5	2.98	3.06	3.16	3.26	3.37
9	3.15	3.25	3.36	3.47	3.60
9.5	3.33	3.43	3.55	3.69	3.83
10	3.50	3.62	3.76	3.90	4.06
11	3.85	4.00	4.16	4.34	4.54
12	4.20	4.37	4.57	4.79	5.03
13	4.55	4.76	4.99	5.25	5.53
14	4.90	5.14	5.42	5.72	6.05
15	5.25	5.53	5.85	6.20	6.58
16	5.60	5.91	6.28	6.69	7.13
17	5.95	6.31	6.73	7.19	7.69
18	6.30	6.70	7.18	7.70	8.26
19	6.65	7.10	7.63	8.22	8.84
20	7.00	7.50	8.09	8.75	9.44
21	7.35	7.90	8.56	9.29	10.06
22	7.70	8.31	9.03	9.84	10.68
23	8.05	8.71	9.51	10.39	11.32
24	8.40	9.13	10.00	10.96	11.97
25	8.75	9.54	10.49	11.54	12.63
26	9.10	9.96	10.99	12.12	13.30
27	9.45	10.37	11.49	12.72	13.98
28	9.80	10.80	12.00	13.32	14.68
29	10.15	11.22	12.52	13.94	15.39
30	10.50	11.65	13.04	14.56	16.10

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 70.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % — LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.15	.15	.15	.15	.15
1	.30	.30	.30	.30	.30
1.5	.45	.45	.45	.46	.46
2	.60	.60	.61	.61	.62
2.5	.75	.76	.76	.77	.78
3	.90	.91	.92	.93	.94
3.5	1.05	1.06	1.08	1.09	1.11
4	1.20	1.22	1.24	1.26	1.28
4.5	1.35	1.37	1.40	1.42	1.45
5	1.50	1.53	1.56	1.59	1.62
5.5	1.65	1.68	1.72	1.76	1.80
6	1.80	1.84	1.88	1.93	1.98
6.5	1.95	2.00	2.05	2.11	2.17
7	2.10	2.15	2.22	2.28	2.36
7.5	2.25	2.31	2.38	2.46	2.55
8	2.40	2.47	2.55	2.64	2.74
8.5	2.55	2.63	2.72	2.83	2.94
9	2.70	2.79	2.90	3.01	3.14
9.5	2.85	2.95	3.07	3.20	3.35
10	3.00	3.11	3.25	3.39	3.55
11	3.30	3.44	3.60	3.78	3.98
12	3.60	3.77	3.96	4.18	4.42
13	3.90	4.10	4.33	4.59	4.88
14	4.20	4.43	4.70	5.01	5.35
15	4.50	4.76	5.08	5.44	5.84
16	4.80	5.10	5.47	5.89	6.34
17	5.10	5.44	5.86	6.34	6.86
18	5.40	5.78	6.26	6.80	7.39
19	5.70	6.13	6.67	7.27	7.93
20	6.00	6.48	7.08	7.76	8.49
21	6.30	6.83	7.50	8.25	9.06
22	6.60	7.19	7.92	8.75	9.65
23	6.90	7.54	8.35	9.27	10.25
24	7.20	7.90	8.79	9.79	10.86
25	7.50	8.26	9.23	10.33	11.49
26	7.80	8.63	9.69	10.88	12.13
27	8.10	9.00	10.14	11.43	12.78
28	8.40	9.37	10.61	12.00	13.44
29	8.70	9.74	11.08	12.57	14.12
30	9.00	10.12	11.55	13.15	14.81

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 75.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % — LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.13	.13	.13	.13	.13
1	.25	.25	.25	.25	.25
1.5	.38	.38	.38	.38	.38
2	.50	.50	.51	.51	.52
2.5	.63	.63	.64	.64	.65
3	.75	.76	.77	.78	.79
3.5	.88	.89	.90	.91	.93
4	1.00	1.02	1.03	1.05	1.07
4.5	1.13	1.15	1.17	1.19	1.22
5	1.25	1.27	1.30	1.33	1.37
5.5	1.38	1.41	1.44	1.48	1.52
6	1.50	1.54	1.58	1.62	1.67
6.5	1.63	1.67	1.72	1.77	1.83
7	1.75	1.80	1.86	1.92	1.99
7.5	1.88	1.93	2.00	2.08	2.16
8	2.00	2.07	2.14	2.23	2.33
8.5	2.13	2.20	2.29	2.39	2.50
9	2.25	2.33	2.43	2.55	2.68
9.5	2.38	2.47	2.58	2.71	2.86
10	2.50	2.60	2.73	2.88	3.04
11	2.75	2.88	3.03	3.22	3.42
12	3.00	3.15	3.34	3.56	3.81
13	3.25	3.43	3.66	3.92	4.22
14	3.50	3.71	3.98	4.29	4.64
15	3.75	4.00	4.31	4.67	5.08
16	4.00	4.28	4.64	5.07	5.53
17	4.25	4.57	4.98	5.47	6.01
18	4.50	4.86	5.33	5.88	6.49
19	4.75	5.16	5.69	6.31	6.99
20	5.00	5.45	6.05	6.74	7.51
21	5.25	5.75	6.41	7.19	8.04
22	5.50	6.05	6.79	7.65	8.59
23	5.75	6.36	7.17	8.12	9.15
24	6.00	6.67	7.56	8.60	9.73
25	6.25	6.98	7.95	9.09	10.32
26	6.50	7.29	8.36	9.60	10.92
27	6.75	7.61	8.77	10.11	11.54
28	7.00	7.93	9.18	10.63	12.17
29	7.25	8.25	9.60	11.17	12.82
30	7.50	8.57	10.03	11.71	13.47

