THE IMPACT OF TAXATION ON THE CAPITAL BUDGETING DECISION OF CORPORATE GROUPS

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A thesis submitted to the Council for National Academic Awards in partial fulfilment of the requirements for the Degree of Doctor of Philosophy.

Plymouth Polytechnic,
Plymouth Business School.

Collaborating Establishment
University of Aston

July, 1987
Declaration

I, hereby declare that whilst registered as a candidate for the degree of Doctor of Philosophy with the Council for National Academic Awards, I have not been a registered candidate for another award of the Council for National Academic Awards, nor of a University.

The following activities, comprising the programme of related studies, have been undertaken:

Attendance at conferences held by the British Accounting Association, the European Accounting Association and the European Finance Association.

Attendance at lectures given by the Institute of Chartered Accountants, England and Wales.

Study, by correspondence course, of the Institute of Taxation Intermediate Stage Examination.

LYNN HODGKINSON
The United Kingdom Tax system is not neutral with respect to a company's investment and financing decisions, that is incentives and disincentives to invest in particular projects or use particular types of financing arise through the imposition of taxation. Such biases may increase or decrease the value of capital projects, and if a company is to be certain of making accurate investment decisions the incremental tax flows arising due to the project must be included in the evaluation.

The tax flows arising through the acceptance of a project may differ depending on the company's or group's tax profile, and therefore the overall tax position of the company or group must be considered. The thesis explains the legislation relating to the taxation of corporate groups and suggests that because the tax system is so complicated, a computerised model is probably necessary. The author's computerised model is developed and tested in the thesis, comparing evaluations conducted using the procedures and assumptions of groups in the surveys, with those of the simulation model. It is shown that both understatements and overstatements occur through incorrectly allowing for taxation.

The results of two empirical surveys are presented. The first, a postal survey, discusses the methods used by companies to incorporate tax in their project appraisals, and the second, based on interviews, provides a review of the whole capital budgeting process.
I would like to extend my thanks and gratitude to

the members of the Accounting Group, Plymouth Polytechnic for their helpful comments and guidance,

the companies who have participated in the empirical surveys,

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My thanks are particularly extended to my supervisors, Dr. John Pointon and Mr. Edward McLaney, whose support and guidance throughout the writing of this thesis have been much appreciated.

Any remaining imperfections are the responsibility of the author.
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Chapter 1

INTRODUCTION

The United Kingdom tax system creates biases in the investment and financing decisions of firms, which, if a company ignores, may lead to sub-optimal decisions; therefore a method of integrating the tax effects must be available. However at present no such rigorous models are available, and most companies, if they attempt to include the effects of taxation at all, do so in a haphazard way. Thus this thesis will attempt to fulfil this need. The primary aim is as follows:

1. To develop simulation models to encapsulate taxation induced interdependencies in the capital budgeting decision of corporate group structures, which is supported by a secondary aim as follows:

2. To demonstrate that sub-optimal decisions may and do arise as a result of the evaluation procedures used by companies which ignore such interdependencies.

Hence there are two stages to the research, the development of the models and an empirical survey to provide insights into what companies actually do in practice. An overview of the chapters will now follow.

The British tax system, as it relates to corporations is reviewed in Chapter 2, when the question as to why corporations are taxed separately from their owners is addressed. An overview of why
incentives and disincentives arise through the imposition of corporation tax. It is then provided, followed by a brief history of corporation tax to illustrate how the different aspects of the tax have developed.

Chapter 3 reviews the capital budgeting process, and a summary of the different surveys conducted in this field is given. This enables a fuller knowledge of the capital budgeting process as a whole to be gained, and provides a useful base for the empirical survey.

Chapter 4 addresses the question as to why and how biases arise in the investment decision of firms. It explores the requirements for neutrality and looks at the more popular of the evaluation techniques and how their results are affected when tax is taken into account. It builds on Chapter 2 by giving a fuller description of how corporation tax is actually imposed.

Financing decisions have an impact on the investment decisions of companies, because the method and cost of financing the investment will obviously have to be included in the evaluation. The companies present financial structure, and their policies with respect to distributions also have an impact on the worth of a project. This area is explored in Chapter 5, and the interactions between investment and financing are more fully discussed.

Corporation tax as it affects corporate groups is explored in
Chapter 6, where a full description of the legislation is given. Taxation induced interdependencies are even more prominent in the capital investment decisions of corporate group structures, due to the possibility of transferring capital allowances and losses between member companies. The effects arising from such interdependencies are examined and several examples are provided.

In Chapter 7 the simulation models are developed. Initially a simple net present value model is used, which is then extended in stages until simulation models fully integrating the taxation of corporate groups are built. These models are tested under different tax profiles to determine the effects taxation has on the investments.

The research methodology forms the basis for Chapter 8 where the methods of collecting information for the empirical survey are discussed.

The present methods used by companies to incorporate tax in their capital budgeting evaluations are considered in Chapter 9, where the results of a postal survey are discussed. The companies included in the survey were chosen from the top 500 companies in the "Times 1000", and a response rate of 57% was achieved.

To provide a fuller picture of the capital budgeting practices of companies an interview survey has been conducted with 33 companies. Their practices and the assumptions they adopt in
their capital budgeting decisions are reported in Chapter 10.

Chapter 11 presents the results of 9 case studies comparing the evaluations of capital projects using the companies' methods and the evaluations using the simulation model. Where possible actual projects have been obtained, but some companies were reluctant to provide such information, in which case hypothetical projects have been developed and analysed according to the standard company procedures.

The conclusions are written up in Chapter 12, where the aims are readdressed. The structure of the thesis is shown on page 5.

The thesis is based on tax legislation immediately following the Finance Act of 1985.
Diagram 1

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Capital Budgeting Theory
Chapter 3

Neutrality and Investment
Chapter 4

Neutrality and Finance
Chapter 5

Taxation of Corporate Group Structures
Chapter 6

Development of Simulation Model
Chapter 7

Research Methodology
Chapter 8

Questionnaire Survey
Chapter 9

Interview Survey
Chapter 10

Case Studies

Evaluations by the Companies
Comparisons
Chapter 11

Evaluations using Model

Results and Conclusions
Chapter 12
CHAPTER 2

THE BRITISH TAX SYSTEM
(as it affects corporations)

The tax system existing in the United Kingdom requires that incorporated associations be subject to corporation tax on their profits. This chapter examines the rationale behind taxing corporations, provides a brief history of how corporation tax developed and discusses the structure of corporation tax. The implications of a tax system giving rise to incentives and disincentives in the company's investment and financing decisions are briefly explored, but will receive a more in-depth treatment in Chapters 4 and 5.

Why tax corporations?

Corporation Tax, which used to be a major source of revenue for the Government has reduced dramatically over recent years, (see Table 1) to such an extent that people are questioning the justification for its existence, and asking why tax corporations at all. This chapter examines the question.

A common reply is that corporate status conveys certain benefits and privileges for which the company should pay, in particular the limited liability status afforded to shareholders in the event of insolvency. If the profits of an organisation were to rise on incorporation, it may be acceptable to tax corporations, however Kay and King (1978) suggest that the reverse may be nearer the truth.
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<th>1972</th>
<th>1982</th>
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<td>Income Tax</td>
<td>32%</td>
<td>31%</td>
<td>28%</td>
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<tr>
<td>Tax on Corporations</td>
<td>4%</td>
<td>7%</td>
<td>5%</td>
</tr>
<tr>
<td>Estate Duty/CTT</td>
<td>3%</td>
<td>2%</td>
<td>.5%</td>
</tr>
<tr>
<td>Capital Gains Tax</td>
<td>n/a</td>
<td>1%</td>
<td>.5%</td>
</tr>
<tr>
<td>Petroleum Revenue Tax</td>
<td>n/a</td>
<td>n/a</td>
<td>5%</td>
</tr>
<tr>
<td>Purchase Tax/VAT</td>
<td>7%</td>
<td>7%</td>
<td>13%</td>
</tr>
<tr>
<td>National Insurance</td>
<td>15%</td>
<td>15%</td>
<td>20%</td>
</tr>
<tr>
<td>Local Authority Rates</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
</tr>
</tbody>
</table>

(Source: "Britain: The Case for Tax Reform" The Economist, September 17, 1983)
Nevertheless, companies do continue to incorporate so there is apparently some advantage for doing so. For large firms at least, the free transferability of shares between shareholders without affecting the day to day management of the firm is surely an advantage. The smaller company may also benefit from tax inducements, for example by ploughing profits back into the company the owner can avoid paying income tax at the cost of paying corporation tax now and capital gains later. For example, if the marginal tax rate of a small company is 30% (prior to the Finance Act 1986), whilst the marginal tax rate of the owner of an unincorporated business may be up to 60%, he will achieve some tax advantage by incorporating, see Table 2. A saving of £450 will result if the business is incorporated. However, there are provisions in respect of close companies aimed at preventing this type of avoidance. A close company is defined as "one which is under the control of five or fewer participators who are directors" and s.16 of the Finance Act 1972 provides that in such cases where distributions fall below their "relevant income" the deficiency may be apportioned to the participators and taxed at higher rates, unless the company can justify the distribution of a lower amount to the Inland Revenue. Nevertheless, incorporation may still be worthwhile in terms of tax saving providing the owner's marginal rate of income tax is high and the dividend payout ratio is less than 100%.

An alternative argument is that "an old tax is a good tax" (Meade
Table 2

<table>
<thead>
<tr>
<th></th>
<th>unincorporated</th>
<th>incurred</th>
</tr>
</thead>
<tbody>
<tr>
<td>tax</td>
<td></td>
<td>tax</td>
</tr>
<tr>
<td>Profit</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>50% gross dividend</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td>MCT (GCT - ACT)</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td>Net Dividend Received</td>
<td>3,500</td>
<td></td>
</tr>
<tr>
<td>Income Tax</td>
<td>6,000</td>
<td>3,000</td>
</tr>
<tr>
<td>less Tax Credit</td>
<td>(1,500)</td>
<td></td>
</tr>
<tr>
<td>Retention (10,000-3,500-1,500-1,500)</td>
<td>3,500</td>
<td></td>
</tr>
<tr>
<td>Capital Gains Tax</td>
<td></td>
<td>1,050</td>
</tr>
<tr>
<td>Total Tax Paid</td>
<td>6,000</td>
<td>5,550</td>
</tr>
</tbody>
</table>

Notes

ACT = Advance Corporation Tax paid by companies on distributions.
GCT = Gross Corporation Tax, the total tax liability of the company
MCT = Mainstream Corporation Tax, GCT - ACT

It is assumed that the share price of the company increases by the amount of the retention and that shareholders immediately dispose of the shares.

National Insurance Contributions are ignored.
and it could be merely the fact that corporation tax already exists, that is should continue to do so. One effect of abolishing corporation tax now, which supports this argument, is that an unexpected windfall would accrue to existing shareholders.

In any event it would appear that corporation tax is here to stay.

Kay and King (1978) consider the effects of corporation tax on the economy and who bears the burden of the taxation in their book "The British Tax System". They state that three groups bear the burden; the entrepreneurs, the suppliers of finance and the buyers of goods and services. The entrepreneurs may make larger than average profits, resulting in a high return to capital. This may occur through the exploitation of a successful invention, through being an exceptionally successful and efficient firm with accumulated goodwill enabling the company to charge higher prices than its competitors, or perhaps through being a "near-monopolist".

If a company is in such a situation it will be paying corporation tax on these above average profits, "pure profits", whereas if a company is foolhardy either by fault or situation it will pay very little in taxation, possible receiving relief for tax losses, (such reliefs will not be obtained until the company is making taxable profits.) Thus the main burden of taxation is
borne by companies making pure profits; Kay and King refer to these profits as returns to entrepreneurship.

If the company is a "near-monopolist" there could be some justification for the burden, assuming near monopolies are not to the benefit of the economy as a whole. However, it is not desirable for the two other situations to be penalised. If the entrepreneurs are not too sensitive to monetary rewards the effect on the economy will be negligible, as the entrepreneur will bear the extra tax. However, the imposition of the tax may cause him to abandon his entrepreneurship and enter more routine employment where his tax payments will be lower. Here, the economy suffers, consumers will have to pay higher prices to encourage more entrepreneurship or there will be a loss of efficiency and ideas. This leads to an excess burden of taxation as no-one benefits, but some people lose.

Returning to the question as to why companies incorporate; if the above mentioned situation were to occur in the unincorporated sector the entrepreneur may find himself subject to taxation in excess of what would be paid were he incorporated.

The suppliers of finance may also bear some of the burden if the tax system is not neutral, and may lead to a preference for overseas investments if the domestic tax rate is seen as too high. Companies will then have to pay higher prices for their capital, which will in turn reduce the "pure profits" for the
company and quite likely mean a higher price is charged to consumers. The desirability of and requirements for a neutral tax system will be examined in later chapters.

Given that a corporation tax is here is to stay the effects of such a tax on capital investment and financing need to be examined further, but first an examination of the history and structure of the United Kingdom corporation tax will receive attention.

Structure and History

Prior to the First World War companies were taxed similarly to individuals; that is the taxation of corporate profits was integrated with the personal income tax. But, with the oncoming of the war the government imposed a special tax on profits to raise extra revenue. These special taxes lasted from 1915 to 1924 and were again imposed from 1937 onwards. Companies had enjoyed the separation of control from ownership since the nineteenth century, but it took until 1947 for the separate taxation of companies to come into force. In 1947 the whole system was rationalised by increasing the rate of Profits Tax and exempting partnerships and individuals from such taxes. This meant that companies were subject to both Income Tax and a special Profits Tax. Since then many changes have occurred, the two major changes occurring in 1965 and 1973.
The "classical system" was introduced by the Finance Act of 1965, and replaced the existing system of Income Tax and Profits Tax. This occurred partly to effect a greater separation of the taxation of incorporated businesses from that of individuals or partnerships. It also placed an important tool in the hands of the Government, who could now effect changes in company behaviour by altering the rates of tax or allowances, for example the Government could induce greater investment by allowing accelerated depreciation as an expense rather than economic depreciation, that is true economic wear and tear. However, the classical system received criticism on the basis that dividends were taxed twice, firstly in the hands of the company, by way of corporation tax and secondly in the hands of the shareholder, through income tax. It was argued that this led to a bias towards the retention of profit. If such retentions led to higher levels of investment it may not be unsatisfactory, however to sustain an effective capital market it is better to let the shareholders have a share in the profits so they are able to choose the best investments available. The second argument against the classical system is the inequality created against incorporated businesses, as unincorporated businesses and individuals were not subject to this double taxation. However, as illustrated above, they may be subject to high marginal tax rates which could somewhat offset this.

The classical system was replaced by the imputation system in 1973. Under the imputation system, ACT (advance corporation tax)
is payable by the company on distributions made to its shareholders, then at the end of the accounting period the company's taxable profits are charged at the appropriate rate of tax to arrive at the Gross Corporation Tax (GCT), then, subject to adequate taxable profits, the ACT is deducted from the GCT and the remainder, the Mainstream Corporation Tax (MCT) is payable to the Inland Revenue. The shareholder then receives the dividend net of tax. If his marginal tax rate is equal to the basic rate of income tax, no further tax is payable or refundable. If his tax rate is higher, he will pay the difference on his annual assessment, and if his marginal tax rate is zero he will be able to claim a refund from the Inland Revenue.

James and Nobes (1978) show how the effective rate of income tax on cash dividends can be calculated, that is

\[
\frac{m-b}{1-b}
\]

where, \( m \) = the shareholder's marginal tax rate, and \( b \) = the basic income tax rate.

Table 3 shows what the effective tax rate on cash dividends is under different marginal tax rates. The dividend paid to the shareholder with a zero marginal tax rate is actually worth 43% more than its face value.

The full corporate tax rate remained at 52% until the Finance Act of 1984, which reduced the rate progressively to 35% for companies with large relevant profits and 30% for companies with small relevant profits. This Act brought with it several other
Table 3

Table showing the effective rate of tax at different marginal personal income tax rates

<table>
<thead>
<tr>
<th>individual's marginal tax rate m%</th>
<th>effective tax rate on cash dividends (m-b)/(1-b)%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-43</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>14</td>
</tr>
<tr>
<td>50</td>
<td>29</td>
</tr>
<tr>
<td>60</td>
<td>43</td>
</tr>
<tr>
<td>75</td>
<td>64</td>
</tr>
</tbody>
</table>

Note: the basic rate is assumed to be 30%
changes as will be discussed below. There has been considerable
debate on whether the corporation tax burden is acceptable with
some considering it to be too high, whilst others consider it
unfairly low, for example, Nader (1973) stated "the tax system
has become to a disgraceful degree an indirect subsidy to
corporations and other privileged groups". Before examining
these arguments the general scope and administration of the
corporation tax will be discussed.

Corporation tax is payable by all companies and incorporated
associations resident in the United Kingdom on all their
assessable profits, and foreign resident companies on the profits
made in the United Kingdom. Pritchard (1985) provides the
following definition of profit: "profit consisting of all
income, capital gains and franked investment income. "Income" is
the total of all items assessable under the schedules and cases
of income tax less charges and interest payments. Franked
investment income is the gross equivalent of dividends received
from other resident companies and is not chargeable to
corporation tax, but is included in the total of the profit which
determines the rate of tax."

Thus MCT is normally assessed by taking revenue less allowable
expenses assessed under the different schedules and cases, then
deducting capital allowances available for that year to arrive at
the net taxable income. Annual charges are then deducted, and
the tax rate charged to arrive at the tax borne. However, some
tax will already have been paid, that is ACT which is normally payable at a rate equivalent to the basic rate of income tax on gross distributions to shareholders 14 days following the quarter year in which the distribution was made. As stated previously the shareholder then receives the distribution net of tax. This ACT is deducted from the company's tax liability at the end of the year, subject to an adequate net taxable income. The balance is then payable as MCT nine months after the company's accounting year end, except where companies were incorporated before April 1965.

There are two rates of corporation tax, a full rate corporation tax and a tax rate for companies with small relevant profits (defined in the Finance Act of 1984 as being those companies with relevant profits under £100,000.) One rationale behind having two rates is to encourage small companies to retain more of their profits, as they may have more difficulty than larger companies in raising external finance. Where a company's profits exceed £100,000, but do not exceed £500,000 the corporation tax charged may be reduced by a fraction of the difference between the upper limit and the company's taxable profits (called tapering relief). The fractions for each of the relevant years and the resultant marginal tax rates (where the profits comprise only net taxable income) are shown in Table 4.

A problem arising from this is that projects which take a company's profits above £100,000 will be subject to a marginal
Table 4

Table showing the tapering relief fractions for each of the relevant years and the resultant marginal tax rates

<table>
<thead>
<tr>
<th>First Year Commencing 1 April</th>
<th>Fraction</th>
<th>Marginal rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>1/20</td>
<td>55%</td>
</tr>
<tr>
<td>1984</td>
<td>3/80</td>
<td>48.75%</td>
</tr>
<tr>
<td>1985</td>
<td>1/40</td>
<td>42.5%</td>
</tr>
<tr>
<td>1986</td>
<td>1/80</td>
<td>36.25%</td>
</tr>
</tbody>
</table>

NB Rates are as set out in the Finance Act 1985, but were subsequently changed by the Finance Act 1986

Example

Profits of A Ltd for year to 31.3.84 (all trading income) = 300,000

Tax at 50% = 150,000

less marginal relief \((1/20 \times (500,000 - 30,000))\) = 10,000

which is equal to 100,000 @ 30% = 30,000

200,000 @ 55% = 110,000

140,000

(Extract from "Finance Act 1984 - Commentary" Ernst & Whinney)
tax rate of 48.75% for the 1984/1985 tax year. This may give rise to an incentive to keep profits below the lower limit, meaning a lower level of investment, unless the investment gives rise to capital allowances sufficiently high enough to offset the difference. This effect is examined by Grundy and Burns (1979), to which reference will be made later.

Depreciation is not allowable as an expense in tax calculations, instead there is a system referred to as capital allowances, which are deducted in arriving at net taxable income. Capital allowances were first introduced by the Capital Allowances Act of 1968. The rates were later increased, but recently they have been severely reduced by the 1984 Finance Act, their present value now being less than previously (see Table 5).

The possible effects this will have on investment will be considered later, however the effect this will have on claiming relief on capital expenditure is shown in Table 6. The Initial Allowance is however still available for buildings in Enterprise Zones (s.38 (4) Finance Act 1984) although at 100%. With this exception it now takes longer to claim full capital allowances, compared to one year prior to the Finance Act 1984. If a discount rate is applied to take account of opportunities lost by not having the rebate available earlier, the present value of the capital allowances, given a constant tax rate are now worth considerably less. Also, as stated earlier, the tax rates have been reduced, which means that subsequent capital allowances will
## Table 5

Table showing the Rates of Capital Allowances following the Finance Act 1984

<table>
<thead>
<tr>
<th>Industrial Buildings</th>
<th>Plant and Machinery</th>
<th>Agricultural Buildings</th>
<th>Hotels</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA%</td>
<td>WDA%</td>
<td>FYA%</td>
<td>WDA%</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>75</td>
<td>4</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>50</td>
<td>4</td>
<td>75</td>
<td>25</td>
</tr>
<tr>
<td>25</td>
<td>4</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>nil</td>
<td>4</td>
<td>nil</td>
<td>25</td>
</tr>
</tbody>
</table>

1. pre 14.3.84
2. pre 31.3.85
3. pre 31.3.86
4. post 31.3.86

N.B. The WDA on Plant and Machinery is based on a reducing balance whereas the other WDA's are based on straight line
Table 6

Table showing the present Value of capital allowances on plant and Machinery as a percentage of cost, assuming a discount rate of 10%.

<table>
<thead>
<tr>
<th>Marginal Tax Rate</th>
<th>50%</th>
<th>45%</th>
<th>40%</th>
<th>35%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>to 14.3.84</td>
<td>to 31.3.85</td>
<td>to 31.3.86</td>
<td>post 31.3.86</td>
</tr>
<tr>
<td>FYA</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>WDA</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>FYA</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>WDA</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>FYA</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>WDA</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>FYA</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>WDA</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>FYA</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>WDA</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
</tbody>
</table>

and so on on a reducing balance basis

| Present Value | 45.5% | 38% | 31.2% | 25% |

Notes:

A tax lag of one year has been assumed.
achieve a reduction in the tax liability at lower rates leading to a further reduction in the present value of capital allowances.

Expenditure on Plant and Machinery is normally pooled, with separate pools maintained for (1) cars costing less than £8,000, (2) cars costing more than £8,000, (3) each asset privately owned and (4) depooled items (see later).

The written down allowance is then claimed on the balance of the pool each year, and when a disposal occurs the pool is reduced by the net proceeds or, if lower, the original cost of the asset. If the net proceeds from the disposal exceed the balance of the pool a balancing charge is made, increasing the company's tax liability.

Depooled items concern assets, defined as short term life assets, which are sold or scrapped within, roughly, 5 years of acquisition. Due to the length of time involved in writing off expenditure on a 25% reducing balance method, for example it takes 8 years to write off 90% of expenditure, the Finance Act 1985 introduced legislation allowing short life assets to be treated individually, with balance adjustments occurring on disposal. For example, assuming an asset costing £10,000, may be defined as a short term life asset, and is disposed of for £5,000 after £2,000 capital allowances have been claimed on the asset, a balancing allowance of £3,000 will be available, that is,
$10,000 - 5,000 - 2,000 = 3,000$. Whereas, if the asset was sold for £6,000, a balancing charge of £1,000 will be made, that is $10,000 - 5,000 - 6,000 = -1,000$.

If a short life asset has not been disposed of within 4 years from the end of the accounting period in which the asset was acquired, the balance of the asset is transferred to the general pool.

Balancing allowances or charges may also arise on the disposal of industrial buildings, and are computed by comparing the written down value with the proceeds (if any) of the disposal.

The Finance Act 1984 also abolished stock relief which had originally been introduced to counteract the effects of inflation on the ever rising cost of stock replacement.

Taxation rules do not allow for immediate set off of Advance Corporation Tax (ACT) unless adequate profits have been made during the year equal to the amount distributed. Under the Finance Act 1984 ACT may be carried back six years, or forward indefinitely. However, if the company finds itself in a situation where it continually makes zero taxable profits or losses it will never be able to claim back the ACT paid. Kent and Theobald (1980) consider the tax system relevant to such a company will not be dissimilar to the classical system, with distributions being in effect taxed twice.
Tax losses are another aspect of where the company cannot obtain tax relief until profits have been made, either in the previous two years or in the future, so a company which continually makes losses will not be able to claim tax reliefs for such losses, unless it is part of a group or consortium which enables the losses to be offset against the profits of member companies.

Another aspect of the United Kingdom Corporation Tax system is that corporation tax is charged on taxable profits, and not on cash flow. Several authors consider this is unjust and advocate a cash flow tax system. This debate is investigated in the next section, when considering the desirability of and requirements for a neutral tax system.

**Tax Neutrality**

A non-neutral tax system has an impact both on a company's investment decision and financing decision. It may affect the level and type of investment undertaken by the company, and the type of finance used to provide the funds for the investment. A neutral tax system may be described as not affecting investment and financing decisions, that is the pre tax rate of return of an investment must equal the post tax rate of return. However whilst neutrality is a desirable objective for the efficient allocation of resources, most tax systems are not neutral, partly because Governments will use the system as a tool to encourage certain actions and discourage others. The Wilson Committee
suggests that neutrality should be a benchmark:

"Neutrality, in this sense is a desirable objective in that, other things being equal, the closer it can be approached the more efficient allocation of resources is in theory likely to be. But planned divergences from neutrality might be desirable from a number of reasons including, for example, considerations of administrative conveniences or the desire to encourage some particular activity or form of organisation. Neutrality is in our view best seen as a benchmark against which instances of non-neutrality, intentional or otherwise need to be justified."

Governments in the United Kingdom have been inclined towards encouraging investment, to stimulate the economy and increase the rate of economic growth. However, whether this has actually been achieved is debatable, and the success of using incentives and disincentives arising from a non-neutral tax system to encourage certain corporate behaviour is examined in Chapter 4.

Whilst the non-neutrality effects on investment and financing decisions receive an indepth treatment in Chapter 4 and 5, a summary is provided here.

Investment decisions are affected by the United Kingdom tax system for a number of reasons. Firstly, discounted cash flow techniques to evaluate investments are by definition based on cash flows, whereas the tax system is not. Immediate tax relief
for capital expenditure is not available, following the Finance Act 1984, changes in working capital are not included in tax assessments and companies making losses do not normally receive an immediate rebate. Thus, the investment decision may be different when taxation is included in the evaluation.

Several authors have proposed the adoption of a cash flow tax system in order to achieve greater neutrality (Brown (1948), Pointon (1978)). If this system was in force, and the company's objective was the maximisation of shareholder's wealth, the company would be able to ignore tax in its capital investment appraisals. Such a system is achieved by taxing net cash inflows and allowing full tax deductibility for cash flows at the same rate of tax.

The United Kingdom tax system allows for tax deductibility for interest payments, again providing there are adequate "taxable profits". Some authors believe that this achieves neutrality providing the system allows economic depreciation (true economic wear and tear) and not full depreciation (Samuelson (1977)), whilst others advocate a system of free depreciation with no interest deductibility, (Sumner(1975), Bierman(1977))

The company's choice of finance may be distorted by taxation, and as Kay and King (1978) state

"A tax system which is not neutral with respect to the different
sources of finance creates a need for legal constraints on financial policy to prevent tax avoidance and encourages companies to devote real resources to discovering ways of converting one kind of income into another in order to minimise tax liabilities."

Conditions for neutrality with respect to the financing decision have been explored, neutrality occurring when "it provides no incentive for the shareholder of a firm to prefer one method of financing to another" (Meade 1978). It is generally considered that where interest deductibility is allowed there is a bias in favour of debt, however if personal taxation is considered the beneficial effects of corporation tax may be mitigated by distortions in the personal tax system enabling shareholders to choose shares suiting their own personal tax situation, Elton and Gruber's "clientele effect" (1970). The benefits of a high levered firm due to interest deductibility may be somewhat offset by the cost/risk effect on the company's liquidity.

It is important for a company to determine its cost of capital to ensure that a required rate of return can be ascertained on capital investments. If a lower rate than the actual cost of capital is used as a hurdle rate the value of the firm will decrease as it accepts marginal projects. If in fact, the tax system was neutral the pre tax cost of capital would be equal to the post tax cost of capital.
A neutral tax system is desirable, in order to alleviate the tendencies to waste talented manpower on devising ingenious tax avoidance schemes, and to enable companies to make optimal finance and investment decisions without the necessity of allowing for the effects of taxation.

The United Kingdom tax system imposes corporation tax on incorporated associations which may create biases in the company's investment and financing decisions. The impact of such biases and the need for companies to allow for such biases in their decisions are more fully explored in later chapters. The following chapter however examines the various stages involved in capital budgeting and a summary is given of several of the surveys conducted in this field, providing a basis to explore the effects of taxation on capital investment decisions.
Before an understanding of the effects of taxation on capital budgeting may be explored an examination must be made of the various stages involved in capital budgeting to determine where and how taxation impinges on the process. This chapter provides a flow diagram of the capital budgeting process as a whole and then briefly describes each step of the process. Various surveys have been conducted in this area, and the results have been noted against the relevant stages. As several authors have stated (Kim (1979), Pike (1982)) it is necessary to view the process as a whole and not as individual stages, hence this approach has been adopted in this chapter, concluding with a discussion of the behavioural implications of capital budgeting.

If a company existed in a perfect environment with no market imperfections, for example no unanticipated inflation, no distortionary taxes and no uncertainty, capital budgeting would involve finding assets with returns greater than costs. However this is not reality, unanticipated inflation, distortionary taxes and risk do exist, and if a company is to achieve its objective whether it be maximisation of shareholders' wealth or otherwise, each of these imperfections must be allowed for in the appraisal of capital projects. Myers (1976) stresses the complexities of including such factors in project appraisal as follows:
"Capital Budgeting is the art of finding assets that are worth more than they cost. Nothing is easier in concept or harder in application."

Several authors consider that academic emphasis is misplaced on the selection and evaluation stages, when what is really required is an integration of the whole process. Hastie (1974) reflects the business world's frustration with this myopic approach:

"I am continually amazed at the academic community's preoccupation with improving investment decisions... investment decision making could be improved if the emphasis were placed on asking the appropriate strategic questions rather than increasing the sophistication of measurement techniques", he summarises "what is really needed is approximate answers to the precise problem rather than precise answers to the approximate problem."

Following such criticisms several articles have been published aimed at looking at the overall capital budgeting process (for example Kim (1979) and Pike (1982)), both have adopted a flow diagram to illustrate the process. An example of a capital budgeting system flow diagram is given in Diagram 2, it is based on the systems approach which highlights the importance of feedback to improve future decisions. This flow diagram is used to discuss each step and show its integration with the rest of the system. The importance of feedback in the capital budgeting
Diagram 2

Flow Diagram showing the capital investment process

Long Range Plan

- Long term capital budget
- Search for and identification of investment alternatives

Reviewing and screening investment alternatives

- Inflation
- Calculation of cash flows
- Risk
- Taxation

- Choice of evaluation technique
- Cut off point

- Calculation of cost of capital
- Risk
- Taxation

Selection of alternative

Control

Post Audit

Success

Failure
process is highlighted by Boersema (1977):

"Any good control system must have a feedback loop, a device to
tell how well the system is working. Unless the total capital
budgeting system is effective, i.e. "good" projects come forward
and are accepted and "bad" projects are rejected all the planning
and detailed analysis is in vain."

Long_Range_Plan

Before a long term capital budget can be produced, the long range
plan must be defined to include the goals and objectives of the
company, otherwise projects will be evaluated on a project by
project basis with no definite aim. Hall (1979) reports one
chief planning officer as saying

"Allocating resources without a sound concept of divisional and
corporate strategy is a lot like throwing darts in a darkened
room."

Financial and investment theory have always stressed the
maximisation of shareholder's wealth as the ultimate goal,
however, companies do have other goals, for example the
maintenance of liquidity, which became of foremost importance
during the liquidity crisis of 1974. Empirical research has
identified multiple goals, for example, Oosteryoung (1973)
reported that 95% of the respondents to his survey used two or
more goals when making capital investment decisions, with 70.5%
using three or more. Petty and Scott (1981) found the
maximisation of the percent return on investments in assets to be
the most important objective in capital investment decisions (78.23%) with the maximisation of common stock price in fourth position (31.18%). Perhaps one reason for this is the difficulty in translating the maximisation of shareholders wealth into an operationally measureable target, also, during a period of stable stock prices, such a goal will not provide an incentive to invest, as the effect on the stock price will be minimal.

**Long_Term_Capital_Budget**

Kim (1979) describes this stage of the capital budgeting process as a "necessity in organising the development of the future growth and providing direction to capital budgeting". The long term capital budget involves the selection of the time period for which capital investments are to be proposed, the classification of different projects and the selection criteria for the projects included in the plan. Whilst requiring a reasonable amount of flexibility, this step in the process will ensure that the company is heading in its chosen direction.

Corr (1983) found that the time span for the budget period tended to be similar to that of the long range plan, usually between 3 - 5 years, and that the selection criteria used were mainly profitability/productivity of capital and long term goals, with a small percentage adopting legisatory requirements, risk and balanced segment growth.
Pike (1981) investigated the formal procedures of companies in 1980/81 and found that 65% had a capital budget period of over 2 years, 74% used an up to date capital budgeting manual, whilst 27% employed at least one full time member of staff on the capital budgeting process. Compared to 1975 he found a marked increase in the adoption of sophisticated procedures.

SEARCH FOR AND IDENTIFICATION OF INVESTMENT ALTERNATIVES

In order to achieve maximisation goals it is essential that the company search for as many investment alternatives as possible, whilst they may be competing for limited resources the imbalance is necessary to ensure the more profitable projects may be selected. But, as Pike and Dobbins (1984) point out, managers will be inclined to skimp on this stage in order to minimise costs, because whilst costs of the search will appear in the accounts, the lost opportunities through an inadequate search will not. Perhaps this is why Pike (1982) found that investment alternatives arose as a response to a problem, not through the simulation of ideas. Nevertheless he found an improvement in 1980/81 of firms requiring a specific search, 83% compared to 76% in 1975/76.

Petty and Scott (1981) found that alternatives tended to originate from the plant level (42.52%) and the division office (39.14%).
Screening and Reviewing

This is the first stage where projects are evaluated to determine whether they are sufficiently attractive to receive further evaluation. This step is necessary otherwise time and money is spent conducting formal evaluations when it may be obvious that the projects should be rejected at this stage. Factors such as compatibility with corporate strategy, feasibility, expected returns and risk involved will be examined, the acceptable projects will be defined and then classified for further investigation.

Petty and Scott (1981) found that the screening process generally took place at the division office or at plant level. Pike and Dobbins (1984) believe that some projects will already have received some backing due to the cost of the feasibility study.

Several alternatives will be available to the company, but will require further evaluation if they are competing for limited resources. It is the following steps which have received most academic attention, and to reiterate whilst they are important they form part only of the capital budgeting process.

Choice of Evaluation Technique

There are several evaluation techniques available for the manager, the most important being the Net Present Value Model
(NPV) the Internal Rate of Return (IRR) the Payback Period and
the Accounting Rate of Return.

The NPV is the most theoretically acceptable method due to it
stressing a project's worth in terms of the maximisation of
shareholders' wealth, that is, it indicates the extent the value
of a company is expected to increase due to the acceptance of a
particular project.

The maximisation of shareholders' wealth is based on the
separation theorem principle (Fisher (1930)), that is, in the
evaluation of projects it is not necessary to know the expected
future spending or consumption patterns of each shareholder, but
that assuming a perfect market, investment decisions are
correctly determined by the market rate of interest.

Nevertheless, there are advocates and critics of each of the
evaluation methods. Weingartner (1974) for example, criticises
the NPV model.

"Discounting itself .... is an artificial procedure which,
although, designed to simplify the decision process obscures most
of what needs to be taken into consideration, and which, in any
case, may not be required, or may even be misleading", whilst
Hodder and Riggs (1985) consider that discounting models have
been unfairly criticised, when if correctly handled provide
useful techniques:
"Managers cannot treat a Discounted Cash Flow evaluation like a black box, looking only at the output. They need to break open the box, examine the assumptions inside and determine how these assumptions affect the analysis of a project's long term profitability."

Most surveys indicate a strong preference to the payback period with the IRR gaining acceptance. The NPV model however does not seem to be as acceptable to the business community. Pike's survey (1981) reflects this with 79% (71%) (the first percentages refer to 1980/81, whilst the percentages in brackets refer to 1975/76) using the payback period; 51% (51%) using the accounting rate of return; 54% (42%) using the IRR, and 38% (32%) using the NPV model. Pike also found that only 26% (33%) of the companies use just one evaluation technique.

Management science techniques are increasing in popularity, Pike found that 35% of the companies included in his survey use mathematical programming, compared to 23% in 1975/76. Pike also found that simulation has increased in popularity from 28% in 1975/76 to 59% in 1980/81.

Estimation of Cash Flows

Corr (1983) identifies three types of capital flow which need to be included in the cash flows; any investment before the
investment becomes on stream, investments and disinvestments during the life of the project, and thirdly the residual value of the investment. However he found that the majority of firms do not include the cost of assets already owned, but the majority included adjustments in working capital. The residual values were generally valued at the end of the project's life at book value.

The timing of cash flows is important, for example if an inflow occurs when the company wishes to invest in a profitable venture, the cash flow will be intrinsically worth more than if the company placed the money in the bank. Hellings (1985) emphasises the importance of the timing of cash flows:

"A project with a lower NPV could be accepted if the cash flows occur where they are most useful to the firm."

However, Hellings implicity assumes capital market imperfections, that is the company has limited access to finance.

The cash flows may be adjusted to allow for inflation and risk, such adjustments are discussed later.

**Calculation of the Cost of Capital**

The discount rate used in Discounted Cash Flow (DCF) techniques is usually some form of the cost of capital. Theoretically the
The cost of capital should be weighted according to the different sources of finance (weighted average cost of capital (WACC)) adjusted accordingly for inflation, risk and taxation effects. Corr (1983) found that 16 out of the 24 companies included in his survey did use the WACC. The weightings may be applied in different ways, Corr (1983) found that 9 used the planned debt equity ratio whilst 7 used the book value. The cost of each source should theoretically be based on current market rates, 13 out of the 16 did use market rates, whilst the other 3 used historical rates.

Corr (1983) also enquired as to the frequency of revision of the cost of capital, and found that 6 revised it as needed, 8 annually, 4 every 2-3 years, 5 every 5 years, and 1 never. If accurate appraisals are to be made the cost of capital will need revising to keep it in line with current rates.

Pike (1981) investigated the hurdle rate for normal risk projects (after tax in monetary terms) and found a range between less than 10% and greater than 29%, with the majority of companies (37%) in the 15% to 19% range. The wide divergence may be indicative of different rates applicable to firms in different industries. Also "normal risk" projects may not necessarily mean the same thing to different companies.
Cut-off Point

Because the capital budget is usually subject to limited resources, that is there is usually an upper limit on the size of the budget, it is necessary to adopt an arbitrarily determined investment cut off point, which will be the deciding factor for the acceptance/rejection decision. The cut-off point is usually flexible and may vary according to the type of project.

There are some projects which may fall below the cut off point, but will be adopted anyway, Corr (1983) calls these projects "non-economic projects" and they tend to fall into four categories: need or urgency, legislative requirements, to maintain operations or the economic impact of an alternative.

Once the techniques have been chosen, a cut-off point decided, the cash flows estimated and the cost of capital calculated, the effects of risk, inflation and taxation need to be considered and allowed for before evaluation can take place.

Risk

Companies as alike most investors, are usually risk averse and would generally prefer a project which has minimal risk attached to it, however if the company adopted a policy of accepting all low risk projects and rejecting all high risk projects, it may be missing out on opportunities of making high returns. Therefore, companies will accept higher risk projects providing the returns are sufficiently high enough to offset the risk involved.
Risk is generally thought of as the volatility of expected outcomes, however Corr (1983) found that this took second place in the answer to his question on how managers defined risk, 44% of the firms defined risk as the probability of not achieving a target rate of return.

When considering investment alternatives the company needs to alter its cut off point to allow for the risk involved in each individual project. There are various ways to handle risk, ranging from the subjective "gut feel" to the sophisticated capital asset pricing model (CAPM). Pike (1982) found that 37% of the companies included in his survey require a formal analysis of risk, and that many use more than one method to conduct the analysis, with 38% using sensitivity analysis, 36% raise the required rate of return, 31% shorten the payback period and 12% use probability analysis.

Simulation is becoming more popular with the availability and accessibility of computers, only 30.54% of the companies in Petty and Scott's survey never use simulation. Its usefulness lies in its ability to answer "what if?" questions, and thus highlights the more sensitive variables for further investigation.

The CAPM is another sophisticated technique in handling risk, which, up until now, has not received great acceptance by the business world (66.47% of Petty and Scott's respondents never use
such techniques.) The CAPM is based on the divisibility of systematic risk and unsystematic risk, the shareholders being able to reduce the latter by holding a diversified portfolio of investments. The company then need only consider the systematic risk attached to the project, by comparing the possible returns of the project with the returns from an efficiently diversified market portfolio. If the return on the project rises 10% when the efficient market's return rises 10% and both would fall by proportionate amounts the project is given a Beta factor of 1. If the projects returns were to alter by only 5% it would receive a Beta of 0.5 and if it were to alter by 20% it would be given a Beta of 2. The higher the Beta coefficient, the higher the risk involved, and subsequently the higher the return that will be required for acceptance of the project. The formula for the CAPM is given by:

\[ E_j = R_f + (\bar{R}_m - R_f)B \]

where, \( E_j \) = the required rate of return for the project
\( R_f \) = the risk free rate of interest
\( \bar{R}_m \) = the mean rate of return on the efficient market portfolio
\( B \) = the beta of the project.

Thus when the Beta is high a high rate of return will be required. The CAPM illustrates the trade off between risk and return as can be shown in Diagram 3, where all the projects above
Diagram 3

Diagram showing the Security Market Line and the linear relationship between risk and return

Diagram showing the Security Market Line and the linear relationship between risk and return

expected/required rate of return

\[ R_X \] (\text{REJECT})

Beta

\( R_m \)

\( R_f \)

ACCEPT

REJECT

\[ \beta \]
the line (the security market risk/return line) may be accepted, whilst all those below the line should be rejected.

**Inflation**

Carsberg and Hope (1975) express the necessity of allowing for inflation in capital budgeting in their survey of 1975, when inflation was reaching heights of 25%.

"The appraisal of projects by estimating effects in terms of current prices is effective only if cash flows in money terms are likely to remain constant and equal to cash flows in current prices. Even in times of government price control such constancy seems unlikely. In other cases, whatever method of appraisal is used estimation of cash flows in terms of current prices will involve some error because the effects of changes in the relative prices of resources will be ignored."

They show how underinvestment can occur through not allowing for inflation and advocate the use of NPV either discounting real cash flows at a real required rate of return or discounting money cash flows at a money required rate of return.

Corr (1983) investigated whether companies do achieve this consistency, and found that 5 of the 24 companies discounted constant cash flows using a current required rate of return. Carsberg and Hope (1976) indicate that this will lead to an
understatement of the project's value.

Because all prices do not increase at the same rate it is essential that the cash flows be adjusted at the relevant rate of inflation for each item. Pike (1984) found that 30% of the companies in his survey did specify different rates for all costs and revenues.

Carsberg and Hope (1976) proved the importance of allowing for inflation, in order to be certain of accepting attractive projects. The final adjustment to be made, before a full evaluation can be conducted, concerns taxation.

**Taxation**

Because this is the main thrust of the thesis and will dealt with later in more detail, only a brief note is included here to show its place in the capital budgeting process.

If taxation had no effect on the value of investments, that is if the tax system were neutral, companies would be able to assess investments without considering the effects of taxation. This is not the case however because taxation is imposed on "taxable profits" and not cash flow, which is the basis for most of the more efficient evaluation techniques. Other effects of the United Kingdom corporation tax system on the worth of capital
projects include the restriction concerning reliefs for losses and restricted advance corporation tax set off.

Thus if the company is to be certain of making correct investment decisions, it must adjust the evaluations for the effect of taxation. Taxation also affects the worth of capital projects through the company's financing decision.

Once all the adjustments have been made the company can carry out the evaluations and adopt the most promising projects. It may be considered that this is the end of the process, commitments have been made which can now not be broken. This is not true, and the company needs the flexibility to abandon projects if they are later found to be uneconomical. Clark, Hindelang and Pritchard (1984) state "failure to abandon projects that are no longer desirable could be very costly. By the same reasoning, failure to abandon projects that could make funds available for substantially better investment opportunities might also be costly from an opportunity standpoint." Also, if the management is to make good decisions in the future it is essential that they receive feedback on the outcomes of past investment decisions. This is achieved by expenditure control and post audits.

Expenditure Control

Some type of progress control needs to be built into the system to enable checks and comparisons to be made between the actual
progress and the expected progress, so corrective action may be taken if necessary.

Corr (1983) found that 14 out of the 24 companies he surveyed required monthly progress reports, 4 required quarterly reports and 6 of the companies did not require any report.

**Post Audits**

The final step in the capital budgeting process is the post audit. Johnson (1981) provides justification for post audits as necessary to improve the quality of future investment decisions and to provide the means to initiate correction regarding projects under review.

Corr (1983) found that 14 of the companies in his survey of 24 required post audits on all capital investment projects, he also found a range of times when the post audit is conducted, the most popular being one year after start up.

The difficulties in conducting post audits must be recognised and the companies included in Corr's survey listed the following problems: changes in environment, change in circumstances, changes in conditions surrounding the project, developing comparable information from the system, tracking and measuring project cash flows, collecting relevant data and separating project data from a complex interrelated system. Despite the
difficulties it is an essential step for an effective capital budgeting system.

To summarise the capital investment process involves planning the long term capital budget in keeping with the company's goals and objectives; an informal evaluation to determine the alternatives worth further investigation; selection of appropriate evaluation techniques; forecasting cash flows, calculation of the company's cost of capital; choosing a cut off point; making adjustments for risk, inflation and taxation; choosing the projects to be adopted and following them up with post audits and controls after implementation.

This system however does not reflect an important aspect of the capital budgeting process, that is the human factor. To conclude this chapter the behavioural aspects of capital budgeting will now be considered.

Clancy et al (1982) emphasise the importance of acknowledging the behavioural aspects of capital budgeting:

"We suggest that those involved in the capital budgeting process and in capital project management should at the very least, be aware of the behavioural factors involved. At best, they should take active steps to ensure that the behavioural factors of capital budgeting do not cause sub optimal decisions."

Clancy et al provide examples of the behavioural aspects in the
different stages of the capital budgeting process, which are discussed briefly below.

The success of the project depends on the personnel. Where there are managers taking over projects from other managers they may not be so motivated towards its success, than if they had initiated it themselves. Also linked with this the manager may attempt to make projects successful or appear successful after the projects have been funded, resulting in considerable strain. Clancy et al suggest that "there should be a graceful mechanism for "bailing out" of projects, otherwise outstanding managers may leave the company or act dysfunctionally in other ways."

Performance review methods tend to be inconsistent with methods of project selection, so a project which could be very profitable over the long term may be rejected if it appears unattractive over the short term. Likert (1967) proposed that top management should be aware of this natural bias caused by performance review methods.

If the capital budgeting process becomes a ritual the rejection of projects by higher level managers could cause embarrassment and be seen as a "slap in the face" by those who had previously endorsed the project. Thus top managers may be reluctant to reject projects and the final decision will become more of a blessing than a rational approval decision.
Individuals react differently to risk (Bridge & Dobbs (1975)) some will be risk averse while others may have a preference to making risky decisions. This may lead to the same project being rejected or accepted depending on who is making the decision.

Most companies are in a capital rationing situation, resulting in the rejection of otherwise profitable projects. Lorie & Savage (1955) suggest that this may give rise to the phenomenon of "sharing the poverty" that is giving all the managers a little rather than financing large projects of a few of the managers. Here internal politics are exerting pressures which may lead to sub-optimal capital budgeting decisions.

Clancy et al conclude by highlighting the dangers involved in ignoring human influences on the capital budgeting process:
"In conclusion, one might say that capital budgeting has a facade of rationality, particularly when elaborate mathematical models are used. They convey an atmosphere of certainty, logicality and scientism. Yet, underlying the decision process are the behavioural factors ....... Unfortunately decision makers may not want to admit that irrational human factors might have been foremost in the acceptance or rejection of a particular project."

This chapter has provided an overview of the capital budgeting process. It has purposefully not included an extensive discussion of each of the stages involved, as this would be outside the scope of the thesis. Attention can now be turned to
the impact of taxation on the investment decision.
Chapter 4
Taxation and Investment

Armed with a basic knowledge of the United Kingdom tax system it is now possible to determine how and when the system creates biases in the investment decision of companies. This chapter first stresses the importance of including incremental tax flows in capital project appraisal. A discussion of the cash flow system proposed by Brown (1948) follows and the requirements for a neutral tax system explored. The effects of taxation on capital budgeting then receives attention when a project is proposed and used to illustrate how, under a neutral tax system, the yield (internal rate of return) is the same after tax as before. Modifications are then made to the flows arising from the project by the inclusion of the tax effects, enabling the final after-tax yield of the project to be determined. The effects of the tax system on the net present value and the payback period of the project are also determined. The interdependencies arising through the above influences are then discussed. It is shown that to an extent the government in effect becomes a business partner in the investment, and thus may reduce the risk. However taxation effects also normally reduce the net present value of the project, and if the reduction in risk is not sufficient to offset the reduction in the return a previous marginal project will now become unattractive. A discussion of these tax effects under the Capital Asset Pricing Model to illustrate this trade off will follow. The chapter is concluded by acknowledging that
Governments may use the biases arising through taxation to provoke certain types of corporate behaviour. Several studies are reviewed which have been conducted to determine whether Governments are successful in achieving the required behaviour.

Tax, if non-neutral has a distortionary effect on both the investment and financing decision, which in turn are interdependent. The two types of decisions are to be treated separately initially, then the integration of the two will be examined.

Taxation effects on capital budgeting have received little attention in academia from a micro view point, but if optimal decisions are to be made taxation must be included in the evaluation, as Boersema(1977) comments:

"Tax disbursements are just as much cash expenditures as any other costs and should not be disregarded."

To include taxation in an evaluation is not an easy task due to the different rules applying to the different investments, and the uncertainty as to future rates and allowances; it is difficult for a company to know the correct marginal rate to apply to each appraisal, as Helliwell(1964) states:

"In most tax systems the net tax payable on a particular incremental project is not likely to be a stable percentage of
annual gross income. For one thing, there may be different tax rates applicable to different portions of the firm's net income.

Nevertheless, there are ways of allowing for taxation, which this thesis will examine in later chapters, when developing a simulation model.

Brown (1948) states that taxes can affect investment expenditure in the following ways. Firstly, it may reduce the disposable income of some consumers, thus reducing their level of consumption which will lead to a lower investment level. Secondly, it may lower the profitability of some investments, thus lowering the amount of investment undertaken, and thirdly, the vicious circle, the lowering of the investment level may affect the interest rate, which may in turn affect the investment level.

Brown advocates a cash flow tax system in order to neutralise taxation effects; he reaches the following conclusions: (a) the effect can be neutralised if a proportional tax levied on the amount expended on durable producer goods can be deducted from income in the year made, and (b) the Government pays for any "losses" of the firm at the same rate as it taxes its income. He considers that depreciation of assets over a short period, say 3 - 5 years with the excess carried forward is relatively close to neutralising the adverse effect of tax (one wonders if he would have supported this during the liquidity crisis of
1974/75). He considers however, that economic depreciation will have an adverse effect on investment, especially where long lived or high cost assets are concerned. He also suggests that the new or growing firm will be more adversely affected than the existing, static firm. Brown adds that whilst his analysis appears to advocate full loss offsets and a one year write off for depreciation, if an investment is financed by debt and interest deductibility is allowed one year depreciation write off is not necessary. He adds that if full loss offset is allowed both revenue and economic costs will be incurred as it will support inefficient firms and provide tax avoidance by owners paying themselves high salaries.

Other authors supporting a cash flow tax system include Lawson and Stark(1975), Sumner(1975), Pointon(1978) and Rickwood and Groves(1979). However, Pointon adds that even with a cash flow tax system biases can arise through the time value of money if the lags between inflows and tax payments and the lags between expenditure and tax relief differ.

Musgrave and Musgrave(1976) suggest that a tax may be "so neutral, in fact, as to be a zero tax". They explain how this may occur as follows:

"An interesting question arises: what happens when depreciation is permitted to be taken in its entirety at the time the investment is made, i.e. when all investment costs may be
expended? Combined with perfect loss offset, this would in fact mean there is no tax. With a 50% tax rate investment of $100 would yield an immediate refund of $50 which, if reinvested, would yield a refund of $25 and so forth until a total refund of $100 was obtained. The investor would combine the initial investment of $100 with an additional $100 advanced by the Treasury, and resulting earnings on $200 net of the 50% tax would be the same as earnings of $100 without tax."

Suener (1975) however dismisses this line of reasoning as assuming the Treasury would be investing funds at the same terms as the firm; if this possibility does not exist, the Treasury gains. It's fault lies in the assumption that all projects are marginal. Pointon (1980) also criticises this theory as being true only if the firm invests in marginal projects or keeps reinvesting its earnings into perpetuity without ever making a cash return to its shareholders.

MacDonald (1980) is another author suggesting that neutrality will lead to no tax revenue, except where imperfect markets lead to greater rates of return than the market rate of return. Or, in an uncertain world where Governments can borrow at near risk free rates of interest, much lower than firms, yet receive the market rate of return for their share in the "pure profits".

Leaving the cash flow tax system for the moment authors seem to advocate two types of tax system for achieving neutrality, (a)
where free depreciation is allowed with no interest deductibility, or (b) economic depreciation with interest deductibility. Sumner (1975) provides the following formulae to illustrate neutrality:

(a) in the absence of taxation an investment is worth undertaking if

\[
\sum_{i=1}^{n} \frac{R_i}{(1 + r)^i} > Q
\]

where, \( R_i = \) net cash flows at time \( t \)
\( r = \) the discount rate
\( Q = \) the cost of the investment

that is, if the present value of the cash flows is greater than the cost of the investment. By introducing a tax both sides of the equation will be reduced by the rate of tax payable.

\[
\sum_{i=1}^{n} \frac{R_i (1 - T)}{(1 + r)^i} > Q (1 - T)
\]

where, \( T = \) the tax rate

so, by cancelling out, the equation is, as before, and a neutral tax system exists.

(b) in the absence of taxation an investment is worth undertaking if
\[ \sum_{i=1}^{\infty} \frac{R_i - \delta Q}{(1 + r)^i} - Q \geq 0 \]

where, the assets depreciates constantly at rate \( \delta \) so, by spending \( Q \) in year 0, and \( \delta \) \( Q \) in each subsequent year the firm acquires a perpetual revenue stream of \( R \) from year 1 onwards.

On introduction of a tax at rate \( T \), and provided interest payments and depreciation are deducted in determining taxable income, the net discount rate becomes \( r(1-T) \) and the cost of the investment becomes \( Q(1-TZ) \), where \( Z \) = the present value of the depreciation deductions. The investment decision is unaltered where

\[
\sum_{i=1}^{\infty} \frac{R(i-T) - \delta Q(1-TZ)}{(1 + r(1-T))^i} \geq Q(1-TZ)
\]

which he solves to give

\[ Z = \frac{\delta}{r(1+T)} + \delta \]

N.B. Sumner adds that it is assumed that the interest rate is not affected by taxation.

So, if either (a) or (b) are implemented along with full offset for losses, tax neutrality is achieved.

Sumner (1975) then considers a neutral system in times of inflation, (a) would not be affected, but (b) would be virtually impossible to use, as Sumner states

"whereas with stable prices the calculation of economic depreciation is merely difficult, in the presence of inflation it becomes impossible."
He therefore advocates free depreciation as a virtually cost-less route to neutrality, but acknowledges the importance of changes in working capital as causing biases if not included in the tax assessments. He also advocates free depreciation on the grounds that it treats equity and debt on an equal basis. But, as Pointon (1980) points out a system of free depreciation may still create biases due to the difference in the rates between income and corporation tax.

"under the imputation system there is an imputed tax credit on dividends which is equal to the basic rate of income tax times the gross dividend and so interest relief would have to be at the same rate of income tax to avoid tax distortions in financing decisions."

Samuelson (1964) is highly critical of a system of free depreciation and presents this most clearly in the following statement:

"Fast depreciation gimmicks in the Swedish, Japanese, German, British and American tax codes are not a return to just recognition of economic obsolescence....They are competitive bribes and giveaways, designed to undertax money income....in order to attract investment from other countries and to stimulate the total of domestic investment growth. If we call spades, spades, let's call bribes, bribes."
and provides an alternative neutral tax base:

"If, and only if, true loss of economic value is permitted as a tax deductible expense will the present discounted value of a cash-receipt stream be independent of the tax rate."

Pointon(1980) suggests that this will only apply if the investment is financed by debt capital and perfect certainty exists.

If both free depreciation and interest deductibility were allowed King(1977) suggests that a capital market inefficiency will exist causing a distortion in flows to corporate investment.

"If the tax system allows both interest payments and investment expenditure to be deductible, which is the current position in the United Kingdom, the introduction of a corporate profits tax would lead to a flow of capital into the corporate sector. In this case, the higher the corporate profits tax rate, the higher the level of investment in the corporate sector."

Until 1984, the United Kingdom tax system allowed for both interest deductibility and free depreciation on certain investments, for example, plant and machinery, thus creating a net incentive to invest, however the gradual withdrawal of Initial and First Year allowances should, ignoring the gradual reduction in the corporation tax rate, somewhat remove this bias.
Nevertheless, as will be discussed later, many biases still exist in the United Kingdom tax system.

Effect of taxation on capital investment

To the extent a project changes the tax situation of a company, the changes need to be included in the evaluation of its worth.

A project is presented below to illustrate that if a neutral tax system is in existence, the post tax internal rate of return is the same as the pre tax rate of return.

The project is first calculated on a pre tax basis, giving an internal rate of return of 11.6% (see Table 7). If the tax system is neutral the post tax internal rate of return will also equal 11.6%, as shown in Table 8.

So, what happens in the United Kingdom to distort this decision?

Firstly, capital allowances are only available if there are sufficient profits against which to offset them, and then only a 25% writing down allowance is available on plant and machinery. Secondly, the tax system is not based on cash flows but on taxable profits, and the build up in working capital usually necessary when undertaking a new project is not treated as an allowable expense; likewise the decrease in working capital occurring at the end of a project is not treated as taxable
Table 7

The pre-tax internal rate of return of a project costing £100,000, assuming the following flows

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflows</th>
<th>Outflows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Expenditure</td>
<td></td>
<td>100,000</td>
</tr>
<tr>
<td>0 Change in working capital</td>
<td></td>
<td>16,645</td>
</tr>
<tr>
<td>1 Profit</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>2 Profit</td>
<td>35,000</td>
<td></td>
</tr>
<tr>
<td>3 Profit</td>
<td>35,000</td>
<td></td>
</tr>
<tr>
<td>4 Profit</td>
<td>40,000</td>
<td></td>
</tr>
<tr>
<td>4 Change in working capital</td>
<td></td>
<td>16,645</td>
</tr>
</tbody>
</table>

internal rate of return = 11.6%

NB Negative and unreal roots are ignored in this chapter.
Table 8

The post-tax internal rate of return of the project assuming a neutral tax system. A constant tax rate of 40% and a constant tax lag of 1 year are assumed. It has been further assumed that taxation will not affect the discount rate.

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflows</th>
<th>Outflows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Cost</td>
<td>100,000</td>
</tr>
<tr>
<td></td>
<td>Change in working capital</td>
<td>16,645</td>
</tr>
<tr>
<td>1</td>
<td>Tax rebate</td>
<td>46,658</td>
</tr>
<tr>
<td></td>
<td>[\left(100,000 + 16,645\right) \times 0.4]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Profit</td>
<td>30,000</td>
</tr>
<tr>
<td>2</td>
<td>Tax [30,000 \times 0.4]</td>
<td>12,000</td>
</tr>
<tr>
<td></td>
<td>Profit</td>
<td>35,000</td>
</tr>
<tr>
<td>3</td>
<td>Tax [35,000 \times 0.4]</td>
<td>14,000</td>
</tr>
<tr>
<td></td>
<td>Profit</td>
<td>35,000</td>
</tr>
<tr>
<td>4</td>
<td>Tax [35,000 \times 0.4]</td>
<td>14,000</td>
</tr>
<tr>
<td></td>
<td>Profit</td>
<td>40,000</td>
</tr>
<tr>
<td></td>
<td>Change in working capital</td>
<td>16,645</td>
</tr>
<tr>
<td>5</td>
<td>Tax [\left(40,000 + 16,645\right) \times 0.4]</td>
<td>22,658</td>
</tr>
</tbody>
</table>

Internal Rate of Return = 11.6%
Thirdly, a neutral tax system requires that the tax rate remains constant throughout the life of a project; the Finance Act of 1984 introduced new corporation tax rates reducing the full rate to 35%, and the small companies rate to 30%, which was subsequently reduced to 29%. A reducing tax rate may give rise to an immediate incentive to invest, since the capital allowances will be initially available at a higher rate than the rate at which profits will be later taxed.

Another distortionary effect, occurring where the company is in a loss making situation, is the restricted offset of losses. If the system is neutral the Inland Revenue would pay a tax rebate to a company within the period of the normal tax lag. However, the corporation tax system only allows offset of losses against profits arising in the same period and profits of the previous period, otherwise the company must carry forward the losses to be set off against future profits.

The internal rate of return of the project under the United Kingdom tax system will depend on the company’s tax profile, for example, if the company is formed for the sole purpose of undertaking a single project the internal rate of return will be 8.6% (see Table 9, profits are taxed at the small companies rate, because the taxable profits are less than £100,000.) Whereas, if there are sufficient profits to offset the capital allowances,
Table 9

The internal rate of return of the project under the United Kingdom tax system, where the company only consists of the project. A one year tax lag and a tax rate of 30\% have been assumed. Capital Allowances are available at a writing down allowance of 25\%.

<table>
<thead>
<tr>
<th>Year</th>
<th>Tax Flows</th>
<th>Capital Allowances Carried Forward</th>
<th>Written Down Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 Capital Allowances available</td>
<td>25,000</td>
<td>75,000</td>
</tr>
<tr>
<td>1</td>
<td>Profit - Capital Allowances</td>
<td>nil</td>
<td>13,750</td>
</tr>
<tr>
<td></td>
<td>[30,000 - (75,000 x 0.25) - 25,000]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Profit - Capital Allowances</td>
<td>7,188 x 0.3</td>
<td>2,156</td>
</tr>
<tr>
<td></td>
<td>[35,000 - (56,250 x 0.25) - 13,750]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Profit - Capital Allowances</td>
<td>24,453 x 0.3</td>
<td>7,336</td>
</tr>
<tr>
<td></td>
<td>[35,000 - (42,187 x 0.25)]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Profit - Balancing Allowance</td>
<td>8,360 x 0.3</td>
<td>2,508</td>
</tr>
<tr>
<td></td>
<td>[40,000 - 31,640]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tax Flows</th>
<th>Year</th>
<th>Inflows</th>
<th>Outflows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Expenditure</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Change in working capital</td>
<td>16,645</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Profit</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Profit</td>
<td>35,000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Profit</td>
<td>35,000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Tax</td>
<td>2,156</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Profit</td>
<td>40,000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tax</td>
<td>7,336</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Change in working capital</td>
<td>16,645</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Tax</td>
<td>2,508</td>
<td></td>
</tr>
</tbody>
</table>

Internal Rate of Return - 8.6\%
the internal rate of return will be 7.9% (see Table 10, here profits are taxed at the full corporation tax rate, because taxable profits are assumed to be in excess of £500,000). Thus, if the company has a hurdle rate of say 9%, they would by ignoring tax accept this project, when in reality, the rate of return of the project would be below the rate required. Hence, if a company uses the internal rate of return the incremental tax flows must be included in the appraisal if accurate decisions are to be made. The effects of tax biases on the net present value of a project are now explored.

**Net Present Value Model**

Given a neutral tax system, the Government in effect becomes a business partner, and shares in the profits and losses of the investment. The investment decision using the Net Present Value (NPV) model will be the same after as before tax (except in a capital rationing situation), that is a positive NPV before tax project will yield a positive NPV after tax, a negative NPV project will yield a negative NPV after tax and a zero NPV project before tax will yield a zero NPV after tax. The absolute NPV will however be reduced by a factor of \(1 - T/(1+k)^L\). (Rickwood and Groves(1979))

where, \(T\) = the marginal rate of corporation tax
\(k\) = the discount rate, and
\(L\) = the tax time lag
The internal rate of return under the United Kingdom tax system assuming the company is in a tax paying situation, with a tax rate of 35%, a tax lag of one year and capital allowances available at 25% (£)

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflows</th>
<th>Outflows</th>
<th>Written Down Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Expenditure</td>
<td>100,000</td>
<td>16,645</td>
</tr>
<tr>
<td>0</td>
<td>Working Capital</td>
<td>0</td>
<td>16,645</td>
</tr>
<tr>
<td>1</td>
<td>Tax saving</td>
<td>8,750</td>
<td>75,000</td>
</tr>
<tr>
<td></td>
<td>((100,000 x 0.25) x 0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Profit</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Tax</td>
<td>10,500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(30,000 x 0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Tax saving</td>
<td>6,562</td>
<td>56,250</td>
</tr>
<tr>
<td></td>
<td>((75,000 x 0.25) x 0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Profit</td>
<td>35,000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Tax</td>
<td>12,250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(35,000 x 0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Tax saving</td>
<td>4,922</td>
<td>42,187</td>
</tr>
<tr>
<td></td>
<td>((56,250 x 0.25) x 0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Profit</td>
<td>35,000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tax</td>
<td>12,250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(35,000 x 0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tax saving</td>
<td>3,691</td>
<td>31,640</td>
</tr>
<tr>
<td></td>
<td>((42,187 x 0.25) x 0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Profit</td>
<td>40,000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Working capital inflow</td>
<td>16,645</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Tax</td>
<td>14,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(40,000 x 0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Tax saving</td>
<td>2,768</td>
<td>23,730</td>
</tr>
<tr>
<td></td>
<td>((31,640 x 0.25) x 0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Tax saving</td>
<td>2,077</td>
<td>17,797</td>
</tr>
<tr>
<td></td>
<td>((23,730 x 0.25) x 0.35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Tax saving</td>
<td>1,557</td>
<td></td>
</tr>
<tr>
<td></td>
<td>((17,797 x 0.25) x 0.35)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Internal Rate of Return = 7.9%

Note: The IRR includes the present value of tax savings from year 8 onwards.
that is, given the investment mentioned earlier in the chapter and a cost of capital of say 8% the NPV before tax equals £10,555, (see Table 11) whereas the NPV after tax at 40% equals £6,644, (see Table 12) ie the NPV before tax multiplied by the discounted tax factor. (£10,555(1-0.40/1.08)=£6,646 (please ignore the rounding error). The Government has contributed a NPV nearly £4,000, the difference between the NPV before tax and the NPV after tax. Such a system will always reduce the absolute NPV providing the tax rate is less than 100%.

As already established the United Kingdom corporation tax system is not neutral and the NPV after tax does not equal the NPV before tax adjusted by one minus the discounted tax rate. Except for industrial and commercial buildings in Enterprise Zones, capital allowances are not instantly available and the NPV is correspondingly less.

Davis and Pointon (1984) provide a simple formula to show how, ignoring tax lags of 9 months or more from the end of the accounting period, a marginal project before tax will be unattractive after tax, that is

the NPV before tax = \( V - J = 0 \) (for the marginal project)

but the NPV after tax = \( V(1-T)-J(1-aT)<0 \)

where, \( V = \) the PV of future cash flows

\( T = \) the tax rate (normal tax lags being ignored)

\( J = \) the cost of the investment, and
Table 11

Table showing the Net Present Value of a project before tax. (£)

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflows</th>
<th>Outflows</th>
<th>Discount Net Flows factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Expenditure</td>
<td>0</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>0 Change in working capital</td>
<td>16.645</td>
<td>(116,645)</td>
<td>1 (116,645)</td>
</tr>
<tr>
<td>1 Profit</td>
<td>30,000</td>
<td>30,000</td>
<td>0.9259 27,777</td>
</tr>
<tr>
<td>2 Profit</td>
<td>35,000</td>
<td>35,000</td>
<td>0.8573 30,006</td>
</tr>
<tr>
<td>3 Profit</td>
<td>35,000</td>
<td>35,000</td>
<td>0.7938 27,783</td>
</tr>
<tr>
<td>4 Profit</td>
<td>40,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Working Capital</td>
<td>16.645</td>
<td>56,645</td>
<td>0.735 41,634</td>
</tr>
</tbody>
</table>

Net Present Value 10.555
Table 12

Table showing the net present value of a project assuming a neutral tax system, a tax rate of 40% and a tax lag of one year.

(£)

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflows</th>
<th>Outflows</th>
<th>Discount Net Flows factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Expenditure</td>
<td>0</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>0 Change in working capital</td>
<td></td>
<td>16,645</td>
<td>(116,645) 1 (116,645)</td>
</tr>
<tr>
<td>1 Tax saving</td>
<td>46,658</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Profit</td>
<td>30,000</td>
<td>76,658</td>
<td>0.9259 70,978</td>
</tr>
<tr>
<td>2 Tax</td>
<td></td>
<td>12,000</td>
<td></td>
</tr>
<tr>
<td>2 Profit</td>
<td>35,000</td>
<td>23,000</td>
<td>0.8573 19,718</td>
</tr>
<tr>
<td>3 Tax</td>
<td></td>
<td>14,000</td>
<td></td>
</tr>
<tr>
<td>3 Profit</td>
<td>35,000</td>
<td>21,000</td>
<td>0.7938 16,670</td>
</tr>
<tr>
<td>4 Tax</td>
<td></td>
<td>14,000</td>
<td></td>
</tr>
<tr>
<td>4 Profit</td>
<td>40,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Working Capital</td>
<td>16,645</td>
<td>42,645</td>
<td>0.735 31,344</td>
</tr>
<tr>
<td>5 Tax</td>
<td>22,658</td>
<td>(22,658)</td>
<td>0.6806 (15,421)</td>
</tr>
</tbody>
</table>

Net Present Value  6,644
a = the PV of the allowances expressed as a percentage of the cost

Assuming a new project can be summarised as follows:

\[ J = 1000 \]
\[ T = 0.4 \]
\[ a = 0.9 \]

neutrality does not exist, and the project which was marginal before tax will now have a negative NPV after tax:

\[ V(1-T) - J(1-aT) = -40. \]

The second imperfection discussed above related to the different tax rates during the life of a project. If the tax rate decreased during the life of the project, that is the outlay achieved a tax relief at a higher rate than the inflows were later taxed at, the NPV will increase, whereas the third imperfection discussed above, that of increases and decreases in working capital not being treated as expenses or revenue for tax purposes will decrease the NPV. Hence companies using the NPV model must also include tax flows in their evaluations.

**Payback Period**

The payback period (PP) on the above investment is 3.29 years before tax, (see Table 13) after tax, given a neutral tax system, the payback period is reduced to 2.81 years (see Table 14), obviously indicating that care must be taken if using the PP as the decision criterion, since it may be different even with a
Table 13

Table showing the Payback Period of a Project before allowing for taxation. (£)

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflows</th>
<th>Outflows</th>
<th>Cumulative Net flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Expenditure</td>
<td>100,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Change in working capital</td>
<td>16,645</td>
<td>(116,645)</td>
<td>(116,645)</td>
</tr>
<tr>
<td>1 Profit</td>
<td>30,000</td>
<td>30,000</td>
<td>(86,645)</td>
</tr>
<tr>
<td>2 Profit</td>
<td>35,000</td>
<td>35,000</td>
<td>(51,645)</td>
</tr>
<tr>
<td>3 Profit</td>
<td>35,000</td>
<td>35,000</td>
<td>(16,645)</td>
</tr>
<tr>
<td>4 Profit</td>
<td>40,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Working Capital</td>
<td>16,645</td>
<td>56,645</td>
<td>40,000</td>
</tr>
</tbody>
</table>

Payback period - 3 + 16,645/56,645

- 3.29 years
### Table 14

Table showing the payback period of a project assuming a neutral tax system (£)

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflows</th>
<th>Outflows</th>
<th>Cumulative Net flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Expenditure</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Change in working capital</td>
<td>16,645</td>
<td>(116,645) (116,645)</td>
</tr>
<tr>
<td>1</td>
<td>Tax saving</td>
<td>46,658</td>
<td>76,658 (39,987)</td>
</tr>
<tr>
<td>1</td>
<td>Profit</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Tax</td>
<td>12,000</td>
<td>23,000 (16,987)</td>
</tr>
<tr>
<td>2</td>
<td>Profit</td>
<td>35,000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Tax</td>
<td>14,000</td>
<td>21,000 4,013</td>
</tr>
<tr>
<td>3</td>
<td>Profit</td>
<td>35,000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tax</td>
<td>14,000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Profit</td>
<td>40,000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Working Capital</td>
<td>16,645</td>
<td>42,645 38,632</td>
</tr>
</tbody>
</table>

Payback period = 2 + 16,987/21,000

= 2.81 years
neutral tax system, due to the Government effectively investing in the project at an early stage but not fully reaping the benefits until later. Under the United Kingdom tax system, assuming the company is in a tax paying situation, the payback period would be 3.4 years (see Table 15).

This exercise has shown the complexities of basing evaluations on post tax cash flows. In a real life situation more complexities arise due to a company typically being involved in more than one project.

Grundy and Burns (1979) examine how the United Kingdom tax system can create complementarity and substitutability among otherwise independent projects. This arises due to there being two rates of corporation tax and the existence of tapering relief between the upper and lower rates. Marginal projects of a company whose profits are, say £450,000 may be subject to an effective tax rate of 48.75%, for the 1984/5 financial year, whereas if another project were to take the company's profits over £500,000, the upper limit, the tax rate would be a more modest 45%. Thus as Grundy and Burns state "problems of interdependency can face companies moving into or out of the small companies tapering provisions range."

Grundy and Burns offer other examples of tax induced interdependencies, such as where a project opportunity may enable a company to relieve its advance corporation tax or losses, in
Table 15

Table showing the Payback Period under the United Kingdom tax system assuming the company is in a tax paying situation, with a tax rate of 35%, a tax lag of one year and capital allowances available at 25% (£)

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflows</th>
<th>Outflows</th>
<th>Cumulative Net flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Expenditure</td>
<td></td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>0 Change in working capital</td>
<td></td>
<td>16,645 (116,645) (116,645)</td>
<td></td>
</tr>
<tr>
<td>1 Tax saving</td>
<td>8,750</td>
<td>30,000</td>
<td>38,750 (77,895)</td>
</tr>
<tr>
<td>1 Profit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Tax</td>
<td></td>
<td>10,500</td>
<td></td>
</tr>
<tr>
<td>2 Tax saving</td>
<td>6,562</td>
<td>35,000</td>
<td>31,062 (46,833)</td>
</tr>
<tr>
<td>2 Profit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Tax</td>
<td></td>
<td>12,250</td>
<td></td>
</tr>
<tr>
<td>3 Tax saving</td>
<td>4,922</td>
<td>35,000</td>
<td>27,672 (19,161)</td>
</tr>
<tr>
<td>3 Profit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Tax</td>
<td></td>
<td>12,250</td>
<td></td>
</tr>
<tr>
<td>4 Tax saving</td>
<td>3,691</td>
<td>40,000</td>
<td>48,086 28,925</td>
</tr>
<tr>
<td>4 Profit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Working Capital</td>
<td>16,645</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Payback period = 3 + 19,161/48,086

= 3.4 years
which case the project’s effective tax rate will be lower than
the company’s average tax rate. They suggest that such
interdependencies are likely to lead to increased centralisation
of the appraisal function, due to the lack of availability of
knowledge of managers who initiate projects.

The capital budgeting decision of corporate groups is further
complicated by the United Kingdom tax system due to the ability
to transfer losses and capital allowances between member
companies, therefore the decision to invest in a project may
affect both its own tax position and that of the group, depending
on the incremental tax flows. Members of groups who have losses
may surrender the losses to other members of the group who may be
making profits, thus reducing their liability to tax (Section

Hence if a project’s profits may be used to relieve another
company’s losses, the project’s effective tax rate may be zero.
Alternatively if the company originating the project had
insufficient profits to claim fully the capital allowances or
relieve its losses arising due to the project, profits may be
available elsewhere within the group to enable immediate (subject
to tax lags) benefit to be taken of the losses and capital
allowances. Losses and capital allowances may therefore be seen
as a group resource, which the group must fully utilise if the
maximisation of shareholders’ wealth is to be achieved.
The effect of the United Kingdom Corporation Tax system on investment will now be considered for its impact on risk, using the Capital Asset Pricing Model (CAPM) (Sharpe(1964), Lintner(1965), Mossin(1966) and Treynor(1965)).

Pointon(1980a) however considers an analysis of the tax effects on corporate returns to be incomplete without a study of risk, since risk and required returns are interrelated. Under the CAPM risk averse investors require greater returns for increased systematic risk.

The minimum required rate of return, denoted by \( k_j \), is given by

\[
    k_j = R_f + (\bar{R}_m - R_f)B_j
\]

where, 
\( R_f \) = risk free rate of interest

\( \bar{R}_m \) = mean rate of return on the efficient market portfolio

\( B_j = \frac{cov(k_j,R_m)}{var(R_m)} \)

\( cov(k_j,R_m) \) = the covariance of the rate of return of project \( j \) with the rate of return on the efficient market portfolio

\( var(R_m) \) = variance of the rate of return on the efficient market portfolio

Pointon provides an example of the use of the CAPM in project appraisal which is reproduced in Table 16. Ignoring tax, or with
### Table 16

Table showing the Beta and Mean Rate of Return of a Project

<table>
<thead>
<tr>
<th>Possible Outcomes</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>All Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of outcome</td>
<td>0.20</td>
<td>0.60</td>
<td>0.20</td>
<td>1.00</td>
</tr>
<tr>
<td>Yield on the efficient market</td>
<td>0.05</td>
<td>0.06</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>Expected or average, market yield</td>
<td>0.01</td>
<td>0.036</td>
<td>0.024</td>
<td>0.07</td>
</tr>
<tr>
<td>Deviation of yield on &quot;efficient&quot; market from average market yield for all outcomes</td>
<td>-0.02</td>
<td>-0.01</td>
<td>+0.05</td>
<td></td>
</tr>
<tr>
<td>Project Returns £ per annum</td>
<td>80,000</td>
<td>90,000</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>Rate of Return on Investment Outlay J</td>
<td>80,000</td>
<td>90,000</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>Expected or average rate of return (using probabilities given)</td>
<td>16,000</td>
<td>54,000</td>
<td>20,000</td>
<td>90,000</td>
</tr>
<tr>
<td>Deviation of project rate of return from average for all outcomes</td>
<td>-10,000</td>
<td>0</td>
<td>+10,000</td>
<td></td>
</tr>
<tr>
<td>Market Deviation</td>
<td>-0.02</td>
<td>-0.01</td>
<td>+0.05</td>
<td></td>
</tr>
<tr>
<td>Covariance of rate of return on the project with that of the market</td>
<td>40</td>
<td>0</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Source: Pointon (1980a)</td>
<td></td>
<td></td>
<td></td>
<td>78</td>
</tr>
</tbody>
</table>
a neutral tax system the mean rate of return = $90,000/J$, and the Beta coefficient \( \beta = \frac{\text{Var}(\text{km})}{\text{Var}(\text{km})} \times \frac{1+0}{3} \). But, in a non-neutral tax system, for example, where 100% immediate offset for capital expenditure is not allowed the mean rate of return now becomes \( \frac{90000(1-T)}{J(1-\alpha T)} \), and the Beta coefficient becomes \( \frac{1}{\text{Var}(\text{km})} \times \frac{1+\alpha(1-T)}{J(1-\alpha T)} \). The \( \alpha \) represents the minus NPV of the capital allowances for every pound of outlay, so if 100% immediate capital allowances are allowed (and hence \( \alpha = 1 \)) the pre tax rate of return and the Beta are the same as those post tax.

However, as discussed earlier the United Kingdom Corporation Tax system does not allow for 100% capital allowances except for certain projects. The PV of \( \alpha \) under differing capital allowances for plant and machinery is as follows:

<table>
<thead>
<tr>
<th>Capital Allowance</th>
<th>PV%</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% FYA</td>
<td>100%</td>
</tr>
<tr>
<td>75% FYA</td>
<td>91%</td>
</tr>
<tr>
<td>50% FYA</td>
<td>82%</td>
</tr>
<tr>
<td>25% WDA</td>
<td>73%</td>
</tr>
</tbody>
</table>

* assuming a 10% cost of capital

Tax time lags, from the end of an accounting period to the tax settlement date are ignored as they are assumed to be the same throughout the life of the project and therefore appear in both the numerator and the denominator. By applying a cost of capital of 10% it can be seen that the NPV's of the capital allowances reduce in value, and hence the expected rate of return and the
risk (Beta) also reduce. With 100% capital allowances there is no reduction in risk nor return, but if there is less than 100% capital allowances a previously attractive project may now become unattractive (see Diagram 4).

Project A is marginal before tax, but after tax (A1) it falls below the security market line, and is thus no longer worth undertaking. Project B is definitely attractive before tax; if the reduction in risk and return brought it to B1 it may still be worth undertaking, but it is possible that the reduction may take it to a position B2, an amount below that required by the post tax level of risk, or as Pointon states

"the fiscal system does not reduce the level of risk by an amount sufficient to compensate for the decline in expected returns."

Again, illustrating that if taxation is not allowed for in appraisal the company may be making incorrect investment decisions.

So, how is the company to be sure of making correct decisions? alternatively put, how should a company allow for tax in project appraisal? This thesis suggests the use of a simulation model, enabling the incremental tax flows of the project to be calculated. But first, it is necessary to reiterate that Governments purposefully introduce biases into the taxation system to promote certain corporate behaviour, for example to increase investment. To conclude this chapter an examination is made of whether company's decisions regarding the level and type
Diagram showing the effect of less than 100% Capital Allowances on the risk and return of a project using the Capital Asset Pricing Model.
of investment are sensitive to investment incentives.

Otto Eckstein (1964) acknowledges the emphasis Governments have placed on investment incentives in the following statement:

"Tax devices to stimulate investment have certainly been the greatest fad in economic policy in the past ten years. In a period when the trends in the use of policy instruments were in the direction of more general, less selective devices, all sorts of liberalized depreciation schemes were embraced with enthusiasm all over the non-communist world."

However, the important question is, are such incentives successful in achieving their aims? Early studies, for example Hart & Prusmann (1963) in their survey from 1954 to 1963 indicated that as much as 36.2% of firms are responsive to incentives, whilst Corner & Williams (1965) found that 21% were responsive in their survey from 1956 to 1963. Hall and Jorgensen (1967) concluded that tax policy in the United States is highly effective in changing the level and timing of investment expenditure and could also achieve changes in the composition of investment, for example they consider that the liberalisation of the depreciation rules in 1954 led to a shift from equipment to structures. Their work, however has been severely criticised by Coen (1969) and Eisner (1969). Coen considers that "neither their results nor their procedures stand up to scrutiny" and adds that their study must therefore be regarded as
inconclusive. Eisner attacks Hall and Jorgensen's study on grounds of their conclusions being based on assumption rather than empirical evidence.

Agarwala & Goodson (1969), Feldstein and Fleming (1971) and King (1972) have provided studies on the effectiveness of tax policy in changing the level of investment, but, as Alam (1983) asks, if investment incentives have a significant impact on investment, why has the level of investment, particularly in manufacturing, fallen? Alam tackles this problem by looking at the investment decision for the single firm. By employing regression analysis he found that the coefficients for investment incentives were not significant at the 5% level, and that in fact the sign for "all industries" was negative. However, he adds that cash grants may have some positive influence, due to his results of comparing the 1970-1973 period when cash grants and accelerated depreciation were available, with the latter period when only accelerated depreciation was available. He concludes his article by saying:

"There is a clear inference to be drawn that Governments should not place excessive reliance on changes in taxation in order to secure changes in the investment behaviour of the corporate sector."

Alam's (1984) later empirical survey supported his findings when only 6.2% of the respondents considered "investment allowances
and tax savings and others" to be one of the three most important factors determining their level of investment.

Alam (1984) suggests that expectations about future demand are likely to be an influential factor in investment decision-making rather than tax savings, possibly due to uncertainty. The search for tax saving may be allocated a much lower priority than the search in other areas of activity due to the complexities of the tax system. Larger firms appeared to be more responsive to tax incentives and Alam suggests this may be because they have more expertise required to exploit the information relevant to their decisions.

Hence, it would appear that Governments may not be very successful in using taxation as a fiscal tool to promote certain types of investment behaviour. The effect on corporate behaviour due to the changes brought about by the Finance Act 1984 may shed more light on the success of Governments using fiscal tools. The results of the interview survey, discussed in Chapter 10 provide an indication of the reactions of the corporate sector.

Taxation obviously affects investment decisions directly through the taxation of profits arising from a project, however, taxation also affects investment through the financing decision, for example ACT may only be recoverable if taxable profits are available. The project may be able to provide these profits, and thus use the unrelieved ACT to reduce the project's tax
liability. As the amount of ACT payable is dependent on the company's dividend policy, its dividend policy will affect the worth of the project. In the next chapter an examination is made of these interdependencies and it is demonstrated how, if the tax system is not neutral with respect to the financing decision, the worth of an investment may be affected.
Chapter 5

Taxation and Finance

Whilst this thesis is primarily concerned with the firm's investment decision, taxation, if not neutral in terms of the financing decision, may affect the worth of a capital project. It is therefore important to consider the company's financing decision in project appraisal. This chapter describes the possible taxation effects on a company's financing decision and illustrates how the yield of an investment may be affected through the company's financing decision.

Stapleton and Burke (1978) define a tax system to be neutral with respect to a particular financing decision "if, under that system the decision has no effect on the market value of the company."

If a tax system is not neutral it may have an important effect on economic efficiency, for example, if a system encouraged a high level of debt, then it may be partly responsible for bankruptcies and their subsequent costs. There may also be a bias in favour of companies with high debt capacities, for example real estate. Whilst, if a system encourages retention as opposed to a new issue of shares as a source of funding, then a bias will exist against high growth firms and infant industries, as Stapleton and Burke (1978) point out:
"the average cost of capital to highly levered and high retention firms is relatively low and investments are undertaken with prospective rates of return that would be insufficient to justify investment in other firms and industries."

Thus it can be seen that neutrality is a desirable objective; so what type of system will achieve neutrality? Van den Tempel (1969), in his report for the EEC on harmonising the EEC tax system, favoured the classical system, on grounds that if the company was to be considered a legal entity, then it should act with motivations of its own, regardless of other groups. Following this argument the usual criticism of the classical system, that it leads to double taxation of distributions, is of no interest to the company since it is of no relevance what happens to the dividends once paid out. He adds that both the dual rate system, which reduces the corporate tax on dividends, and the imputation system, provide a bias in favour of dividends which would lead to a lower level of investment than in a no-tax world.

However if the goals and interests of other people are important and to quote Stapleton and Burke (1978)

"the corporation is regarded simply as an alternative vehicle for pursuing the interests of its owners, the shareholders", then the classical system favoured by Van den Tempel may cause management to increase retentions, in order to keep dividends within the no-tax level, since otherwise dividends will be
subjected to double taxation. The imputation tax system in this respect is more neutral. The objective of maximisation of shareholders' wealth, which is central to most financial theory is adopted in this thesis thus the imputation system is the more neutral.

Miller and Modigliani in their 1958 paper advocate that under certain assumptions the market value of a company is not affected by the company's leverage, and concluded that levered companies cannot command a premium over unlevered companies because investors have the opportunity of putting the equivalent leverage into their portfolio by borrowing on their personal accounts. However, one of the assumptions was the absence of corporate taxation.

Debt financing has the advantage of treating interest payments as tax deductible, and thus the market value of the company is increased if debt financing is used, for example see Table 17. Thus the total increase in payments to all investors is £175, where the company is geared, that is the interest payment multiplied by the corporation tax rate(£500x.35)

This figure represents a tax shield provided by the Government for the levered company. If the debt employed is permanent the present value of the tax shield equals

\[ \frac{\text{£175}}{r} = \text{tc.B} \text{ (Modigliani and Miller(1963))} \]

where, tc = the corporation tax rate
Table 17

Table showing the increase in payments to all investors where debt financing is used, assuming an interest rate of 10%, and a corporation tax rate of 35%, ignoring personal taxation.

<table>
<thead>
<tr>
<th></th>
<th>Company X</th>
<th>Company Y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a 100% based equity company</td>
<td>a geared company</td>
</tr>
<tr>
<td>Earnings before interest and taxes</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Interest income to debt holders</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Taxes</td>
<td>2,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Income available to shareholders</td>
<td>1,300</td>
<td>975</td>
</tr>
<tr>
<td>Income to shareholders and debt holders</td>
<td>1,300</td>
<td>1,475</td>
</tr>
</tbody>
</table>
\[ B = \text{the market value of debt}, \quad r = \text{the interest rate on debt}. \]

Thus the present value of the tax shield in the example is

\[ .35 \times £5000 = £1750 \]

It must however be added, that only if the company is in a full tax paying situation will the tax deductibility of interest be effective.

If interest deductibility increases the value of the firm, then why do companies choose less than 100% debt capital structures? Interest payments to debt holders are required, by law, to be paid otherwise the debt holder may enforce a receivership or liquidation, whereas distributions to shareholders are not required by law. The interest payments to debt holders must be fully paid before a distribution may be made, and thus if a company is achieving a low level of profits, there may be little left after paying interest for distribution to shareholders. For this reason debt is considerably more risky than share capital. If a company increases its debt/equity ratio shareholders may require higher returns, for the extra risk they are experiencing, and debt holders may increase their rates of interest. The present value of the tax shield due to interest deductibility may be offset by the risk involved in highly levered companies.