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 80.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % — LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.10	.10	.10	.10	.10
1	.20	.20	.20	.20	.20
1.5	.30	.30	.30	.31	.31
2	.40	.40	.41	.41	.41
2.5	.50	.51	.51	.52	.52
3	.60	.61	.62	.63	.64
3.5	.70	.71	.72	.73	.75
4	.80	.81	.83	.85	.87
4.5	.90	.92	.94	.96	.99
5	1.00	1.02	1.05	1.08	1.11
5.5	1.10	1.13	1.16	1.19	1.23
6	1.20	1.23	1.27	1.31	1.36
6.5	1.30	1.34	1.38	1.43	1.49
7	1.40	1.44	1.50	1.56	1.63
7.5	1.50	1.55	1.61	1.69	1.77
8	1.60	1.66	1.73	1.81	1.91
8.5	1.70	1.77	1.85	1.95	2.06
9	1.80	1.87	1.97	2.08	2.21
9.5	1.90	1.98	2.09	2.22	2.36
10	2.00	2.09	2.21	2.35	2.52
11	2.20	2.31	2.46	2.64	2.84
12	2.40	2.54	2.72	2.94	3.18
13	2.60	2.76	2.98	3.24	3.54
14	2.80	2.99	3.25	3.56	3.91
15	3.00	3.22	3.52	3.89	4.31
16	3.20	3.46	3.81	4.23	4.71
17	3.40	3.69	4.09	4.58	5.14
18	3.60	3.93	4.39	4.95	5.58
19	3.80	4.17	4.69	5.32	6.03
20	4.00	4.41	5.00	5.71	6.51
21	4.20	4.66	5.32	6.11	7.00
22	4.40	4.91	5.64	6.52	7.50
23	4.60	5.16	5.97	6.94	8.02
24	4.80	5.42	6.31	7.38	8.56
25	5.00	5.68	6.65	7.83	9.11
26	5.20	5.94	7.00	8.28	9.68
27	5.40	6.20	7.36	8.75	10.26
28	5.60	6.47	7.73	9.24	10.86
29	5.80	6.73	8.10	9.73	11.48
30	6.00	7.01	8.48	10.23	12.10

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 85.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.08	.08	.08	.08	.08
1	.15	.15	.15	.15	.15
1.5	.23	.23	.23	.23	.23
2	.30	.30	.31	.31	.31
2.5	.38	.38	.38	.39	.40
3	.45	.46	.46	.47	.48
3.5	.53	.53	.54	.55	.57
4	.60	.61	.62	.64	.66
4.5	.68	.69	.71	.73	.75
5	.75	.77	.79	.82	.85
5.5	.83	.85	.87	.91	.94
6	.90	.93	.96	1.00	1.05
6.5	.98	1.01	1.05	1.09	1.15
7	1.05	1.09	1.13	1.19	1.26
7.5	1.13	1.17	1.22	1.29	1.37
8	1.20	1.25	1.31	1.39	1.49
8.5	1.28	1.33	1.41	1.50	1.60
9	1.35	1.41	1.50	1.60	1.73
9.5	1.43	1.50	1.59	1.71	1.85
10	1.50	1.58	1.69	1.82	1.98
11	1.65	1.75	1.88	2.06	2.26
12	1.80	1.92	2.09	2.30	2.55
13	1.95	2.09	2.29	2.55	2.85
14	2.10	2.27	2.51	2.82	3.17
15	2.25	2.44	2.73	3.09	3.51
16	2.40	2.62	2.96	3.38	3.87
17	2.55	2.81	3.19	3.68	4.25
18	2.70	2.99	3.43	3.99	4.64
19	2.85	3.18	3.68	4.32	5.05
20	3.00	3.37	3.94	4.66	5.48
21	3.15	3.56	4.20	5.00	5.92
22	3.30	3.76	4.47	5.37	6.39
23	3.45	3.95	4.75	5.74	6.87
24	3.60	4.16	5.03	6.13	7.36
25	3.75	4.36	5.32	6.53	7.88
26	3.90	4.57	5.62	6.94	8.41
27	4.05	4.78	5.93	7.37	8.95
28	4.20	4.99	6.25	7.80	9.52
29	4.35	5.20	6.57	8.25	10.09
30	4.50	5.42	6.90	8.71	10.69