The above has ignored personal taxation which, when introduced
may reduce or eliminate the tax advantage created by debt. Miller (1977) proposes that, under a classical tax system the present value of the tax shield becomes:

\[ [1 - \frac{(1-t_c)(1-t_{PS})}{1-t_{pd}}] B \]

where, \( t_{PS} = \) the personal tax rate on distributions (assuming the total amount available for shareholders is distributed)

\( t_{pd} = \) the personal tax rate on debt interest

The example shown in Table 18 illustrates the effects of personal taxation on the amount distributed to debt holders and shareholders. If the personal tax rate imposed on shareholders exceeds the personal tax rate imposed on debt holders there is an increase in the present value of the tax shield. Vice versa, if the tax rate imposed on debt holders is higher the present value of the tax shield will be lower. This situation reflects the classical system. Under the imputation tax system distributions are not subjected to further taxation in addition to corporate taxation, providing the shareholders tax rate is equal to the basic rate of income tax. Here the tax shield may be eliminated if the corporation tax rate is equal to the personal tax rate imposed on debt holders. However, if the corporation tax rate is higher, as shown in Table 19, there will still be a tax advantage to debt. Hence, provided shareholders are basic rate taxpayers:

the present value of the tax shield = \[ [1 - \frac{(1-t_c)}{(1-t_{pd})}] B \]
Table 10

Table showing the increase in payments to all investors where debt financing is used, assuming an interest rate of 10%, a corporation tax rate of 35%, and an income tax rate to both shareholders and debtholders of 35%, under a classical tax system.

<table>
<thead>
<tr>
<th></th>
<th>Company X</th>
<th>Company Y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a 100% equity based</td>
<td>a geared company</td>
</tr>
<tr>
<td>Earnings before interest and taxes</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Interest income to debt holders</td>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td>Taxes</td>
<td>700</td>
<td>525</td>
</tr>
<tr>
<td>Before-tax income available to shareholders</td>
<td>1,300</td>
<td>975</td>
</tr>
<tr>
<td>Total Personal Taxation*</td>
<td>455</td>
<td>516</td>
</tr>
<tr>
<td>After tax Income to shareholders and debt holders</td>
<td>845</td>
<td>959</td>
</tr>
</tbody>
</table>

*. Note: Company X 1,300 x 0.35 = 455
Company Y (975 x 0.35) + (500 x 0.35) = 516
Table showing the increase in payments to all investors where debt financing is used, assuming an interest rate of 10%, and a corporation tax rate of 35%, and an income tax rate of 30%, under an imputation tax system.

<table>
<thead>
<tr>
<th></th>
<th>Company X</th>
<th>Company Y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a 100% equity based</td>
<td>a geared company</td>
</tr>
<tr>
<td>Earnings before interest and taxes</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Interest income to debt holders</td>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td>Taxes (before ACT set-off)</td>
<td>2,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Net Dividends to shareholders</td>
<td>1,300</td>
<td>975</td>
</tr>
<tr>
<td>ACT (3/7 x Net Dividends)</td>
<td>557</td>
<td>417</td>
</tr>
<tr>
<td>MCT (700 - 557)</td>
<td>143</td>
<td>(525-417) 108</td>
</tr>
<tr>
<td>After tax income to debtholders and shareholders</td>
<td>1,300</td>
<td>1,325</td>
</tr>
</tbody>
</table>

* Note 500 - (500 x 0.3) + 975 = 1,325
King (1977) has approached the problem of neutrality with respect to dividend policy by determining when a shareholder would find retentions preferable to dividends. He finds that when the following equation holds neither is preferred.

\[(1 - ms) = (1 - b) (1 - g)\]

where, \(ms\) = the shareholder's marginal tax rate, 
\(b\) = the basic rate of income tax, and 
\(g\) = the capital gains tax rate

thus, in the United Kingdom neutrality is achieved where the shareholders marginal tax rate equals 0.51%, however very few shareholders are likely to have such a marginal tax rate, thus the system is not neutral. This equation also shows that if capital gains tax did not exist, the tax system would be more neutral, since the marginal tax rate for neutrality would be 30%, a rate which is likely to be appropriate to more shareholders.

Pointon (1981) extends King's model to accommodate risk, and finds that the equation would remain the same.

Pointon provides a table, reproduced in Table 20, which illustrates the requirements for neutrality.

There are restrictions on the company's ability to reduce the mainstream corporation tax by the ACT already paid, concerning the adequacy of taxable profits, and if the company is in a situation of loss making, the ACT may be carried forward indefinitely, as Kent and Theobald (1980) point out, where ACT is
### Table 20

Table showing the conditions for a neutral tax system under different states of nature.

<table>
<thead>
<tr>
<th>Dividend policy</th>
<th>No Dividends</th>
<th>Full Dividends</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State of nature</strong></td>
<td><strong>h = 1-(1-T)(1-g)</strong></td>
<td><strong>b = T</strong></td>
</tr>
<tr>
<td>Insufficient cash profits to pay interest on debentures</td>
<td>h = 1-(1-T)(1-g)</td>
<td>b = T</td>
</tr>
<tr>
<td>Insufficient cash profits, after interest, to repay debt capital</td>
<td>h = 1-(1-T)(1-g)</td>
<td>h = 1-(1-b)(1-g)</td>
</tr>
<tr>
<td>Sufficient cash profits to meet all debt obligations</td>
<td>h = 1-(1-T)(1-g)</td>
<td>b = T</td>
</tr>
</tbody>
</table>

where,  
- h = the (higher) marginal rate of personal tax on investment income  
- T = the full rate of corporation tax  
- g = the rate of capital gains tax  
- b = the basic rate of income tax

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irrecoverable the advantages of the imputation system in removing
double taxation are negligible, and the tax system is almost
identical to the classical system.

It is widely accepted that the discount rate used in discounted
cash flow evaluations should be adjusted for the tax advantage of
debt, that is, ignoring the tax lag:

\[ \text{the cost of debt} = K_i (1 - t) \]

where, \( K_i \) = the cost of debt before interest deductibility
\( t \) = the corporation tax rate.

An alternative approach is to include the incremental tax flows
of the project as cash flows. The latter allows, more readily
for the situation where a company falls in and out of different
tax bands during the life of the project. As Keane (1976) states
"the conventional practice of reducing the cost of debt by a
factor of \((1-t)\) for discounting purposes is based on the premise
that a project's cash flows should be measured as if they derive
no benefit from the tax deductibility of interest payments, and
on the fiction, by way of compensation, that the return required
by lenders is lower than it actually is by an amount equal to the
corporate rate of tax."

In conclusion the tax effects of the financing of capital
projects must be included in the evaluations. For risk-free
projects appropriate adjustments can readily be made, although
when risk is included the determination of the tax effects attributable to financing methods are less clear. Nevertheless, if the project is risk-free and financed by debt, the tax payable will be decreased by the interest payable multiplied by the effective tax rate, alternatively if the project is financed by an issue of share capital, and the company is in a non-tax paying situation, the ACT paid from incremental dividends distributed from project cash flows, must be included as a cost of the project. Timing differences affecting the sources of finance must also be included. It is proposed that the tax effects should be included as cash flows, and not by altering the discount rate.

The investment decision and financing decision interact and must be considered together when evaluating a project. These interactions are included in the model presented in Chapter 8. The next chapter discusses the tax legislation relating to corporate groups, and the interdependencies arising due to the legislation.
Chapter 6
The Taxation of Corporate Group Structures

To reiterate, this thesis is concerned with the capital investment decisions of corporate group structures, and the way their management allow for taxation in such decisions. As discussed previously, there are certain rules for the taxation of corporate group structures which allow for the transfer of tax losses and capital allowances between member companies. This chapter discusses these rules, their effects and their implications and hence shows the complexities necessary to be included in the models developed later.

The meaning of group differs depending on the context, but here group will take on the meaning given to it under s.258 of the Income and Corporation Taxes Act 1970, that is: two companies are considered to be part of the same group if

a) one company is the 75% subsidiary of the other, or
b) both companies are 75% subsidiaries of a third company. Thus:

```
a) A  75%  B
    /  75%  /
   /    /
  A    B
```

the groups are AB and ABC respectively. Also the following forms
as F controls both G and H to the extent of at least 75%.

Finally a group exists as follows:

d)  

\[ 
\begin{array}{c}
I \\
75\% \\
\downarrow \\
J \\
60\% \\
\downarrow \\
K \\
80\% \\
\downarrow \\
L \\
40\% \\
\end{array} 
\]

because, I controls L to the extent of (75% of 60%) and (80% of 40%) i.e. 77%, which is greater than the 75% control required.

The '75% control' refers to the ownership of ordinary share capital, and, in addition for group relief to be available, the 75% relationship must apply in terms of any possible dividend distribution, and distribution of assets on liquidation. Group relief provisions apply only to companies resident in the United Kingdom (s.258(7) (Income and Corporation Taxes Act 1970)), so in diagram (d) above, if K were a non-resident company the group would consist of only I and J. Finally, if any share capital is held in such a way that on the disposal of such shares any sale would be treated as a trading receipt, such share capital should be ignored in determining whether the shares are directly or indirectly held. So, what losses do qualify for group relief?
Basically, group relief may be divided into four types, trading losses, capital allowances, excess charges and excess management expenses of investment companies.

Trading Profits
The adjusted profit computation for the period of account is further adjusted for any appropriate capital allowances, and if a trading loss results, it will qualify for group relief, irrespective of whether there are other profits.

Excess Charges
Excess Charges, which may occur if a company found that its charges exceed its total profits chargeable to corporation tax, are only available for relief where there are no other profits of the company chargeable to corporation tax.

Capital Allowances
If the company is trading, the appropriate capital allowances will form part of the trading loss, through which relief is effected. However, it is possible for capital allowances to be available in a non-trading organisation, for example, where a patent is purchased as an investment, in which case, the allowances are given by way of discharge or repayment and are available primarily against the income deriving from the asset on which the claim is made. Where the allowances exceed the income for any particular period, the excess may be subject to group relief.
Excess Management Expenses

Here the excess management expenses of an investment company, which may be the parent company acting as a collection and coordination centre for the other activities within the group, may qualify for relief.

The companies forming a group may be divided into surrendering companies and claimant companies and for group relief to take effect there must be at least one of each in the group. Then the maximum amount of relief available is determined by the lower of "relief available" and "profit capable of being relieved". The surrendering company may decide the amount of its loss it wishes to surrender, or whether it is more beneficial to claim relief under s.177(2) of the income and Corporation Taxes Act 1970 to carry back its losses, or to carry forward its loss under s.177(1).

Whichever, the decision may affect both its own tax position and that of the group as a whole, its loss in effect being a group resource. Different advantages exist for each of the options, as Crouch (1984) lists below:

"(1) There is a cash flow effect to carrying losses backwards which may increase their real value. The corporation tax of previous periods may become repayable immediately, whereas the corporation tax of other group companies for the same accounting period, may not be due for some months into the future."
(2) The surrendering company will have to claim to reduce its own current accounting period's total profit to nil, before being able to carry back any remaining losses.

(3) Claims under s.177(2) and s.177(3a) cannot be made to cover part of the total profits of a period. If there are sufficient losses, the profits must be reduced to nil. It is not possible to choose how much relief can be claimed. (see illustration below.)

(4) Losses carried backwards may displace charges on income resulting in the carry forward of trade charges under s.177(8) and the loss on non-trade charges.

(5) There may be different effective rates of corporation tax applicable to the accounting periods of the surrendering company. With projected rates of corporation tax falling gradually to a mere 35%, the prospect of a repayment of tax at 52% appears very generous."

A further adjustment will be necessary if the surrendering company and claimant company have different year-ends. The common period to both companies is the relevant one, ie if the surrendering company's year end was 30 June, whilst the claimant's year-end was 30 September, then the common period would be from the 1 October to the 30 June, thus only 3/4 of losses would be transferable between these two companies.
Table 21 illustrates how group relief may be effected.

Here Company A has the option to carry the loss back under s.177(2), or transfer the loss to Company B. If the company chooses to claim under s.177(2) a repayment of £3,120 (6,000 @ 52%) will occur. Had Company A preferred to transfer its loss to Company B, only £1,000, could have been set off, there being only 6 months common accounting period between them. Company A could also carry the loss forward under s.177(1), but, as the tax rate is falling, it is unlikely that this would be beneficial.

<table>
<thead>
<tr>
<th>30 September 1983</th>
<th>30 June 1983</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>Company B</td>
</tr>
<tr>
<td>6,000</td>
<td>(7,000)</td>
</tr>
<tr>
<td>Capital allowance (2,000)</td>
<td>(2,000)</td>
</tr>
<tr>
<td>4,000</td>
<td>(9,000)</td>
</tr>
</tbody>
</table>

Company B may carry back the loss under s.177(2), thus reducing the tax bill for 1982/1983 by £1,040 (setting off 2,000), it could then transfer £2,000 of the loss to Company A, saving tax of £1,020, it will then be necessary for Company B to carry the remainder of the losses, £5,000, forward.
Table 21

Table showing how group relief may be effected between companies with different accounting periods (ignoring small companies rate)

<table>
<thead>
<tr>
<th>Year End</th>
<th>Tax Rate</th>
<th>Profits</th>
<th>Capital Allowances</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Sep 1981</td>
<td>52%</td>
<td>10,000</td>
<td>2,000</td>
</tr>
<tr>
<td>30 Sep 1982</td>
<td>52%</td>
<td>(5,000)</td>
<td>1,000</td>
</tr>
<tr>
<td>30 Sep 1983</td>
<td>51%</td>
<td>6,000</td>
<td>2,000</td>
</tr>
<tr>
<td>30 Sep 1984</td>
<td>47.5%</td>
<td>4,000</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 June 1981</td>
<td>52%</td>
<td>5,000</td>
<td>2,000</td>
</tr>
<tr>
<td>30 June 1982</td>
<td>52%</td>
<td>4,000</td>
<td>2,000</td>
</tr>
<tr>
<td>30 June 1983</td>
<td>51.5%</td>
<td>(7,000)</td>
<td>2,000</td>
</tr>
<tr>
<td>30 June 1984</td>
<td>48.75%</td>
<td>3,000</td>
<td>2,000</td>
</tr>
</tbody>
</table>

Note: There is more than one corporation tax rate applied to profits of accounting years when the year ends do not fall on 31 March. The effective tax rate is thus a weighted average, and is calculated as follows:

1. 52%*(6/12)+50%*(6/12) = 51% (Sep 83)
2. 50%*(6/12)+45%*(6/12) = 47.5% (Sep 84)
3. 52%*(9/12)+50%*(3/12) = 51.5% (June 83)
4. 50%*(9/12)+45%*(3/12) = 48.75% (June 84)
30 September 1984

Company A

loss carried forward

3,000

(2,000)

1,000

30 June 1984

Company B

(5,000)

3,000

(2,000)

(4,000)

Here, Company B has no alternative but to carry forward the loss, because, as the loss occurred other than during the current accounting period, group relief is not available.

The above examples illustrate how group relief may be effected, and the alternatives available to the surrendering company. The effects of group relief may now be looked at in the context of the capital budgeting decision.

In order to illustrate how capital investment decisions are affected, a simple group structure consisting of only two companies, will be used. Firstly, a project will be evaluated by Company A without reference to the tax profile of Company B; this will then be compared to an evaluation taking into account Company B's tax position.
Year | Investment | Cash Flow
---|---|---
0 | (10,000) | 
1 | | 5,000
2 | | (3,000)
3 | | 6,000
4 | | 7,000
5 | | 5,000

Assumptions:

The tax rate is 50% throughout the life of the project.

There is a tax lag of one year.

The discount rate is 10%

There are profits only arising from the project.

100% capital allowances are available subject to satisfactory profits.
Thus in the absence of competing projects the company should accept this project, however if there was another mutually exclusive project, which yielded a net present value of £3,000, then the company should accept that project.

Example 2 (see Table 22)

Company B has the same accounting period as Company A and is making profits of £5,000 per year.
Table showing the evaluation of a project in a group situation where another member company is making profits of £5,000 p.a.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(10,000)</td>
</tr>
<tr>
<td>1</td>
<td>Company B uses the group relief to reduce its tax by 5000(0.5) = 2,500, 5,000 loss carried forward</td>
</tr>
<tr>
<td>1</td>
<td>5,000</td>
</tr>
<tr>
<td>2</td>
<td>Company A uses the remaining 5,000 to offset its tax on the cash inflow for year 1</td>
</tr>
<tr>
<td>2</td>
<td>(3,000)</td>
</tr>
<tr>
<td>3</td>
<td>Company B uses the group relief to reduce its tax liability, a resultant flow of 3000(0.5) = 1,500.</td>
</tr>
<tr>
<td>3</td>
<td>6,000</td>
</tr>
<tr>
<td>4</td>
<td>tax at 50% on 6,000 = 3,000</td>
</tr>
<tr>
<td>4</td>
<td>7,000</td>
</tr>
<tr>
<td>5</td>
<td>tax at 50% on 7,000 = 3,500</td>
</tr>
<tr>
<td>5</td>
<td>5,000</td>
</tr>
<tr>
<td>6</td>
<td>tax at 50% on 5,000 = 2,500</td>
</tr>
</tbody>
</table>

NPV = £2,225.96
Here the NPV = £2,225.96, and if the competing project exists, the company will now choose this project in preference.

Thus, a group may under-invest if it fails to take into account its whole tax profile. Another situation where the profitability of a project may be underestimated may occur where the group as a whole has trading losses, then any profit arising from the project may be set against the losses of the same accounting period, resulting in an effective rate of tax of zero on the projects inflows. In Table 23 an example of this uses the same information as before, except this time Company B is making losses of £5,000 each year.

If Company B has prospects of making profits in the future it will then be able to offset its losses itself, however due to the time value of money, they will be worth considerable less in tax savings than if used by Company A as shown in Table 23. However, not all of Company B's losses were utilised by Company A and these should be carried forward.

Thus the net present value of the project is £3838.78; again this project would be accepted in preference to the other. Thus, if a group is to make optimal investment decisions it is clear that either each company must have full information of the tax profiles of all the other companies in the group, or, that the investment decision be made centrally. The former is probably impractical because the information load would be too great, and
Table 23

Table showing the evaluation of a project in a group situation where another member company is making losses of £5,000 p.a.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flows</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Project</td>
<td>Company B</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>(10,000)</td>
<td>(5,000)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5,000</td>
<td>(5,000)</td>
<td></td>
</tr>
<tr>
<td>2 tax</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>(3,000)</td>
<td>(5,000)</td>
<td></td>
</tr>
<tr>
<td>3 tax</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6,000</td>
<td>(5,000)</td>
<td></td>
</tr>
<tr>
<td>4 tax</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>7,000</td>
<td>(5,000)</td>
<td></td>
</tr>
<tr>
<td>5 tax</td>
<td>(1,000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5,000</td>
<td>(5,000)</td>
<td></td>
</tr>
<tr>
<td>6 tax</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Tax on inflow of 5,000 zero because capital allowance claimed.
- 5,000 claimed as a capital allowance, and 1,000 set off as group relief.
- 5,000 set off as group relief.
it would be necessary to inform all the companies each time an investment decision is made. A further problem occurs when the management of two individual companies use the same tax losses in their investment evaluations, Grundy and Burns (1979) refer to this as "double counting". In these circumstances, the most profitable project after allowing for the tax benefits should be adopted, and a reappraisal made of the other, without the tax benefits, however the two companies would not be aware of this problem.

Interdependencies also occur when a group finds its assessable profit within the tax band where tapering relief applies, here, the effective tax rate will be considerably higher than outside this band, for example for the 1984/85 tax year, if a company's taxable profits are between £100,000 and £500,000, then the effective tax rate for projects not taking the group's profits over £500,000 is 48.75%, compared to a 45% tax rate if the profits were over £500,000 and 30% if the profits were under £100,000. Grundy and Burns (1979) show how this may lead to the adoption of projects which take the taxable profits over the upper threshold which would otherwise have been considered unattractive. This effect is somewhat reduced by the lowering of the tax rates following the Finance Act 1984, nevertheless it still illustrates how incorrect decisions may be made if the managers do not know the correct effective tax rate.

The second alternative also presents problems, because companies
may resent losing some degree of autonomy, and this may be against the management philosophy of decentralisation, as Grundy and Burns (1979) suggest the following consequences may occur:

"a perceived and real increase in the importance in project appraisal of the role of some central project analyst or coordinator (with access to all investment proposals within the company and a knowledge of the total tax situation facing the company.), and

(2) a perceived and real decrease in the influence of the originators of proposals on the appraisal of these proposals." Grundy and Burns consider the latter to be particularly disturbing, as it may discourage ideas. They add that "it may be worthwhile to persevere in the attempt to retain a degree of decentralisation of the project appraisal function."

They offer the following possibilities in the attempt to overcome these problems:

a) the submission of projects on a pre-tax basis
b) the initiating manager could draw up several evaluations of the same project based on different tax rates
c) encourage managers to submit proposals, which may, on the face of it appear unprofitable, and
d) batch proposals arising in different parts of the organisation to enable more accurate decisions to be made.

There are obvious problems in (a), as tax can be a significant determinant on the profitability of the project, and the manager
may have only a vague idea of whether the project was profitable. Item (b) appears to yield advantages, as the investment analyst would clearly be aware of whether the project is profitable when the effective rate of tax is applied to it. Feedback is of importance here, so that the initiating manager is aware of the tax rate applied when the proposal was viewed in the context of the whole group.

Under item (c) because, projects appearing to be unattractive when viewed independently may give rise to complementarity when viewed in the context of the whole group, managers should be encouraged to submit proposals which are slightly unattractive. With (d) the larger the batches of proposals the better the decision-making should be, but a balance needs to be struck between the size of the batches and the extent of the costs (e.g. motivational costs, lost opportunities) of deferring profitable projects. Thus the manager of a corporate group is faced with two problems:

(1) how to centralise the investment decision without distracting autonomy from the individual companies, and
(2) how to cope with the complexities caused by the tax induced interdependencies.

The simulation model described in Chapter 7 addresses the latter and shows how it is possible to integrate these complexities in the company's investment decisions.
Chapter 7

The Simulation Model

Types of Financial Models

Today's decision maker is faced with the task of making decisions in a complex, unstable environment. In order to carry out this task he needs information as to the likely effects of his decisions. To determine the effects of his actions he could simply implement the decision and see what happens, but this could be impractical, costly or even impossible. An alternative response involves simulation, when a realistic model of the complex world situation is developed, and the decision maker can "experiment", and so determine the effects of a decision. This chapter briefly examines the models available to the manager, and develops a simulation model to be used in capital budgeting. This model is then tested under a variety of scenarios.

There are several models available to the decision maker, which all, broadly speaking, may be defined as representations of all or part of a company's current or prospective operations, or of its economic environment. These models may be classified into several categories as described below.
Deterministic Simulation

A deterministic model uses single valued estimates as input data, and a simulation model imitates a more complex reality, so, together, a deterministic simulation model is a representation of the company's current or future operations. The representation requires assumptions regarding the relationships between the variables formulated. In a deterministic model these representations allow the model builder to vary 1) the conditions under the control of the manager, and 2) the assumptions relating to the environment or conditions outside the control of the manager. These two factors allow the manager to test the implications of various plans for the future. The model developed later in the chapter is of this type.

Probabilistic Simulation

Probabilistic models employ multiple estimates as input data, with attached probabilities reflecting the relative frequency of the occurrence of specific values. Such models are useful to examine the implications of various proposed future plans under a range of likely performances, for example probabilities representing the demand for a new product may be embodied in a capital investment model.

Optimising models

This type of model provides the decision maker with an optimal solution to some specified objective function subject to certain
conditions being fulfilled. Linear programming is a type of optimising model.

Why use a deterministic simulation model in Capital Budgeting?

The taxation complexities referred to in previous chapters make the building of a general analytical model at the very least cumbersome if not impossible (see Berry and Dyson(1979) and Pointon(1982)). Whereas a simulation model could be used to calculate the tax flows with project acceptance and without project acceptance, and thus determine the tax flows attributable to the project. These tax flows could then be included with the other cash flows, and the net present value of the project determined. Whilst the simulation could be done manually it would be extremely tedious and time consuming, and may lead to human error, whereas by employing a computer the model can be executed within a few minutes, therefore a computer has been used for the simulation.

Gosh and Kantor(1985) express the usefulness of using computers to determine the impact of taxation on capital budgeting decisions as follows:

"One important implication of this analysis is that better corporate tax planning can be achieved if capital budgeting decisions incorporate the differences in the tax provisions and their effect on the NPV expression. The number of possible calculations and their degree of difficulty make computer models
essential. These models would provide accuracy and timeliness to the decision making process with up-to-date adjustments for our many changes in tax legislation."

Previous simulation models used in capital budgeting

David Hertz (1964) was one of the first to propose the use of simulation in capital budgeting when evaluating a proposal for a $10 million expansion of a processing plant. He used nine data input variables and used the information obtained to compare the risk/return characteristics of the investment alternatives. Thus his simulation was probabilistic, which is the more commonly used in capital budgeting to analyse risk. Clark, Hindelang and Pritchard (1984), also develop a general capital budgeting programming model to analyse the risk of a project, and to determine the alternative which, under the different probabilities is expected to yield the maximum utility. They include a variable for taxation in the model but only on an elementary scale. The simulation model developed in this chapter is deterministic, and as such varies considerably from these models, due to the different objectives of such models.

Bhaskar (1982) also uses simulation to build a model for evaluating capital projects, but again, he only includes tax at an elementary level.
Development of the Model

There are some disadvantages involved in using a simulation model for capital investment decisions. Firstly, if there is a large amount of data to be inputted it will be both costly and time consuming, however once a company has inputted a large proportion of the data only a few variables will need changing when a new project is evaluated. Secondly, the model is based on forecasts, and therefore suffers from the inherent weaknesses of forecasts, however as most capital budgeting models are based on forecasts this must be accepted if a capital budgeting evaluation model is to be used. The advantage of the simulation model in this respect, is that it enables the manager to employ sensitivity analysis with little extra work involved. By altering the variables under question the program can be rerun and the effects on the net present value of the project analysed. Thirdly, the model is only a simplified representation of reality, and some assumptions are necessary, for example, if the project is of a substantially different risk category to the company as a whole further modifications will be required. It is considered however that the assumptions are not unreasonable, and as such do not greatly affect the usefulness of the model.

The MDMS computer package was chosen due to its ability to handle a large amount of data, and the way it presents the information is suitable. The package also allows for ratio analysis to be conducted if the company wishes to check the effects on the more
important of its ratios such as liquidity. However, the MDMS package proved too small in the final stages of the development of the model and the model was transferred to the Supercalc spreadsheet on the Apricot microcomputer. For this reason there are two types of print out, but the underlying equations are the same.

Prior to developing the model, the basic net present value model is analysed, a project invented, and the net present value of that model determined. This model is then developed and modified to include tax and other complexities, and, at each stage, the net present value is determined and compared with the previous net present value. As the model develops some variables will be changed to indicate further the effects of not allowing for certain contingencies such as unrelieved Advance Corporation Tax.

Secondly, the model will be developed to incorporate the interdependencies of other projects and circumstances within a single company. Finally, the model will incorporate the complexities of corporate group structures.

The Basic Net Present Value Model

The assumptions of this model are as follows:

1. All cash flows occur at the year-end.
2. Taxes are lagged one year.
3. Advance Corporation Tax is ignored.
4. The discounted value of the capital allowances for assets written down at 25% per annum on a reducing basis, is calculated as follows:

\[ 0.25J T \left( \frac{1+k}{0.25+k} \right) \]

where, 

- \( J \) = cost of asset 
- \( T \) = tax rate 
- \( k \) = discount rate

(Davis & Pointon (1984) p.103)

when discounted to the first tax payment date on which a reduced liability is given. Hence the present value is \( 0.25JT/(0.25+k) \)

5. Tax is imposed at the full rate of 35%.

6. The discount rate is 15%.

7. Interest is tax deductible.

8. The flows of the project are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of investment</td>
<td>(10,000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in working capital</td>
<td></td>
<td>(1,000)</td>
<td></td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>Cash flows</td>
<td></td>
<td>(1,000)</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td>Scrap value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,000</td>
</tr>
</tbody>
</table>

The basic model has been put into computer readable form and the command file executed giving a NPV of -£139.39, a potentially unattractive project.

The model to be developed will be based on the basic model with
several of the assumptions relaxed in order to add more realism. At each stage of the development command files will be prepared and executed to determine the effects on the NPV.

**Discounting Quarterly**

The assumption that all cash flows occur at the year end may distort the PV of the investment, especially if the discount rate is high. This effect may be lessened by treating the flows as occurring at the end of each quarter.

The flows for each quarter need to be defined and entered as data, they are then discounted quarterly to determine the discounted values at the year end. The necessary command file to effect this has been prepared and the NPV determined.

The NPV has now increased to £504.02. If a higher rate of discount was used the effect would be greater.

**Capital Allowances**

The basic model assumes that capital allowances are received irrespective of the company's profit situation, however the Capital Allowances Act of 1968 provides that the company may only offset the capital allowances for that period if there are adequate profits. Then, if there is an excess of capital allowances they may be set against profits of any description for
the same accounting period, then against profits of any
description for the previous accounting period; providing the
accounting period is of the same length. If there is still an
excess they may be carried forward to future accounting periods
but only set off against profits of the same trade. As this
project is being evaluated in isolation it will be necessary to
carry forward the capital allowances under s.169 of the CAA 1968
to be treated as capital allowances of the next period until
fully utilised. However, because of the time value of money, the
capital allowances will be worth less in present value terms than
if received immediately.

The investment is defined as a short life asset under the Finance
Act 1985, thus providing it is disposed of within five years from
purchase a balancing allowance or charge will arise at the time
of disposal.

Again command files incorporating these factors have been
prepared and executed. As expected there is a decrease in the NPV
due to the later set-off of the capital allowances. The later
the company is able to relieve its capital allowances the greater
the negative effect will be on the NPV. For example, assuming
there are two projects with the same NPV before considering the
above effects, one reaping high profits early in its life, whilst
the other reaps higher profits in later years, the former project
will be more attractive.
In order to bring advance corporation tax (ACT) into the calculations the firm's dividend policy must be ascertained. It is generally thought that directors prefer to maintain a certain level of dividend with increases only when the directors feel they can be maintained in subsequent years. The directors generally prefer not to declare an increase in the rate of dividend, for example see Baker et al (1985). It has been assumed that the company on which the data is based has a dividend policy as follows: where the project gives rise to zero or negative profits, no dividend will be payable due to the project. Where there are positive profits, dividends will be payable at the rate of 25% of the profits (before capital allowances are deducted). Dividends are not deducted from the cash flows, as this would be contrary to the principles of the NPV model, ie the NPV model determines the NPV of the investment to the shareholders irrespective of whether the profits are distributed or retained.

The imputation system provides that ACT is payable on the dividends fourteen days following the end of the quarter during which the dividend is paid, the quarters ending on the 31 March, 30 June, 30 September and 31 December. ACT is charged at the basic rate of income tax, thus if £500 (net) is payable to shareholders, then ACT = 3/7 x £500 = £214. Thus if £500 is distributed on the 31 July, then £214 will normally be payable to shareholders.
the Inland Revenue as ACT on the 14 October (although it will be treated as occurring on the 1 October in the model.) The ACT paid during the year may then be deducted in arriving at the MCT payable at the end of the year. However, the deduction may occur up to 18 months after the payment of ACT, and only then if adequate profits (after deducting capital allowances) have been made. Thus, due to the time value of money, the value of the deduction will be less in real terms.

The command files have been prepared to include these effects and executed. The NPV has now dropped to -£67.72, due to the timing difference between paying ACT, and reducing the Mainstream Corporation Tax payment. Again, if profits do not occur until later in the project's life, the NPV will be lower.

**Accounting Period v's Fiscal Year**

If a company's accounting period spans two fiscal years, and different rates of corporation tax apply during those two years (due to legislation changing the tax rates), a modification to the model will be necessary.

**Different Tax Bands**

If the company's profits fluctuate sufficiently to cause it to drop in and out of different tax liabilities, i.e., sometimes the small companies' tax rate applies sometimes the full corporation
tax rate applies and sometimes tapering relief applies, then a modification must be made to ensure that the correct tax rate is used.

This completes the simulation model analysing projects in isolation. The model will now be developed to include the taxation induced interdependencies of a single company.

The investment decision of a single company is further affected by taxation due to (1) the availability of profits against which to set Capital Allowances off immediately, (2) the existence of losses giving rise to an effective tax rate of zero (excluding ACT), (3) unrelieved ACT may be relieved earlier with profits arising from the project, and (4) profits and losses arising from the project, which may take the company into different tax bands. These effects may give rise to both incentives and disincentives, depending on the companies tax profile.

In the previous model Capital Allowances could only be utilised when the project made profits. This delayed the tax advantage by several years. However, if there are other profits in the company, the project’s Capital Allowances may be set off against those profits, reducing the tax payable by the Capital Allowances multiplied by the effective tax rate. There may be an increase in the tax payable in subsequent years, when the project is making profits, nevertheless due to discounting the earlier reduction in the tax payable will lead to a higher NPV.
If the company is in a loss making situation, profits arising from the project will be subject to a zero effective tax rate (excluding ACT) until the losses are fully relieved, likewise, if the company has unrelieved ACT, profits arising from the project may be used to relieve the ACT, again reducing the tax payable. However the losses and ACT relieved due to the project are then not available for use by the company at a later date, thus some charge needs to be made for the use of them. The size of the charge will depend on the likelihood of the company being in a situation to utilise the losses. For example, if a company is likely to remain in a loss making situation in the foreseeable future, the charge should be quite small. However, if the company is expecting to enter a 'profit making' situation in the near future the charge should approximate the tax savings from the effect of losses discounted from the time when the company can utilise them as if no project had existed.

Profits arising from the project may cause the company's taxable profits to be subject to different tax rates other than if the project was not in existence. For example, if the company's taxable profits fall between the upper and lower limits they will be subject to tapering relief. If the project's profits increase the company's taxable profits above the upper limit they will then be subject to the slightly lower full rate. Likewise, if there are losses arising from the project they may take the company's taxable profits below the lower limit when they will be
subject to the small companies rate.

Thus a simulation model of the investment decision of a single company should include these interdependencies. This model must also include certain legislative effects.

As stated previously, if there are unrelieved losses and Capital Allowances they may be carried forward under s.177(1) of the ICTA 1970 to be relieved against future profits, however they may only be relieved against profits of the same trade. Thus if a company carries on several trades a restriction must be made to ensure that this legislation is adhered to.

A company may set its losses off against profits arising from any source during the year in which the losses arise and the previous year, providing it is of equal length, under s.177(2). The possibility of using the profits of a previous period must be modelled to ensure that the company takes full advantage of the situation. There are two ways in which the company can effect this:

1. It may always set off ACT brought forward and ACT of the previous period (period 1) first, and if losses are made in the present period (period 2), only allow the remainder of the taxable profits, after deduction of the gross dividend equivalent of the ACT set off to be used to relieve the losses of period 2. This will give rise to a rebate equal to the lesser of the

127
losses of period 2 multiplied by the effective tax rate of period 1, or the remainder of the taxable profits, after deducting the gross dividend equivalent of period 1 after allowing for previously unrelieved ACT, multiplied by the effective tax rate of period 1 (see Table 24).

2. Alternatively, the company may decide to reduce its ACT set off in period 1, and allow all the taxable profits to be available against which to set off the losses of period 2. In this case there will be a rebate equal to the lessor of (a) losses of period 2 multiplied by the effective tax rate of period 1, or (b) the taxable profits of period 1 before any ACT set off multiplied by the effective tax rate of period 1. In arriving at the MCT payable for period 1 ACT would have been deducted. If then the profits of period 1 utilised against the losses of period 2 exceed the remainder of the taxable profits of period 1 less any ACT deducted, then the rebate must be reduced by the excess multiplied by the basic rate of income tax.

Thus, with both methods in the above examples there is an effective tax payment of zero, with (i) losses carried forward or (ii) the gross dividend equivalent of ACT carried forward of the same amount. This will however only happen when the company's effective tax rate in period 1 is equal to the basic rate of income tax, for example, see Table 25.

Hence, a saving of 2,500 has been achieved due to the difference
Table 24

Table showing the effect of using the two methods on the Company’s Tax Liability

<table>
<thead>
<tr>
<th>Year</th>
<th>Taxable Profits</th>
<th>ACT set-off</th>
<th>Gross Dividend Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10,000</td>
<td>2,100</td>
<td>7,000</td>
</tr>
<tr>
<td>2</td>
<td>(8,000)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Method 1

Year 1 Taxable Profits @ 30%
10000 @ 30% 3,000
ACT set-off 2,100
Tax Payable 900

Year 2 Available from year 1 for offset
Taxable Profit-Gross Dividend
10,000 - 7,000 = 3,000
Rebate 3000 @ 30% = 900
Losses carried forward = 5,000

Method 2

Year 1 as above

Year 2 Available for offset
Taxable Profit = 10,000
Losses 8,000
Rebate = 8,000 @ 30% = 2,400

less excess, ie taxable profit utilised 8,000 minus taxable profit-gross dividend 3,000 excess 5,000

Rebate is therefore reduced by 5,000 @ 30% = 1,500
Rebate = 900
ACT carried forward = 1,500 of which the gross dividend equivalent = 5,000
### Table 25

Table showing the effect of using the two methods on the Company's Tax Liability

<table>
<thead>
<tr>
<th>Year</th>
<th>Taxable profits</th>
<th>ACT</th>
<th>Gross Dividend Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>200,000</td>
<td>30,000</td>
<td>100,000</td>
</tr>
<tr>
<td>2</td>
<td>(150,000)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Method 1**

**Year 1**

Taxable profits @ 35% - ACT set-off

\[ 200,000 @ 35\% = 70,000 - 30,000 = 40,000 \]

**Year 2**

Taxable profits available for offset

\[ 200,000 - 100,000 = 100,000 \]

Losses for offset = 150,000

Rebate = 100,000 @ 35% = 35,000

Effective tax payment over the two years = 5000

Losses carried forward = 50,000

**Method 2**

Available for offset = 200,000

Losses = 150,000

\[ 50,000 \]

Tax at 0.35%

\[ 17,500 \]

ACT 50,000 @ (3/10)

\[ 15,000 \]

MCT

\[ 2,500 \]

Effective tax payment = 2,500

ACT carried forward = £15,000 of which the grossed equivalent is £50,000

Note: Small Companies rate and marginal small companies relief are ignored
between the basic rate of income tax and the company's effective
tax rate. However, the unrelieved ACT may only be offset at a
rate of 30% in the future, whereas the losses carried forward may
be offset at the company's effective tax rate of that period,
which may be higher. This may mean that the company will achieve
a saving if it adopts Method 1, for example see Table 26.

Thus a tax saving of £5,600 will have been achieved.

It is likely that Method 2 may often be more beneficial as full
ACT offset may be achieved by utilising the profits of the
previous 6 years under s.52 of the Finance Act of 1984. Also if
this is not available there are less restrictions to setting off
unrelieved ACT than setting off losses brought forward, for
example the restriction that the profits utilised must be from
the same trade. Nevertheless the method chosen by a company will
depend on its own particular tax profile, therefore models have
been developed which encompass both of these methods.

These models have been executed several times to illustrate the
effects of altering different variables on the net present value
of the project, see Tables 27, 28 and 29.

Table 27 shows that where each year (i)a company is making
constant profits of £600,000 and claiming constant Capital
Allowances of £50,000, and (ii) the company is able to relieve
both its Advance Corporation Tax and Capital Allowances, then a
Table 26

Table showing the effect of using the two methods on the Company's Tax Liability

<table>
<thead>
<tr>
<th>Year</th>
<th>Taxable profits</th>
<th>ACT</th>
<th>Gross Dividend Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80,000</td>
<td>21,000</td>
<td>70,000</td>
</tr>
<tr>
<td>2</td>
<td>(200,000)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>300,000</td>
<td>21,100</td>
<td>70,000</td>
</tr>
</tbody>
</table>

Method 1

Year 1  Taxable profits @ 30% - ACT set-off = 3,000

Year 2  Rebate = 10,000 @ 30% = 3,000
Losses carried forward = 190,000

Year 3  Taxable profits 300,000
less losses bfwd 190,000
---
110,000 @ 38% = 41,800
less act set-off 21,000
---
20,800

Effective tax payments over the 3 years = 20,800

Method 2

Year 1  as above

Year 2  Available for offset = 80,000 @ 30% = 24,000
less excess = 70,000 @ 30% = 21,000
---
Rebate 3,000

Year 3  Taxable profits 300,000
Losses bfwd 120,000
---
180,000 @ 38% = 68,400
less actbfwd + act set-off 42,000
---
26,400

thus a tax saving of £5,600 will be achieved, using Method 1.
Table showing the Net Present Value of a project assuming the company is making constant profits of £800,000, and has constant capital allowances of £50,000 per annum.

<table>
<thead>
<tr>
<th>Method 1</th>
<th>Present Value of flows without project = £3,795K</th>
</tr>
</thead>
<tbody>
<tr>
<td>(setting off ACT first)</td>
<td>Present Value of flows with project = £3,795.4K</td>
</tr>
</tbody>
</table>

Net Present Value of Project = £400

Method 2 Present Value of flows (setting off previous years profits first)

- Present Value of flows without project = £3,795K
- Present Value of flows with project = £3,795.4K

Net Present Value of Project = £400

Here, because the company is making profits and is able to relieve both its ACT and Capital Allowances, it does not matter which method the company uses. The Net Present Value of the project is £400, and is therefore, in the absence of competing projects, worth undertaking.

Note: Dividend payout is assumed to be one quarter of profits, excluding the profits arising from the project.
Table 28

Table showing the Net Present Value of a project assuming the company is making profits of (K) 300 (100) 400 (200) 300 (700) 300 300 300 300 300 300 and has constant capital allowances of £30,000

| Method 1 | Present Value of flows without project = £943.56K |
| Setting off ACT first | Present Value of flows with project = £940.92K |

Net Present Value of Project = -£2.64K

Method 2

| Present Value of flows without project = £946.12K |
| Setting off previous years profits first |
| Present Value of flows with project = £946.18K |

Net Present Value of Project = £60

Here it is important to determine which method the company will use to set off its ACT and losses etc. because the present value of the company flows is greater with Method 2, then it will adopt this method. Hence, the project is attractive, with a positive net present value. However, if Method 1 had been adopted the project would be unattractive.

Note: Dividend payout is assumed to be one quarter of profits, excluding the profits arising from the project, and zero when the company is making losses.
Table 29
Table showing the Net Present Value of a project assuming the company is making constant losses of £200,000, and has constant capital allowances of £30,000

<table>
<thead>
<tr>
<th>Method 1</th>
<th>Present Value of flows without project = -£2070.4K</th>
</tr>
</thead>
<tbody>
<tr>
<td>(setting off ACT first)</td>
<td>Present Value of flows with project = -£2068.2K</td>
</tr>
</tbody>
</table>

Net Present Value of Project = £2,200

Method 2 Present Value of flows
(setting off without project = -£2070.4K previous years profits first)

Present Value of flows with project = -£2068.2K

Net Present Value of Project = £2,200

Again it does not matter which method the company adopts because the Net Present Value of the flows is the same. The present value of the project is however quite large because of the company's losses, therefore the project is quite attractive.

Note: Dividend payout is assumed to be zero due to the company making losses.
NPV of £400 is achieved.

The NPV is reduced in Table 28 where the company has fluctuating profits and losses. Here, if the company used Method 1 the project is unattractive, whereas if Method 2 is used, that is allowing for losses to be set off against the previous years profits before relieving any Advance Corporation Tax, a NPV of £60 is achieved.

Table 29 shows the NPV of the project when the company is in a loss making situation. A NPV of £2,200 is achieved here irrespective of which method is used.

**Simulation model incorporating group effects**

The potential utilisation of profits to relieve capital allowances and losses arising in a single company is further extended for groups of companies, when profits arising in one company may be used to relieve capital allowances and losses arising in another company forming part of the group (as defined in Chapter 5) providing their accounting periods are the same.

It is assumed in the model that the accounting periods of all the companies in the group are the same.

The company receiving the benefit of the losses may choose whether to utilise all available losses or only a proportion. The model assumes that all losses, ACT and Capital Allowances will be
relieved as soon as possible and thus the claimant will utilise all available profits to offset its losses. However, the profits of another company may only be utilised to offset losses arising in the same period, that is there is no provision to offset losses under s.171(2) against the profits of a previous period of another group member.

Dividends may be paid by the company to its parent company, allowing a franked payment to be made by the subsidiary, and franked investment income (FII) to arise for the parent. If the subsidiary has "taxable profits", it will be able to set off the ACT paid against the Gross Corporation Tax at the year end, whilst the parent may set off the ACT arising from its distributions against the FII, allowing the ACT to be relieved earlier if the parent company is making losses. This may only be achieved in this direction, i.e., the subsidiary paying dividends to its parent, and to incorporate this in the model would enforce an unrealistic assumption. However, as it is possible to transfer assets in the group, it would be possible to move the project to either the subsidiary or the parent depending on which is necessary for the above to work, no modification to the model is required.