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 90.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % — LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.05	.05	.05	.05	.05
1	.10	.10	.10	.10	.10
1.5	.15	.15	.15	.15	.16
2	.20	.20	.20	.21	.21
2.5	.25	.25	.26	.26	.27
3	.30	.30	.31	.32	.32
3.5	.35	.36	.36	.37	.38
4	.40	.41	.42	.43	.45
4.5	.45	.46	.48	.49	.51
5	.50	.51	.53	.55	.58
5.5	.55	.57	.59	.62	.65
6	.60	.62	.65	.68	.73
6.5	.65	.67	.71	.75	.80
7	.70	.73	.77	.82	.88
7.5	.75	.78	.83	.89	.97
8	.80	.84	.89	.97	1.06
8.5	.85	.89	.96	1.04	1.15
9	.90	.95	1.03	1.12	1.24
9.5	.95	1.01	1.09	1.20	1.34
10	1.00	1.06	1.16	1.29	1.44
11	1.10	1.18	1.30	1.46	1.66
12	1.20	1.30	1.45	1.65	1.90
13	1.30	1.41	1.60	1.85	2.15
14	1.40	1.54	1.76	2.06	2.42
15	1.50	1.66	1.93	2.28	2.71
16	1.60	1.79	2.10	2.52	3.01
17	1.70	1.91	2.28	2.76	3.34
18	1.80	2.04	2.46	3.02	3.68
19	1.90	2.18	2.66	3.29	4.04
20	2.00	2.31	2.86	3.58	4.42
21	2.10	2.45	3.06	3.88	4.82
22	2.20	2.59	3.28	4.19	5.24
23	2.30	2.73	3.50	4.51	5.68
24	2.40	2.88	3.73	4.85	6.13
25	2.50	3.03	3.97	5.20	6.61
26	2.60	3.18	4.22	5.57	7.10
27	2.70	3.33	4.47	5.94	7.61
28	2.80	3.49	4.73	6.33	8.13
29	2.90	3.65	5.00	6.74	8.67
30	3.00	3.81	5.28	7.15	9.23

TABLE A: CONVERSION OF NOMINAL PRE TAX TO NOMINAL POST TAX DISCOUNT RATES

MARGINAL TAX RATE(PER CENT) 95.00

PRE TAX NOMINAL DISCOUNT RATE %	POST TAX NOMINAL DISCOUNT RATE % — LAG IN PAYMENT OF TAX (YEARS) .00	.50	1.00	1.50	2.00
.5	.03	.03	.03	.03	.03
1	.05	.05	.05	.05	.05
1.5	.08	.08	.08	.08	.08
2	.10	.10	.10	.10	.11
2.5	.13	.13	.13	.13	.14
3	.15	.15	.16	.16	.17
3.5	.18	.18	.18	.19	.20
4	.20	.21	.21	.22	.24
4.5	.23	.23	.24	.26	.27
5	.25	.26	.27	.29	.32
5.5	.28	.29	.30	.33	.36
6	.30	.31	.34	.37	.40
6.5	.33	.34	.37	.41	.45
7	.35	.37	.40	.45	.51
7.5	.38	.40	.44	.49	.56
8	.40	.43	.47	.54	.62
8.5	.43	.46	.51	.59	.68
9	.45	.48	.55	.64	.75
9.5	.48	.51	.59	.69	.82
10	.50	.54	.63	.75	.90
11	.55	.61	.71	.87	1.06
12	.60	.67	.80	1.00	1.24
13	.65	.73	.90	1.14	1.43
14	.70	.80	1.00	1.29	1.65
15	.75	.87	1.11	1.46	1.88
16	.80	.94	1.23	1.63	2.14
17	.85	1.01	1.35	1.82	2.41
18	.90	1.09	1.48	2.03	2.70
19	.95	1.17	1.62	2.25	3.01
20	1.00	1.25	1.76	2.48	3.34
21	1.05	1.33	1.91	2.72	3.70
22	1.10	1.41	2.07	2.98	4.07
23	1.15	1.50	2.24	3.25	4.46
24	1.20	1.59	2.41	3.54	4.87
25	1.25	1.68	2.59	3.84	5.30
26	1.30	1.78	2.79	4.16	5.75
27	1.35	1.88	2.98	4.48	6.22
28	1.40	1.98	3.19	4.83	6.71
29	1.45	2.08	3.41	5.18	7.21
30	1.50	2.19	3.63	5.55	7.73