The intention of legislation regarding corporate group taxation is to treat the group as near as possible as if it were a single company.
As before, under the models for a single company two models have been produced, one to allow for the deduction of ACT before allowing offset under s.171(2), and the second allowing for set-off under s.171(2) before ACT relief.

Also the group may choose whether to use the profits of the previous period before transferring any remaining losses to another member company, or vice versa. The method providing the maximum utility will depend on the group's tax profile. Thus 3 methods are required as follows:

(a) Stage 1: set off ACT. Stage 2: set off losses against previous year's profits. Stage 3: set off losses against other member companies.

(b) Stage 1: set off losses against profits of other member companies. Stage 2: set off losses against previous year's profits. Stage 3: set off ACT.

(c) Stage 1: set off ACT. Stage 2: set off losses against profits of other member companies. Stage 3: set off losses against previous year's profits.

These models have been executed several times to determine the effects of different groups profiles. The final modification to the simulation model concerns the effects of different sources of finance and the calculation of the discount rate.
The financing strategy of the project may affect the project's worth. If the project is financed by debt, the interest payment is tax deductible, which providing the company is in a tax paying situation will reduce the group's tax liability. If the project is financed by an issue of share capital compared with a retention, there may well be a subsequent increase in dividend payout, and Advance Corporation Tax paid. ACT is payable fourteen days after the end of the quarter in which there has been a distribution, but the mainstream corporation tax (MCT) is not reduced by the ACT paid until, up to 33 months after the distribution. The NPV of a project financed partly or wholly by share capital, will be lower due to the timing difference. ACT may only be deducted from the MCT payable providing there are adequate "taxable profits". If the company is likely to remain in a loss making situation the ACT paid may not be recoverable for several years, and in effect becomes a cost of the project.

The simulation model causes the discount rate, \( r \), to be calculated based on the weighted average cost of capital, that is

\[
r = \frac{(MVE \times KE) + (MVD \times KD) + (MVP \times KP)}{MVE + MVD + MVP}
\]

where,

- \( MVE \) = market value of equity
- \( MVD \) = market value of debt
- \( MVP \) = market value of preference share capital
KE = cost of equity
KD = cost of debt
KP = cost of preference capital

KE is based on the Gordon growth model, that is

\[
KE = \frac{D_1 + G}{Po - Ee}
\]

where, \(D_1\) = total dividends paid in 1 year's time
\(Po\) = current market value of equity
\(G\) = expected growth of dividends
\(Ee\) = cost of an issue of equity

\[
KD = \frac{i}{MVD - Ed}
\]

where, \(i\) = annual interest payment
\(MVD\) = market value of debt
\(Ed\) = cost of an issue of debt

NB KD is calculated pre tax, and the effects of interest deductibility are included as cash flows.

\[
KP = \frac{dp}{MVP - Ep}
\]

where \(dp\) = preference dividend payout
\(MVP\) = Market value of preference share capital
\(Ep\) = cost of an issue of preference share capital
The cost of issuing debt is tax deductible under s.38 of the Finance Act 1980, and this has also been incorporated in the model.

There are other techniques available to calculate the discount rate, for example, the adjusted present value method and the equity residual income method. Franks et al (1985) suggest that the later is the most confusing, and prefer the adjusted present value method, because, whilst the weighted average cost of capital method is the simplest to use, it does not "cope with the problem of temporary non-taxpaying, where tax shields on interest charges must be carried forward to a future date."

However, the model developed in this thesis treats the tax deductibility of interest as a cash flow, which is only available if there is adequate taxable income, and thus avoids the problem suggested by Franks et al. The weighted average cost of capital is the also most widely used in practice. For these reasons the weighted average cost of capital has been adopted in the model.

The Gordon dividend growth model has been adopted in preference to the capital asset pricing model (CAPM) because the CAPM is, conceptually a single period risk adjusted rate. If the CAPM is used to value multi-period cash flows it is necessary to assume that the future risk free rates and risk premiums are known with certainty. Whereas, the Gordon Model represents a risk adjusted
rate for a perpetuity.

The model also enables the effects of investing in a project at different times of the year to be included, for example, if a project involves an investment in plant and machinery at the beginning of the accounting period the company will have to wait at least 21 months before gaining the benefit of the capital allowances, whereas an investment at the end of the accounting period may attract capital allowances after 9 months.

The project adopted throughout the development of the model is again evaluated in the context of a group using different group tax profiles.

This chapter has presented the stages involved in the building of a simulation model which enables the incremental tax flows, of a capital project arising in a corporate group, to be calculated and included in the evaluation of the project. This model is used to determine whether biases arise in the methods used by companies to incorporate tax in their evaluations. Nine case studies are presented in Chapter 11 examining how and why such biases may arise.
As previously stated, the aims of this thesis are to provide computer models to enable more accurate representation of taxation to be integrated in the capital budgeting decision of corporate group structures, to test these models and to gain an insight into how companies at present allow for taxation in their capital budgeting processes.

Capital budgeting is essential to the success of a company, and, although several authors have expressed their dissatisfaction that the evaluation stage is receiving more academic attention than other important issues in the capital budgeting process (Pike (1982), Pinches (1982)), it is however a necessary stage and as such it is important that the manager conducts the evaluation as accurately as possible. If the manager does not allow for taxation in the evaluation, or, if tax is allowed for only superficially, the evaluation may be subject to biases, and as Mills (1983) concludes, "clearly there are significant tax implications that should not be ignored. To ignore these effects by omitting them from the analysis and basing calculations on cash flow before tax is no answer."
At present there are no readily available models for companies to use which integrate to any extent the interactions and interdependencies arising through taxation. Hence one of the main thrusts of this thesis is to provide such models, which the author developed in part one of the thesis.

Thus to reiterate a primary aim is as follows:

1. To develop simulation models to encapsulate taxation induced interdependencies arising in the capital budgeting decisions of corporate groups.

To support the primary aim, a secondary aim is as follows:

2. To investigate sub-optimal decisions which may and do arise as a result of the evaluation procedures used by companies, which ignore such interdependencies.

An overview of the thesis is provided in Diagram 5. Now that the models have been presented the reader is now invited to turn his/her attention to the empirical evidence.

Postal Survey

To gain an insight into how companies incorporate tax effects in their capital appraisals a mail questionnaire survey was adopted. It was first considered that a postal survey may lead to biases...
due to poor response, but, as can be seen below, this did not prove to be a problem. A second problem with a postal survey, is the need for a concise questionnaire with pre-coded questions. This may lead to respondents choosing the nearest alternative, which will not be a true representation. Although the questionnaire required the ticking of yes/no answers, the respondent was asked to add further information as desired. The questionnaire is reproduced in Appendix B.

There are several factors which are considered to improve the response rate to mail questionnaires, and where appropriate they have been employed in this survey.

To determine whether questionnaire size affects the response rate to mail questionnaires, Scott (1961) and Sirken et al (1960) have conducted surveys which have involved sending two different short questionnaires to two samples of respondents and a third questionnaire, the other two compiled, to a third sample. There was no indication that the short questionnaires received higher response rates. Nevertheless, the questionnaire used in this survey has been restricted to two pages in length.

Scott (1961) suggests that official sponsorship may increase the response rate. This survey has been in part sponsored by the Chartered Institute of Management Accountants, and this was indicated in the covering letter. As many of the respondents were accountants, this may have increased the response rate.
A franked envelope was included with the questionnaire, it is thought however that a stamped envelope promotes response more than a franked envelope, due to the sender having to pay in advance for the stamp. (Scott(1961)).

Emphasis has been placed on the importance of including a covering letter with the questionnaire, stating the importance of the questionnaire, and why the addressee's response is important. A covering letter was forwarded with the questionnaire.

The opportunity of replying to questionnaires anonymously may increase the response rate, and the opportunity to reply anonymously was available to the respondents. It was considered particularly important for a survey of this kind due to the sensitivity of taxation issues. Thirty one companies replied anonymously.

Three areas are addressed in the survey, as follows:
1. the evaluation techniques used by the companies, and how the discount rate is calculated if discounted cash flow techniques are used;
2. how the companies allow for taxation in their evaluations; and,
3. whether corporate groups allow for the problems of member companies carrying out their investment appraisals in isolation.
Research Methodology: Stage One

Questionnaires were forwarded to the Financial Director of 234 United Kingdom companies chosen from the top 500 companies of the "Times 1000". Usable replies were received from 134 companies, a response rate of over 57%. The companies replying have first been classified into three groups, highly capital intensive (59 companies), low capital intensity (44 companies) and anonymous (31 companies). Manufacturing, engineering and telecommunication companies are included in the high capital intensive group, whereas retail, leisure and service companies are included in the low capital intensive group. A second classification of replies has been examined in terms of the company's ranking in the Times 1000, as follows:

<table>
<thead>
<tr>
<th>Ranking</th>
<th>1-100</th>
<th>101-200</th>
<th>201-300</th>
<th>301-400</th>
<th>401-500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of companies</td>
<td>14</td>
<td>26</td>
<td>22</td>
<td>24</td>
<td>17</td>
</tr>
</tbody>
</table>

Reminders were posted to the companies not replying, (see Appendix C for covering letter) and they were asked to state their reasons for non-compliance. A further 30 usable replies were received at this stage, and 66 companies replied stating their reasons for non-compliance see Table 30. The results of the questionnaire are discussed in Chapter 9, where a comparison
### Table 30

Table showing reasons for non-participation in the survey

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of companies</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient time to complete the questionnaire</td>
<td>19</td>
<td>28.8%</td>
</tr>
<tr>
<td>Company policy not to complete questionnaires</td>
<td>12</td>
<td>18.2%</td>
</tr>
<tr>
<td>Receive too many questionnaires concerning project appraisal</td>
<td>11</td>
<td>16.7%</td>
</tr>
<tr>
<td>Returned the questionnaire anonymously</td>
<td>6</td>
<td>9.1%</td>
</tr>
<tr>
<td>Receive too many questionnaires</td>
<td>5</td>
<td>7.6%</td>
</tr>
<tr>
<td>Do not consider tax important in project appraisal</td>
<td>3</td>
<td>4.5%</td>
</tr>
<tr>
<td>Other (see note 2)</td>
<td>10</td>
<td>15.2%</td>
</tr>
</tbody>
</table>

**Notes**

1. Some respondents stated more than one reason.
2. Other reasons included:
   - Most questions not appropriate for international conglomerate with differing circumstance at operating level.
   - Not appropriate for financial services
   - Most projects do not have a defined payback
   - The impact of taxation in relation to the decision is minimal
   - Difficult to provide one word answers to complex matters
   - Several different operating companies within the group use different methods
   - Takeover and closure of head office
   - Two major takeovers have stretched our resources.
of practices between the classifications is examined.

Although the letters were addressed to the financial director of the company, the questionnaires were completed by other personnel, as can be seen in Table 31. The designatory letters of the respondents were also requested, and these are reproduced in Table 32.

**Questionnaire**

To determine whether the questionnaire was appropriate it was circulated to colleagues of the Plymouth Business School, and was forwarded to the Research Department of the Chartered Institute of Management Accountants for their comments and the questionnaire was amended accordingly.

The questions included in the survey are as follows:

What methods are used in project appraisal?

Is taxation allowed for in project appraisal? (If the company does not include tax in their appraisals, they were asked to return the questionnaire at this stage)

How is taxation allowed for?

If discounted cash flow techniques are used, how is the discount
<table>
<thead>
<tr>
<th>Personnel completing the questionnaire</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance Director</td>
<td>26</td>
<td>19.4%</td>
</tr>
<tr>
<td>Accountant/Treasurer</td>
<td>26</td>
<td>19.4%</td>
</tr>
<tr>
<td>Financial Controller/Manager</td>
<td>13</td>
<td>9.7%</td>
</tr>
<tr>
<td>Taxation Manager/Accountant</td>
<td>7</td>
<td>5.2%</td>
</tr>
<tr>
<td>Strategic/Corporate Planner</td>
<td>5</td>
<td>3.7%</td>
</tr>
<tr>
<td>Company/ Director Secretary</td>
<td>4</td>
<td>3.0%</td>
</tr>
<tr>
<td>Other</td>
<td>17</td>
<td>12.7%</td>
</tr>
<tr>
<td>Anonymous</td>
<td>32</td>
<td>23.9%</td>
</tr>
<tr>
<td>Not stated</td>
<td>4</td>
<td>3.0%</td>
</tr>
<tr>
<td></td>
<td>134</td>
<td></td>
</tr>
</tbody>
</table>
### Table 32

The designatory letters of the personnel completing the questionnaire

<table>
<thead>
<tr>
<th>Designatory Letters</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCA/ACA/CA</td>
<td>52</td>
<td>36.7%</td>
</tr>
<tr>
<td>BSc/BA/BAcc</td>
<td>11</td>
<td>7.7%</td>
</tr>
<tr>
<td>ACMA/FCMA</td>
<td>10</td>
<td>7.0%</td>
</tr>
<tr>
<td>MA/MBA</td>
<td>9</td>
<td>6.3%</td>
</tr>
<tr>
<td>FCCA/ACCA</td>
<td>7</td>
<td>4.9%</td>
</tr>
<tr>
<td>ACIS/FCIS</td>
<td>5</td>
<td>3.5%</td>
</tr>
<tr>
<td>FIC/ACI</td>
<td>2</td>
<td>1.4%</td>
</tr>
<tr>
<td>others</td>
<td>17</td>
<td>11.9%</td>
</tr>
<tr>
<td>none/not stated</td>
<td>29</td>
<td>20.4%</td>
</tr>
</tbody>
</table>

**Note**

Some personnel have more than one set of designatory letters.
rate calculated?

Were there any unrelieved advance corporation tax (ACT), losses or unclaimed capital allowances at the start and/or the end of the 1985 financial year?

What is the accounting period?

Is the company the head office/holding company of a group? (if the company is not, the respondent was asked to return the questionnaire at this stage)

Is the transfer of losses and/or unclaimed capital allowances between member companies allowed, and if so does the claimant pay some recompense to the surrendering company?

What are the group's goals and objectives?

Non Response Bias

As already stated a major problem with postal surveys is poor response. The response rate to this survey was 57%, which is favourable considering that taxation issues are often treated with delicacy. Erdos (1970) stresses the problems of relying on postal surveys with response rates less than 100%, as follows:

"No mail survey can be considered reliable unless it has a
minimum of 50% response or unless it demonstrates with some form of verification that the non-respondents are similar to the respondents."

This survey has achieved a response rate in excess of 50%, but nevertheless, it is important to attempt to examine the characteristics of the non-respondents.

Tests have been conducted to determine the character of the non-respondents and to indicate the extent of non-response bias.

Firstly, the companies participating were compared with the companies not participating in terms of rank, and capital intensity. (The companies replying anonymously are truly anonymous and it is impossible to determine which category they belong to, therefore they have been included with the non-respondents.) Chi square tests have been used to determine whether a relationship exists between the companies replying and the category they fall within.

Table 33 illustrates the companies replying and not replying and whether they belong to the high capital intensive, low capital intensive group or the anonymous group. There is no relationship at the 5% level between the companies replying and a particular classification.

Table 34 illustrates the ranking of the companies and whether
Table 33

Table showing the number of companies replying to the postal questionnaire, and the number of groups not replying included in the high and low capital intensive groups.

<table>
<thead>
<tr>
<th></th>
<th>High Capital Intensity</th>
<th>Low Capital Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replying to the</td>
<td>59</td>
<td>44</td>
</tr>
<tr>
<td>questionnaire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not replying (or</td>
<td>66</td>
<td>65</td>
</tr>
<tr>
<td>included in the</td>
<td></td>
<td></td>
</tr>
<tr>
<td>anonymous group)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 34

Table showing the number of companies replying to the postal questionnaire, and the number not replying in terms of their ranking in the Times 1000.

<table>
<thead>
<tr>
<th></th>
<th>1-100</th>
<th>101-200</th>
<th>201-300</th>
<th>301-400</th>
<th>401-500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies</td>
<td>14</td>
<td>26</td>
<td>22</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>replying</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Companies</td>
<td>15</td>
<td>29</td>
<td>31</td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td>not</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>replying</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
they have replied, again there is no significant relationship, indicating that the non-respondents are alike the respondents.

It has been suggested that companies delaying in replying to questionnaires may be more alike the non-respondents, for example see Scott (1961). Tests were conducted to determine whether any significant relationships exist between the answers to the questions, and the group replying before the follow-up letter and those replying after the letter.

There was no instance of a significant relationship between the responses and when the questionnaire was received, indicating that if the late respondents may be considered as similar to the non-respondents, non-response bias is not a problem.

It has been suggested (Zikmund 1984) that the respondents level of interest in a questionnaire may affect his decision to respond. It must therefore be noted that the respondents who are less interested in the impact of taxation on capital budgeting may be less likely to respond, however there is no evidence to support this hypothesis.

The second part of the empirical work involved an interview survey to gain a fuller understanding of the capital budgeting procedures of corporate groups.
Research Methodology: Stage Two

The research methodology employed in the second stage is the structured interview approach, enabling information to be collected in a systematic way whilst allowing the participants to elaborate on issues requiring further discussion.

One problem associated with structured interviews is interviewer bias, where the researcher may be inclined to phrase questions in such a way as to influence the response, or the participant may be inclined to respond in a particular way to please/displease the researcher. The problem is accentuated if more than one researcher is involved in collecting the information, due to different personal characteristics. There was, however only one researcher involved in this survey. Attempts were made to minimise interviewer bias by introducing a topic in outline and allowing the participant to expand the topic with little influence from the interviewer.

Another problem associated with the structured interview approach was cost, however the companies were quite flexible in arranging the time and date of the interview which enabled two companies, in similar locations, to be interviewed on the same day, thus reducing cost.

A third problem which exists in all surveys is whether the researcher has fully understood the meaning intended in a response. In order to check the accuracy, copies of the reports
were written up following the interview, and were forwarded to
the participants for clarification.

Twenty three of the companies replying to the postal
questionnaire were included in this survey. To determine whether
the 23 companies could be accepted as a true representation of
the sample included in the postal survey several chi square tests
were conducted. For representation to be acceptable there
should be no significant relationships between the companies
included in the interview survey and the companies not included
and their responses to the questions in the postal questionnaire.
There was no evidence of significant relationships.

**Questionnaire used in Stage Two**

To ensure that the questionnaire used during the structured
interviews was appropriate, an initial questionnaire was drafted
and tested in a pilot survey, involving five large companies. A
full revision was then undertaken and a second questionnaire was
developed.

This questionnaire was reviewed by colleagues at the Plymouth
Business School, following which amendments were made resulting
in the questionnaire used in this survey.

The questionnaire is divided into five sections. The first
section examines the length of the capital budgeting plan, how it
fits with the strategic plan, and the annual size of the capital budget. The second section determines when and how capital projects arise, and the criteria used in the screening process. The decision phase is examined in the third section, including the effects of risk, inflation and taxation. The use of post audits forms the fourth section, and the impact of the Finance Act 1984 is discussed in the final section. A copy of the questionnaire is included in Appendix D.

Sample

Initially letters were forwarded to the Financial Controller of fourteen groups of companies in the South West region. Three companies offered to participate, a response rate of 21%.

Letters were then forwarded to the Financial Director of twenty large United Kingdom based groups of companies chosen from the Times 1000. Six companies offered to participate, and one company forwarded a copy of its capital budgeting manual. All seven have been included in the survey, a response rate of 31%.

Finally, twenty two of the companies included in the postal survey were interviewed, and one company was forwarded a copy of the structured interview questionnaire which was completed and returned. Information obtained from the twenty three companies is included in the survey, a response rate of 17% of the companies participating in the postal survey.
The thirty three companies consisted of 1 single company, 2 private limited groups of companies and 30 public limited groups of companies. To determine whether the practices varied according to the size of the company, the companies were classified in terms of the size of their turnover, see Table 35.

Although the letters were addressed to the Finance Director or Finance Controller, the participants were as shown in Table 36.

The length of the interviews varied from a half hour to over three hours. Reports were written up after the interview and were forwarded to the interviewee to clarify interpretation and accuracy, and amendments were made as necessary.

The third stage of the research involved testing the simulation model and comparing the results with an evaluation based on the different companies procedures and assumptions. Where possible actual projects have been obtained. However, due to the reluctance of some of the companies to provide such data it has been necessary to develop hypothetical projects, and evaluate them by following the assumptions of the companies obtained from the interviews.

The comparisons highlight the biases arising from the companies' evaluations and these have been analysed.
Table 35

Table showing the companies participating in the survey in terms of size

<table>
<thead>
<tr>
<th>Turnover (£)</th>
<th>Number of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 100,000</td>
<td>3</td>
</tr>
<tr>
<td>100,000 to 1,000,000</td>
<td>20</td>
</tr>
<tr>
<td>1,000,000 +</td>
<td>10</td>
</tr>
</tbody>
</table>
Table 36

Table showing the personnel participating in the survey

<table>
<thead>
<tr>
<th>Position</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance Director</td>
<td>7</td>
</tr>
<tr>
<td>Planning Controller/Manager</td>
<td>7</td>
</tr>
<tr>
<td>Chief/Management Accountant</td>
<td>6</td>
</tr>
<tr>
<td>Financial/Investment Controller</td>
<td>4</td>
</tr>
<tr>
<td>Tax Manager/Group Accountant Tax</td>
<td>3</td>
</tr>
<tr>
<td>Treasurer</td>
<td>2</td>
</tr>
<tr>
<td>Group Secretary</td>
<td>2</td>
</tr>
<tr>
<td>Other (note 1)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>36 (note 2)</td>
</tr>
</tbody>
</table>

Notes

1. other included: Head Of Business Evaluation Department
   Economist
   Project Analyst
   Group Financial Manager

2. There were two participating managers for three of the companies
The hypotheses developed in this chapter will then be readdressed to determine (1) whether the models produced do in fact enable taxation effects of corporate group structures to be more fully integrated, and (2) whether in fact biases do exist in the way companies evaluate projects.
Chapter 9

Methods used by companies to incorporate tax in their project appraisals

This chapter presents the results of a postal survey aimed at determining how companies attempt to include taxation in their project evaluations. A response rate of over 57% was achieved with 134 companies participating. Over 19% of the companies disregard tax in their capital evaluations. Many of the companies including tax in their appraisals do not fully encapsulate the tax effects, with almost 50% using the average rate of tax, although many were not actually in a full tax paying situation.

A mail questionnaire was adopted as the research mode, and the questions included in the survey were as follows:

What methods are used in project appraisal?

Is taxation allowed for in project appraisal? (If the company does not include tax in their appraisals, they were asked to return the questionnaire at this stage.)

How is taxation allowed for?

If discounted cash flow techniques are used, how is the discount
rate calculated?

Were there any unrelieved Advance Corporation Tax (ACT), losses or unclaimed capital allowances at the start and/or the end of the 1985 financial year?

What is the accounting period?

Is the company the head office/holding company of a group? (If the company is not, the respondent was asked to return the questionnaire at this stage.)

Is the transfer of losses and/or unclaimed capital allowances between member companies allowed, and if so does the claimant pay some recompense to the surrendering company?

What are the group's goals and objectives?

The research methodology and the sample chosen are discussed in Chapter 8. The groups have first been classified into low intensive, high intensive and anonymous groups, and secondly in terms of their ranking in the "Times 1000".

**Evaluation Techniques**

Various evaluation techniques are available to appraise their capital investment proposals including the payback period (PP),
the accounting rate of return (ARR), the net present value model (NPV) and the internal rate of return (IRR).

Most surveys indicate a strong preference to the PP with the IRR gaining acceptance. The NPV model however does not seem to be acceptable to the business community. Pike's survey (1981) reflects this with 79% using the PP, 51% using the ARR, 54% using the IRR, and 38% using the NPV in 1980/1981.

The results of the survey presented here (see Table 37) also support these findings with the PP being the most widely used method (73%), closely followed by the IRR (60%). However, the IRR was considered the most important method of evaluating projects by 21% of the companies, whilst PP was considered the most important technique by 17%. Nevertheless, the NPV appears to have increased in popularity, with 51% of the companies now using it, compared to 38% in Pike's survey.

Pike also found that only 26% of the companies used just one method; this survey shows that 21% of the companies now use only one method, with the highest proportion using three (37%) see Table 38.

To determine whether particular groups use different techniques hypotheses were set up as follows:
Table 37

Table showing the usage and first preference of evaluation techniques

<table>
<thead>
<tr>
<th></th>
<th>first preference</th>
<th>usage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number of companies</td>
<td>percentage</td>
</tr>
<tr>
<td>Payback Period (PP)</td>
<td>23</td>
<td>17%</td>
</tr>
<tr>
<td>Accounting Rate of Return (ARR)</td>
<td>14</td>
<td>10%</td>
</tr>
<tr>
<td>Internal Rate of Return (IRR)</td>
<td>28</td>
<td>21%</td>
</tr>
<tr>
<td>Net Present Value Method (NPV)</td>
<td>18</td>
<td>13%</td>
</tr>
</tbody>
</table>
Table 38

Table showing the number of evaluation techniques used by companies and their preferences for the techniques

<table>
<thead>
<tr>
<th>number of methods</th>
<th>1</th>
<th>2</th>
<th>O*</th>
<th>3</th>
<th>2</th>
<th>O*</th>
<th>4</th>
<th>O*</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>17</td>
<td>4</td>
<td>9</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>IRR</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>9</td>
<td>10</td>
<td>8</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>ARR</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>NPV</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>other</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes:
1. O* - no preference
2. Other includes: return on capital employed for new shares
discounted cash flow for lease v buy
return on assets managed
balanced growth of group
effect on short term profit and loss account
average return on overall project cost
3. Two companies reported having more than four methods.
Hypothesis 1

There is no significant relationship between the groups, high capital intensive, low capital intensive and anonymous and the particular techniques used.

This hypothesis was tested by using chi square tests, and it was found that the hypothesis could be accepted for the NPV(Table 39), IRR(Table 40) and the PP(Table 41), but was rejected for the ARR(Table 42). There was evidence to suggest that the anonymous group were less likely to use the ARR.

Hypothesis 2

There is no significant relationship between the company's ranking in the "Times 1000" and the evaluation techniques used by the company.

It was found that the hypothesis could be accepted for the PP(Table 43) and the NPV(Table 44), but was rejected for the IRR(Table 45) and the ARR(Table 46). There was evidence to suggest that the higher ranking the company the more likely it will use the IRR, and apart from the first group, the more likely the company would use the ARR.

A comparison has been made to determine whether the companies using DCF techniques are more likely to take tax into account.
Table 39

Table showing the number of companies using the net present value method in terms of capital intensity

<table>
<thead>
<tr>
<th>number of companies</th>
<th>uses net present value method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>row percent</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGH</td>
<td>30</td>
</tr>
<tr>
<td>capital intensity</td>
<td>24</td>
</tr>
<tr>
<td>ANONYMOUS</td>
<td>14</td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.6632

Number of cells with expected frequencies of less than 5 - none
<table>
<thead>
<tr>
<th>number of companies</th>
<th>uses internal rate of return</th>
<th>row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>row percent</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>column percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>HIGH</td>
<td>37</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>62.7%</td>
<td>37.3%</td>
</tr>
<tr>
<td></td>
<td>45.7%</td>
<td>42.3%</td>
</tr>
<tr>
<td>LOW</td>
<td>30</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>69.8%</td>
<td>30.2%</td>
</tr>
<tr>
<td></td>
<td>37%</td>
<td>25%</td>
</tr>
<tr>
<td>ANONYMOUS</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>45.2%</td>
<td>54.8%</td>
</tr>
<tr>
<td></td>
<td>17.3%</td>
<td>32.7%</td>
</tr>
<tr>
<td>Column Total</td>
<td>81</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>60.9%</td>
<td>39.1%</td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom - 0.0941

Number of cells with expected frequencies of less than 5 - none
Table 41

Table showing the number of companies using the payback period in terms of capital intensity

<table>
<thead>
<tr>
<th>number of companies</th>
<th>uses payback period</th>
</tr>
</thead>
<tbody>
<tr>
<td>row percent</td>
<td>yes</td>
</tr>
<tr>
<td>column percent</td>
<td></td>
</tr>
<tr>
<td>HIGH</td>
<td>49</td>
</tr>
<tr>
<td>83.1%</td>
<td>16.9%</td>
</tr>
<tr>
<td>50%</td>
<td>28.6%</td>
</tr>
<tr>
<td>LOW</td>
<td>27</td>
</tr>
<tr>
<td>62.8%</td>
<td>37.2%</td>
</tr>
<tr>
<td>27.6%</td>
<td>45.7%</td>
</tr>
<tr>
<td>ANONYMOUS</td>
<td>22</td>
</tr>
<tr>
<td>71%</td>
<td>29%</td>
</tr>
<tr>
<td>22.4%</td>
<td>25.7%</td>
</tr>
<tr>
<td>Column Total</td>
<td>98</td>
</tr>
<tr>
<td>73.7%</td>
<td>26.3%</td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.0666

Number of cells with expected frequencies of less than 5 - none
Table 42

Table showing the number of companies using the accounting rate of return in terms of capital intensity

<table>
<thead>
<tr>
<th>number of companies</th>
<th>uses accounting rate of return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>yes</td>
</tr>
<tr>
<td>row percent</td>
<td></td>
</tr>
<tr>
<td>column percent</td>
<td></td>
</tr>
<tr>
<td>HIGH</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>49.2%</td>
</tr>
<tr>
<td></td>
<td>59.2%</td>
</tr>
<tr>
<td>LOW</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>32.6%</td>
</tr>
<tr>
<td></td>
<td>28.6%</td>
</tr>
<tr>
<td>ANONYMOUS</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>19.4%</td>
</tr>
<tr>
<td></td>
<td>12.2%</td>
</tr>
<tr>
<td>Column Total</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>36.8%</td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.0161

Number of cells with expected frequencies of less than 5 - none
### Table 43

Table showing the number of companies using the payback period in terms of ranking in the Times 1000

<table>
<thead>
<tr>
<th>rank in Times 1000</th>
<th>number of companies</th>
<th>uses payback period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>row percent</td>
<td>column percent</td>
</tr>
<tr>
<td>1-100</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>101-200</td>
<td>26</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>201-300</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>301-400</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>401-500</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Column Total</td>
<td>76</td>
<td>76</td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom - 0.1999

Number of cells with expected frequencies of less than 5 = 2 of 10 (20%)
Table 44

Table showing the number of companies using the net present value method in project appraisal, in terms of ranking in Times 1000

<table>
<thead>
<tr>
<th>number of companies</th>
<th>uses net present value method</th>
<th>row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>percent</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>column percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-100</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>53.8%</td>
<td>46.2%</td>
</tr>
<tr>
<td></td>
<td>13%</td>
<td>12.5%</td>
</tr>
<tr>
<td>101-200</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>24.1%</td>
<td>27.1%</td>
</tr>
<tr>
<td>201-300</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>rank in Times 1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>54.5%</td>
<td>45.5%</td>
</tr>
<tr>
<td></td>
<td>22.2%</td>
<td>20.8%</td>
</tr>
<tr>
<td>301-400</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>41.7%</td>
<td>58.3%</td>
</tr>
<tr>
<td></td>
<td>18.5%</td>
<td>29.2%</td>
</tr>
<tr>
<td>401-500</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>70.6%</td>
<td>29.4%</td>
</tr>
<tr>
<td></td>
<td>22.2%</td>
<td>10.4%</td>
</tr>
<tr>
<td>Column Total</td>
<td>54</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>52.9%</td>
<td>47.1%</td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom - 0.4829

Number of cells with expected frequencies of less than 5 - none
Table 45

Table showing the number of companies using the internal rate of return in project appraisal, in terms of ranking in Times 1000

<table>
<thead>
<tr>
<th>rank in Times 1000</th>
<th>number of companies uses internal rate of return</th>
<th>column percent</th>
<th>row total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>row percent</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>1-100</td>
<td></td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19.4%</td>
<td>0%</td>
</tr>
<tr>
<td>101-200</td>
<td></td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>73.1%</td>
<td>26.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28.4%</td>
<td>20%</td>
</tr>
<tr>
<td>201-300</td>
<td></td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45.5%</td>
<td>54.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14.9%</td>
<td>34.3%</td>
</tr>
<tr>
<td>301-400</td>
<td></td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>62.5%</td>
<td>37.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.4%</td>
<td>25.7%</td>
</tr>
<tr>
<td>401-500</td>
<td></td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>58.8%</td>
<td>41.2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14.9%</td>
<td>20%</td>
</tr>
<tr>
<td>Column Total</td>
<td></td>
<td>67</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65.7%</td>
<td>34.3%</td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom - 0.0183

Number of cells with expected frequencies of less than 5 - 1 of 10 (10%)
Table 46

Table showing the number of companies using the accounting rate of return in project appraisal, in terms of ranking in Times 1000

<table>
<thead>
<tr>
<th>number of companies uses accounting rate of return</th>
<th>row percent</th>
<th>column percent</th>
<th>yes</th>
<th>no</th>
<th>row total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1-100</td>
<td>4</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>34.8%</td>
<td>69.2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9.3%</td>
<td>15.3%</td>
<td>12.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>101-200</td>
<td>16</td>
<td>10</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>61.5%</td>
<td>38.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>37.2%</td>
<td>16.9%</td>
<td>25.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>201-300</td>
<td>13</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>rank in Times 1000</td>
<td></td>
<td></td>
<td>59.1%</td>
<td>40.9%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30.2%</td>
<td>15.3%</td>
<td>21.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>301-400</td>
<td>7</td>
<td>17</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>29.2%</td>
<td>70.8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16.3%</td>
<td>28.8%</td>
<td>23.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>401-500</td>
<td>3</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>17.6%</td>
<td>82.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7%</td>
<td>83.7%</td>
<td>16.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Column Total 43</td>
<td>43</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>42.2%</td>
<td>57.8%</td>
<td></td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom - 0.0106

Number of cells with expected frequencies of less than 5 - none
Hypothesis 3

There is no significant relationship between whether a company uses discounted cash flow techniques and whether tax is taken into account in project appraisal.

The hypothesis is rejected at the .1% level (see Table 47), indicating that there is strong evidence to suggest that the companies using DCF techniques are more likely to include tax in project appraisal.

Most of the companies using only the PP did not include tax in their evaluations, whereas 3 of the 4 companies using the ARR included tax in their evaluations.

If discounted cash flow techniques are used it is important to know how the discount rate has been calculated. A variety of discount rates are used as can be seen in Table 48. The weighted average cost of capital is based on the costs of capital from equity and debt, weighted for the amount of capital acquired from each source. This is generally considered the most appropriate measure. The marginal cost of debt is used to calculate the effect that additional borrowing would have on the debt interest rate charged to the company, whereas the average cost of debt represents the average debt interest rate charged to the firm. Corr (1983) found that 16 out of the 24 (67%) companies included in his survey used the weighted average cost of capital.
Table 47

Table showing the number of companies using discounted cash flow techniques, and including tax in project appraisal

<table>
<thead>
<tr>
<th>number of companies</th>
<th>row percent</th>
<th>column percent</th>
<th>yes</th>
<th>no</th>
<th>row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>uses discounted cash flow techniques</td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>yes</td>
<td>97</td>
<td>14</td>
<td>111</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>87.4%</td>
<td>12.6%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>89.8%</td>
<td>56%</td>
<td>83.5%</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>no</td>
<td>11</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>yes</td>
<td>50%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>no</td>
<td>10.2%</td>
<td>44%</td>
<td>16.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Column Total</td>
<td>108</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>yes</td>
<td>81.2%</td>
<td>18.8%</td>
<td></td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.0001
Number of cells with expected frequencies of less than 5 = 1 of 4 (25%)
Table 48

Table showing the methods of calculating the discount rate used in the Net Present Value Model. Many companies reported adjusting the discount rate for risk.

<table>
<thead>
<tr>
<th>Method of calculating the discount rate</th>
<th>Number of companies</th>
<th>As a percentage of companies using the NPV model (67)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighted average cost of capital</td>
<td>24</td>
<td>36%</td>
</tr>
<tr>
<td>Marginal cost of debt</td>
<td>20</td>
<td>30%</td>
</tr>
<tr>
<td>Average cost of debt</td>
<td>9</td>
<td>13%</td>
</tr>
<tr>
<td>Not answered/stated</td>
<td>4</td>
<td>6%</td>
</tr>
<tr>
<td>Other (see note 2)</td>
<td>9</td>
<td>15%</td>
</tr>
</tbody>
</table>

Notes

1. One company uses both the average and marginal cost of debt as the discount rate.

2. Other included

   Derived from capital asset pricing model adjusted for risk, Beta and gearing

   3 month minimum borrowing rate less current inflation rate

   Rate which we decide we require to satisfy shareholders

   Estimated cost of equity (long run historical rate of return on market applied to ungeared cash flows.)
however only 24 companies out of the 65 using the NPV model (37%) used the weighted average cost of capital, with 31% using the marginal cost of debt. Many of the companies stated that they adjusted the discount rate to incorporate risk.

As stated earlier, if a company is to aim at making accurate investment appraisals, the incremental tax flows attributable to the project must be included in the appraisal. However, 19% of the companies do not include tax at all. This is considerably higher than Corr's findings, where only 2 of the 24 companies (8%) disregarded tax. To determine whether a highly capital intensive company is more likely to include tax in its appraisals, a comparison was made, the results are shown in Table 49. Only 5 (8.3%) of the high capital intensive companies did not include tax, whereas 8 (18.2%) of the low capital intensive companies disregarded tax. A hypothesis was set up as follows:

Hypothesis 4

There is no relationship between the classification of the companies, whether they be high capital intensive, low capital intensive or anonymous and whether tax is taken into account in project appraisal.

This hypothesis is rejected at the 0.2% level, with the anonymous group less likely to include tax in project appraisal.
<table>
<thead>
<tr>
<th>number of companies</th>
<th>includes tax in project appraisal</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>row percent</td>
<td>yes</td>
<td>no</td>
<td>row total</td>
</tr>
<tr>
<td>column percent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGH</td>
<td>54</td>
<td>5</td>
<td>59</td>
</tr>
<tr>
<td>91.5%</td>
<td>8.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.5%</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOW</td>
<td>36</td>
<td>8</td>
<td>44</td>
</tr>
<tr>
<td>81.8%</td>
<td>18.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33%</td>
<td>32%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COLUMN TOTAL</td>
<td>109</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>81.3%</td>
<td>18.7%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom - 0.0022

Number of cells with expected frequencies of less than 5 - none
Hypothesis 5

There is no relationship between the rank of the company and whether it includes tax in project appraisal, (see Table 50).

This hypothesis was accepted at the 5% level, indicating that there is no significant relationship.

The companies not including tax in their appraisals were asked to return the questionnaire at this stage, and were later asked to state their reasons for not including tax, the replies are presented in Table 51. A copy of the letter is reproduced in Appendix E. Rockley (1973) suggests that if a project is only sound if based upon some transient current reductions in rates of taxation, then it should not be accepted, however tax is a cash flow and the best estimate should be included in the project appraisal. Rockley adds that "the fact that so many companies were not greatly influenced by taxation rate reductions was also because they did not feel the tax encouragements to be future reliable stimulants." Not one company in this survey indicated that they did not include tax because of the unreliability of it remaining unchanged.

In order to include tax accurately in the appraisal, it must be included as a cash flow when physically paid, and must represent the decrease/increase in the tax payable by the company attributable to the project. The majority of the companies, 99% do include tax when it is physically paid.
Table 50

Table showing the number of companies including tax in project appraisal in terms of ranking in Times 1000

| Number of Companies | Includes Tax |  | Row Total |
|---------------------|--------------|-------------------------|
|                     | Yes          | No                      |           |
|                     | Row Percent  | Column Percent          |           |
| 1-100               | 12           | 2                       | 14        |
|                     | 85.7%        | 14.3%                   |           |
|                     | 13.3%        | 15.4%                   | 13.6      |
| 101-200             | 25           | 1                       | 26        |
|                     | 96.2%        | 3.8%                    |           |
|                     | 27.8%        | 7.7%                    | 25.2%     |
| 201-300             | 19           | 3                       | 22        |
| Rank in Times 1000  | 86.4%        | 13.6%                   |           |
|                     | 21.1%        | 23.1%                   | 21.4%     |
| 301-400             | 19           | 5                       | 24        |
|                     | 79.2%        | 20.8%                   |           |
|                     | 21.1%        | 38.5%                   | 23.3      |
| 401-500             | 15           | 2                       | 17        |
|                     | 88.2%        | 11.8%                   |           |
|                     | 16.7%        | 15.4%                   | 16.5%     |

Column Total 90 13 12.6%

Chi square significance at 2 degrees of freedom = 0.5010

Number of cells with expected frequencies of less than 5 - 5 of 10 (50%)
Table 51

Table showing the reasons stated for not including tax in project appraisal.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax is not considered relevant in project appraisal</td>
<td>3</td>
</tr>
<tr>
<td>The company is in a non-taxpaying situation</td>
<td>1 (see note 1)</td>
</tr>
<tr>
<td>The tax effects are minimal</td>
<td>3 (see note 2)</td>
</tr>
<tr>
<td>The tax system is so complicated that the costs of evaluating the taxation effects exceed possible benefits</td>
<td>1</td>
</tr>
<tr>
<td>Other (see note 3)</td>
<td>3</td>
</tr>
</tbody>
</table>

Notes

1. The company stated that because of unrelieved advance corporation tax the effective tax rate is at present 6%.

2. One of the companies clarified that the tax effects are minimal between similar projects.

3. Other included:
   - Taxation is not a matter within the responsibility of the person who would normally originate a capital application.
   - The group tax position.
   - Tax is controlled at the centre, not at subsidiary level, whereas projects come from subsidiary level.
The project under consideration may alter the tax band, which the company finds itself in. For example, if a company's profits are between £100,000 and £500,000 an effective tax rate of 48.75% will be charged for the 1984/85 tax year, due to tapering relief. If the project takes the company's taxable profits over the £500,000 mark, a lower tax rate of 45% should be charged to the project. If a company charges a marginal project with a tax rate of 48.75%, it may reject it, when, if the true effective tax rate had been charged it would have been accepted. Also, if the company originating the project is part of a corporate group, and there are losses or unclaimed capital allowances, either in the company, or in other member companies the losses or capital allowances may be allowable for set off against the profits of the project for the same accounting period. The effect of this would be that a lower rate of tax should be charged, than if the project is being considered on a "stand alone" basis. However, only 53(50%) of the companies used the marginal tax rate in their evaluations. A hypothesis has been set up to determine whether particular companies are more likely to use the marginal rate of tax.

**Hypothesis 6**

There is no relationship between the classification of the companies and whether the marginal rate of tax is used in project appraisal, see Table 52.

The hypothesis may be accepted at the 5% level indicating that
Table 52

Table showing the number of companies using the average rate of tax or marginal rate of tax in project appraisal in terms of capital intensity

<table>
<thead>
<tr>
<th>number of companies</th>
<th>rate of tax used</th>
<th>column percent</th>
<th>row percent</th>
<th>row total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>marginal</td>
<td>average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGH</td>
<td>31</td>
<td>20</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td></td>
<td>60.8%</td>
<td>39.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>57.4%</td>
<td>38.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOW capital intensity</td>
<td>15</td>
<td>21</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td></td>
<td>41.7%</td>
<td>58.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>27.8%</td>
<td>40.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANONYMOUS</td>
<td>8</td>
<td>11</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>42.1%</td>
<td>57.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.8%</td>
<td>21.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Column Total</td>
<td>54</td>
<td>52</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50.9%</td>
<td>49.1%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom - 0.1488

Number of cells with expected frequencies of less than 5 - none
the companies using the marginal rate of tax are not more likely to belong to the high capital intensive group, the low capital intensive group or the anonymous group. However, the high capital intensive companies appeared to show a slight preference for the average rate of tax, whereas the low capital intensive companies show a preference for the marginal rate of tax.

A hypothesis was also set up to determine whether there was a relationship between the ranking of the company and whether it used the marginal rate of tax, see Table 53.

The hypothesis may be accepted at the 5% level indicating that there is no relationship between the size of the company and whether the marginal rate of tax is used in project appraisal.

Whether, the companies stating that they used the marginal rate of tax did in fact use the correct marginal rate, is doubtful, as only 18% of the groups of companies allowed for the transfer of unclaimed capital allowances and unrelieved losses between member companies. Corr reports that 20 out of the 24 companies (83%) participating in his survey used the marginal rate of tax.

It was expected that the companies with neither unrelieved losses or ACT or unclaimed capital allowances would be more likely to use the average rate of tax. A hypothesis was set up to determine whether the companies other than in a full tax paying situation were more likely to use the marginal rate of tax in
### Table 53

Table showing the number of companies using the average rate of tax, and the marginal rate of tax, in project appraisal, in terms of ranking in the Times 1000

<table>
<thead>
<tr>
<th>number of companies</th>
<th>rate of tax used</th>
<th>row total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>average</td>
<td>marginal</td>
</tr>
<tr>
<td></td>
<td>row percent</td>
<td>column percent</td>
</tr>
<tr>
<td>1-100</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>41.7%</td>
<td>58.3%</td>
</tr>
<tr>
<td></td>
<td>10.9%</td>
<td>17.1%</td>
</tr>
<tr>
<td>101-200</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>62.5%</td>
<td>37.5%</td>
</tr>
<tr>
<td></td>
<td>32.6%</td>
<td>22%</td>
</tr>
<tr>
<td>201-300</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>rank in Times 1000</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>19.6%</td>
<td>22%</td>
</tr>
<tr>
<td>301-400</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>55.6%</td>
<td>44.4%</td>
</tr>
<tr>
<td></td>
<td>21.7%</td>
<td>19.5%</td>
</tr>
<tr>
<td>401-500</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>46.7%</td>
<td>53.3%</td>
</tr>
<tr>
<td></td>
<td>15.2%</td>
<td>19.5%</td>
</tr>
<tr>
<td>Column Total</td>
<td>46</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>52.9%</td>
<td>47.1%</td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.7650

Number of cells with expected frequencies of less than 5 - none
project appraisal.

Hypothesis 8
There is no relationship between the company's tax profile and whether the marginal tax rate is used in project appraisal, see Table 54.

The hypothesis is accepted at the 5% level indicating that there is no relationship between whether the company is in a full tax paying situation and whether the marginal tax rate is used in project appraisal.

A hypothesis was set up to determine whether the high capital intensive companies are more likely not to be in a full tax paying situation.

Hypothesis 9
There is no relationship between the classification of the company and whether the company is in a full tax paying situation, see Table 55.

The hypothesis may be rejected at the 5% level indicating that no particular group, that is high capital intensive, low capital intensive and the anonymous groups are more likely to be in a full tax paying situation.
Table 54

<table>
<thead>
<tr>
<th>number of companies</th>
<th>tax rate used</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>average</td>
<td>marginal</td>
</tr>
<tr>
<td>no</td>
<td>35</td>
<td>33</td>
<td>68</td>
</tr>
<tr>
<td>51.5%</td>
<td>48.5%</td>
<td>66%</td>
<td>65.4%</td>
</tr>
<tr>
<td>full tax paying</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>situation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>yes</td>
<td>18</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>50%</td>
<td>50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34%</td>
<td>35.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Column Total</td>
<td>53</td>
<td>51</td>
<td>49%</td>
</tr>
<tr>
<td>51%</td>
<td>49%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.8865
Number of cells with expected frequencies of less than 5 = none
Table 55

Table showing the number of companies in a full tax-paying, and less than full tax-paying situation in terms of capital intensity

<table>
<thead>
<tr>
<th>capital intensity</th>
<th>no</th>
<th>yes</th>
<th>row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
<td>34</td>
<td>19</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>64.2%</td>
<td>35.8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>47.9%</td>
<td>52.8%</td>
<td>49.5%</td>
</tr>
<tr>
<td>LOW</td>
<td>23</td>
<td>13</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>63.9%</td>
<td>36.1%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32.4%</td>
<td>36.1%</td>
<td>33.6%</td>
</tr>
<tr>
<td>ANONYMOUS</td>
<td>14</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>77.8%</td>
<td>22.2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19.7%</td>
<td>11.1%</td>
<td>16.8%</td>
</tr>
<tr>
<td>Column Total</td>
<td>71</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td></td>
<td>66.4%</td>
<td>33.6%</td>
<td></td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.5312

Number of cells with expected frequencies of less than 5 - none
Hypothesis 10

There is no relationship between the ranking of the company and whether it is in a full tax paying situation, see Table 56.

The relationship may be accepted at the 5% level indicating that there is no relationship between the size of the group and a particular tax profile.

As stated above, companies forming part of a group may transfer losses and capital allowances between member companies to reduce the group's tax liability. To take advantage of this the transfer of the capital allowances and losses must be allowed, and the effects included in the project evaluation. If the company surrendering the reliefs expects to enter a tax paying situation in the near future, a higher liability to tax will arise later, as the surrendering company will no longer have these reliefs to offset against its own taxable profits. A charge must therefore be made against the project when this higher liability arises. Although the decrease in tax will be equal to the later increase, providing there is no change in the tax rates, the overall effect will be positive, due to the time value of money.

Table 57 shows whether the groups not in a full tax paying situation allow for the transfer. As can be seen, few groups do allow for this transfer, and this may result in under investment.

A hypothesis was set up to determine whether the groups not in a full tax paying situation were more likely to allow for the
### Table 56

Table showing the number of companies in full, or less than full, tax paying situations, in terms of ranking in Times 1000

<table>
<thead>
<tr>
<th>Rank in Times 1000</th>
<th>Full Tax Paying Situation</th>
<th>Column Percent</th>
<th>Row Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>1-100</td>
<td>8</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>66.7%</td>
<td>33.3%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14%</td>
<td>12.5%</td>
<td>13.5%</td>
</tr>
<tr>
<td>101-200</td>
<td>18</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>72%</td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>31.6%</td>
<td>21.9%</td>
<td>28.1%</td>
</tr>
<tr>
<td>201-300</td>
<td>13</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>68.4%</td>
<td>31.6%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22.8%</td>
<td>18.8%</td>
<td>21.3%</td>
</tr>
<tr>
<td>301-400</td>
<td>12</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>63.2%</td>
<td>36.8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>21.1%</td>
<td>21.9%</td>
<td>21.3%</td>
</tr>
<tr>
<td>401-500</td>
<td>6</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>42.9%</td>
<td>57.1%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.5%</td>
<td>25%</td>
<td>15.7%</td>
</tr>
<tr>
<td>Column Total</td>
<td>57</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>64%</td>
<td>36%</td>
<td></td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.4604

Number of cells with expected frequencies of less than 5 = 1 of 10 (10%)
Table 57

Table showing the number of companies either in a full tax paying situation or in a less than full tax paying situation, allowing for the transfer of capital allowances and losses between member companies to be taken into account in project appraisal.

<table>
<thead>
<tr>
<th>number of companies</th>
<th>allows for the transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>yes</td>
</tr>
<tr>
<td>row percent</td>
<td></td>
</tr>
<tr>
<td>column percent</td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>70.6%</td>
</tr>
<tr>
<td>full tax paying</td>
<td></td>
</tr>
<tr>
<td>situation</td>
<td></td>
</tr>
<tr>
<td>yes</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>14.7%</td>
</tr>
<tr>
<td></td>
<td>29.4%</td>
</tr>
<tr>
<td>Column Total</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>18.1%</td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.7174  
Number of cells with expected frequencies of less than 5 = none
transfer of capital allowances and losses between member companies

**Hypothesis 11**

There is no relationship between the tax profile of the group and whether the transfer of capital allowances and losses between member companies is allowed to be taken into account in project appraisal.

The hypothesis may be accepted at the 5% level indicating that groups not in a full tax paying situation are no more likely to allow for the transfer of losses and capital allowances to be included in project appraisal.

**Hypothesis 12**

There is no relationship between the classification of the group and whether the transfer of capital allowances and losses between member companies is allowed to be taken into account in project appraisal, see Table 58.

The hypothesis may be accepted at the 5% level indicating that there is no relationship between the classification of the group and whether the transfer of losses and capital allowances is allowed to be included in project appraisal.

**Hypothesis 13**

There is no relationship between the ranking of the group and
Table 58

Table showing the number of companies allowing for the transfer of capital allowances and losses between member companies to be taken into account in project appraisal, in terms of capital intensity

<table>
<thead>
<tr>
<th>number of companies</th>
<th>allows for the transfer</th>
<th></th>
<th></th>
<th>row total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>row percent</td>
<td>column percent</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>40</td>
</tr>
<tr>
<td>HIGH</td>
<td>18.4%</td>
<td>52.9%</td>
<td>81.6%</td>
<td>50.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>49</td>
<td>40</td>
</tr>
<tr>
<td>LOW</td>
<td>12.5%</td>
<td>23.5%</td>
<td>87.5%</td>
<td>35.4%</td>
</tr>
<tr>
<td>capital intensity</td>
<td></td>
<td></td>
<td>32</td>
<td>28</td>
</tr>
<tr>
<td>ANONYMOUS</td>
<td>26.7%</td>
<td>23.5%</td>
<td>73.3%</td>
<td>13.9%</td>
</tr>
<tr>
<td>Column Total</td>
<td>17</td>
<td>11</td>
<td>79</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>17.7%</td>
<td>15.6%</td>
<td>82.3%</td>
<td>84.4%</td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.4876

Number of cells with expected frequencies of less than 5 - 1 of 6 (16.7%)
whether the transfer of capital allowances and losses between member companies is allowed to be taken into account in project appraisal, see Table 59.

The hypothesis may be accepted at the 5% level indicating that there is no relationship between the size of the groups and whether the transfer of losses and capital allowances is allowed to be included in project appraisal.

However, if a group evaluates a project centrally, it may be that the group's overall tax effects are taken into account. The majority of groups do evaluate some projects centrally, subject to ceilings, as illustrated in Table 60, but there are still many projects where the full effects may not necessarily be considered.

Goals

Financial and investment theory have always stressed the maximisation of shareholder's wealth as the ultimate goal, however the existence of other goals is greatly acknowledged, for example the maintenance of liquidity, which became of foremost importance during the liquidity crisis of 1974. Empirical research has identified multiple goals; for example, Oosteryoung (1973) reported that 95% of the respondents to his survey used two or more goals when making capital investment decisions, with 70.5% using three or more. Petty and Scott in their 1981 survey found the maximisation of percent return on investments to be the
Table 59

Table showing the number of companies allowing for the transfer of capital allowances and losses between member companies to be taken into account in project appraisal, in terms of ranking in the Times 1000

<table>
<thead>
<tr>
<th>rank in Times 1000</th>
<th>number of companies allows for the transfer</th>
<th>row percent</th>
<th>column percent</th>
<th>row total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>yes</td>
<td>no</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-100</td>
<td>2</td>
<td>10</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16.7%</td>
<td>83.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15.4%</td>
<td>14.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>101-200</td>
<td>5</td>
<td>17</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22.7%</td>
<td>77.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>38.5%</td>
<td>25%</td>
<td>27.2%</td>
<td></td>
</tr>
<tr>
<td>201-300</td>
<td>0%</td>
<td>100%</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td>23.5%</td>
<td>19.8%</td>
<td></td>
</tr>
<tr>
<td>301-400</td>
<td>4</td>
<td>12</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25%</td>
<td>75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30.8%</td>
<td>17.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>401-500</td>
<td>2</td>
<td>13</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.3%</td>
<td>86.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15.4%</td>
<td>19.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Column Total</td>
<td>13</td>
<td>68</td>
<td>84%</td>
<td></td>
</tr>
</tbody>
</table>

Chi square significance at 2 degrees of freedom = 0.3059

Number of cells with expected frequencies of less than 5 = 5 of 10 (50%)
Table 60

Table showing the level, in the hierarchy of the companies, where capital projects are evaluated.

<table>
<thead>
<tr>
<th>Evaluation Level</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>All evaluated centrally</td>
<td>14</td>
</tr>
<tr>
<td>None evaluated centrally</td>
<td>6</td>
</tr>
<tr>
<td>Projects over a certain size are evaluated centrally, sizes as follows:</td>
<td></td>
</tr>
<tr>
<td>&lt; £100,000</td>
<td>15</td>
</tr>
<tr>
<td>£100,000 - £500,000</td>
<td>20</td>
</tr>
<tr>
<td>&gt; £500,000</td>
<td>2</td>
</tr>
<tr>
<td>Not specified/not answered</td>
<td>38</td>
</tr>
</tbody>
</table>

Note

The above table only includes the head offices of corporate groups.
most important objective in capital investment decisions (78.23%) with the maximisation of common stock price in fourth position (31.18%). Perhaps one reason for this is the difficulty of translating the maximisation of shareholder's wealth into an operationally measureable target. Also, during a period of stable stock prices such a goal will not provide an incentive to invest, as the effect on the stock price will be minimal.

If the companies forming a corporate group have different goals, the investment decision may vary within the group depending on which company is assessing the project. Table 6.1 confirms the existence of multiple goals, and shows the importance attached to the goals. The maximisation of shareholders' wealth rates third in existence as a goal, with, "to achieve a growth rate in earnings per share" rating first. Maximisation of percent return on total investment is second. However, shareholders' wealth maximisation is the second most important goal, after, "the achievement of a desired growth rate in earnings per share".

The results of the questionnaire have indicated that companies, in general, do not consider tax accurately in the appraisal of capital projects. As already suggested the United Kingdom tax system is complicated and requires a sophisticated model to integrate all the effects. The simulation model provided in Chapter 7 enables the effects of taxation on the investment decisions of corporate groups to be incorporated in project appraisal.
Table 6.1

Table showing the group’s goals and the levels of importance attached to them.

<table>
<thead>
<tr>
<th>order of importance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>not stated</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>to achieve a desired growth rate in earnings per share</td>
<td>32</td>
<td>17</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>24</td>
<td>83</td>
</tr>
<tr>
<td>to maximise the percent return on total asset investment</td>
<td>13</td>
<td>23</td>
<td>13</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>70</td>
</tr>
<tr>
<td>to maximise shareholder’s wealth</td>
<td>14</td>
<td>9</td>
<td>5</td>
<td>9</td>
<td>4</td>
<td>1</td>
<td>14</td>
<td>56</td>
</tr>
<tr>
<td>to maximise net income</td>
<td>8</td>
<td>13</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>15</td>
<td>51</td>
</tr>
<tr>
<td>to maintain a desired gearing level</td>
<td>0</td>
<td>4</td>
<td>11</td>
<td>11</td>
<td>8</td>
<td>1</td>
<td>8</td>
<td>43</td>
</tr>
<tr>
<td>to maximise sales</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>other (see note 1)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

Note

1. other included

- to increase production, remove bottle necks and improve quality
- maximise percentage return on capital employed
- to maintain overall steady growth
- personnel and customer services
- not specified
Twenty three of the companies included in the postal survey were included in an interview survey, the results of which are presented in Chapter 10. The intention of the interview survey is to give a fuller picture of the capital budgeting procedures of corporate groups.
In order to provide in depth information of company procedures and policies, an interview survey was conducted with 33 large companies. This chapter examines the different methods used by the companies. This information is required to conduct the comparisons between the companies' methods and the simulation model, to be discussed in Chapter 11. The research methodology adopted is discussed in Chapter 8.

Reports were written up following the interview, and copies of the reports are included in Appendix F.

As was discussed in Chapter 3, the whole capital budgeting process should be considered, and the approach to the discussion of the results follows the same tract.

Creation Phase

The importance of capital budgeting to a company's success is stated in the capital budgeting manual of one of the sample companies as follows:

"in any business, future success depends on today's investment decisions. The importance of these decisions stems from the level of resources committed and their largely irrevocable nature. Major capital investments are fundamental to a business and will, if successful, create a solid base for future earnings."
Mistakes can only be rectified slowly and expensively and lead not only to a waste of cash but also to an uncompetitive cost structure and a consequent deterioration in market strength and earnings potential. It is important, therefore, that a disciplined approach is used in the assessment of all capital investment proposals."

Thus to ensure the projects are in furtherance of the company's goals and objectives it is necessary to formulate a strategic plan.

One company expressed the importance of including capital projects in the strategic plan as follows:

"major capital projects will be an integral part of a business strategy .... the business strategy is developed in medium term plans and annual budgets. The capital proposal is merely the final stage of the consideration of a capital expenditure project."

The time span employed by the companies in formulating strategic plans is shown in Table 62 and the time span employed for the capital budgeting plan is shown in Table 63.

One of the companies stated that if a project becomes part of the capital budget plan, "it has a much better chance of getting done."
Table 62

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>9</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>5+</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>none</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
### Table 63

The time span of the capital budgeting plan

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>5+</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>none</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

207
Table 64 shows the number of companies with the same time span for the strategic plan and capital budgeting plan.

The size of the companies' annual capital budget is shown in Table 65.

Search for and identification of investment alternatives

In order to achieve the goal of shareholder's wealth maximisation it is essential that the company search for as many opportunities as possible, whilst it is true they will in practice be competing for limited resources the imbalance is necessary so the more profitable projects can be selected. Over 50% of the companies in this survey do undertake a systematic search as is shown in Table 66.

Pike(1982) found that 83% of the companies participating in his survey required a specific search for opportunities.

Table 67 shows the level at which projects originate in the company.

These results are similar to a survey by Petty and Scott (1981), where 42.5% of the projects originate at the operating level. As may be expected the larger companies are more decentralised with few projects, other than large acquisitions, arising at the senior level.
### Table 64

Table showing the number of companies using the same time period in the capital budgeting as in the strategic plan.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>same time plan</td>
<td></td>
<td>14</td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td>time span of capital budgeting plan is larger</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>time span of strategic plan is larger</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>only one, or none used</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>not stated</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 65

The size of the annual capital budget.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>size (£)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>up to 1 million</td>
<td>2</td>
<td></td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>1 to 50 million</td>
<td></td>
<td>15</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>50 to 100 million</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>100 to 200 million</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>200 million +</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>not stated</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>turnover (£000)</td>
<td>-100</td>
<td>100-1000</td>
<td>1000+</td>
<td>total</td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
<td>----------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>search</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>required</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>yes</td>
<td>-</td>
<td>11</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>no</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>sometimes</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>exceptionally</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 67**

Table showing the level in the hierarchy where projects arise.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>where originating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>senior/top level</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>operating level</td>
<td>1</td>
<td>9</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>divisional level</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>various</td>
<td>-</td>
<td>8</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Screening

The criteria used by the companies at the screening stage is presented in Table 68.

Following the screening stage several possibilities will be available to the company, but will require further evaluation especially if they are competing for limited resources.

Sometimes it is necessary for companies to undertake non-economic projects, as Corr (1983) states "There is no clear definition of what constitutes a non-economic project. The term is used to describe projects for which no economic justification is calculated." The criteria used by the companies to determine whether such projects should be accepted are shown in Table 69. One participant stated, with respect to non-economic projects: "it is seen necessary to experiment strategically".

Decision Phase

Projects arising from the screening will undergo a full evaluation at this stage to determine their worth. Firstly, the cash flows must be determined, the evaluation techniques are then applied, and a cut off point chosen, probably based on the cost of capital. Risk, inflation and taxation effects must be included if an accurate evaluation is to be achieved. One
Table 68

Table showing the criteria used by the companies when screening the projects.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>criteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>profitability/ productivity of capital</td>
<td>1</td>
<td>9</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>strategic requirements</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>payback period</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>to maintain or improve operations</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>necessity</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>judgement</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>various</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>other (see notes)</td>
<td>-</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

notes

other included:
- risks
- responsibility of subsidiaries
- depends on where originating
Table 69

Table showing the criteria used by the companies to determine whether non economic projects should be accepted.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>criteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>health and safety</td>
<td>-</td>
<td>8</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>social/environmental</td>
<td>-</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>R&amp;D/strategically necessary</td>
<td>-</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>legislation</td>
<td>-</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>repair/maintenance</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>none</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>
company does not conduct capital appraisals due to its policy that "if it needs something it should buy it".

**Calculation of cash flows.**

The estimates of the cash flows may be derived through internal sources, for example experience and knowledge or through external sources such as market research. Changes in working capital arising through adoption of the project and the residual value of the investment should be included as cash flows, and the effects of inflation should be included. Care should be taken if discounted cash flow techniques are used, that either a current rate of return is used to discount current value cash flows (both including a factor for inflation), or a constant real rate of return is used to discount constant real value cash flows (neither including a factor for inflation). Table 70 shows the number of companies including changes in working capital, residual values and inflation effects in the evaluation. One participant considered the residual value of the investment to be:

"the most important thing in the project and may be the difference between a good and bad project."

In order to improve future forecasts it is necessary to determine the accuracy of the forecasting methods used by the companies. Forecasted cash flows should therefore be checked against the actual cash flows. Twenty one of the companies always check the
Table 70

Table showing whether the companies include changes in working capital, residual values and inflation effects in capital appraisals

<table>
<thead>
<tr>
<th></th>
<th>yes</th>
<th>no</th>
<th>sometimes</th>
<th>not stated</th>
</tr>
</thead>
<tbody>
<tr>
<td>changes in working capital</td>
<td>27</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>residual values</td>
<td>21</td>
<td>6</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>inflation effects</td>
<td>24</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
accuracy of the cash flows as is shown in Table 71.

Risk and taxation also affect the cash flows and the cost of capital which should be used to calculate the cut off point. They are both considered at the end of the decision stage.

Once the cash flows have been determined, the evaluation techniques may then be applied.

**Evaluation Techniques**

There are several evaluation techniques available for the manager, the most widely used include the Net Present Value Model (NPV), the Internal Rate of Return (IRR), the Payback Period (PP) and the Accounting Rate of Return (ARR).

Most surveys indicate a strong preference for the payback period with the IRR gaining acceptance. The NPV model however does not seem to be acceptable to the business community. Pike's survey (1981) reflects this with 79% using the payback period, 51% using the ARR, 54% using the IRR and 38% using the NPV model. This survey also shows the PP as the most widely used technique (76% of the companies) marginally more popular than the IRR (70% of the companies). The techniques used by the companies are presented in Table 72. Only 21% of the companies use one or no methods, (see Table 73.)

If discounted cash flow techniques are used an error may occur if
### Table 7.1

Table showing whether the companies check the forecasts for accuracy.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>always</td>
<td>1</td>
<td>12</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>usually</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>on major projects</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>for short period</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>on selective projects</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>never</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 7.2

Table showing the evaluation techniques used by the companies.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>technique</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>payback period</td>
<td>1</td>
<td>17</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td>internal rate of return</td>
<td>-</td>
<td>13</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>net present value method</td>
<td>-</td>
<td>12</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>accounting rate of return</td>
<td>-</td>
<td>8</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>subjective</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>return on capital employed</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 73

Table showing the number of evaluation techniques used by the companies.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>8</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>8</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>none</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
a company discounts at the end of the year, because the cash flow occurring at the beginning of the year is treated exactly the same as a cash flow occurring at the end of the year. A cash flow of 1.00 at the start of the year is worth 1.15 at the end of the year assuming a discount rate of 15%. Fifteen of the companies included in the survey discount at the year end, whilst only one discounts monthly.

To determine which projects should be accepted the company must choose a cut off point.

**Cut-off point**

Because the capital budget is usually subject to limited resources, that is there is usually an upper limit on the size of the budget, and, to ensure that the project will increase the shareholder's wealth, it is necessary to adopt an arbitrarily determined investment cut off point, which will be the deciding factor for the acceptance/rejection decision. The cut off point is usually flexible and may vary according to the type of project, otherwise projects with high returns may be accepted regardless of their risk characteristics. Thus a group may require different cut off points depending on the classification of the project. Table 74 shows whether the companies operate a group wide cut off point.

The cut off points used by the companies are presented in Table 220.
**Table 74**

Table showing the number of companies employing a group wide hurdle rate

<table>
<thead>
<tr>
<th>Using a group wide hurdle rate</th>
<th>Number of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>16</td>
</tr>
<tr>
<td>yes, but flexible</td>
<td>5</td>
</tr>
<tr>
<td>no</td>
<td>9</td>
</tr>
<tr>
<td>not stated</td>
<td>2</td>
</tr>
</tbody>
</table>
75. If discounted cash flow techniques are used, the cut off point should be based on the company's cost of capital adjusted for risk and possibly increased to allow for the non-remunerative projects undertaken by the companies. The discount rates used are shown in Table 76.

One participant stated that the discount rate needed to be:
"politically acceptable to all parties"

The capital budgeting manual of another company stated how the discount rate should be calculated:
"the choice of real discount rate for evaluation of NPVs and to set as the "hurdle rate" against which to judge IRRs will vary from business to business. The real Weighted Average Cost of Capital for the group has been determined to be about 7%, but even for a business with the same risk characteristics as the group as a whole there will be a proportion of unrenumerative projects...and some loading of the discount rate to take account of these may well be desirable. More generally, not all the group's businesses will have the same risk characteristics as the group as a whole and in some cases it will be appropriate to think in terms of a higher or lower cost of capital."

As stated the discount rate should be based on the company's cost of capital, adjusted for risk and possibly with a loading for non remunerative projects. The methods used to calculate the cost of capital are now considered.
<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>no minimum return</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>not stated</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>subjective</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>no evaluation techniques</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>IRR/NPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 10%</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10 - 20%</td>
<td>-</td>
<td>12</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>20 - 30%</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Payback Period</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 5 years</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>5 - 10 years</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Return on capital employed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20% - 30%</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 76

Table showing the discount rate used in discounted cash flows.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>weighted average cost of capital</td>
<td>14</td>
</tr>
<tr>
<td>marginal cost of debt</td>
<td>4</td>
</tr>
<tr>
<td>subjective</td>
<td>2</td>
</tr>
<tr>
<td>capital asset pricing model</td>
<td>1</td>
</tr>
<tr>
<td>other (see note)</td>
<td>3</td>
</tr>
<tr>
<td>not used/stated</td>
<td>9</td>
</tr>
</tbody>
</table>

Notes

- Other included
- Rate which we decide we require to satisfy shareholders
- Expected return on equity
- Estimated cost of equity
Cost of capital

The discount rate used in the discounted cash flow techniques is usually some form of the cost of capital. Theoretically, the cost of capital should be weighted according to the different sources of finance (weighted average cost of capital (WACC)) adjusted accordingly for inflation, risk and taxation effects.

Corr found that 16 out of the 24 companies included in his survey did use the WACC (67%). Only 42% of the companies included in this survey used the WACC, as is shown in Table 77.

The weightings used to calculate the cost of capital can be applied in different ways, Corr (1983) found that 9 used the planned debt/equity ratio, whilst 7 used the book value of the ratio. The cost of each source should theoretically be based on current market rates, 13 out of the 16 companies in Corr's survey did use the current rate, whilst 3 based it on the historical rate. The weightings used by the company are shown in Table 78.

The cost of capital obviously varies for different companies and the rates are presented in Table 79.

Corr also enquired as to the frequency of revision of the cost of capital, and found that 6 revised as needed, 8/annually; 5/every five years and 1/never. If realistic estimates are to be derived the cost of capital will need to be revised frequently in line with current rates. Table 80 shows how frequently costs of capital are revised by the companies included in this survey.
Table showing the basis of the companies' costs of capital.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>weighted average cost of capital</td>
<td>-</td>
<td>8</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>overdraft bank rate</td>
<td>1</td>
<td>5</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>other (see note)</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>no calculation/no specific calculation</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

**Notes**

other included
(interest+dividend)/shareholders' funds
estimated cost of equity
stock exchange expectations
Table 78

Table showing the weightings and values used by the companies when calculating the weighted average cost of capital.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>weightings</td>
<td>----------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>planned ratio</td>
<td>5</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>actual/current ratio</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>market's perception of gearing</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>values</td>
<td>----------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>historic values of debt and equity</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>market/current values</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>convergence historic/market values</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 79

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 5</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5 -</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>10 -</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>15 -</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>20 - 25</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>not stated</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>

Table showing the costs of capital for the companies.
Table 80

Table showing the frequency of revision of cost of capital.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>continually</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>frequently</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>annually</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>infrequently</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>if a major change</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>not stated</td>
<td>2</td>
<td>7</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>not used for managerial purposes</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Note

The companies revising their cost of capital continuously, based their cost of capital on the bank overdraft rate.
Reasons given by the participants for not revising their cost of capital more often, included:

"the changes in the cost of equity are frequent and therefore it would be difficult to keep in line"

"revised infrequently due to the group's belief that the cost of equity is a stable long run phenomenon, although the variances of annual returns is high".

Risk

Risk is generally thought of as the volatility of expected outcomes, however Corr (1983) found that this took second place in the answer to his question on how managers defined risk, 44% of the firms define risk as the probability of not achieving a target rate of return. The companies in this survey defined risk as stated in Table 81.

When considering investment alternatives the company needs to alter its cut-off point to allow for the risk involved in each individual project. There are a variety of ways to handle risk, ranging from the subjective "gut feeling" to the sophisticated Capital Asset Pricing Model (CAPM), and beyond, for example the Arbitrage Pricing Model. Pike (1981) found that 37% of the companies included in his survey require a formal analysis of risk, and that many use more than one method to conduct the analysis, with 38% using sensitivity analysis; 36% raise the
Table 81

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>little exposure/not concerned</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>not achieving target</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>uncertain market potential</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>costs exceeded/revenues not achieved</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>lack of certainty</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>subjective</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>not stated</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>other (see notes)</td>
<td>-</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

**Notes**

- other included
- how much of cash flow depended on fixed costs as related to sales
- degree of divergence of the actual outcome from that projected
- life of project, suppliers, skilled staff
- government changes and interest changes
- obsolesences and changes in costs
- never getting a new product again
- risk on merchandising
required rate of return; 31% shorten the payback period and 12% use probability analysis. The methods used by the companies participating in this survey are shown in Table 82. The CAPM is a sophisticated technique for handling risk, which, this survey suggests, has not yet received great acceptance by the business world. The CAPM is based on the divisibility of systematic and unsystematic risk, the shareholders being able to reduce the latter by holding a diversified portfolio of investments. The company need only consider the systematic risk attached to the project with the efficient market portfolio's overall returns.

Simulation is becoming more popular with the availability and accessibility of computers. Its usefulness lies in its ability to answer "what if" questions and thus highlights the more sensitive variables for further investigation. One of the companies reported using Monte Carlo simulation but reported that "the decision makers had difficulty in understanding the model, and there had been difficulty in obtaining sensible probabilistic data."

Very few of the companies included in the survey used mathematical programming in capital project appraisal, and one participant stated "there has never been enough information to do capital rationing in the textbook manner."
Table 82

Table showing the methods the companies use to allow for risk in the evaluation

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>sensitivity analysis</td>
<td>1</td>
<td>14</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>subjectively</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>adjust discount rate</td>
<td>-</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>payback period</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>capital asset pricing model</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>little attention</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>not stated</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>
Taxation

If taxation had no effect on the rate of return on investments, that is if it were neutral, companies would be able to assess investments without considering the effects of tax. This is not the case however, because taxation is imposed on "taxable profits" and not cash flow, which is the basis for most of the evaluation methods, except the accounting rate of return. Other effects of the United Kingdom corporation tax system affecting capital investment evaluations include the restrictions concerning reliefs for losses and restricted Advance Corporation Tax set-off. Thus if a company is to be certain of making correct investment decisions, it must adjust evaluations for the effects of taxation.

Three of the companies included in this survey do not include tax in project appraisal. Responses concerning the implications of tax in capital project appraisal included:
1. "the company is interested in the commercial aspects of the project more than the tax effects."
2. "would not base a capital project purely on tax"

The United Kingdom tax system does not allow for the immediate relief of Advance Corporation Tax, if insufficient "taxable income" is made. The tax rate is also affected if a company is in a loss making situation, as the relief is not available immediately. Grundy and Burns(1979) show how this may cause interdependencies between projects, due to the effect it has on the marginal tax rate. Table 83 shows the number of companies in
Table 83

Table showing the number of companies in alternative tax paying situations.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>in a non or reduced tax paying situation</td>
<td>2</td>
<td>10</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>in a full tax paying situation</td>
<td>1</td>
<td>10</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
a non-taxpaying situation.

If the group is in any other than a full tax paying situation the appropriate marginal tax rate should be used in the evaluations. Table 84 shows the number of companies in a non-taxpaying situation using the average rate of tax.

Corporate groups may transfer losses and capital allowances between member companies. Thus if accurate investment decisions are to be made it is necessary to look at the group's overall tax position, as one participant stated

"it is important that tax is computed on a basis which reflects the group's overall position in the tax area covered."

Few groups however do allow for the transfer to be taken into account in project appraisal, as can be seen in Table 85.

The reasons given by the participants for not allowing the transfer included

"projects are run on a stand alone basis"

"all projects are evaluated under the same tax assumptions for direct comparison. The timing of the investments, anyway could not be predicted with the required accuracy."

Once the techniques have been chosen, a cut off point determined, the cash flows estimated, the cost of capital calculated and the effects of inflation, risk and taxation taken into account, the evaluation may be conducted, and the projects put forward for
Table 84

Table showing the number of companies in different tax-paying situations, and the tax rate used in evaluations.

<table>
<thead>
<tr>
<th></th>
<th>ignores tax</th>
<th>average rate of tax</th>
<th>marginal rate of tax</th>
<th>not stated</th>
</tr>
</thead>
<tbody>
<tr>
<td>in a non or reduced tax paying situation</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>in a full tax paying situation</td>
<td>1</td>
<td>7</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 85

Table showing the number of companies allowing the transfer of capital allowances and losses between member companies, in relation to their tax situation.

<table>
<thead>
<tr>
<th>Transfer allowed</th>
<th>Reduced tax paying situation</th>
<th>Full tax paying situation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>no</td>
<td>13</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
approval. The level in the hierarchy where projects may be approved varies depending on the size of the company and the size of the project. Table B6 shows the size of the projects required to be submitted centrally.

Implementation Phase

The number of companies conducting post audits is shown in Table B7. One participant stated, when asked whether the company used post audits, "officially yes, unofficially no due to the squeezing of costs".

The companies were then asked if a project was found to be uneconomic at the post audit stage, the likelihood of it being dropped, Table B8 summarises the responses.

Responses concerning the dropping of projects following unfavourable post audits included:
"too far down the line"
"conducted "more for knowledge"
"there are obvious social, political and even psychological reasons why disinvestment decisions are not readily taken"
"conducted more "to obtain feedback and to learn from past experience in order to improve future proposals and decisions"
"in theory it is possible for a project to be totally uneconomic to be dropped but it would be more likely that a project be truncated possibly due to a change in the environment"
Table 86

Table showing the level of capital projects which are required to be submitted centrally.

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>£</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;5000</td>
<td>2</td>
<td>7</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>&gt;100,000</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>&gt;250,000</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>&gt;500,000</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>&gt;1,000,000</td>
<td>-</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>all</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>most</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 87

Table showing the number of companies conducting post audits

<table>
<thead>
<tr>
<th>turnover (£000)</th>
<th>-100</th>
<th>100-1000</th>
<th>1000+</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>always</td>
<td>-</td>
<td>9</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>sometimes/on major projects</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>never</td>
<td>2</td>
<td>7</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>not stated</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 88

Table showing the probability of a project being dropped following an unfavourable post audit.

<table>
<thead>
<tr>
<th>number of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>unlikely</td>
</tr>
<tr>
<td>possible</td>
</tr>
<tr>
<td>has occurred</td>
</tr>
<tr>
<td>never been unfavourable</td>
</tr>
<tr>
<td>too late</td>
</tr>
</tbody>
</table>
"the decision will depend on the estimated comparative costs (including intangibles eg employee and public relations) of continuation, retrenchment or liquidation." and "it is difficult to show whether the calculations were incorrect or whether the nature of the project has changed."

The above comments highlight the problems of dropping projects after a post audit, and it is possible that more companies use them to improve future decisions, providing feedback for the capital budgeting decision, and completing the flow of the capital budgeting process.

Companies were also asked to state their opinions concerning the radical changes brought about by the Finance Act of 1984, which progressively lowered first year capital allowances. The corporation tax rate was lowered from 52% to 35% for companies with "taxable profits" in excess of £500,000, and from 35% to 30% for companies with "taxable profits" less than £100,000, and stock relief was abolished. The companies' reactions to these changes are summarised in Table 89.

Conclusions

Twenty three of the companies included in the sample have been found to be representative of the initial sample used in the interview survey. It is possible therefore to make generalisations, although, I do so tentatively, that in general companies do not accurately consider tax in their capital
Table showing the companies' reactions to the Finance Act 1984.

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Number of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>favourable</td>
<td>8</td>
</tr>
<tr>
<td>unfavourable</td>
<td>6</td>
</tr>
<tr>
<td>decreased value of marginal project</td>
<td>4</td>
</tr>
<tr>
<td>increased tax burden</td>
<td>2</td>
</tr>
<tr>
<td>decreased amount of leasing conducted</td>
<td>2</td>
</tr>
<tr>
<td>little effect</td>
<td>2</td>
</tr>
</tbody>
</table>

Brought forward projects

<table>
<thead>
<tr>
<th>Action</th>
<th>Number of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>6</td>
</tr>
<tr>
<td>no</td>
<td>2</td>
</tr>
</tbody>
</table>

Lead to a change in policy

<table>
<thead>
<tr>
<th>Action</th>
<th>Number of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>1 (subtle)</td>
</tr>
<tr>
<td>no</td>
<td>12</td>
</tr>
</tbody>
</table>
evaluations, and by not doing so, may make incorrect investment decisions. The information gained from the interviews, and the annual reports will now be used to consider whether biases may and in fact do arise in the evaluations.

It is also worth noting that there is still a divergence between the procedures advocated by theory and actual practice, for example, very few groups allow the transfer of capital allowances and losses between member companies to be taken into account in project appraisal, and, sophisticated techniques such as the capital asset pricing model and mathematical programming are used by only a very few companies.

The next chapter involves comparing the effects of taking tax into account using the companies' methods and using a computerised model which fully integrates the United Kingdom corporation tax system.
Chapter 11

An examination of the capital budgeting evaluations of companies compared to the simulation model.

This chapter illustrates how biases may arise in the evaluation of capital projects due to incorrectly allowing for tax. The procedures by nine of the groups included in the interview survey are considered and projects are evaluated using the groups methods. The results are then compared to evaluations using the simulation model, presented in Chapter 8. One company provided an actual project, another company developed an example of a project solely for this purpose, and hypothetical projects were developed for the remaining seven companies. The information gained at the interview and the companies' standard forms were utilised to evaluate the projects. Information has also been utilised from the group's annual reports and the Extel service.

Several assumptions are necessary to use the simulation model, and, for this reason it is stressed that these cases studies are not intended to show the errors of particular companies, but to illustrate that, groups must fully consider the group's tax profile when evaluating a capital project and include the incremental tax flows arising due to the project. The companies involved obviously have access to considerably more information, and there may be other reasons for taking a particular course of action.
The simulation model not only allows for taxation effects to be considered but also includes other features such as quarterly discounting, which the company may not necessarily use. For this reason the reconciliation between the company's cash flows and present value may vary from the cash flows and present value derived using the simulation model, apart from tax differences.

Each investment is first evaluated using the company's methods. The simulation model is then run and the flows and present value determined. A reconciliation is then presented to determine the extent of the differences followed by a discussion of why these differences may have occurred.

Case Study 1

This group uses the payback period to evaluate capital projects, which is not directly comparable with the simulation model, it is therefore necessary to calculate the NPV of the project using the cash flows determined by the group.

The variables used and the assumptions used for the evaluations are as follows:
1. The project's flows are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost of the project</td>
<td>(100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>change in working capital</td>
<td>(10)</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cost savings</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

2. The investment is in plant and machinery, which has no scrap value and is a short term asset as defined by the Finance Act 1985.

3. The group has unrelieved Advance Corporation Tax of £813,000, as shown in the annual accounts.

4. The group's due date of payment of corporation tax is one year after the end of the accounting period, but the group uses a tax lag of two years in its evaluations. The simulation model will utilise a one year tax lag.

5. The group uses a discount rate of 13%, which the respondent stated was based on the group's cost of capital. In the simulation model the cost of capital is calculated using the weighted average cost of capital, weighted according to the market value of share capital as at the date of the last company report, ie the share price at that date multiplied by the number of shares issued, the book value of debt (as a proxy for the
market value) and the book value of preference capital. The dividend growth model was used to calculate the cost of equity, and the expected growth in dividends was estimated using regression analysis based on the growth of dividend per share over the previous 5 years, the expression is as follows:

\[ \frac{D_1}{P_0 - E_e} + G \]

where, \( D_1 = \) dividend payable at the end of year 1, which has been calculated using regression analysis

\( P_0 = \) the market value of equity at period 0

\( E_e = \) the cost of an issue of equity (assumed zero)

\( G = \) expected growth in dividend per share

The cost of debt is calculated by determining the interest payments for the 1985/86 Finance Year and dividing by the book value of debt at the end of the group's 1985 accounting year, ie

\[ \frac{D_i}{MVD - E_d} \]

where, \( D_i = \) the interest paid during the 1985/86 accounting year

\( MVD = \) the book value of debt at the end of the group's accounting year

\( E_d = \) the cost of issuing debt (assumed zero)

The cost of preference capital is calculated by dividing the amount of dividends paid to preference shareholders during the
1985/86 year by the value of preference capital as at the end of the 1985/86 year, i.e.

\[ ___D_p___ \]

\[ MVP - Ep \]

where, \( D_p \) = the dividends paid to preference shareholders during 1985/86

\[ MVP = \text{the book value of preference share capital at the end of the group's 1985/86 accounting period.} \]

\[ Ep = \text{the cost of raising preference share capital (assumed zero).} \]

6. The company in which the project arises provides one quarter of the group's profits.

7. The group's capital allowances for the 1985/86 accounting period have been stated at £165,000. It has been assumed that this will be the future rate of capital allowances, excluding any capital allowances arising from the project.

8. It is necessary to forecast the future profits and dividend payout of the group in order to encapsulate the tax effects in the simulation model. Forecasts are prone to error, and it may be worthwhile for a company to try several scenarios to determine the effects of the tax flows.

There are a variety of forecasting models available, but the regression model has been adopted for this case study, to
forecast future profits and dividend payouts, based on the previous six years figures.

The correlation for the forecasted dividend payout is acceptable at 62.6 R2 adj, which was somewhat expected, as several authors have suggested management try to maintain their previous dividend payouts with increases only when they can be sustained in subsequent years. For example, Baker et al (1985) state "because these managers believed that shareholders preferred a steady stream of dividends, firms tended to make periodic partial adjustments toward a target payout ratio rather than dramatic changes in payout. Thus, in the short run, dividends were smoothed in an effort to avoid frequent changes." The equation for future dividend payout is $C_2 = 465 + 36.3C_1$, where $C_1 = \text{year } 0 \cdots n$, and $C_2 = \text{dividend payout for year } 0\cdots n$.

The regression analysis for the future profits is somewhat less acceptable with a correlation coefficient of 30.7 R2 adj, however as no other measure is available regression analysis has been used to forecast future profits with an equation of $C_3 = -40 + 445C_1$, where $C_1 = \text{year } 0 \cdots n$, and $C_3 = \text{profit for year } 0\cdots n$.

9. The group has previously paid preference dividends of £248,000, and it has been assumed that this will be maintained.

10. Dividends are paid, half in the second quarter and half in 

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the fourth quarter.

11. The project is financed in the same ratio as its present gearing ratio.

12. The project is of an average risk class to the group as a whole.

13. The cash flows are equal throughout the year.

**Payback Period**

Using the groups standard form, see Table 90 a payback period of 4.67 years is achieved, however it ignores the two large tax payments arising in the following two years.

**Net Present Value**

The group does not use the net present value model, thus it is first necessary to calculate the net present value using the cash flows calculated for the payback period to enable a comparison to be made. A present value of £5,799 is achieved, see Table 91.

**Simulation Model**

The model used is the simulation model presented in Chapter 7. The NPV of the project using the simulation model is £3,610. The difference is partly due to a different discount rate, the
TABLE 90

Standard Form of Group to calculate Payback Period.

PROJECT COST JUSTIFICATION.

(Based on * Govt. Energy cash flow formula).

<table>
<thead>
<tr>
<th>Calendar years:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c) Cash balance b/f</td>
<td>£</td>
<td>£</td>
<td>£</td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>(b) Capital cost of project</td>
<td>(113,000)</td>
<td>(95,740)</td>
<td>(61,799)</td>
<td>(37,100)</td>
<td></td>
</tr>
<tr>
<td>(+) Tax writing down allowance.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(b) at 35% tax - deferred for 2 years.</td>
<td>(100,000)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(d) Sub total</td>
<td>-</td>
<td>-</td>
<td>6,750</td>
<td>6,562</td>
<td>4,922</td>
</tr>
<tr>
<td>(e) Cost savings per annum(+).</td>
<td>(100,000)</td>
<td>(113,000)</td>
<td>(86,990)</td>
<td>(55,237)</td>
<td>(32,178)</td>
</tr>
<tr>
<td>(f) Interest on (d) + (e) at 13%</td>
<td>-</td>
<td>30,000</td>
<td>30,000</td>
<td>30,000</td>
<td>60,000</td>
</tr>
<tr>
<td>(g) Corporation tax on (e) minus (f) at 35% deferred for 2 years.</td>
<td>(13,000)</td>
<td>(12,740)</td>
<td>(9,359)</td>
<td>(5,822)</td>
<td>(875)</td>
</tr>
<tr>
<td>(h) Corporation tax on (e) minus (f) at 35% - deferred for 2 years.</td>
<td>-</td>
<td>-</td>
<td>4,550</td>
<td>(6,041)</td>
<td>(7,224)</td>
</tr>
<tr>
<td>(i) Cash movement c/f</td>
<td>(113,000)</td>
<td>(95,740)</td>
<td>(61,799)</td>
<td>(37,100)</td>
<td>19,723</td>
</tr>
</tbody>
</table>

Payback Period = 4 2/3 years

From the HMSO publication: Energy audits.