TABLE C: PRESENT VALUE PER DOLLAR OF CAPITAL INVESTMENT FOR DIMINISHING BALANCE DEPRECIATION SCHEDULES

MARGINAL TAX RATE(PER CENT) 100

POST TAX NOMINAL DISCOUNT RATE %	I%= 0 F%= 25.00 D%= 10.00 S%= 0	0 25.00 15.00 0	0 25.00 25.00 0	0 25.00 50.00 0
.5	.9643	.9758	.9853	.9926
1	.9318	.9531	.9712	.9853
1.5	.9022	.9318	.9575	.9782
2	.875	.9118	.9444	.9712
2.5	.85	.8929	.9318	.9643
3	.8269	.875	.9196	.9575
3.5	.8056	.8581	.9079	.9509
4	.7857	.8421	.8966	.9444
4.5	.7672	.8269	.8856	.9381
5	.75	.8125	.875	.9318
5.5	.7339	.7988	.8648	.9257
6	.7188	.7857	.8548	.9196
6.5	.7045	.7733	.8452	.9137
7	.6912	.7614	.8359	.9079
7.5	.6786	.75	.8269	.9022
8	.6667	.7391	.8182	.8966
8.5	.6554	.7287	.8097	.8910
9	.6447	.7188	.8015	.8856
9.5	.6346	.7092	.7935	.8803
10	.625	.7	.7857	.875
11	.6071	.6827	.7708	.8648
12	.5909	.6667	.7568	.8548
13	.5761	.6518	.7434	.8452
14	.5625	.6379	.7308	.8359
15	.55	.625	.7188	.8269
16	.5385	.6129	.7073	.8182
17	.5278	.6016	.6964	.8097
18	.5179	.5909	.6860	.8015
19	.5086	.5809	.6761	.7935
20	.5	.5714	.6667	.7857
21	.4919	.5625	.6576	.7782
22	.4844	.5541	.6489	.7708
23	.4773	.5461	.6406	.7637
24	.4706	.5385	.6327	.7568
25	.4643	.5313	.625	.75
26	.4583	.5244	.6176	.7434
27	.4527	.5179	.6106	.7370
28	.4474	.5116	.6038	.7308
29	.4423	.5057	.5972	.7247
30	.4375	.5	.5909	.7188

I%=INVESTMENT ALLOWANCE
F%=FIRST YEAR ALLOWANCE
D%=ANNUAL ALLOWANCE (DIMINISHING BALANCE)

TABLE D: DISCOUNT FACTORS FOR CALCULATION OF EFFECTIVE MARGINAL TAX RATE

POST TAX DISCOUNT RATE %	DELAY IN TAX LIABILITY/RELIEF (YEARS) .50	1.00	1.50	2.00
.5	.9975	.9950	.9925	.9901
1	.9950	.9901	.9852	.9803
1.5	.9926	.9852	.9779	.9707
2	.9901	.9804	.9707	.9612
2.5	.9877	.9756	.9636	.9518
3	.9853	.9709	.9566	.9426
3.5	.9829	.9662	.9497	.9335
4	.9806	.9615	.9429	.9246
4.5	.9782	.9569	.9361	.9157
5	.9759	.9524	.9294	.9070
5.5	.9736	.9479	.9228	.8985
6	.9713	.9434	.9163	.8900
6.5	.9690	.9390	.9099	.8817
7	.9667	.9346	.9035	.8734
7.5	.9645	.9302	.8972	.8653
8	.9623	.9259	.8910	.8573
8.5	.9600	.9217	.8848	.8495
9	.9578	.9174	.8787	.8417
9.5	.9556	.9132	.8727	.8340
10	.9535	.9091	.8668	.8264
11	.9492	.9009	.8551	.8116
12	.9449	.8929	.8437	.7972
13	.9407	.8850	.8325	.7831
14	.9366	.8772	.8216	.7695
15	.9325	.8696	.8109	.7561
16	.9285	.8621	.8004	.7432
17	.9245	.8547	.7902	.7305
18	.9206	.8475	.7801	.7182
19	.9167	.8403	.7703	.7062
20	.9129	.8333	.7607	.6944
21	.9091	.8264	.7513	.6830
22	.9054	.8197	.7421	.6719
23	.9017	.8130	.7331	.6610
24	.8980	.8065	.7242	.6504
25	.8944	.8000	.7155	.6400
26	.8909	.7937	.7070	.6299
27	.8874	.7874	.6987	.6200
28	.8839	.7812	.6905	.6104
29	.8805	.7752	.6825	.6009
30	.8771	.7692	.6747	.5917