The pay-back period is the point in time when the (negative) cost turns into a positive figure.

cc: Group Board
### Table 91

Table showing the net present value of the project using the cash flows derived by the company

<table>
<thead>
<tr>
<th>Year</th>
<th>Flows</th>
<th>Discount Rate</th>
<th>Discounted Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(100,000)</td>
<td>1</td>
<td>(100,000)</td>
</tr>
<tr>
<td>1</td>
<td>30,000</td>
<td>0.885</td>
<td>26,550</td>
</tr>
<tr>
<td>2</td>
<td>30,000+8,750+4,550</td>
<td>0.7831</td>
<td>33,908</td>
</tr>
<tr>
<td>3</td>
<td>30,000+6,562-6,041</td>
<td>0.6931</td>
<td>21,154</td>
</tr>
<tr>
<td>4</td>
<td>60,000+4,922-7,224</td>
<td>0.6133</td>
<td>35,386</td>
</tr>
</tbody>
</table>

Net present Value - 16,698

The cash flows are as given in Table 90, except interest is not treated as a cash flow, as this would be contrary to the net present value method.
weighted average cost of capital of the group, according to the simulation model is 11%, whereas the group uses a discount rate of 13%. Other reasons for the difference are due to tax differences and timing differences. A reconciliation of the differences is provided in Table 92 and are discussed below.

1. The group does not include changes in working capital in its cash flows, which has led to an overstatement of the cash flow by 10,000 in year 0 and an understatement of the cash flow in year 4. The present value of this using the discount rate calculate by the simulation model is an overstatement of the NPV of £3,503 by the group.

2. The group discounts cash flows at the year end, whereas the simulation model enables the cash flows to be calculated quarterly. This results in an understatement by the group of the cash flows, as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(£000)</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>2.5</td>
</tr>
</tbody>
</table>

discounted giving a PV of £4,659.

3. The group does not acknowledge short life assets, whereas the simulation model does. Thus the group allows capital allowances for the fifth year of £7,910 and the simulation model allows a balancing allowance of £31,640, a difference of £23,730 at a tax rate of 35% = £8,305. The PV of this difference is an understatement by the company of £4,844.
<table>
<thead>
<tr>
<th>year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>co's flows</td>
<td>(100)</td>
<td>30</td>
<td>43.3</td>
<td>30.5</td>
<td>57.7</td>
<td>(4.7)</td>
</tr>
<tr>
<td>1.work. capital</td>
<td>(10)</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2.disc flows</td>
<td></td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>3.cap allws.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.3</td>
</tr>
<tr>
<td>4.disc ACT</td>
<td>(2.47)</td>
<td>.49</td>
<td>(.15)</td>
<td>(.12)</td>
<td>(.18)</td>
<td>(.16)</td>
</tr>
<tr>
<td>5.tax lag</td>
<td></td>
<td>13.3</td>
<td>(12.8)</td>
<td>(2.6)</td>
<td>(2.5)</td>
<td>(13.2)</td>
</tr>
<tr>
<td>6.diff interest</td>
<td>(3.5)</td>
<td>(3.41)</td>
<td>(2.23)</td>
<td>(.99)</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>7.unrelieved ACT</td>
<td>(10.8)</td>
<td>.61</td>
<td>10.18</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(112.47) 30.74 28.8 36.78 66.53 (9.02)
4. If the project is financed in some part by an issue of share capital rather than retentions, there will be an increase in dividend payout and an increase in Advance Corporation Tax payable. Although ACT may reduce the tax liability of the group at the due date of payment of mainstream corporation tax, there is a timing difference between the date ACT is paid and the due date. The discounted difference between payment of ACT and reducing the gross corporation tax due to the increase in dividends should be included as a cost to the project. Thus the group has overstated the PV of the investment by £2,448.

| w/o ACT | 399.43 | 415.29 | 430.71 | 442.29 | 462.43 |
| project DISC | 410.49 | 426.79 | 442.64 | 454.53 | 475.24 | 491.09 |
| with ACT | 401.83 | 417.15 | 432.67 | 444.31 | 464.57 |
| project DISC | 412.96 | 428.7 | 444.65 | 456.61 | 477.44 | 493.39 |
| differences | (2.47) | .49 | (.15) | (.12) | (.18) | (.16) |

5. The group uses a two year tax lag when its due date of payment is one year following its accounting period. This gives rise to an overstatement by the group as follows:

<table>
<thead>
<tr>
<th>year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(13.3)</td>
<td>12.8</td>
<td>2.8</td>
<td>2.5</td>
<td>13.2</td>
<td></td>
</tr>
</tbody>
</table>

a discounted difference of £9,726.
6. The group has assumed that the investment is financed totally by debt, whereas the simulation model has assumed that the project is financed by an issue of ordinary share capital, preference share capital and debt in the same proportion as its existing ratio. The group has therefore allowed for more interest deductibility leading to an overstatement by the group as follows:

<table>
<thead>
<tr>
<th>year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>interest as calculated by the group</td>
<td>13</td>
<td>12.74</td>
<td>9.36</td>
<td>5.82</td>
<td>0.87</td>
</tr>
<tr>
<td>interest as calculated in the simulation model</td>
<td>2.99</td>
<td>2.99</td>
<td>2.99</td>
<td>2.99</td>
<td>2.99</td>
</tr>
<tr>
<td>difference</td>
<td>10.01</td>
<td>9.75</td>
<td>6.37</td>
<td>2.83</td>
<td>(2.12)</td>
</tr>
</tbody>
</table>

@ 35%  

|  | 3.5 | 3.41 | 2.23 | .99 | (.74) |

the discounted differences equal £7,716.

7. Although there are cash flows arising from the project they do not occur in year zero, but a capital allowance of £25,000 is available in year zero. The profits of the company and the rest of the group are sufficient to allow this capital allowance to be claimed but reduce the amount of ACT which may be deducted for the gross corporation tax in the first year. The company does
not allow for this effect in its methods, the simulation model however does include this effect. The remainder of the ACT is relieved in years 2 and 3. The differences are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relieved w/o project</td>
<td>701.93</td>
<td>835.43</td>
<td>521.51</td>
</tr>
<tr>
<td>Less relieved with project</td>
<td>693.53</td>
<td>837.9</td>
<td>533.65</td>
</tr>
<tr>
<td>Plus ACT payable with project</td>
<td>401.83</td>
<td>417.15</td>
<td>432.67</td>
</tr>
<tr>
<td>Less ACT payable w/o project</td>
<td>399.43</td>
<td>415.29</td>
<td>430.71</td>
</tr>
<tr>
<td>(10.8)</td>
<td>.61</td>
<td>10.18</td>
<td></td>
</tr>
</tbody>
</table>

8. The other differences between the two evaluations is due to a different discount rate being used.
Case Study 2

This group of companies uses the internal rate of return to evaluate its capital projects, the capital appraisal form is shown in Table 93. There is no statement on the form as to the tax lag used by the group but the respondent stated that tax was included in the appraisal when it is actually paid, therefore a tax lag of one year has been assumed. The form also mentions depreciation, and this has been taken to mean capital allowances based on a 25% writing down allowance.

The project's financial details are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost of project</td>
<td>(700)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>change in work. capital</td>
<td>100</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>cost savings</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
</tbody>
</table>

Assumptions and variables used:

1. The plant has a scrap value of zero, and is a short term asset has defined by the Finance Act 1985.

2. The respondent stated that the group has unrelieved losses, and it has been assumed that these amount to £1,000,000.
## Table 93

### 8. Trading Forecast

<table>
<thead>
<tr>
<th>YEAR</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDITIONAL SALES</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ADDITIONAL PROFIT OR REDUCED COSTS BEFORE INTEREST AND TAX</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PROFIT MARGIN %</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### 9. Cash Flow Summary (Not Required for Applications under £20,000)

**OUT:** (£000)

- FIXED ASSETS: 700
- WORKING CAPITAL: 100
- TAX PAID: 800

**IN:**

- PROFIT BEFORE TAX: 300
- DEPRECIATION: £1.25
- RESIDUAL VALUE: £1.25

**Cash Flow for Year** (£3875) 345.94 229.45 220.84 314.38 (105)

**Cumulative Cash Flow or Pay Back** (£3875) (£39261) (£163.36) £57.48 £371.86 266.8

Net Present Value @ 20% < £53,910

### 10. DCF Return

### 11. Estimated Completion Date

**Dates and Amount of Progress Payments**

### 12. Application Signed on Behalf of Subsidiary

**Managing Director**

### 13. Application Approved/Rejected

**Finance Director**

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3. The tax lag is one year.

4. The company in which the project arises provides one quarter of the group's profits and is entitled to one quarter of the group's capital allowances excluding the capital allowances excluding the capital allowances arising due to the project.

5. The capital allowances are based on the previous year's figures of £3,278,000, and it has been assumed that this will continue.

6. The future profits and dividend payouts have been forecasted using regression analysis. The equation for profits is 

\[ C_1 = -44 + 6176C_2 \]

where \( C_1 \) = profits at year \( 0 \ldots n \), and \( C_2 \) = year \( 0 \ldots n \). The R2 adj for profits is .952, which suggests that past profits are a good indicator of future profits.

The dividend payout equation is \( C_1 = 1323 + 572C_2 \), where \( C_1 \) = the dividend payout for year \( 0 \ldots n \), and \( C_2 \) = year \( 0 \ldots n \), again with a satisfactory R2 adj of .975.

7. Dividends are paid in two stages, half in the second quarter and half in the fourth quarter.

8. The cost of capital used in the simulation model is based on the weighted average cost of capital (see Case Study 1 for an explanation). The market value of equity is calculated by
averaging the share price for 1985, £5.14 and multiplying by the number of share, 45,664,700. The book value of debt is used and there is no preference share capital. The dividend growth model has been used to calculate the cost of equity, and a dividend growth rate of 5% has been used, calculated using regression analysis based on the percentage increase in dividend per share over the last four years, see Table .

9. It has been assumed that the project is financed in the same proportions as the group’s gearing ratio, and is of average risk to the group as a whole.

10. The group does not have any unrelieved advance corporation tax.

11. The cash flows are smoothed throughout the year.

**Net Present Value**

Using a discount rate, based on the group’s cost of capital, stated by the respondent, of 20%, the NPV of the flows calculated by the company is £53,910, whereas the NPV using the simulation model is £185,083. A very large difference is due to the simulation model using a discount rate of 7.0215%. If a discount rate of 7.0215% is used to calculate the NPV of the flows calculated by the group, a NPV of £129,844. The other differences are as follows:
1. The group does not include interest deductibility as a cash flow, although the cost of capital used by the group may be adjusted for this effect. The simulation model has calculated interest payments of £5,146 per annum, which at a tax rate of 35% yield interest deductibility of £1800 per annum.

2. There is an increase in ACT payable due to the project, which is not effectively deducted from the group's tax liability until at least one year later. This timing difference results in the following differences:

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISC ACT</td>
<td>2073.02</td>
<td>2322.39</td>
<td>2571.77</td>
<td>2821.14</td>
<td>3070.51</td>
<td>3319.89</td>
</tr>
<tr>
<td>ACT</td>
<td>2037.86</td>
<td>2283</td>
<td>2528.14</td>
<td>2773.29</td>
<td>3018.43</td>
<td></td>
</tr>
<tr>
<td>DISC ACT - ACT</td>
<td>35.16</td>
<td>59.33</td>
<td>243.63</td>
<td>747.95</td>
<td>1521.38</td>
<td></td>
</tr>
<tr>
<td>+ ACT</td>
<td>2043.31</td>
<td>2289.11</td>
<td>2534.91</td>
<td>2780.71</td>
<td>3026.51</td>
<td></td>
</tr>
<tr>
<td>(5.55)</td>
<td>(.77)</td>
<td>(.77)</td>
<td>(.78)</td>
<td>(.80)</td>
<td>(.80)</td>
<td></td>
</tr>
</tbody>
</table>

3. The group deducts the capital allowances one year early which results in the following differences:
### Table 94

**Reconciliation**

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>group's flows</td>
<td>(738.75)</td>
<td>345.94</td>
<td>229.45</td>
<td>220.84</td>
<td>314.38</td>
<td>(105)</td>
</tr>
<tr>
<td>1. interest</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>2. disc ACT</td>
<td>(5.55)</td>
<td>(.77)</td>
<td>(.77)</td>
<td>(.78)</td>
<td>(.80)</td>
<td>(.80)</td>
</tr>
<tr>
<td>3. cap allows</td>
<td>(61.25)</td>
<td>15.31</td>
<td>11.49</td>
<td>8.61</td>
<td>6.46</td>
<td>19.38</td>
</tr>
<tr>
<td>4. discflows</td>
<td>7.79</td>
<td>7.79</td>
<td>7.79</td>
<td>7.79</td>
<td>7.79</td>
<td>7.79</td>
</tr>
<tr>
<td>5. balancing allw.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>58.14</td>
</tr>
</tbody>
</table>

---- ---- ---- ---- ---- ----

(805.55) 370.07 249.76 238.26 329.63 (26.48)
The group discounts at the year end, whereas the simulation model discounts quarterly, resulting in the following differences:

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(61.25)</td>
<td>(45.94)</td>
<td>(34.45)</td>
<td>(25.84)</td>
<td>(19.38)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.25</td>
<td>45.94</td>
<td>34.45</td>
<td>25.84</td>
<td>19.38</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.1 | discounted differences | 1.8 | 1.8 | 1.8 | 1.8 |

5. The group does not acknowledge short term life assets, which results in an understatement of the capital allowances available in the fourth year, and a tax difference in the fifth year of £221,486 (balancing allowance calculated by the simulation model) less £55,371 (capital allowance calculated by the group) which equals £166,115, which, at a tax rate of 35%, equals £58,140.
This group of companies is involved in the electronics industry. The group uses the net present value model to evaluate capital projects, and a copy of its standard form is reproduced in Table 95. The assumptions used to evaluate the project are as follows:

1. The projects flows are as follows:

<table>
<thead>
<tr>
<th>year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>capital expenditure</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>change in working capital</td>
<td>(1000)</td>
<td>(10)</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>net inflows</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>

2. The investment is in a short term life asset as defined by the Finance Act 1985.

3. The group uses a discount rate of 17%, compared with a discount rate of 5% derived by the simulation model.

4. Tax payments are payable one year following the end of the accounting period, and the group uses the statutory rate of tax in its evaluation.

5. The group's future profits have been estimated using regression based on the previous 5 years profit figures. A
### Calculation of Savings/Cash Income

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net profit before tax</td>
<td>-</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>-</td>
</tr>
<tr>
<td>Add back finance charge</td>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Add back depreciation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Cash income</td>
<td>-</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>-</td>
</tr>
</tbody>
</table>

### Calculation of Corp. Tax

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net profit before tax</td>
<td>(250)</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Add depreciation and other disallowable items</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Less capital allowances</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Taxable results</td>
<td>(250)</td>
<td>112.5</td>
<td>159.38</td>
<td>194.63</td>
<td>220.9</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Taxation (taxable results x tax rates)</td>
<td>(87.5)</td>
<td>39.37</td>
<td>55.78</td>
<td>168.08</td>
<td>77.31</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

### Discounted cash flow (at 17% after tax)

<table>
<thead>
<tr>
<th>NET INVESTMENT</th>
<th>NET REVENUE</th>
<th>Total Net Cash Flow</th>
<th>PRESENT VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>Cash/Re-grouping</td>
<td>Corp. Total Tax Revenue</td>
<td>Discount Net Cumulative Value Factor</td>
</tr>
<tr>
<td>Installation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Investment</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes
- This form must be supported by your major assumptions and working per showing how these calculations were produced.
correlation of .9764 is achieved indicating that profits are increasing in a relatively linear pattern. The equation derived is \( y = 5090 + 1330x \), where \( y \) = the profit for year 1...n, and \( x \) = year 1...n.

6. It is assumed that the company proposing the project provides one quarter of the group's profits and claims one quarter of the groups capital allowances, and is only involved in the trade in which the project arises.

7. The capital allowances available to the group, excluding the capital allowances arising from the project are assumed to be £8,000,000.

8. The group's future dividend payout has been estimated using regression analysis, based on the dividend payout for the last five years. The equation derived is \( y = 1199.97 + 337.49x \), where \( y \) = dividend payout for year 1...n, and \( x \) = year 1...n. A correlation coefficient of .99 was achieved.

9. The group is in a full tax paying situation.

10. The discount rate derived by the simulation model is based on the weighted average cost of capital, (see case study 1). The data used is as follows:

    MVD = based on the book value given in the annual report
    MVP = 0
MVE - based on the average market value of equity for 1986, ie the number of issued shares multiplied by the average share price

\[ D1 = \text{the estimate dividend payout for year 1} \]

\[ G = \text{the rate of increase in dividends has a negative slope of } -5\%, \text{ however this is not realistic for inclusion in the} \]

\[ \text{WACC computation, a growth rate of 2\% has therefore been assumed.} \]

11. The project is financed in the same ratio as the group’s present gearing ratio, and is of an average risk class to the group as a whole.

12. The group has assumed the project is financed totally by debt with an interest rate of 10%.

**Net Present Value**

The NPV of the project, evaluated using the groups methods is £32,500, compared to a NPV of £269,700 using the simulation model. One of the main differences is due to the difference in the discount rate. If the group had used a discount rate of 5%, the NPV of the project using the group’s methods would be £299,387. The other differences are listed below.
<table>
<thead>
<tr>
<th></th>
<th>year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>group flows</td>
<td>(1010)</td>
<td>487.5</td>
<td>360.63</td>
<td>344.22</td>
<td>341.92</td>
<td>(77.31)</td>
<td></td>
</tr>
<tr>
<td>1. interest</td>
<td></td>
<td>2.05</td>
<td>(32.95)</td>
<td>(32.95)</td>
<td>(32.95)</td>
<td>(32.95)</td>
<td></td>
</tr>
<tr>
<td>2. discact</td>
<td>(12.61)</td>
<td>(1.48)</td>
<td>(1.51)</td>
<td>(1.52)</td>
<td>(1.52)</td>
<td>17.65</td>
<td></td>
</tr>
<tr>
<td>3. cap all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>83.06</td>
<td></td>
</tr>
<tr>
<td>4. discflow</td>
<td></td>
<td>7.93</td>
<td>7.93</td>
<td>7.93</td>
<td>7.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1022.61)</td>
<td>496.00</td>
<td>334.1</td>
<td>317.68</td>
<td>315.38</td>
<td>(9.55)</td>
<td></td>
</tr>
</tbody>
</table>
Reconciliation (see Table 96.)

1. The group has allowed for interest payments of £100,000 per annum, whereas the interest payments derived by the simulation model amount to £58,860, at a tax rate of 35%, allowing for interest deductibility of £35,000 and £2,051 respectively. The simulation model has allowed for interest in the year on investment whereas the group does not allow for interest until the year later.

<table>
<thead>
<tr>
<th>Year</th>
<th>Group Interest @ 35%</th>
<th>Interest from Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35</td>
<td>2.051</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>2.051</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>2.051</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>2.051</td>
</tr>
</tbody>
</table>

2. As stated previously, the Advance Corporation Tax payable due to an increase in share issue, must be discounted and the difference between when the ACT is paid and when it may be reclaimed must be included as a cash flow.

<table>
<thead>
<tr>
<th>Project</th>
<th>DISC ACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>With ACT</td>
<td>1382.11  1526.75  1671.38  1816.23  1960.66</td>
</tr>
<tr>
<td>Project - DISC ACT</td>
<td>1400.34  1546.89  1693.43  1840.19  1986.53</td>
</tr>
<tr>
<td>Without ACT</td>
<td>1394.55  1540.49  1686.43  1832.59  1978.31</td>
</tr>
<tr>
<td>Project DISC ACT</td>
<td>1412.95  1560.81  1708.68  1856.76  2004.41</td>
</tr>
</tbody>
</table>

---

(12.61) (1.48) (1.51) (1.52) (1.52) 17.65
3. The group does not acknowledge short term life assets in the appraisal of capital projects, leading to an understatement by the group of £83,060 in the fifth year.

4. The group discounts its flows annually, whereas the simulation model discounts quarterly, leading to an understatement by the group of £7,930 in years 1 to 4.
Case Study 4

This case study is based on an actual project undertaken by a group of companies, which was evaluated in 1981. It is not known whether the group was in a full tax paying situation at that time, but as the group uses the statutory rate of tax, at present, despite having unrelieved Advance Corporation Tax and losses, it has been assumed that he group was not in a full tax paying situation, but used the statutory rate of tax.

The group uses the internal rate of return, the payback period and the net present value model to evaluate projects. The evaluation form used by the group is included in Table 97.

Assumptions

1. The flows of the project are as follows:

<table>
<thead>
<tr>
<th>year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(59,280)</td>
<td>105,715</td>
<td>105,715</td>
<td>105,715</td>
<td>105,715</td>
<td>105,715</td>
</tr>
</tbody>
</table>

2. The capital allowances applicable to the project are available at 100% first year allowance.

3. There is a one year tax lag, and the group charges tax at the statutory rate, that is 52%. The calculations in the simulation
**CAPITAL EXPENDITURE AUTHORISATION REQUEST – PROFITABILITY SUMMARY**

**OPERATING GROUP** ..................................................  

**LOCATION** ..........................................................  

**PROJECT TITLE** ....................................................  

**REQUEST NO.** .......................................................  

**DATE** .................................................................  

**DIVISION** ............................................................  

### EFFECT OF PROPOSAL excluding DEPRECIATION

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional Sales Volume</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>£</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capital Expenditure Phasing</strong></td>
<td>(59280)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade-In</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment Grant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Additional Sales Revenue</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cost Savings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Before Tax Profit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capital Allowances</strong></td>
<td>59,280</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tax</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>After Tax Profit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Additional Working Capital</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Net Cashflow</strong></td>
<td>(59,280)</td>
<td>136,541</td>
<td>50,743</td>
<td>50,743</td>
<td>50,743</td>
<td>50,743</td>
</tr>
</tbody>
</table>

(For details of additional sales revenue, working capital and cost savings see forms 5, 6, and 7)

### FINANCIAL APPRAISAL

- **Payback Period** .................................................. 0.43 Years
- **DCF Rate of Return** .............................................. 17.8%
- **NPV @ 5%** ......................................................... £201,102

### SENSITIVITY ANALYSIS

<table>
<thead>
<tr>
<th>Factor</th>
<th>% Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporation Tax</td>
<td></td>
</tr>
<tr>
<td>Capital Expenditure</td>
<td></td>
</tr>
<tr>
<td>Sales Volume</td>
<td></td>
</tr>
<tr>
<td>Selling Price</td>
<td></td>
</tr>
<tr>
<td>Variable Operating Costs</td>
<td></td>
</tr>
<tr>
<td>Fixed Operating Costs</td>
<td></td>
</tr>
<tr>
<td>Working Capital</td>
<td></td>
</tr>
</tbody>
</table>

### RESULTS

- **Payback Period (Years)** ........................................ 0.43
- **DCF Rate of Return (%)** ......................................... 17.8
- **NPV @ 5% (£000's)** ............................................... £201,102
model are based on a full corporation tax rate of 52%.

4. The group uses a 5% discount rate, whereas the simulation model has calculated a discount rate of 5.35%.

5. The forecasted profit and dividend figures are based on actual figures for the 5 years (note the group would not have this information, but because the group uses the statutory rate of tax, it does not consider the group's tax profile.)

6. The company proposing the project provides one quarter of the group's profits and is entitled to one quarter of the group's capital allowances excluding the capital allowances applicable to the project.

7. The company proposing the project is entitled to £18,750K unrelieved capital allowances and losses, whereas the remainder of the group is entitled to £56,250K unrelieved losses and capital allowances.

8. The group discounts at the year end, whereas the simulation model discounts quarterly.

9. There is unrelieved advance corporation tax of £11200.71K.

10. The company proposing the project is charged interest equal to the previous years total interest payment, that is £8,050K.
11. The discount rate calculated in the simulation model is based on:

\[ \text{MVD} = \text{The book value of debt} \]
\[ \text{MVE} = \text{The market value of equity, number of shares} \times \text{average share price in 1986} \]
\[ = 128,522 \times \left( \frac{(7.10+5.27)}{2} \right) = 794,908. \]
\[ \text{MVP} = \text{the book value of preference shares} \]
\[ \text{Dp} = \text{the previous year's preference share dividend payout} \]
\[ \text{D1} = \text{the ordinary share dividend payout in year 1} \]
\[ G = \text{the growth in ordinary share dividend is estimated at} \]
\[ 0.3\%, \text{but as this seems rather low a growth rate of} \]
\[ 2\% \text{has been used.} \]

The company has calculated a net present value of £201,102, whereas the simulation model has derived a net present value of £211,082. There is a variance due to the difference in the discount rate, although the difference is not great.

**Reconciliation** (see Table 98)

1. The simulation model discounts the cash flows quarterly compared to the group, which discounts annually. This leads to an understatement by the group of £2,097 in years 1 to 5.

2. The simulation model has allowed for interest deductibility as a cash flow rather than adjusting the discount rate. The group may have adjusted the discount rate, but if this has happened the
Table 28

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Group's flows (59280) 136541 50743 50743 50743 50743 50743 -

1. 2097.9 2097.9 2097.9 2097.9 2097.9 2097.9

2. 796.1 796.1 796.1 796.1 796.1 796.1

3. (54972)

4. (384) (21.1) (60.5) (32.4) (81.5) (60.1) (61.7)

5. (379) 12616.8 (7981.6) (4256.1)

6. (31621.8) 31621.8

(59664) 107413.1 97815.1 45623 49299.4 53576.9 (54237.6)
discount rate will have been adjusted in accordance with a tax rate of 52%, when it should have been adjusted in accordance with a tax rate of zero for years 1 and 2 (unrelieved losses), 22% for years 3 and 4 (unrelieved Advance Corporation Tax) and 52% for the remaining years. The difference in the cash flows due to not including interest deductibility as a cash flow, is £1,531 x .52 = £796.12. N.B. although full interest deductibility is not available until year 5, the adjustment for this is included in note 5 and 6.

3. The group does not include the tax payment following the cash flow occurring in year 5, a negative cash flow of £54,792 is included in the simulation model for year 6.

4. The Advance Corporation Tax payable due to an increase in share issue, must be discounted and the difference between when the ACT is paid and when it may be reclaimed must be included as a cash flow.

<table>
<thead>
<tr>
<th>8075.36</th>
<th>8421.00</th>
<th>9583.87</th>
<th>10140.12</th>
<th>11722.88</th>
<th>12833.20</th>
<th>13964.37</th>
</tr>
</thead>
<tbody>
<tr>
<td>less</td>
<td>7970.14</td>
<td>8311.29</td>
<td>9459.00</td>
<td>10008.00</td>
<td>11570.14</td>
<td>12666.00</td>
</tr>
<tr>
<td>less 8459.36</td>
<td>8821.20</td>
<td>10039.36</td>
<td>10622.36</td>
<td>12280.09</td>
<td>13443.21</td>
<td>14628.17</td>
</tr>
<tr>
<td>plus 8349.15</td>
<td>8706.27</td>
<td>9908.56</td>
<td>10483.67</td>
<td>12120.09</td>
<td>13268.06</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>(384)</td>
<td>(21.19)</td>
<td>(60.51)</td>
<td>(32.38)</td>
<td>(81.54)</td>
<td>(60.06)</td>
<td>(61.74)</td>
</tr>
</tbody>
</table>

5. There is a difference in the amount of unrelieved Advance
Corporation Tax set off during years 1 to 4 due to the increase in capital allowances in the first year and the increase in profits in subsequent years, as follows:

<table>
<thead>
<tr>
<th></th>
<th>without ACTWO</th>
<th>project less ACT</th>
<th>with ACTWO</th>
<th>project ACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA's written off</td>
<td>13020</td>
<td>8311.29</td>
<td>26031.78</td>
<td>8349.15</td>
</tr>
<tr>
<td>Capital allowances</td>
<td>19665</td>
<td>9459</td>
<td>12132.91</td>
<td>9908.56</td>
</tr>
<tr>
<td></td>
<td>14264.14</td>
<td>10008</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There is a difference in the amount of capital allowances set off during years 1 and 2, due to the capital allowances and profits due to the project, which the group has ignored.

<table>
<thead>
<tr>
<th></th>
<th>without project</th>
<th>with project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital allowances</td>
<td>60000</td>
<td>60000</td>
</tr>
<tr>
<td>CA's written off</td>
<td>128350</td>
<td>66650</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>with project</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital allowances</td>
<td>119280</td>
<td>60000</td>
</tr>
<tr>
<td>CA's written off</td>
<td>126818.8</td>
<td>127461.2</td>
</tr>
<tr>
<td></td>
<td>(60811.2)</td>
<td>(60811.2)</td>
</tr>
<tr>
<td>52%</td>
<td>(31621.2)</td>
<td>31621.2</td>
</tr>
</tbody>
</table>
The standard form used by this group of companies is reproduced in Table 99. The flows attributable to the project is as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>investment</td>
<td>(1000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>change in working capital</td>
<td>(200)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>net inflows</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
</tbody>
</table>

**Assumptions**

1. The profits have been forecasted using regression analysis, achieving an equation of $C_l = 187 + 47.1C_S$, where $C_l =$ the forecasted profit for year 1....n, and $C_S =$ year 1....n. A $R^2_{adj}$ of 69% was achieved. The company proposing the project is assumed to provide one tenth of the profits, without the project.

2. The dividends have also been forecasted using regression analysis, with an equation of $C_2 = 30.14 + 7.46C_S$, where $C_2 =$ the forecasted dividend payout to ordinary shareholders for years 1....n, and $C_S =$ year 1....n. A correlation of .98 was
### TABLE 99

Incremental Income and Expenditure arising from the Investment

<table>
<thead>
<tr>
<th>Year</th>
<th>19xx (£)</th>
</tr>
</thead>
</table>

#### INCREMENTAL INCOME

<table>
<thead>
<tr>
<th>Component</th>
<th>(Part 4)</th>
<th>(Part 5)</th>
<th>Total A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost Savings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### INCREMENTAL EXPENDITURE

<table>
<thead>
<tr>
<th>Component</th>
<th>(Part 5)</th>
<th>(Part 4)</th>
<th>Total B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semi-Fixed Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue Expenditure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total B</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### INCREMENTAL PROFIT/(LOSS)

A-B

<table>
<thead>
<tr>
<th></th>
<th>300</th>
<th>300</th>
<th>300</th>
<th>300</th>
<th>300</th>
<th>300</th>
<th>300</th>
</tr>
</thead>
</table>

### Incremental Cash Flows arising from the Investment

#### CASH INFLOW

<table>
<thead>
<tr>
<th>Component</th>
<th>(above)</th>
<th>Add back Depreciation</th>
<th>Government Grants</th>
<th>Other</th>
<th>Total Inflow C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit/(Loss)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Inflow C</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### CASH OUTFLOW

<table>
<thead>
<tr>
<th>Component</th>
<th>(Part 4)</th>
<th>(Part 5)</th>
<th>Total Outflow D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Expenditure</td>
<td>1000</td>
<td></td>
<td>1200 (12.5)</td>
</tr>
<tr>
<td>Increase/(Decrease) in Working Capital</td>
<td>200</td>
<td></td>
<td>5625</td>
</tr>
<tr>
<td>Tax Paid</td>
<td></td>
<td>-</td>
<td>7.97</td>
</tr>
<tr>
<td>Capital and Other Tax Allowances</td>
<td></td>
<td>-</td>
<td>9.73</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>-</td>
<td>11.04 (167.77)</td>
</tr>
<tr>
<td>Total Outflow D</td>
<td></td>
<td></td>
<td>12.78</td>
</tr>
</tbody>
</table>

#### NET CASH FLOW C-D

<table>
<thead>
<tr>
<th></th>
<th>(1200)</th>
<th>3.125</th>
<th>254.375</th>
<th>292.03</th>
<th>90.27</th>
<th>238.96</th>
<th>48.197 (12.78)</th>
</tr>
</thead>
</table>


achieved indicating that the dividend payout has increased in a linear pattern.

3. The group is assumed to have capital allowances per annum of £400,000, with the company proposing the project claiming one tenth of them.

4. The group uses a discount rate of 14%, whereas the simulation model has derived a discount rate of 7.36%.

5. The group has unrelieved advance corporation tax of £49,400K, as shown in the group's annual report.

6. The group and the simulation model has employed a tax lag of one year.

7. Capital Allowances are available on the project at a writing down allowance of 25%.

8. The group pays preference dividends of £400,000 per annum (not including any increase in preference dividend due to the project.)

9. Dividends are paid in two halves, in the second quarter and in the fourth quarter.

10. The group discounts annually, whereas the simulation model
discounts quarterly.

11. The company proposing the project is charged interest of £20,810K per annum, one tenth of the total for the group.

12. The weighted average cost of capital is based on the following:

\[ MVE = \text{market value of equity in 1986, that is number of shares} \times \text{average share price}, \]

\[ MVD = \text{book value of debt as per accounts} \]

\[ MVP = \text{book value of preference share capital as per accounts} \]

\[ \beta = \text{the ordinary dividend payout has grown at a rate of -0.01 per annum, as this seems unlikely that the company intends this trend a growth rate of 2\% has been assumed.} \]

13. The group uses a tax rate of 5\%, that is the statutory rate adjusted for unrelieved advance corporation tax.

The group's cash flows discounted at 14\% equal £36.28K, whereas the simulation model shows a net present value of £246.95K. A large difference is due to the difference in the discount rate, and if the group had used the discount rate calculated by the simulation model a net present value of £314.626 would have been achieved. The reconciliation below itemises the other differences.
1. The simulation model discounts the cash flows quarterly compared to the group, which discounts annually. This leads to an understatement by the group of £8.15 in years 1 to 6.

2. The simulation model has allowed for interest deductibility as a cash flow rather than adjusting the discount rate. The difference in the cash flows due to not including interest deductibility as a cash flow, is £47.48K x .35 = £16.62K.

3. The simulation model shows the unrelieved Advance Corporation Tax as fully relieved in the first year, whereas the group uses a tax rate adjusted for unrelieved corporation tax for all the years under consideration. This has led to an overstatement by the group as follows:

<table>
<thead>
<tr>
<th>year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>taxable flows (250)</td>
<td>112.5</td>
<td>159.4</td>
<td>194.6</td>
<td>220.8</td>
<td>240.6</td>
<td>255.6</td>
<td></td>
</tr>
</tbody>
</table>
@ 35%-5%=30%  (75) 33.7 47.8 58.3 66.2 72.2 76.7

4. The Advance Corporation Tax payable due to reducing retentions and issuing shares, must be discounted and the difference between when the ACT is paid and when it may be reclaimed must be included as a cash flow.
Table 100

Table showing the reconciliation between the flows calculated by the company and derived using the simulation model

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td>8.2</td>
<td>8.2</td>
<td>8.2</td>
<td>8.2</td>
<td>8.2</td>
<td>8.2</td>
<td>8.2</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>16.6</td>
<td>16.6</td>
<td>16.6</td>
<td>16.6</td>
<td>16.6</td>
<td>16.6</td>
<td>16.6</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>75</td>
<td>(33.7)</td>
<td>(47.8)</td>
<td>(58.3)</td>
<td>(66.2)</td>
<td>(72.2)</td>
<td>(76.7)</td>
</tr>
<tr>
<td>4.</td>
<td>(7.5)</td>
<td>(0.8)</td>
<td>(0.8)</td>
<td>(0.9)</td>
<td>(0.9)</td>
<td>(1.0)</td>
<td>(0.9)</td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td>(1207.5)</td>
<td>411.5</td>
<td>284.7</td>
<td>268.1</td>
<td>254.6</td>
<td>247.8</td>
<td>439.7</td>
<td>(73.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>32863.1</td>
<td>36118</td>
<td>39372.9</td>
<td>42627.8</td>
<td>45882.7</td>
<td>49137.6</td>
<td>52392.5</td>
<td>55647.4</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>32280</td>
<td>35477.1</td>
<td>38674.3</td>
<td>41871.4</td>
<td>45068.6</td>
<td>48265.7</td>
<td>51462.9</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>32870.6</td>
<td>36126.2</td>
<td>39381.8</td>
<td>42637.5</td>
<td>45893.1</td>
<td>49148.8</td>
<td>52404.4</td>
<td>55660.1</td>
</tr>
<tr>
<td>+</td>
<td>32287.4</td>
<td>35485.2</td>
<td>38683.1</td>
<td>41880.9</td>
<td>45078.8</td>
<td>48276.7</td>
<td>51474.6</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td></td>
</tr>
</tbody>
</table>

(7.5) (0.8) (0.8) (0.9) (0.9) (1.0) (0.9) (1.0)
Case Study 6

This group of companies has a wide portfolio of activities. A copy of the group's standard form is reproduced in Table 101, showing the evaluation of a hypothetical project which has been developed with the following cash flows:

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>investment (2000)</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>change in working capital (100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flow</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

**Assumptions**

1. The group has unrelieved losses of £7,000,000.

2. The group uses the average tax rate.

3. The tax lag is one year.

4. Profits have been forecasted using regression analysis, giving the following equation $C_1 = 1317 + 2629C_3$, where $C_1$ = forecasted profits for years 1.....n, and $C_3$ = year 1.....n. A R2adj of 94.7% was achieved indicating that profits have increased
<table>
<thead>
<tr>
<th>YEAR</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUDGET YEAR TO:</td>
<td>31.3.</td>
<td>31.3.</td>
<td>31.3.</td>
<td>31.3.</td>
<td>31.3.</td>
<td>31.3.</td>
<td>31.3.</td>
<td>31.3.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trading Profit</th>
<th>-</th>
<th>500</th>
<th>500</th>
<th>500</th>
<th>500</th>
<th>500</th>
<th>500</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add: Depreciation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Less: Movement in Current Assets:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- Debtors</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- Stocks</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- Other Assets</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- Inter-company</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- Creditors</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- Other Liab./Accruals</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capital Expenditure</th>
<th>(2000)</th>
<th>(100)</th>
<th>(100)</th>
<th>(100)</th>
<th>(100)</th>
<th>(100)</th>
<th>(100)</th>
<th>(100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-time costs</td>
<td>175</td>
<td>175</td>
<td>175</td>
<td>175</td>
<td>175</td>
<td>175</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>Taxation payments</td>
<td>(43.75)</td>
<td>(76.56)</td>
<td>(101.17)</td>
<td>(119.63)</td>
<td>(133.47)</td>
<td>(143.8)</td>
<td>(143.8)</td>
<td>(143.8)</td>
</tr>
<tr>
<td>Other Cash Flow (specify)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Cash Flow (before interest)</th>
<th>(2100)</th>
<th>675</th>
<th>456.25</th>
<th>423.44</th>
<th>398.83</th>
<th>380.37</th>
<th>466.53</th>
<th>(143.8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest calculated at 15%</td>
<td>(157.5)</td>
<td>(264.37)</td>
<td>(179.53)</td>
<td>(113.56)</td>
<td>(51.98)</td>
<td>6.56</td>
<td>70.07</td>
<td>94.2</td>
</tr>
<tr>
<td>Annual Cash Flow After Interest</td>
<td>(2257.5)</td>
<td>410.63</td>
<td>276.72</td>
<td>309.89</td>
<td>346.95</td>
<td>386.93</td>
<td>536.60</td>
<td>(49.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cumulative Cash Flow</th>
<th>(2257.5)</th>
<th>(1846.81)</th>
<th>(1570.15)</th>
<th>(1260.26)</th>
<th>(913.31)</th>
<th>(526.38)</th>
<th>(10.22)</th>
<th>(39.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Payback: Years.Mths.</td>
<td>Disc Rate</td>
<td>1</td>
<td>1.15</td>
<td>1.3225</td>
<td>1.52</td>
<td>1.749</td>
<td>2.011</td>
<td>2313</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Present values of Annual Cash Flow before Interest</th>
<th>(2100)</th>
<th>586.96</th>
<th>344.99</th>
<th>278.58</th>
<th>228.03</th>
<th>189.14</th>
<th>201.7</th>
<th>(54.6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative N.P.V.</td>
<td>(1513.04)</td>
<td>(1148.05)</td>
<td>(889.11)</td>
<td>(621.11)</td>
<td>(372.11)</td>
<td>(283.11)</td>
<td>(201.7)</td>
<td>(54.6)</td>
</tr>
</tbody>
</table>
linearly. The company proposing the project is assumed to provide one quarter of the profits, excluding the profits arising from the project.

5. Dividends have been forecasted using regression analysis and an equation of \( C_2 = 974 + 614C_3 \) was derived, where \( C_2 = \) ordinary share dividend payout for years 1...n, and \( C_3 = \) year 1...n. A \( R^2_{adj} \) of 85.7% was achieved.

6. The group does not have unrelieved Advance Corporation Tax.

7. Capital Allowances are available for the project at a writing down allowance of 25%.

8. The company proposing the project is assumed to be entitled to one quarter of the group's capital allowances, which are estimated to be £12,000K per annum.

9. The group does not have any preference share capital.

10. The company proposing the project is charged interest of £672.5K per annum which is a quarter of the group's interest payments.

11. The group uses a discount rate of 15%, whereas the simulation model has derived a discount rate of 5.47%. The group discounts annually, whereas the simulation model discounts quarterly.
12. Dividends are paid in two halves, in the second quarter and in the fourth quarter.

13. The project is assumed to be of average risk and is assumed to be financed by debt and equity in the same ratio as its present gearing.

14. The discount rate used in the simulation model is based on the following:

\[ MVE = \text{market value of equity as at 1986, that is number of shares issued times the average share price for 1986,} \]
\[ 126265655 \times \left(\frac{2.27+1.58}{2}\right) \]

\[ MVD = \text{book value of debt as per accounts} \]

\[ G = \text{estimated growth in dividends of 2.4\%, using regression analysis} \]

The net present value calculated using the group's methods is (£328.68K), whereas the simulation model has calculated a net present value of (£140.52K). A large difference is due to the different discount rate, if the group had used the discount rate calculated using the simulation model, a net present value of (£164.79K) would have been achieved. The other differences are listed below.
Table 102

Table showing the reconciliation between the flows calculated by the company and derived using the simulation model

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>group’s flows</td>
<td>(2100)</td>
<td>675</td>
<td>456.3</td>
<td>423.4</td>
<td>398.8</td>
<td>380.4</td>
<td>466.5</td>
<td>(143.8)</td>
</tr>
<tr>
<td>1.</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
</tr>
<tr>
<td>3.</td>
<td>(20.1)</td>
<td>(2.4)</td>
<td>(2.3)</td>
<td>(2.4)</td>
<td>(2.4)</td>
<td>(2.4)</td>
<td>(2.5)</td>
<td>(2.5)</td>
</tr>
<tr>
<td>4.</td>
<td>(169.8)</td>
<td>5.6</td>
<td>164.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>(5.9)</td>
<td>5.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(2100.1) | 512.9 | 481.5 | 601.3 | 412.4 | 393.9 | 480 | (140.4) |
Reconciliation see Table 102

1. The simulation model discounts the cash flows quarterly compared to the group, which discounts annually. This leads to an understatement by the group of £10.14K in years 1 to 6.

2. The simulation model has allowed for interest deductibility as a cash flow rather than adjusting the discount rate. The group may have however adjusted the discount rate. This leads to an understatement by the group of £16.76K @ 35% = £5.87K in years 1 to 7.

3. The Advance Corporation Tax payable due to an increase in share issue, must be discounted and the difference between when the ACT is paid and when it may be reclaimed must be included as a cash flow.

\[
\begin{array}{cccccccccc}
2556.6 & 2823.3 & 3090 & 3356.7 & 3623.4 & 3890.1 & 4156.8 & 4423.5 \\
- & 2522.6 & 2785.7 & 3048.9 & 3312 & 3575.1 & 3838.3 & 4101.4 \\
- & 2576.7 & 2845.5 & 3114.2 & 3383 & 3651.8 & 3920.6 & 4189.4 & 4458.2 \\
+ & 2542.4 & 2807.6 & 3072.8 & 3338 & 3603.2 & 3868.4 & 4133.6 & 4403.8 \\
\hline
(20.1) & (2.4) & (2.3) & (2.4) & (2.4) & (2.4) & (2.5) & (2.5)
\end{array}
\]

4. There is a difference in the amount of unrelieved Advance Corporation Tax set off during years 1 to 3 due to the increase in capital allowances in the first year and the increase in profits in subsequent years, as follows:
without ACTWO | 2522.6 | 2785.7 | 3048.9
project less ACT | 1428.6 | 3065.9 | 3862.6

with ACTWO | 2542.4 | 2807.6 | 3072.8
project ACT | 1278.6 | 3093.4 | 4050.8

(169.8) | 5.6 | 164.3

5. There is a difference in the amount of capital allowances set off during years 1 and 2, due to the capital allowances and profits due to the project, which the group has ignored.

without Capital Allowances | 12000 | 12000
project CA's written off | 16914.7 | 14085.3

with Capital allowances | 12500 | 12375
project CA's written off | 17397.9 | 14477.1

(16.8) | 16.8
@ 35% (5.9) | 5.9
This group of companies is involved in the manufacture of food stuffs. A copy of the standard form used by the company is reproduced in Table 103. A hypothetical project was developed with the following cash flows:

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment (1000)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Change in working capital (100)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Net inflows</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

**Assumptions**

1. The group's profits have been forecasted using regression analysis, and an equation was derived as follows:

   \[ C_2 = 30,100K + 6,520KC_1, \]

   where \( C_2 \) = profits for years 1...n, and \( C_1 = \) years 1...n. It is assumed that the company proposing the project provides one quarter of the profits, excluding the project.

2. The ordinary share dividend payout has been forecasted using regression analysis, and an equation was derived as follows:

   \[ C_1 = 8870K + 1010KC_2, \]

   where \( C_1 = \) ordinary share dividend payout in years 1...n, and \( C_2 = \) yeares 1...n.
<table>
<thead>
<tr>
<th>YEAR</th>
<th>FVFL</th>
<th>ASSET</th>
<th>COST £000</th>
<th>DEP. ON GRANT £000</th>
<th>AT 75% OF TAX £000</th>
<th>FLOW £000</th>
<th>SALES UNITS</th>
<th>VALUE £000</th>
<th>SALES £000</th>
<th>MARGIN £000</th>
<th>EXPENSES £000</th>
<th>FLOW £000</th>
<th>AT £000</th>
<th>OF TAX £000</th>
<th>DEP 'N £000</th>
<th>DEP 'N £000</th>
<th>FLOW £000</th>
<th>INVEST £000</th>
<th>FLOW £000</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1,000</td>
<td>-</td>
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<td>1,000</td>
<td>20</td>
<td>1,000</td>
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<td>1,000</td>
<td>2000</td>
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<td>10</td>
<td>100</td>
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<td>100</td>
<td>100</td>
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<tr>
<td>1</td>
<td>1</td>
<td>837</td>
<td>1,000</td>
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<tr>
<td>2</td>
<td>2</td>
<td>873</td>
<td>1,000</td>
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<tr>
<td>6</td>
<td>6</td>
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<tr>
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<tr>
<td>8</td>
<td>8</td>
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<td>100</td>
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<tr>
<td>11</td>
<td>11</td>
<td>987</td>
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<td>100</td>
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<tr>
<td>12</td>
<td>12</td>
<td>987</td>
<td>1,000</td>
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<td>2000</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>(100)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>987</td>
<td>1,000</td>
<td>-</td>
<td>-</td>
<td>1,000</td>
<td>2000</td>
<td>100</td>
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<td>100</td>
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<tr>
<td>14</td>
<td>14</td>
<td>987</td>
<td>1,000</td>
<td>-</td>
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<td>2000</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>(100)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>987</td>
<td>1,000</td>
<td>-</td>
<td>-</td>
<td>1,000</td>
<td>2000</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>(100)</td>
<td></td>
</tr>
</tbody>
</table>
3. The group has preference share capital of £6700K, and is assumed to pay dividends to preference share holders of £300K per annum, as per accounts.

4. The group uses the marginal tax rate in its evaluations, with a tax lag of one year.

5. The group has unrelieved Advance Corporation Tax of £23,200K and unrelieved losses of £45,400K, as per accounts. The company proposing the projects is assumed to be entitled to one quarter of both.

6. The company proposing the project is assumed to be charged interest of £2512.5K per annum, one quarter of the group’s total interest payments.

7. The group discounts its cash flows at 10%, 15%, 20% and 25%, whereas the simulation model has calculated a discount rate of 12.8%.

8. The project is assumed to be of average risk and financed in the same ratio as the group’s present gearing ratio.

9. The dividends are paid in two halves, in the second quarter and in the fourth quarter.
10. Capital Allowances are available to the project at a writing down allowance of 25% per annum.

11. The discount rate calculated by the simulation model is based on the following:

\[ MVE = \text{Market value of equity as at 1986, number of shares} \times \text{share price,} \quad 70,200,000 \times £2.24 = 157,248,000 \]

\[ MVD = \text{book value of debt, as per accounts} \]

\[ MVP = \text{book value of preference share capital, as per accounts} \]

\[ S = \text{forecasted growth in dividends,} \ 7\%, \ \text{calculated using regression analysis} \]

The net present value calculated by the group using a 10% discount rate is £11.7K, whereas the simulation model has calculated a net present value of -£78.48K, when a discount rate of 12.79% is used. If the group had used the same discount rate as the simulation model a net present value of -£21.85K. The other differences are listed below.

Reconciliation see Table 104

1. The simulation model discounts the cash flows quarterly compared to the group, which discounts annually. This leads to an understatement by the group of £9.35K in years 0 to 6.

2. The simulation model has allowed for interest deductibility as a cash flow rather than adjusting the discount rate. The group
Table 104

Table showing the reconciliation between the flows calculated by the company and derived using the simulation model

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>group's flows</td>
<td>(896)</td>
<td>199.4</td>
<td>179.2</td>
<td>166.9</td>
<td>157.7</td>
<td>150.7</td>
<td>245.6</td>
<td>-</td>
</tr>
<tr>
<td>1.</td>
<td>9.3</td>
<td>9.3</td>
<td>9.3</td>
<td>9.3</td>
<td>9.3</td>
<td>9.3</td>
<td>9.3</td>
<td>-</td>
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<tr>
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<td>12.4</td>
<td>12.4</td>
<td>12.4</td>
<td>12.4</td>
<td>12.4</td>
<td>12.4</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>(4)</td>
<td>4.6</td>
<td>20.2</td>
<td>12.3</td>
<td>9.2</td>
<td>6.9</td>
<td>5.2 (54.4)</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>(23.7)</td>
<td>(1.8)</td>
<td>(1.7)</td>
<td>(1.7)</td>
<td>(2.4)</td>
<td>(2.4)</td>
<td>(2.5)</td>
<td>15.3</td>
</tr>
<tr>
<td>5.</td>
<td>(48.6)</td>
<td>(30.8)</td>
<td>79.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>14</td>
<td>(3.7)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(914.4) | 189.3 | 184.9 | 278.8 | 186.2 | 176.9 | 270 | 26.7 | -   |

299
may have adjusted the discount rate. The difference in the cash
flows due to not including interest deductibility as a cash flow,
is £35.43K x .35 = £12.4K.

3. The group includes the tax flows a year early, according to
the standard form. This has led to the following differences:

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td></td>
<td>(4)</td>
<td>4.6</td>
<td>20.2</td>
<td>12.3</td>
<td>9.2</td>
<td></td>
<td>6.9</td>
<td>5.2 (54.4)</td>
</tr>
</tbody>
</table>

4. The Advance Corporation Tax payable due to an increase in
share issue, must be discounted and the difference between when
the ACT is paid and when it may be reclaimed must be included as
a cash flow.

<table>
<thead>
<tr>
<th></th>
<th>6729.6</th>
<th>7175.9</th>
<th>7622.2</th>
<th>8068.5</th>
<th>8514.8</th>
<th>8961</th>
<th>9407.3</th>
<th>4604.9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- 6527.1</td>
<td>6960</td>
<td>7392.9</td>
<td>7825.7</td>
<td>8258.6</td>
<td>8691.4</td>
<td>9124.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 6753.3</td>
<td>7200.7</td>
<td>7648.6</td>
<td>8096.4</td>
<td>8544.3</td>
<td>8992.2</td>
<td>9440</td>
<td>4620.7</td>
</tr>
<tr>
<td></td>
<td>+ 6550.1</td>
<td>6984.1</td>
<td>7418.5</td>
<td>7852.8</td>
<td>8287.2</td>
<td>8721.6</td>
<td>9156</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>23.7</td>
<td>(1.8)</td>
<td>(1.7)</td>
<td>(1.7)</td>
<td>(2.4)</td>
<td>(2.4)</td>
<td>(2.5)</td>
<td>15.3</td>
</tr>
</tbody>
</table>

5. There is a difference in the amount of unrelieved advance
corporation tax set off during years 1 to 4 due to the increase
in capital allowances in the first year and the increase in
profits in subsequent years, as follows:
<table>
<thead>
<tr>
<th></th>
<th>6527.1</th>
<th>6960</th>
<th>7392.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>project less ACT</td>
<td>4142.2</td>
<td>19748.2</td>
<td>20179.5</td>
</tr>
<tr>
<td></td>
<td>6550.1</td>
<td>6984</td>
<td>7418.5</td>
</tr>
<tr>
<td>project ACT</td>
<td>4116.6</td>
<td>19741.4</td>
<td>20284.7</td>
</tr>
<tr>
<td></td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>(48.6)</td>
<td>(30.8)</td>
<td>79.6</td>
<td></td>
</tr>
</tbody>
</table>

6. The group uses the marginal rate of tax as follows

<table>
<thead>
<tr>
<th>year</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8%</td>
<td>5%</td>
</tr>
</tbody>
</table>

This does not fully coincide with the simulation model, but it is more likely that the group will know when its unrelieved Advance Corporation Tax is exhausted, but should monitor it closely. The differences are as follows:

<table>
<thead>
<tr>
<th>year</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14</td>
<td>(3.7)</td>
</tr>
</tbody>
</table>
This case study is based on a project developed by the respondent for the sole purpose of conducting this comparison. The evaluation form of the group is reproduced in Table 105. The group consists of two large companies.

**Assumptions**

1. The future profits for the company proposing the project, and the other company have been forecasted using regression analysis, giving respective equations of $C_1 = 34602.8 + 5030.2C_5$, and $C_1 = 12210.6 + 7856.4C_5$ where $C_1 =$ the forecasted profit for year $1 \ldots n$, and $C_5 =$ year $1 \ldots n$. Correlation coefficients of .99 were achieved for both equations.

2. The dividends have also been estimated as follows:

<table>
<thead>
<tr>
<th>year</th>
<th>dividend</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>30495</td>
</tr>
<tr>
<td>1</td>
<td>32019.75</td>
</tr>
<tr>
<td>2</td>
<td>33620.74</td>
</tr>
<tr>
<td>3</td>
<td>35301.77</td>
</tr>
<tr>
<td>4</td>
<td>37066.86</td>
</tr>
<tr>
<td>5</td>
<td>38920.21</td>
</tr>
<tr>
<td>6</td>
<td>40866.22</td>
</tr>
<tr>
<td>7</td>
<td>42909.53</td>
</tr>
</tbody>
</table>

302
### Capital Expenditure Appraisal - Discounted Cash Flow Analysis (£'000s)

<table>
<thead>
<tr>
<th>INVESTMENT</th>
<th>YR0</th>
<th>YR1</th>
<th>YR2</th>
<th>YR3</th>
<th>YR4</th>
<th>YR5</th>
<th>YR6</th>
<th>YR7</th>
<th>YR8</th>
<th>YR9</th>
<th>YR10</th>
<th>TAX YR</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISPOSAL PROCEEDS</td>
<td>-</td>
<td>-</td>
<td>1,467</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>BUILDING WORKS</td>
<td>1,467</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EQUIPMENT - NTA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EQUIPMENT - TA</td>
<td>1,727</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PLANT - GTA</td>
<td>522</td>
<td>73</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>LUMP DUTY</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>FIXTURES &amp; FITTINGS</td>
<td>1,719</td>
<td>29</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>NET INC. IN WORKING CAPITAL</td>
<td>445</td>
<td>12</td>
<td>72</td>
<td>77</td>
<td>83</td>
<td>89</td>
<td>96</td>
<td>103</td>
<td>111</td>
<td>119</td>
<td>-</td>
<td>(1,706)</td>
</tr>
</tbody>
</table>

**Investment Cash Flow**

5,880 707 72 77 83 89 96 103 111 119 (1,706)

**Total Trading Costs and Revenues**

| SALES | 5,395 | 11,999 | 12,469 | 13,404 | 14,410 | 15,409 | 16,935 | 17,901 | 19,244 | 20,687 | 11,119 |
| LOSS PROFIT | 1,546 | 3,374 | 3,574 | 3,842 | 4,130 | 4,450 | 4,773 | 5,131 | 5,515 | 5,929 | 3,187 |
| PAYROLL | 327 | 573 | 973 | 1,114 | 735 | 757 | 740 | 603 | 327 | 852 | 439 |
| OTHER COSTS | 762 | 818 | 895 | 936 | 976 | 1,017 | 1,064 | 1,112 | 1,162 | 1,215 | 963 |

**Trading Cash Flow - Net Profit**

459 1,796 1,986 2,194 2,419 2,664 2,921 3,215 3,526 3,882 1,785

**Pre-Tax Cash Flow**

15,422 1,000 1,914 2,117 2,336 2,575 2,853 3,112 3,415 3,743 3,491

**Tax Cash (Inflow)/Outflow**

- (1,873) 354 490 614 731 860 1,077 1,198 1,324 604

**Post-Tax Cash Flow**

13,549 1,000 1,420 1,627 1,722 1,843 1,997 2,152 2,339 2,546 2,166 (604)

**Acceptance Criteria**

**Discount Rate**

18%

**Net Present Value (NPV) (£'000s)**

2,386

**Internal Rate of Return**

29%

**Return on Investment**

33% 42% 76% 113% 146% 20% 26% 33% 40% 48% 37%

**Payback Period**

3.6 years

**Average Cont. Post-Up Pay**

15%
3. The group is assumed to have capital allowances per annum of £80,000, with the company proposing the project claiming one half of them.

4. The group uses a discount rate of 18%, whereas the simulation model has derived a discount rate of 7.9%.

5. The group has no unrelieved Advance Corporation Tax.

6. The group and the simulation model has employed a tax lag of one year.

7. Capital Allowances are available on the project at a writing down allowance of 25% on plant and machinery.

8. The group has no preference share capital.

9. Dividends are paid in two halves, in the second quarter and in the fourth quarter.

10. The group discounts annually, whereas the simulation model discounts quarterly.
11. The company proposing the project is charged interest of £6286K per annum, one half of the total for the group.

12. The weighted average cost of capital is based on the following:

\[ MVE = \text{market value of equity in 1986, that is number of shares } \times \text{average share price} \]
\[ = 369668K \times £3.1 = £1145970.8 \]

\[ MVD = \text{book value of debt as per accounts} \]

\[ MVP = 0 \]

\[ G = \text{the ordinary dividend payout has grown at a rate of 5\% per annum} \]

13. The group uses the statutory tax rate.

14. The project is assumed to be of average risk and financed in the same ratio as the group's present gearing ratio.

The group's cash flows discounted at 18\% equal £2,286K, whereas the simulation model shows a net present value of £8,715K. A large difference is due to the difference in the discount rate, and if the group had used the discount rate calculated by the simulation model a net present value of £5481.97 would have been achieved. The reconciliation below itemises the other differences.
Reconciliation see Table 106

1. The simulation model has allowed for interest deductibility as a cash flow rather than adjusting the discount rate. The difference in the cash flows due to not including interest deductibility as a cash flow, is £7.74K in years 2 to 11.

2. The simulation shows that there is unrelieved advance corporation tax in the early years showing the following differences in the cash flows:

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13069.3</td>
<td>13722.7</td>
<td>14408.9</td>
</tr>
<tr>
<td>2</td>
<td>11354.1</td>
<td>15220.1</td>
<td>14626.7</td>
</tr>
<tr>
<td>3</td>
<td>13112.9</td>
<td>13770.3</td>
<td>14458.8</td>
</tr>
<tr>
<td>4</td>
<td>11197.5</td>
<td>15517.2</td>
<td>14637.3</td>
</tr>
</tbody>
</table>

3. The Advance Corporation Tax payable due to an increase in share issue, must be discounted and the difference between when the ACT is paid and when it may be reclaimed must be included as a cash flow.
Table showing the reconciliation between the flows calculated by the company and derived using the simulation model

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>group's flows</td>
<td>(5422)</td>
<td>1274</td>
<td>1560</td>
<td>1627</td>
<td>1722</td>
<td>1843</td>
<td>1987</td>
</tr>
</tbody>
</table>

1. | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |

2. | | 210.2 | 249.5 | (39.3) |

3. | (44.5) | (4.9) | (3.4) | (3.6) | (3.7) | (3.9) | (4.1) |

<table>
<thead>
<tr>
<th>Year</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>group's flows</td>
<td>2152</td>
<td>2339</td>
<td>2546</td>
<td>2166</td>
<td>(604)</td>
</tr>
</tbody>
</table>

1. | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |

3. | (4.3) | (4.5) | (4.7) | (4.9) | (5.3) |

| | | | | | | |

2155.4 | 2342.2 | 2549.0 | 2168.8 | (601.6) |
<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13327.9</td>
<td>13994.3</td>
<td>14694</td>
<td>15428.7</td>
<td>16200.2</td>
<td>17010.2</td>
<td>17860.7</td>
</tr>
<tr>
<td></td>
<td>13069.3</td>
<td>13722.7</td>
<td>14408.9</td>
<td>15129.3</td>
<td>15885.8</td>
<td>16680.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13372.4</td>
<td>14042.8</td>
<td>14745</td>
<td>15482.2</td>
<td>16256.3</td>
<td>17069.1</td>
<td>17922.6</td>
</tr>
<tr>
<td></td>
<td>13112.9</td>
<td>13770.3</td>
<td>14458.8</td>
<td>15181.7</td>
<td>15940.8</td>
<td>16737.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(44.5)</td>
<td>(4.9)</td>
<td>(3.4)</td>
<td>(3.6)</td>
<td>(3.7)</td>
<td>(3.9)</td>
<td>(4.1)</td>
</tr>
<tr>
<td>Year</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18753.7</td>
<td>19691.4</td>
<td>20676</td>
<td>21709.8</td>
<td>22795.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17514.1</td>
<td>18389.8</td>
<td>19309.3</td>
<td>20274.7</td>
<td>21288.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18818.7</td>
<td>19759.6</td>
<td>20747.6</td>
<td>21785</td>
<td>22874.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17574.8</td>
<td>18453.5</td>
<td>19376.2</td>
<td>20345</td>
<td>21362.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4.3)</td>
<td>(4.5)</td>
<td>(4.7)</td>
<td>(4.9)</td>
<td>(5.3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This case study is based on a hypothetical project with the following flows:

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>----</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>investment (10000)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>change in working capital (100)</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>scrap value (1000)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>net inflows</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td></td>
</tr>
</tbody>
</table>

The evaluation form of the group is reproduced in Table 107.

Assumptions

1. The future profits for the group have been forecasted using regression analysis, giving an equation of

\[ C_1 = 5667.9 + 5667.9C_5 \]

where \( C_1 \) = the forecasted profit for year \( 1 \ldots n \), and \( C_5 \) = year \( 1 \ldots n \). A correlation coefficient of .72 was achieved.

2. The dividends have also been forecasted using regression analysis with the following equation

\[ C_1 = 561.7 + 191.3C_5 \]

where \( C_1 \) = ordinary share dividend payout for years \( 1 \ldots n \), and \( C_5 \) = years \( 1 \ldots n \).
### Table 107

| Project: |  |
| Branch: |  |

#### 1. Year

#### 2. Year End

#### 3. Capital Expenditure (date & amount)

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 4. Additional Working Capital Required:

- Stock
- Debtors
- Creditors

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 5. Disposal Value Receivable

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 6. Present Cost of Expenditure

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 7. Discounted Tax Relief (rate & amount)

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>774.62</td>
<td>657.92</td>
<td>373.56</td>
<td>(257.71)</td>
<td>(180.75)</td>
</tr>
</tbody>
</table>

#### 8. Total Present Cost

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17225.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 9. Summary of Anticipated Benefits

#### 10. Sales Increase

#### 11. Change in Margin of Existing Sales

#### 12. Additional Gross Profit

#### 13. Overheads Savings:

- Salaries
  - Other Payroll @ 17%
  - Other

#### 14. Additional Overheads:

- Salaries
  - Other Payroll @ 17%
  - Maintenance
  - Other

#### 15. Net Total of Benefits (12 - 13 - 14)

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
</tr>
</tbody>
</table>

#### 16. Present Value of Benefits

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3704</td>
<td>3429</td>
<td>3175</td>
<td>2940</td>
<td>2722</td>
<td></td>
</tr>
</tbody>
</table>

#### 17. Discounted Tax Relief (rate & amount)

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1147.58</td>
<td>1062.58</td>
<td>983.87</td>
<td>910.92</td>
<td>848.51</td>
<td></td>
</tr>
</tbody>
</table>

#### 18. Net Post-Tax Benefit

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11022.34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 19. Net Present Value of Project (18 - 8)

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3796.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Date of Approval: 

Dates of Audit Reviews: 

---
3. The group is assumed to have capital allowances per annum of £2,000K, with the company proposing the project claiming one twelfth of them.

4. The group uses a discount rate of 8%, whereas the simulation model has derived a discount rate of 4.6%.

5. The group has unrelieved Advance Corporation Tax of £646K.

6. The group and the simulation model has employed a tax lag of one year 7 months.

7. Capital Allowances are available on the project at a writing down allowance of 25% on plant and machinery.

8. The group has preference share capital of £600K, and pays preference dividends of 28K per annum as per accounts.

9. Dividends are paid in two halves, in the second quarter and in the fourth quarter.

10. The group discounts annually, whereas the simulation model discounts quarterly.

11. The company proposing the project is charged interest of £2.8K per annum, one twelfth of the total for the group.
12. The weighted average cost of capital is based on the following:

\[ MVE = \text{market value of equity in 1986, that is number of shares} \times \text{average share price}, \]

\[ \text{ie} \ 17379K \times \£3.71 = \£64476.09K \]

\[ MVD = \text{book value of debt as per accounts} \]

\[ MVP = \text{book value of preference share capital, as per accounts} \]

\[ G = \text{the ordinary dividend payout is assumed to grow at a rate of} \ 2\% \ \text{per annum} \]

13. The group uses the statutory tax rate.

14. The project is assumed to be of average risk and financed in the same ratio as the group's present gearing ratio.

The group's cash flows discounted at 8% equal £3796.8K, whereas the simulation model shows a net present value of £5294.37K. A large difference is due to the difference in the discount rate. The reconciliation below itemises the other differences.

Reconciliation see Table 108

1. The simulation model has allowed for interest deductibility as a cash flow rather than adjusting the discount rate. The difference in the cash flows due to not including interest
Table 108

Table showing the reconciliation between the flows calculated by the company and derived using the simulation model.

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group's flows (10100)</td>
<td>4852</td>
<td>3275.6</td>
<td>3115.9</td>
<td>2996.1</td>
<td>4006.5</td>
<td>1161.6</td>
<td></td>
</tr>
</tbody>
</table>

1. 69.4 69.4 69.4 69.4 69.4

2. (115) (14.2) (16.4) (16.9) (17.1) (17.5) (18.0)

3. 1.7 1.7 1.7 1.7 1.7 1.7

(10215) 4908.9 3330.3 3170.1 3050.1 4060.1 (1145.3)
deductibility as a cash flow, is £1.7K in years 1 to 6.

2. The advance corporation tax payable due to an increase in share issue, must be discounted and the difference between when the ACT is paid and when it may be reclaimed must be included as a cash flow.

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(115)</td>
<td>(14.2)</td>
<td>(16.4)</td>
<td>(16.9)</td>
<td>(17.1)</td>
<td>(17.5)</td>
<td>(18.0)</td>
</tr>
</tbody>
</table>

3. The group discounts quarterly, whereas the simulation model discounts quarterly, which leads to an understatement by the group by £69.4K in years 1 to 6.
Conclusions

This chapter has presented nine case studies to illustrate how and when biases may arise in the evaluation of capital projects, if full consideration is not taken of tax. The most common differences will now be discussed.

1. The group does not include interest deductibility as a cash flow.
While the group may alter the interest rate used for interest deductibility, it would need revising each time the group changed its tax position. This led to an understatement by the group of the project's cash flows.

2. The group does not allow for the timing difference between when Advance Corporation Tax is paid, and when it may be effectively reclaimed.

The group may consider that providing there are sufficient profits to offset Advance Corporation Tax it requires no further consideration in the appraisal of capital projects. However, the set off of Advance Corporation Tax may occur up to 30 months after it has been paid. This timing difference should be discounted and included as a cost of the project.

3. The group uses the statutory rate of tax.
If the group is in a full tax paying situation it is correct to use this tax rate, however several of the groups were not in such a situation, yet still used the statutory rate, when either a zero rate or a reduced rate should have been used. This led to both over and understatement of the net present value. The necessity to calculate the effective rate for each year was illustrated with many of the groups entering different tax profiles throughout the life of the project.

4. Projects are discounted annually.

Not one of the groups included in the case studies discounted more frequently than annually. The simulation model illustrated how this leads to an understatement of the net present value.

5. There is a difference in the discount rate.

The discount rate calculated in the simulation model varied considerably from the discount rate used by the groups. The simulation model based the calculations on the weighted average cost of capital, and appeared very low on several occasions, it may be that the group has access to better information, such as market rates on debt applicable to that particular group.

However, biases may and do arise in the evaluation of capital projects due to not fully considering tax. This chapter has shown the complexities of including tax in the appraisal, and
illustrates the need for a computerised model, such as the model developed in chapter 7.
Chapter 12

Conclusions

Taxation impinges on the capital investment decision of companies both directly through the investment decision and indirectly through the financing decision, and if companies and groups of companies are to make accurate investment decisions the incremental tax flows arising due to the project must be included as cash flows.

Several authors have suggested that the evaluation stage of the capital budgeting process receives too much academic attention. Whilst it is true that the whole process must be reviewed regularly and improved as necessary, it is essential that the project is evaluated as accurately as possible.

To summarise the results of the research, the thesis may be divided into three parts:

1. the literature survey;
2. the development of the simulation model; and,
3. the empirical surveys.

The literature survey covered such aspects as the structure of the United Kingdom tax system and how it affects the investment and financing decision of corporate group structures.
Several examples of projects were provided to illustrate how a non neutral tax system may affect a project's worth, and how under or over investment may occur if a company or group fails to accurately include the incremental tax flows of a project in the evaluation of its worth.

It was shown that the post tax internal rate of return of a project is not necessarily the same as the pre tax rate of return under the United Kingdom tax system. The Net Present Value of a project which was marginal before tax may become unattractive or more attractive after tax, depending on its profile, and the payback period of a project may differ post-tax to pre-tax if tax flows are not included.

The United Kingdom tax system is not neutral due to such factors as lack of immediate relief for losses and less than 100% capital allowances. Incentives arise due to certain types of financing, through the tax deductibility of interest, and timing differences such as the setting off of Advance Corporation Tax.

A review of the capital budgeting process was undertaken to provide a framework in which to analyse the effects of tax in capital budgeting.
The complexities of including tax in calculating a project's incremental tax flows was highlighted in the literature survey, and it was noted that there are no available models for such calculations. A company may be unable to devote time to calculating the tax flows of each project, if there is no computerised model available for the purpose. It was therefore determined that the main thrust of the thesis should be an investigation of whether such a model may be built to fully incorporate the tax legislation affecting the capital budgeting decision of corporate groups.

The computerised simulation model was built in stages. The first model was a simple evaluation of the net present value of a project in isolation. This was then developed to include the calculation of capital allowances, and to determine whether there are sufficient profits to offset the allowances, Advance Corporation Tax, quarterly discounting and different tax bands.

The model was then extended to include the evaluation of a project in a company, and it was determined that two models were required, one allowing for the set off of advance corporation tax before setting losses off against the previous years profits, and the second setting off losses first.

The interdependencies arising in a corporate group situation were
then included, and three models were developed. The final stage of the model was to include the financing effects, which required the group's discount rate to be calculated, using the weighted average cost of capital. The project was assumed to be financed in the same proportion as the group's existing gearing ratio, and the effects of the increase in the sources of finance on the tax flows of the project have been included in the model.

At each stage of the development the model was run to determine the effect on the net present value, and it was shown that under certain scenarios the project was attractive, whilst under alternative scenarios the project became unattractive, illustrating the need to include the incremental tax flows.

The Empirical Surveys

Two surveys were conducted to determine the capital budgeting practices of companies and how tax was managed in the evaluation of capital projects.

The first was a mail questionnaire which was forwarded to 234 companies chosen from the top 500 of the Times 1000, of which 134 replied, a response rate of 57%. This survey was aimed at determining the methods used by companies to incorporate tax in their appraisals.

Over 19% did not include tax in their appraisals, and many of the
others did not include tax accurately, with 50% of the companies using the average rate of tax, when the marginal tax rate should have been used. Only 17 of the corporate groups included in the survey allowed for the transfer of unclaimed capital allowances and unrelieved losses between member companies.

The conclusion of the survey is that few companies accurately allow for tax in project appraisal. The companies not including tax were asked their reasons for such a policy and one of the reasons stated was the complexity of the tax system, highlighting the need for a computerised model.

The second survey was based on interviews, and thirty three companies participated. This survey was more in depth and covered the whole of the capital budgeting process. The reports were written up individually, and are included in Appendix L, and an overview of the results is presented in Chapter 10. The information gained from the survey enabled a comparison of the methods used by the companies to be made with the evaluation of a project using the simulation model, to determine whether biases may and in fact do arise as the result of not fully allowing for tax in project appraisal. It was found that both understatements and overstatements of the net present value occur, stressing the importance of including tax in project appraisal.

This thesis has extended the work by authors such as Pointon (1978), Grundy and Burns (1979) and Mills (1984) who showed
the necessity of including tax by determining where and when biases actually arise in practice. Morgan (1986) conducted an empirical survey to determine the reactions of companies to the Finance Act of 1984. The empirical survey included in this thesis extends this research by gaining the views of companies to taxation issues. The thesis also provides an up to date review of the capital budgeting process of corporate groups.

The interview survey illustrated that companies do not consider the calculation of their costs of capital, and hurdle rates in detail. If the rate used is too low the company may be accepting projects which are unattractive, and lower the value of the company, whereas if the rate is too high the company may reject projects which would increase the value of the company. The calculation of the cost of capital requires further investigation, by examining the methods used by companies to calculate the cost of capital and comparing the figures with the rates which would be calculated using the weighted average cost of capital, as was used in this survey, and the capital asset pricing model.

Finally, another interesting avenue for further research is to consider the interest of companies to implement the simulation model developed in this thesis. If a company is willing to adopt the model, the implementation of the model should be monitored, and the effect on the company's policies examined.
The maximisation of shareholders' wealth is considered, in theory, the most important financial goal for companies, yet, as was shown in the interview survey companies have several other goals, which should be considered in project appraisal. Goal programming enables goals to be defined and priorities to be attached to the goals. Deviations from these goals are then minimised in the objective function, and the worth of the project is considered in the light of the other goals. The model developed in this thesis has instead considered the maximisation of shareholders' wealth as the sole objective. The inclusion of goal programming might be another useful area for further research, despite inconsistencies with modern financial theory.
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Chapter 8


Chapter 9


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Chapter 10


**Chapter 12**


SuperCalc ver. 1.12

X1 = B64/B39
X2 = B41/B42
X3 = (C37/B44)+B47
X4 = (((X1*B39)+(X3*B44)+(X2*B42))/(B39+B44+B42))+1
X5 = B37
X6 = B48
X7 = X5+X6
X8 = (X7/2)*(3/7)
X9 = B38
X10 = ((B38/4)/(X4*B19))+((B38/4)/(X4*B20))+((B38/4)/(X4*B21))+(B38/4)
X11 = B38
X12 = B1-X11
X13 = IF(X28>0,X28,0)-W89
X14 = IF(0<X31,W89,IF(X28>0,X28,0))
X15 = W89-X32
X16 = IF(X28>0,X28,0)-X32
X17 = IF(B2>0,B2,0)-W92
X18 = IF(0<X35,W92,IF(B2>0,B2,0))
X19 = W92-X36
X20 = IF(B2>0,B2,0)-X36
X21 = IF(B3>0,B3,0)-W95
X22 = IF(0<X39,W95,IF(B3>0,B3,0))
X23 = W95-X40
X24 = IF(B3>0,B3,0)-X40
X25 = X34+IF(X28<0,X28,0)-B4-X26-X27
X26 = IF(0<X43,(B4+X26*X27-IF(X28<0,X28,0)),X34)
X27 = X34-X44
X28 = B4+X26*X27-IF(X28<0,X28,0)-X44
X29 = X38+IF(B2<0,B2,0)-B5
X30 = IF(0<X47,(B5-IF(B2<0,B2,0)),X38)
X31 = X38-X48
X32 = B5-IF(B2<0,B2,0)-X48
X33 = X42+IF(B3<0,B3,0)-B6
X34 = IF(0<X51,(B6-IF(B3<0,B3,0)),X42)
X35 = X42-X52
X36 = B6-IF(B3<0,B3,0)-X52
X37 = X49-X46
X38 = IF(0<X55,X46,X49)
X39 = X49-X56
X40 = X46-X56
X41 = X45-X50
X42 = IF(0<X59,X50,X45)
X43 = X45-X60
X44 = X50-X60
X63 = X57-X54
X64 = IF(0<X63,X54,X57)
X65 = X57-X64
X66 = X54-X64
X67 = X61-X66
X68 = IF(0<X67,X66,X61)
X69 = X61-X68
X70 = X66-X69
X71 = X53-X62
X72 = IF(0<X71,X62,X53)
X73 = X53-X72
X74 = X62-X74
X75 = X73-X58
X76 = IF(0<X75,X58,X73)
X77 = X75-X76
X78 = X58-X76
X79 = W147-X78
X80 = IF(0<X79,X78,W147)
X81 = W147-X80
X82 = X78-X80
X83 = W148-X74
X84 = IF(0<X83,X74,W148)
X85 = W148-X84
X86 = X74-X84
X87 = X85-X82
X88 = IF(0<X87,X82,X85)
X89 = X82-X88+X33
X90 = X81-X86
X91 = IF(0<X90,X86,X81)
X92 = X86-X91+X37
X93 = W146-X70
X94 = IF(0<X93,X70,W146)
X95 = X70-X94+X41
X96 = X32+X44+X56+X76
X97 = X36+X48+X60+X72
X98 = X40+X52+X64+X68
X99 = X96+X97+X98
X100 = X80+X88+X84+X91+X94
X103 = (X8/(X4*X20)+X8
X104 = X8*2
X105 = X65+X69+X77
X106 = (X104*(10/3)) + W137
X107 = X106-X105
X108 = IF(X107<0,X106,X105)/(10/3)
X109 = IF(W105-(W108*(10/3))-X100>0,W105-(W108*(10/3))-X100,0)
X112 = W134+V132+U130+T128+S126
X115 = W132+V130+U128+T126
X117 = W130+V128+U126
X118 = W128+U126
X119 = W126
X120 = IF(((X104-X108)*(10/3))+W137>0,((X104-X108)*(10/3))+W137,0)
X121 = IF(S109-X112>0,S109-X112,0)
X122 = T109-X115
X123 = U109-X117
X124 = V109-X118
X125 = W109-X119
X126 = IF(X120=X109,X120,X109)
X127 = X120-X126
X128 = IF(X127<X125,X127,X125)
X129 = X127-X128
X130 = IF(X129<X124,X129,X124)
X131 = X129-X130
X132 = IF(X131<X123,X131,X123)
X133 = X131-X132
X134 = IF(X133<X122,X133,X122)
X135 = X133-X134
X136 = IF(X135<X121,X135,X121)
X137 = X135-X136
X138 = (X120-X137)/(10/3)
X139 = ((1-B23)*X108)*(10/3)
X140 = X69-X139
X141 = X65+IF(X141<0,X141,0)
X142 = X77-X140
X143 = IF(X141=0,X141,0)+IF(X143<0,X143,0)
X144 = IF(X142=0,X142,0)+IF(X144<0,X144,0)
X145 = IF(IF(X143=0,X143,0)+IF(X142<0,X142,0)>0,IF(X143<0,X143,0)+IF(X142<0,X142,0),0)
X146 = IF(X144<0,X144,0)
X147 = IF(X145=0,X145,0)
X148 = IF(X145<0,X145,0)
X149 = (B24*B30)+(B25*B31)
X150 = (B26*B30)+(B27*B31)
X151 = (B28*B30)+(B29*B31)
X152 = (X105-B60)*X151
X153 = IF(X152=0,X152,0)
X154 = IF(0<X105,1,0)
X155 = B61-X105
X156 = IF(X155<0,B61,X105)*X150*X154
X157 = AND(X105>B61,X105<B60)*(X105-B61)*X149
X158 = B60-B61
X159 = IF(0<X152,X152,0)*X149
X160 = X157+X159
X161 = W156/W150
X162 = W160/W149
X163 = W153/W151
X164 = IF(X100<X163,X100,X163)*W151
X165 = X100-(X164/W151)
X166 = IF(X165<X162,X165,X162)*W149
X167 = X165-(X166/W149)
X168 = IF(X167<X161,X167,X161)*W150
X169 = X164+X166+X168
X170 = X153+X156+X160-X138-X108
X171 = IF(W170>0,W170,0)/(X4*B62)
X172 = B2+X28+B3-X18-X22+X23-X50+X21-X171-X103+X29
X173 = X172/(X4*B36)
X174 = X173+W174
SuperCalc ver. 1.12

AT1 = B64/B39
AT2 = B41/B42
AT3 = (C37/B44)+B47
AT4 = (((AT1*B39)+((AT3*B44)+(AT2*B42)))/(B39+B44+B42))+1
AT5 = B37+((B37/B63)+((B50*B49)/B51))
AT6 = B48+((B15+B16+B17*B18)*B52*AT2)
AT7 = AT5+AT6
AT8 = (AT7/2)*(3/7)
AT17 = AT10+AT12+AT14+AT16
AT18 = B15/(AT4*B19)+B16/(AT4*B20)+B17/(AT4*B21)+B18
AT19 = B38+853*B49*AT11+B40
AT20 = (((-AT10+AT19/4))/(AT4*B19))+((-AT12+AT19/4))/(AT4*B20)+((-AT14+AT19/4)/1)+(-AT16+AT19/4)
AT21 = AT19-AT17
AT22 = B11+B12+B13+B14
AT23 = (B11/(AT4*B19))+(B12/(AT4*B20))+(B13/(AT4*B21))+(B14)
AT24 = (AS24+AS26)*B57
AT25 = B58-AT24
AT26 = B54*AT25
AT27 = (AS25-AS26-B32-B33-B34-B35)*B59
AT28 = AT22+B7+B8+B9+B10+B1-AT21
AT29 = (B32/(AT4*B19))+(B33/(AT4*B20))+(B34/(AT4*B21))+B35
AT30 = (B7/(AT4*B19))+(B8/(AT4*B20))+B9/(AT4*B21))+B10
AT31 = IF(ATA2B)>0,ATA2B,0)-AS89
AT32 = IF(0<AT31,AS89,IF(ATA2B>0,ATA2B,0))
AT33 = AS89-AT32
AT34 = IF(ATA2B>0,ATA2B,0)-AT32
AT35 = IF(B2>0,B2,0)-AS92
AT36 = IF(0<AT35,AS92,IF(B2>0,B2,0))
AT37 = AS92-AT36
AT38 = IF(B2>0,B2,0)-AT36
AT39 = IF(B3>0,B3,0)-AS95
AT40 = IF(0<AT39,AS95,IF(B3>0,B3,0))
AT41 = AS95-AT40
AT42 = IF(B3>0,B3,0)-AT40
AT43 = AT34+IF(ATA2B<0,ATA2B,0)-B4-AT26-AT27
AT44 = IF(0<AT43,(B4+AT26+AT27-IF(ATA2B<0,ATA2B,0)),AT34)
AT45 = AT34-AT44
AT46 = B4+AT26+AT27-IF(ATA2B<0,ATA2B,0)-AT44
AT47 = AT38+IF(B2<0,B2,0)-B5
AT48 = IF(0<AT47,(B5-IF(B2<0,B2,0)),AT38)
AT49 = AT38-AT48
AT50 = B5-IF(B2<0,B2,0)-AT48
AT51 = AT42+IF(B3<0,B3,0)-B6
AT52 = IF (O<AT51, (B6-IF (B3<0, B3, 0), AT42)
AT53 = AT42-AT52
AT54 = B6-IF (B3<0, B3, 0)-AT52
AT55 = AT49-AT46
AT56 = IF (O<AT55, AT46, AT49)
AT57 = AT49-AT56
AT58 = AT46-AT56
AT59 = AT45-AT50
AT60 = IF (O<AT59, AT50, AT45)
AT61 = AT45-AT60
AT62 = AT50-AT60
AT63 = AT57-AT54
AT64 = IF (O<AT63, AT54, AT57)
AT65 = AT57-AT64
AT66 = AT54-AT64
AT67 = AT61-AT66
AT68 = IF (O<AT67, AT66, AT61)
AT69 = AT61-AT68
AT70 = AT66-AT68
AT71 = AT53-AT62
AT72 = IF (O<AT71, AT62, AT53)
AT73 = AT53-AT72
AT74 = AT62-AT72
AT75 = AT73-AT58
AT76 = IF (O<AT75, AT58, AT73)
AT77 = AT73-AT76
AT78 = AT58-AT76
AT79 = AS147-AT78
AT80 = IF (O<AT79, AT78, AS147)
AT81 = AS147-AT80
AT82 = AT78-AT80
AT83 = AS148-AT74
AT84 = IF (O<AT83, AT74, AS148)
AT85 = AS148-AT84
AT86 = AT74-AT84
AT87 = AT85-AT82
AT88 = IF (O<AT87, AT82, AT85)
AT89 = AT82-AT88+AT33
AT90 = AT81-AT86
AT91 = IF (O<AT90, AT86, AT81)
AT92 = AT86-AT91+AT37
AT93 = AS146-AT70
AT94 = IF (O<AT93, AT70, AS146)
AT95 = AT70-AT94+AT41
AT96 = AT32+AT44+AT56+AT76
AT97 = AT36+AT48+AT60+AT72
AT98 = AT40+AT52+AT64+AT68
AT99 = AT96+AT97+AT98
AT100 = AT80+AT88+ATB4+AT91+AT94
AT103 = (ATB/(AT4*B20)) + AT8
AT104 = AT8+2
AT105 = AT65+AT69+AT77
AT106 = (AT104*(10/3))+AS137
AT107 = AT106-AT105
AT108 = IF(AT107<0,AT106,AT105)/(10/3)
AT109 = IF((AS105-(AS108*(10/3))-AT100>0,AS105-(AS108*(10/3))-AT100,0)
AT112 = AS134+AR132+AQ130+AP128+AO126
AT115 = AS132+AR130+AQ128+AP126
AT117 = AS130+AR128+AQ126
AT118 = AS128+AR126
AT119 = AS126
AT120 = IF(((AT104-AT108)*(10/3))+AS137>0,((AT104-AT108)*(10/3))+AS137,0)
AT121 = IF(AS109<AT112>0,AS109-AT112,0)
AT122 = AP109-AT115
AT123 = AQ109-AT117
AT124 = AR109-AT118
AT125 = AS109-AT119
AT126 = IF(AT120<AT109,AT120,AT109)
AT127 = AT120-AT126
AT128 = IF(AT127<AT125,AT127,AT125)
AT129 = AT127-AT128
AT130 = IF(AT129<AT124,AT129,AT124)
AT131 = AT129-AT130
AT132 = IF(AT131<AT123,AT131,AT123)
AT133 = AT131-AT132
AT134 = IF(AT133<AT122,AT133,AT122)
AT135 = AT133-AT134
AT136 = IF(AT135<AT121,AT135,AT121)
AT137 = AT135-AT136
AT138 = (AT120-AT137)/(10/3)
AT139 = (AT108*B23)*(10/3)
AT140 = ((1-B23)*AT108)*(10/3)
AT141 = AT69-AT139
AT142 = AT65+IF(AT141<0,AT141,0)
AT143 = AT77-AT140
AT144 = IF(AT141<0,AT141,0)+IF(AT143<0,AT143,0)
AT145 = IF(AT142<0,AT142,0)+IF(AT144<0,AT144,0)
AT146 = IF(IF(AT143<0,AT143,0)+IF(AT142<0,AT142,0)>0,IF(AT143<0,AT143,0)+IF(AT142<0,AT142,0),0)
AT147 = IF(AT144>0,AT144,0)
AT148 = IF(AT145>0,AT145,0)
AT149 = (B24*B30)+(B25*B31)
AT150 = (B26*B30)+(B27*B31)
AT151 = (B28*B30)+(B29*B31)
AT152 = (AT105-B60)*AT151
AT153 = IF(AT152>0,AT152,0)
AT154 = IF(0<AT105,1,0)
AT155 = B61-AT105
AT156 = IF(AT155<0,B61,AT105)*AT150*AT154
AT157 = AND(AT105>B61,AT105*(B60)*(AT105-B61)*AT149
AT158 = B60-B61
AT159 = IF(0<AT152,AT158,0)*AT149
AT160 = AT157+AT159
AT161 = AS156/AS150
AT162 = AS160/AS149
AT163 = AS153/AS151
AT164 = IF(AT100<AT163,AT100,AT163)*AS151
AT165 = AT100-(AT164/AS151)
AT166 = IF(AT165<AT162,AT165,AT162)*AS149
AT167 = AT165-(AT166/AS149)
AT168 = IF(AT167<AT161,AT167,AT161)*AS150
AT169 = AT164+AT166+AT168
AT170 = AT153+AT156+AT160-AT138-AT108
AT171 = IF(AS170>0,AS170,0)/(AT4^B62)
AT172 = B2+AT28+B3-AT1B-AT22+AT23-AT30+AT21-AT171-AT103+AT29
AT173 = (AT172-X172)/(AT4^B36)
AT174 = AT173+AS174
Appendix Aii
The Simulation Model setting off as follows:
(i) against previous years profits
(ii) against profits of other member companies
(iii) advance corporation tax

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X1 = B64/B39
X2 = B41/B42
X3 = (C37/B44)+B47
X4 = (((X1*B39)+(X3*B44)+(X2*B42))/(B39+B44+B42)+1
X5 = B37
X6 = B48
X7 = X5+X6
X8 = (X7/2)*(.3/7)
X19 = B38
X20 = ((B38/4)/(X4^B19))+((B38/4)/(X4^B20))+((B38/4)/(X4^B21))+B38/4
X21 = B38
X28 = B1-X21
X31 = IF(X28>0,X28,0)-W95
X32 = IF(0<X31,W95,IF(X28>0,X28,0))
X33 = W95-X32
X34 = IF(X28>0,X28,0)-X32
X35 = IF(B2>0,B2,0)-W91
X36 = IF(0<X35,W91,IF(B2>0,B2,0))
X37 = W91-X36
X38 = IF(B2>0,B2,0)-X36
X39 = IF(B3>0,B3,0)-W87
X40 = IF(0<X39,W87,IF(B3>0,B3,0))
X41 = W87-X40
X42 = IF(B3>0,B3,0)-X40
X43 = X34+IF(X28<0,X28,0)-B4-X26-X27
X44 = IF(0<X43,(B4+X26+X27-IF(X28<0,X28,0)),X34)
X45 = X34-X44
X46 = B4+X26+X27-IF(X28<0,X28,0)-X44
X47 = X38+IF(B2<0,B2,0)-B5
X48 = IF(0<X47,(B5-IF(B2<0,B2,0)),X38)
X49 = X38-X48
X50 = B5-IF(B2<0,B2,0)-X48
X51 = X42+IF(B3<0,B3,0)-B6
X52 = IF(0<X51,(B6-IF(B3<0,B3,0)),X42)
X53 = X42-X52
X54 = B6-IF(B3<0,B3,0)-X52
X55 = X49-X46
X56 = IF(0<X55,X46,X49)
X57 = X49-X56
X58 = X46-X56
X59 = X45-X50
X60 = IF(0<X59,X50,X45)
X61 = X45-X60
X62 = X50-X60
X63 = W147 - X58
X64 = IF(0<X63,X58,W147)
X65 = W147 - X64
X66 = X58 - X64
X67 = W148 - X62
X68 = IF(0<X67,X62,W148)
X69 = W148 - X68
X70 = X62 - X68
X71 = X69 - X66
X72 = IF(0<X71,X66,X69)
X73 = X66 - X72
X74 = X65 - X70
X75 = IF(0<X74,X70,X65)
X76 = X70 - X75
X77 = W146 - X54
X78 = IF(0<X77,X54,W146)
X79 = X54 - X78
X80 = X57 - X79
X81 = IF(0<X80,X79,X57)
X82 = X57 - X81
X83 = X79 - X81
X84 = X61 - X83
X85 = IF(0<X84,X83,X61)
X86 = X61 - X85
X87 = X83 - X85 + X41
X88 = X53 - X76
X89 = IF(0<X88,X76,X53)
X90 = X53 - X89
X91 = X76 - X89
X92 = X90 - X73
X93 = IF(0<X92,X73,X90)
X94 = X90 - X93
X95 = X73 - X93 + X33
X96 = X32 + X44 + X56 + X93
X97 = X36 + X48 + X60 + X89
X98 = X40 + X52 + X81 + X85
X99 = X96 + X97 + X98
X100 = X64 + X72 + X68 + X75 + X78
X101 = X86 + X82 + X94
X102 = 10/3
X103 = W138 - X100
X104 = W140 - X103
X105 = X103 / X102
X106 = W143
X107 = IF(X104<0,X106,X105)
X108 = W157 + (W144 * X102) - (X107 * X102)
X109 = IF(X108>0,X108,0)
X110 = W160
X111 = W162
X112 = W164
X113 = W166
X114 = W168
X115 = W146
X116 = IF(X109<X115,X109,X115)
X117 = X109-X116
X118 = IF(X117<X114,X117,X114)
X119 = X117-X118
X120 = IF(X119<X113,X119,X113)
X121 = X119-X120
X122 = IF(X121<X112,X121,X112)
X123 = X121-X122
X124 = IF(X123<X111,X123,X111)
X125 = X123-X124
X126 = IF(X125<X110,X125,X110)
X127 = X125-X126
X128 = (X109-X127)/X102
X129 = IF(X104<0,0,X104)
X130 = W144+W181-X107-X128
X131 = X129-W182
X132 = X7/2
X133 = X7/2
X134 = X132*(3/7)
X135 = X133*(3/7)
X136 = (X134/(X4^B20))\times X135
X137 = X134+X135
X138 = X101
X139 = W182+X131
X140 = (X137*(10/3))\times X139
X141 = X140-X138
X142 = X138/(10/3)
X143 = X140/(10/3)
X144 = IF(X141<0,X143,X142)
X145 = W101-(X107\times X102)-X100
X146 = IF(X145<0,X145,0)
X147 = S169+T171+U173+V175+W177
X152 = T169+U171+V173+W175
X154 = U169+V171+W173
X155 = V169+W171
X156 = W169
X157 = (X137\times X102)+X139-(X144\times X102)
X158 = IF(X157>0,X157,0)
X159 = S146-X149
X160 = IF(X159>0,X159,0)
X161 = T146-X152
X162 = IF(X161>0,X161,0)
X163 = U146-X154
X164 = IF(X163>0,X163,0)
X165 = V146-X155
X166 = IF(X165>0,X165,0)
X167 = W146-X156
X168 = IF(X167>0,X167,0)
X169 = IF(X158<X146,X158,X146)
X170 = X158-X169
X171 = IF(X170<X168,X170,X168)
X172 = X170-X171
X173 = IF(X172<X166,X172,X166)
X174 = X172-X173
X175 = IF(X174<X164,X174,X164)
X176 = X174-X175
X177 = IF(X176<X162,X176,X162)
X178 = X176-X177
X179 = IF(X178<X160,X178,X160)
X180 = X178-X179
X181 = (X158-X180)/X102
X182 = X178-X179
X183 = (B24*B30)+(B25*B31)
X184 = (B26*B30)+(B27*B31)
X185 = (B28*B30)+(B29*B31)
X186 = (X101-B60)*X185
X187 = IF(X186>0,X186,0)
X188 = IF(0<X101,1,0)
X189 = B61-X101
X190 = IF(X189<0,B61,X101)*X184*X188
X191 = AND(X101>B61,X101<B60)*(X101-B61)*X183
X192 = B60-B61
X193 = IF(0<X186,X192,0)*X183
X194 = X191+X193
X195 = W190/W184
X196 = W194/W183
X197 = W187/W185
X198 = IF(X100<X197,X100,X197)*W185
X199 = X100-(X198/W185)
X200 = IF(X199<X196,X199,X196)*W183
X201 = X199-(X200/W183)
X202 = IF(X201<X195,X210,X195)*W184
X203 = X198+X202*X200-IF(X130>0,X130,0)
X204 = X187+X190+X194-X144-X181
X206 = IF(W204>0,W204,0)
X208 = B2+X28+B3-X18-X22+X23-X30+X21-X206-X136+X29
X209 = X208/(X4+B36)
X210 = X209+W210
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AT1 = B64/B39
AT2 = B41/B42
AT3 = (C37*B44)+B47
AT4 = ((AT1*B39)+(AT3*B44)+(AT2*B42))/(B39+B44+B42)+1
AT5 = B37+((B37/B63)*((B50*B49)/B51))
AT6 = B48+((B51+B16+B17+B18)*B52*AT2)
AT7 = AT5+AT6
AT8 = (AT7/2)*(3/7)
AT17 = AT10+AT12+AT14+AT16
AT18 = B15/(AT4^B19)+B16/(AT4^B20)+B17/(AT4^B21)+B18
AT19 = B38+((B53*B49*AT1)
AT20 = ((-AT10+(AT19/4))/(AT4^B19))+((-AT12+(AT19/4))/(AT4^B20))+((-AT14+(AT19/4))
AT21 = (AT19-AT17
AT22 = B11+B12+B13+B14
AT23 = (B11/(AT4^B19))+(B12/(AT4^B20))+(B13/(AT4^B21))+(B14)
AT24 = (AS24+AS26)*B57
AT25 = B58-AT24
AT26 = B54*AT25
AT27 = (AS25-AS26-B32-B33-B34-B35)*B59
AT28 = AT22+B7+B8+B9+B10+B1-AT21
AT29 = (B32/(AT4^B19))+B33/(AT4^B20)+B34/(AT4^B21)+B35
AT30 = (B7/(AT4^B19))+B8/(AT4^B20)+B9/(AT4^B21)+B10
AT31 = IF(0<AT28,0,AT28)-AS95
AT32 = IF(0<AT31,AS95,IF(0<AT28,0,AT28))
AT33 = AS95-AT32
AT34 = IF(0<AT28,0,AT28)-AT32
AT35 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT36 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT37 = AS91-AT36
AT38 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT39 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT40 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT41 = AS91-AT36
AT42 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT43 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT44 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT45 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT46 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT47 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT48 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT49 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT50 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT51 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT52 = IF(0<AT35,AS91,IF(0<AT28,0,AT28))
AT53 = AT42-AT52
AT54 = A6-IF(B3<0,B3,0)-AT52
AT55 = AT49-AT46
AT56 = IF(0<AT55,AT46,AT49)
AT57 = AT49-AT56
AT58 = AT46-AT56
AT59 = AT45-AT50
AT60 = IF(0<AT59,AT50,AT54)
AT61 = AT45-AT60
AT62 = AT50-AT60
AT63 = AS147-AT58
AT64 = IF(0<AT63,AT58,AS147)
AT65 = AS147-AT64
AT66 = AT58-AT64
AT67 = AS148-AT62
AT68 = IF(0<AT67,AT62,AS148)
AT69 = AS148-AT68
AT70 = AT62-AT68
AT71 = AT69-AT66
AT72 = IF(0<AT71,AT66,AT69)
AT73 = AT66-AT72
AT74 = AT65-AT70
AT75 = IF(0<AT74,AT70,AT65)
AT76 = AT70-AT75
AT77 = AS146-AT54
AT78 = IF(0<AT77,AT54,AS146)
AT79 = AT54-AT78
AT80 = AT37-AT79
AT81 = IF(0<AT80,AT79,AT57)
AT82 = AT57-AT81
AT83 = AT79-AT81
AT84 = AT61-AT83
AT85 = IF(0<AT84,AT83,AT61)
AT86 = AT61-AT85
AT87 = AT83-AT85+AT41
AT88 = AT53-AT76
AT89 = IF(0<AT88,AT76,AT53)
AT90 = AT53-AT89
AT91 = AT76-AT89
AT92 = AT90-AT73
AT93 = IF(0<AT92,AT73,AT90)
AT94 = AT90-AT93
AT95 = AT73-AT93+AT33
AT96 = AT32+AT44+AT56+AT93
AT97 = AT36+AT48+AT60+AT89
AT98 = AT40+AT52+AT81+AT85
AT99 = AT96+AT97+AT98
AT100 = AT64+AT72+AT68+AT75+AT78
AT101 = AT86+AT82+AT94
AT102 = 10/3
AT103  =  AS138-AT100
AT104  =  AS140-AT103
AT105  =  AT103/AT102
AT106  =  AS143
AT107  =  IF (AT104<0,AT106,AT105)
AT108  =  AS157+(AS144*AT102)-(AT107*AT102)
AT109  =  IF (AT108>0,AT108,0)
AT110  =  AS160
AT111  =  AS162
AT112  =  AS164
AT113  =  AS166
AT114  =  AS168
AT115  =  AS146
AT116  =  IF (AT109<AT115,AT109,AT115)
AT117  =  AT109-AT116
AT118  =  IF (AT117<AT114,AT117,AT114)
AT119  =  AT117-AT118
AT120  =  IF (AT119<AT113,AT119,AT113)
AT121  =  AT119-AT120
AT122  =  IF (AT121<AT112,AT121,AT112)
AT123  =  AT121-AT122
AT124  =  IF (AT123<AT111,AT123,AT111)
AT125  =  AT123-AT124
AT126  =  IF (AT125<AT110,AT125,AT110)
AT127  =  AT125-AT126
AT128  =  (AT109-AT127)/AT102
AT129  =  IF (AT104<0,0,AT104)
AT130  =  AS144+AS181-AT107-AT128
AT131  =  AT129-AS182
AT132  =  AT7/2
AT133  =  AT7/2
AT134  =  AT132*(3/7)
AT135  =  AT133*(3/7)
AT136  =  (AT134/(AT4*820)) + AT135
AT137  =  AT134+AT135
AT138  =  AT101
AT139  =  AS182+AT131
AT140  =  (AT137*(10/3))+AT139
AT141  =  AT140-AT138
AT142  =  AT138/(10/3)
AT143  =  AT140/(10/3)
AT144  =  IF (AT141<0,AT143,AT142)
AT145  =  AS101-(AT107*AT102)-AT100
AT146  =  IF (AT145>0,AT145,0)
AT149  =  AO169+AP171+AO173+AR175+AS177
AT152  =  AP169+AO171+AR173+AS175
AT154  =  AQ169+AR171+AS173
AT155  =  AR169+AS171
AT156  =  AS169
AT157  =  (AT137*AT102)+AT139-(AT144*AT102)
AT158 = IF(AT157>0,AT157,0)
AT159 = AT146-AT149
AT160 = IF(AT159>0,AT159,0)
AT161 = AP146-AT152
AT162 = IF(AT161>0,AT161,0)
AT163 = A0146-AT154
AT164 = IF(AT163>0,AT163,0)
AT165 = AR146-AT155
AT166 = IF(AT165>0,AT165,0)
AT167 = AS146-AT156
AT168 R$ = IF(CAT157>0,AT157,0)
AT169 = AT158-AT168
AT170 = IF(AT169>0,AT169,0)
AT171 = AT170-AT171
AT172 = IF(AT172>0,AT172,0)
AT173 = AT172-AT173
AT174 = IF(AT174>0,AT174,0)
AT175 = AT174-AT175
AT176 = IF(AT176>0,AT176,0)
AT177 = AT176-AT177
AT178 = IF(AT178>0,AT178,0)
AT179 = AT178-AT179
AT180 = IF(AT180>0,AT180,0)
AT181 = (AT180-AT180)/AT102
AT182 = AT178-AT179
AT183 = (B24*B30)+(B25*B31)
AT184 = (B26*B30)+(B27*B31)
AT185 G = (B28*B30)+(B29*B31)
AT186 = (AT161-B60)*AT185
AT187 = IF(AT187>0,AT187,0)
AT188 = IF(0<AT101,1,0)
AT189 = B61-AT101
AT190 = IF(AT189<0,B61,AT101)*AT184*AT188
AT191 = AND(0<AT101,B61,AT101<0)*AT185
AT192 = B60-B61
AT193 = IF(0<AT186,AT192,0)*AT183
AT194 = AT191+AT193
AT195 = AS190/AS184
AT196 = AS194/AS183
AT197 = AS187/AS185
AT198 = IF(AT100<AT197,AT100,AT197)*AS185
AT199 = AT100*(AT198/AS185)
AT200 = IF(AT199<AT196,AT199,AT196)*AS183
AT201 = AT199-(AT200/AS183)
AT202 = IF(AT201<AT195,AT210,AT195)*AS184
AT203 = AT198+AT202+AT200-IF(AT130>0,AT130,0)
AT204 = AT187+AT190+AT194-AT181
AT206 = IF(AS204>0,AS204,0)
AT208 = B2+AT28+B3-AT18+AT22+AT23-AT30+AT21-AT206-AT136+AT29
AT209 = AT208/(AT4*B36)
AT210 = AT209+AS210

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\[
\begin{align*}
X65 &= W147 - X64 \\
X66 &= X58 - X64 \\
X67 &= W148 - X62 \\
X68 &= IF(0 < X67, X62, W148) \\
X69 &= W148 - X68 \\
X70 &= X62 - X68 \\
X71 &= X69 - X66 \\
X72 &= IF(0 < X71, X66, X69) \\
X73 &= X66 - X72 \\
X74 &= X65 - X70 \\
X75 &= IF(0 < X74, X70, X65) \\
X76 &= X70 - X75 \\
X77 &= W146 - X54 \\
X78 &= IF(0 < X77, X54, W146) \\
X79 &= X54 - X78 \\
X80 &= X57 - X79 \\
X81 &= IF(0 < X80, X79, X57) \\
X82 &= X57 - X81 \\
X83 &= X79 - X81 \\
X84 &= X61 - X83 \\
X85 &= IF(0 < X84, X83, X61) \\
X86 &= X61 - X85 \\
X87 &= X83 - X85 + X41 \\
X88 &= X53 - X76 \\
X89 &= IF(0 < X88, X76, X53) \\
X90 &= X53 - X89 \\
X91 &= X76 - X89 \\
X92 &= X90 - X73 \\
X93 &= IF(0 < X92, X73, X90) \\
X94 &= X90 - X93 \\
X95 &= X73 - X93 + X33 \\
X96 &= X32 + X44 + X56 + X93 \\
X97 &= X36 + X48 + X60 + X89 \\
X98 &= X40 + X52 + X81 + X85 \\
X99 &= X96 + X97 + X98 \\
X100 &= X64 + X72 + X68 + X75 + X78 \\
X103 &= (X8 / (X4 - 820)) + X8 \\
X104 &= X8 * 2 \\
X105 &= X82 + X86 + X94 \\
X106 &= (X104 + (10/3)) + W137 \\
X107 &= X106 - X105 \\
X108 &= IF(X107 < 0, X106, X105) / (10/3) \\
X109 &= IF(W105 - (W108 * (10/3)) - X100 > 0, W105 - (W108 * (10/3)) - X100, 0) \\
X112 &= W134 + V132 + U130 + T128 + S126 \\
X115 &= W132 + V130 + U128 + T126 \\
X117 &= W130 + V128 + U126 \\
X118 &= W128 + U126 \\
X119 &= W126 \\
X120 &= IF(((X104 - X108) * (10/3)) + W137 > 0, ((X104 - X108) * (10/3)) + W137, 0) \\
X121 &= IF(S109 - X112 > 0, S109 - X112, 0) \\
X122 &= T109 - X115 \\
X123 &= U109 - X117
\end{align*}
\]
X124 = V109-X118
X125 = W109-X119
X126 = IF(X120<X109, X120, X109)
X127 = X120-X126
X128 = IF(X127<X125, X127, X125)
X129 = X127-X128
X130 = IF(X129<X124, X129, X124)
X131 = X129-X130
X132 = IF(X131<X123, X131, X123)
X133 = X131-X132
X134 = IF(X133<X122, X133, X122)
X135 = X133-X134
X136 = IF(X135<X121, X135, X121)
X137 = X135-X136
X138 = (X120-X137)/(10/3)
X139 = (X108*B23)*(10/3)
X140 = ((1-B23)*X108)*(10/3)
X141 = X86-X139
X142 = X82+IF(X141<0, X141, 0)
X143 = X94-X140
X144 = IF(X141<0, X141, 0)+IF(X143<0, X143, 0)
X145 = IF(X142<0, X142, 0)+IF(X144<0, X144, 0)
X146 = IF(IF(X143<0, X143, 0)+IF(X142<0, X142, 0)>0, IF(X143<0, X143, 0)+IF(X142<0, X142, 0)
X147 = IF(X144<0, X144, 0)
X148 = IF(X145<0, X145, 0)
X149 = (B24*B30)+(B25*B31)
X150 = (B26*B30)+(B27*B31)
X151 = (B28*B30)+(B29*B31)
X152 = (X105-B60)*X151
X153 = IF(X152<0, X152, 0)
X154 = IF(0<X105, 1, 0)
X155 = B61-X105
X156 = IF(X155<0, B61, X105)*X150*X154
X157 = AND((X105>B61, X105<B60)*X105-B61)*X149
X158 = B60-B61
X159 = IF(0<X152, X152, 0)*X149
X160 = X157+X159
X161 = W156/W150
X162 = W160/W149
X163 = W153/W151
X164 = IF(X100<X163, X100, X163)*W151
X165 = X100-(X164/W151)
X166 = IF(X165<X162, X165, X162)*W149
X167 = X165-(X166/W149)
X168 = IF(X167<X161, X167, X161)*W150
X169 = X164+X166+X168
X170 = X153+X156+X160-X138-X108
X171 = IF(W170<0, W170, 0)/(X4^B62)
X173 = X172/(X4^B36)
X174 = X173+W174
SuperCalc ver. 1.12

AT1 = B64/B39
AT2 = B41/B42
AT3 = (C37/B44)+B47
AT4 = ((AT1*B39)+(AT3*B44)+(AT2*B42))/(B39+B44+B42)+1
AT5 = B37+((B37/B63)*((B50*B49)/B51))
AT6 = B48+((B15+B16+B17+B18)*B52*AT2)
AT7 = AT5+AT6
AT8 = (AT7/2)*(3/7)
AT17 = AT10+AT12+AT14+AT16
AT18 = B15/(AT4*B19)+B16/(AT4*B20)+B17/(AT4*B21)+B18
AT19 = B38+((B53*B49)*AT1)+B40
AT20 = ((-AT10+(AT19/4))/(AT4*B19))+((-AT12+(AT19/4))/(AT4*B20))+((-AT14+(AT19/4))

AT21 = AT19-AT17
AT22 = B11+B12+B13+B14
AT23 = (B11/(AT4*B19))+(B12/(AT4*B20))+(B13/(AT4*B21))+(B14)
AT24 = (AS24+AS26)*B57
AT25 = B58-AT24
AT26 = B54*AT25
AT27 = (AS25-AS26-B32-B33-B34-B35)*B59
AT28 = AT27+B7+B8+B9+B10+B1-AT21
AT29 = (B32/(AT4*B19))+(B33/(AT4*B20))+(B34/(AT4*B21))+(B35
AT30 = (B7/(AT4*B19))+(B9/(AT4*B20))+(B9/(AT4*B21))+(B10
AT31 = IF(AT28>0,AT28,0)-AS95
AT32 = IF(0<AT31,AS95,IF(AT28>0,AT28,0))
AT33 = AS95-AT32
AT34 = IF(AT28>0,AT28,0)-AT32
AT35 = IF(B2>0,B2,0)-AS91
AT36 = IF(0<AT35,AS91,IF(B2>0,B2,0))
AT37 = AS91-AT36
AT38 = IF(B2>0,B2,0)-AT36
AT39 = IF(B3>B3,0)-AS97
AT40 = IF(0<AT39,AS97,IF(B3>B3,0))
AT41 = AS97-AT40
AT42 = IF(B3>B3,0)-AT40
AT43 = AT34+IF(AT28<0,AT28,0)-B4-AT26-AT27
AT44 = IF(0<AT43, (B4+AT26+AT27-IF(AT28<0,AT28,0)),AT34)
AT45 = AT34-AT44
AT46 = B4+AT26+AT27-IF(AT28<0,AT28,0)-AT44
AT47 = AT38+IF(B2<0,B2,0)-B5
AT48 = IF(0<AT47, (B5-IF(B2<0,B2,0)),AT38)
AT49 = AT38-AT48
AT50 = B5-IF(B2<0,B2,0)-AT48
AT51 = AT42+IF(B3<0,B3,0)-B6
AT52 = IF(0<AT51, (B6-IF(B3<0,B3,0)), AT42)
AT53 = AT42-AT52
AT54 = B6-IF(B3<0,B3,0)-AT52
AT55 = AT49-AT46
AT56 = IF(0<AT55, AT46, AT49)
AT57 = AT49-AT56
AT58 = AT46-AT56
AT59 = AT45-AT50
AT60 = IF(0<AT59, AT50, AT45)
AT61 = AT45-AT60
AT62 = AT50-AT60
AT63 = AS147-AT58
AT64 = IF(0<AT63, AT58, AS147)
AT65 = AS147-AT64
AT66 = AT58-AT64
AT67 = AS148-AT62
AT68 = IF(0<AT67, AT62, AS148)
AT69 = AS148-AT68
AT70 = AT62-AT68
AT71 = AT69-AT66
AT72 = IF(0<AT71, AT66, AT69)
AT73 = AT66-AT72
AT74 = AT65-AT70
AT75 = IF(0<AT74, AT70, AT65)
AT76 = AT70-AT75
AT77 = AS146-AT54
AT78 = IF(0<AT77, AT54, AS146)
AT79 = AT54-AT78
AT80 = AT57-AT79
AT81 = IF(0<AT80, AT79, AT57)
AT82 = AT57-AT81
AT83 = AT79-AT81
AT84 = AT61-AT83
AT85 = IF(0<AT84, AT83, AT61)
AT86 = AT61-AT85
AT87 = AT83-AT85+AT41
AT88 = AT53-AT76
AT89 = IF(0<AT88, AT76, AT53)
AT90 = AT53-AT89
AT91 = AT76-AT89
AT92 = AT90-AT73
AT93 = IF(0<AT92, AT73, AT90)
AT94 = AT90-AT93
AT95 = AT73-AT93+AT33
AT96 = AT32+AT44+AT56+AT93
AT97 = AT36+AT48+AT60+AT89
AT98 = AT40+AT52+AT81+AT85
AT99 = AT96+AT97+AT98
AT100 = AT64+AT72+AT68+AT75+AT78
AT103 = (AT8/(AT4*B20))+AT8
AT104 = AT8*2
AT105 = ATB2 + ATB6 + AT94
AT106 = (AT104*(10/3)) + AS137
AT107 = AT106 - AT105
AT108 = IF(AT107*0, AT106, AT105)/(10/3)
AT109 = IF(AS105 - (AS108*(10/3)) - AT100 > 0, AS105 - (AS108*(10/3)) - AT100, 0)
AT112 = AS134 + AR132 + AQ130 + AP128 + AQ126
AT115 = AS132 + AR130 + AQ128 + AP126
AT117 = AS130 + AR128 + AQ126
AT118 = AS128 + AR126
AT119 = AS126
AT120 = IF(((AT104 - AT108)*(10/3)) + AS137 > 0, ((AT104 - AT108)*(10/3)) + AS137, 0)
AT121 = IF(AR109 - AT112 > 0, AR109 - AT112, 0)
AT122 = AP109 - AT115
AT123 = AQ109 - AT117
AT124 = AR109 - AT118
AT125 = AS109 - AT119
AT126 = IF(AR120 < AT109, AT120, AT109)
AT127 = AT120 - AT126
AT128 = IF(AR127 < AT105, AT127, AT125)
AT129 = AT127 - AT128
AT130 = IF(AR129 < AT121, AT124, AT129, AT124)
AT131 = AT129 - AT130
AT132 = IF(AR131 < AT113, AT113, AT123)
AT133 = AT131 - AT132
AT134 = IF(AR133 < AT122, AT133, AT122)
AT135 = AT133 - AT134
AT136 = IF(AR135 < AT121, AT135, AT121)
AT137 = AT135 - AT136
AT138 = (AT120 - AT137)/(10/3)
AT139 = (AT105*B23)*(10/3)
AT140 = ((1-B23)*AT108)*(10/3)
AT141 = AT86 - AT139
AT142 = ATB2 + IF(AT141 < 0, AT141, 0)
AT143 = AT94 - AT140
AT144 = IF(AT141 < 0, AT141, 0) + IF(AT143 < 0, AT143, 0)
AT145 = IF(AT142 < 0, AT142, 0) + IF(AT144 < 0, AT144, 0)
AT146 = IF(IF(AT143 < 0, AT143, 0) + IF(AT142 < 0, AT142, 0) > 0, IF(AT143 < 0, AT143, 0) + IF(AT142 < 0, AT142, 0), 0)
AT147 = IF(IF(AT144 < 0, AT144, 0)
AT148 = IF(AT145 < 0, AT145, 0)
AT149 = (B24*B30) + (B25*B31)
AT150 = (B26*B30) + (B27*B31)
AT151 = (B28*B30) + (B29*B31)
AT152 = (AT105 - B60) * AT151
AT153 = IF(AT152 < 0, AT152, 0)
AT154 = IF(0 < AT105, 1, 0)
AT155 = B61 - AT105
AT156 = IF(AT155 < 0, B61, AT105) * AT150 * AT154
AT157 = AND(AT105 < B61, AT105 < B60) * (AT105 - B60) * AT149
AT158 = B60 - B61

A358
\[
\begin{align*}
AT159 &= IF(0 < AT152, AT158, 0) \times AT149 \\
AT160 &= AT157 + AT159 \\
AT161 &= AS156/AS150 \\
AT162 &= AS160/AS149 \\
AT163 &= AS153/AS151 \\
AT164 &= IF(AT100 < AT163, AT100, AT163) \times AS151 \\
AT165 &= AT100 - (AT164/AS151) \\
AT166 &= IF(AT165 < AT162, AT165, AT162) \times AS149 \\
AT167 &= AT165 - (AT166/AS149) \\
AT168 &= IF(AT167 < AT161, AT167, AT161) \times AS150 \\
AT169 &= AT164 + AT166 + AT168 \\
AT170 &= AT153 + AT156 + AT160 - AT138 - AT108 \\
AT171 &= IF(AS170 > 0, AS170, 0) / (AT4^B62) \\
AT172 &= B2 + AT28 + B3 - AT18 - AT22 + AT23 - AT30 + AT21 - AT171 - AT103 + AT29 \\
AT173 &= (AT172 - X172) / (AT4^B36) \\
AT174 &= AT173 + AS174
\end{align*}
\]
Thank you for agreeing to answer this questionnaire. Much work has been conducted concerning the effects of tax on capital project appraisal, and this survey attempts to establish whether companies do consider tax in their capital budgeting decisions.

This questionnaire mainly requires yes/no answers, but any additional comments will be most gratefully received.

If you would like a copy of the research results please complete the following details. However, if you prefer to remain anonymous please return the questionnaire under separate cover. The study is being conducted in strict confidence.

Name ________________________________

Position ________________________________

Designatory Letters _________________________

Company ________________________________

Address __________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

Telephone Number _______________________

Please return using the enclosed envelope to:

Lyn Hodgkinson BA, Plymouth Business School,
Plymouth Polytechnic, Drake Circus, Plymouth PL4 8AA
1. Which methods do you use in project appraisal? If more than one please state order of importance.
   a) Payback period
   b) Accounting rate of return
   c) Internal rate of return
   d) Net present value
   e) Other, please specify

2. Do you allow for taxation in your project appraisal?
   If yes, please answer the following questions. If no, please return the questionnaire to the address given, and I thank you for taking part.

3. How do you allow for taxation?
   a) treat tax as a cash flow when tax is paid
   b) treat tax as a cash flow at the balance sheet date
   c) alter the discount rate if discounted cash flow techniques are used, if yes please explain how the alterations are made.

4. If discounted cash flow techniques are used, how does the company calculate the discount rate?
   a) weighted average cost of capital
   b) cost of debt i) average cost of debt
   ii) cost of marginal debt for the project
   c) other, please specify

The following questions relate to the 1985 financial year.

5. At the start of the year did the company have any of the following?
   a) unrelieved Advance Corporation Tax
   b) unrelieved losses
   c) unclaimed capital allowances

6. At the end of the year did the company have any of the following?
   a) unrelieved advance corporation tax
   b) unrelieved losses
   c) unclaimed capital allowances
7. What tax rate did the company employ in its capital investment appraisal?
   a) marginal tax rate for the project
   b) average tax rate

8. What is the company’s accounting period?
   a) 1 January - 31 December
   b) 1 July - 30 June
   c) 1 April - 31 March
   d) other, please specify

9. Is the company a member of a group?
   if yes, is it the head office/ holding company
   If yes, please answer the following questions, if no, please return the questionnaire and I thank you for taking part.

10. Are projects evaluated centrally above a certain level
     please specify

11. In its project appraisal is a group company allowed to reduce the tax payable on a project by utilizing the losses or unclaimed capital allowances arising in another group company
     If yes, will the company utilizing the capital allowances/ losses pay some recompense to the other company

12. What are the group’s goals and objectives? If more than one please state order of importance.
    a) to maximise the percent return on total asset investment
    b) to achieve a desired growth rate in earnings per share
    c) to maximise net income
    d) to maximise shareholders’ wealth
    e) to maximise sales
    f) to maintain a desired gearing level
    g) other, please specify

13. Would you be prepared for further discussion on the subject by telephone or at your office?

I thank you for taking part.
Dear Sir,

The Impact of Taxation on Capital Budgeting

I refer to my letter dated the 18th June requesting your participation in my postal survey. Unfortunately, I do not appear to have received your questionnaire.

May I repeat my request for your assistance. If you are willing to participate could you please complete the enclosed questionnaire and return it to the above address.

If, however, you do not wish to participate could you please give your reasons below and return the slip to the above address. I thank you in anticipation.

Yours faithfully,

Lynn Hodgkinson
Research Assistant

________________________________________

Reasons for not participating

1. insufficient time to complete questionnaire  

2. company policy not to complete questionnaires  

3. do not consider tax important in project appraisal  

4. receive too many questionnaires concerning project appraisal  

5. Other, please state  

6. You have returned the questionnaire anonymously (thank you for your assistance)
APPENDIX D
INTERVIEW SURVEY QUESTIONNAIRE

QUESTIONNAIRE FOR STRUCTURED INTERVIEWS

Name of firm:
Address of firm:

Name of respondent:
Position of respondent:

Company Information

Is the company publicly quoted?
Is the company a subsidiary/associate of another company?
Is the company a member of a group? If yes, is it the holding company/head office?

What is the group’s present level of turnover (last available figures)?
How many employees are presently employed (equivalent to full time)?
What are the group’s total assets on the latest balance sheet?

What activities is the group primarily concerned with?
CAPITAL BUDGETING

What is the time span employed in the capital budgeting process?
What is the average size of the annual capital budget?
What is the time span of the company's strategic plan?

Creation Phase

Does the company employ some method of systematic search for investment opportunities?

At what level in the hierarchy are projects usually originated, at what level are they screened?

When the projects are screened, what criteria are used to assess them?

(eg profitability, productivity of capital, long term goals/strategy, to maintain operations, legislative/regulatory requirements, project risk, balanced segment growth)
Does the company undertake non-economic projects, if yes, what criteria are used for evaluation? (eg need/urgency, legislative requirements, maintain operations, economic impact of an alternative)

Decision Phase

Where are projects normally accepted/rejected?

Are proposals submitted to this level jointly, or singularly? Do ceilings exist?

What evaluation methods are used and importance of each method?

If the group uses discounted cash flow methods, how is the discount rate calculated? When during the year does discounting take place?

What are the cutoff points for the various methods employed, what are
How does the company forecast its cash flows?

Are the forecasted cash flows checked against actual for accuracy?

Does the company include changes in working capital in the forecasted cash flows?

Is the residual value of the investment included in the forecasts? If yes, at what value? (book value, market value, residual value)

What is the company's present cost of capital?
How frequently is it revised?

How does the company calculate its cost of capital? (eg WACC, cost of debt)

If WACC, is it based on current market values, or historical? are the weights based on the planned or actual debt/equity ratios?

Does the group have a group wide hurdle rate?

Inflation

Are the effects of inflation recognised in the evaluations? How?

Risk
Does the group consider the project's risk when evaluating a project? If yes, how? (e.g., payback, risk-adjusted discount rate, Beta coefficients, certainty equivalent, sensitivity analysis, simulation).

How does the management define risk? (e.g., probability of not achieving a target rate of return, variation in return, uncertain market potential).

What is the management's present attitude to the company's overall risk?

Does the group use sensitivity analysis in capital investment appraisal?

Does the group use management science techniques such as mathematical programming, network analysis?
Implementation Phase

What methods of cost control does the group use, if any?

Does the group conduct post-audits?

at what stage are they conducted?

If a project is then found to be uneconomic, what is the likelihood of it being dropped? Will this depend on how long the project has been underway?
What extent of autonomy does each individual company have? Responsibility for the full capital budgeting decision? The whole decision is centralised? There are ceilings on individual projects? There is a ceiling on the annual capital budget?

Are the companies aware of projects being undertaken by other member companies?

Does the company allow for the transfer of capital allowances and tax losses between member companies?

Will the company taking advantage of the transfer pay in some way a compensation to the transfeeree?

Are the possibilities of each company carrying out its investment decision in isolation recognised? If yes, does the company attempt to overcome this problem?
How is the performance of each group member assessed?
TAXATION

Is taxation taken into account in project appraisal?

If discounted cash flow techniques are used, is the discount rate altered for the delay in payment/rebate of tax?

Does the group at present have unrelieved ACT?

Does it alter its tax rate to account for the unrelieved ACT?

Is the present situation, with regard to tax losses, nil taxable profits and capital allowances, between tax bands considered in project appraisal? Is some modification made to the tax rate used in the evaluation?

Does the group adjust its cost of capital if tax relief on interest is
unobtainable because of the above situations?

If the group drops in and out of different tax situations, what do they expect their marginal rate to be?

Does the group use their marginal rate or average rate of tax in project appraisal?

Is sensitivity analysis employed to assess the effects of different tax rates?

Does the group consider its shareholders' marginal tax rates when determining its dividend policies?
FINANCE ACT 1984

What was the group's reaction to the changes brought about by this act?

Has it resulted in any change of policy?

Does the firm attempt to forecast changes in the tax system or work on a status quo? Were they able to forecast the changes brought about by this act?
LEASING

What are the group's views on leasing? Is it involved in leasing?
How does it calculate the cost of a lease?

Is there any other information the group would like to offer?

Would the group wish to receive a copy of the research results?

It is hoped that a more in depth study will be conducted, would the group be willing to further take part?
Dear Mr

The Impact of Taxation on Capital Budgeting

I thank you for participating in my postal survey. I am pleased to report that I have, to date, received responses from over 45% of the companies included in the survey.

From your questionnaire I understand that you do not include taxation in your project evaluations. I have listed a few reasons why this may be so, and would be grateful if you would tick the appropriate reason. If you could return the slip to the above address I would be most grateful.

I will be writing a report concerning the results of the survey in a few weeks time, which I will forward to you.

Again, thank you for your assistance.

Yours sincerely,

Lynn Hodgkinson
Research Assistant

Reason for not including tax in project evaluations

1. tax is not considered relevant in project appraisal
2. the company is in a non-tax paying situation
3. the tax effects are minimal
4. the tax system is so complicated that the costs of evaluating the taxation effects exceed possible benefits
5. other, please state
Group A

Group A is involved in the processing and production industry, exporting to 40 countries worldwide. Its total assets for the year 1984 amounted to over £17 million with a turnover of almost £35 million. Over the last five years improvements in turnover of almost 100%, with similar improvements in profits and share price have been enjoyed. The annual capital budget varies between £1/2 and £3/4 million with the majority of the investments being for "more efficient and economical manufacture". The group adopts an annual capital budget to December each year, with a four year strategic plan.

Creation Phase

The group does not employ a systematic method of searching for project availability. Most projects originate at the senior staff (eg. engineer) or director (technician director) level, where they are screened to assess their worthwhileness for further investigation. The criteria used here is the project's profitability in terms of payback, and, the necessity to maintain operations.

The group sometimes undertakes uneconomic projects if necessary for repair and maintenance, and there is a procedure for approving such projects. Another example of an uneconomic project is the provision of company cars.
Decision Phase

The projects are assessed at different levels, to which they are submitted singularly. Only projects over £10,000 require group board level approval, with those between £1,000 and £10,000 requiring the Managing Director's approval, and those below, a director's approval.

Payback Period is the most important evaluation method with discounted cash flow methods used only infrequently.

Most of the projects are labour saving, so savings may be calculated directly, the amounts estimated being checked after 6-12 months. Changes in working capital are included for tax purposes. The residual value of the investment is generally not included.

The company's cost of capital is 13% on debt financing and a figure of 43% was suggested for equity, with both being continually revised. The company normally calculated its cost of capital based on the cost of debt. There is a group wide hurdle rate.

The group attempts to build in the effects of inflation into the cash flows. Risk did not receive considerable attention because the company was "not diverse"
The group intends to employ some method of specific search in the future but, at present, about 7 proposals arise each year from different contacts. The projects normally originate at the top level and the main criteria at this stage is profitability and productivity of capital.

The group does not undertake non-economical projects intentionally. The top management usually make the acceptance/rejection decision, based on "management hunch and estimation". The project would then be given a trial period of 3 months with rigid budgets. Forecasts are only calculated on individual projects during the trial period. No other formal methods of evaluation are conducted. Risk is considered important and the problem cases are itemised for their pros and cons. The management define risk as uncertain market potential due to it being involved in a new market. Sensitivity analysis is used informally.

The group works on monthly budgets and it is hoped that an integrated system will be implemented.

Implementation Phase

The group intends to conduct post audits in the future. A project may be dropped if found to be uneconomical depending on the reason.
The group utilises sensitivity analysis in relation to profit, to help market its shares, but no management science techniques are used.

Implementation Phase

Every two months the group defines the amount spent on approved projects with a full analysis conducted every six months.

Post audits are conducted on certain projects, for example, new items of plant and machinery are audited between 6-12 months after start up. The respondent stated that a project found to be uneconomic at the post audit is unlikely to be dropped.

The companies are generally not aware of projects being undertaken by other companies within the company.

Taxation

The transfer of capital allowances and tax losses is allowed for in the groups tax computations, but not at the decision making level, as

"each one has to stand on its own two feet."

The group includes tax as a cash flow, but, although it has unrelieved advance corporation tax, it does not alter the tax rate to account for this, instead it uses the average rate of tax.
Reactions to the Finance Act 1984

The respondent considered that the legislation may lead to an increased tax burden particularly due to the abolition of stock relief. Although the group did not bring forward projects the respondent could imagine that this will have happened elsewhere, and that it may lead to a decrease in investment for a few years. The group does not attempt to forecast changes in the tax system.

Group B

Group B has recently been taken over by another company.

The group is employed in the electronic/telecommunications industry with a turnover of approximately £850 million. It employs a capital budget of one year in detail, and a looser framework of five years.

The time span of the strategic plan is 5 years.

Creation Phase

Projects arise in most levels in the organisation and are usually screened at the same level using a variety of criteria. The group does not employ specific methods to search for projects. Non-economical projects, are sometimes undertaken, for example,
a disaster stand by costing £1/2 million would be difficult to justify financially.

Decision Phase

Projects receive their final acceptance decision at different levels in the hierarchy, depending on their size. If the project appeared in the budget, the ceilings are as follows:

- Divisional management up to £150,000
- Senior Directors £150,000 - £250,000
- Managing Directors and Financial Director £250,000 -£500,000
- Above to the head office of the group.

Discounted payback, net present value and internal rate of return are all used in the evaluation, with the net present value method rated the most important, however there is no minimum return standard. The weighted average cost of capital, based on current market costs and weighted by the planned debt/equity ratio, is used as the discount rate, with discounting occurring quarterly.

The group does not use any specific methods of forecasting, but includes each element of cost in the cash flow. The residual value of the investment is not included as a cash flow.

Inflation is taken into account by estimating the future value of each part of the cash flow specifically. Risk is dealt with mainly subjectively, however sensitivity analysis is
sometimes used. The group is not particularly concerned if the project is of a different risk category to the group as a whole. Risk is analysed in the capital investment process when considered important, otherwise best estimates are used. The group does not employ management science techniques.

Implementation Phase

When asked whether post audit controls exist, the respondent stated that they were "Officially yes, unofficially no due to the squeezing of costs."

Taxation

The group considers tax in project appraisal to the extent as to how it will affect its liability, for example, if the group has losses carried forward tax will be ignored, but where tax is expected to be paid the rate will depend on the dividends. Tax is included as a cash flow when the liability is due. The group has unrelieved advance corporation tax. It alters the tax payable on the project when there are losses, unrelieved capital allowances, etc. and adjusts the weighted average cost of capital accordingly. The group uses the marginal tax rate in the evaluation.

Finance Act 1984
The group considers the greatest effect of this legislation will arise from the removal of the first year allowance on plant and machinery, however the legislation would not lead to a change in the group's policies. The group does not attempt to forecast changes in the tax system.

Company C

Company C is a single company with operating divisions, involved in the provision of large equipment and transportation. Its turnover for the first six months of 1985 amounted to over £1300 million. The company has an annual average capital budget of around £100 million.

A forecast is prepared for 10 years hence with the first five years listed in detail. The company also employs a 3 year operating budget.

Creation Phase

A specific search for projects is made, and there are individual personnel employed for their technical knowledge to buy into new technology. Projects usually originate at the divisional level, and the criteria used to evaluate these projects at this stage include profitability, productivity of capital, risks and sensitivities.
The company sometimes undertakes non-financial projects, such as social improvements for staff and legislative requirements, an example was provided of a canteen for which there was no financial justification, but there was a legal obligation. However the project was required to be supported by proof that the "processes of getting the best deal had been gone through."

Decision Phase.

Projects above £1/4 million are required to be submitted to the corporate level with the following information:

1. background information
2. alternatives available, and why rejected
3. type of investment, the company classified their assets into the following classes:
   a) freehold land and buildings
   b) leasehold land and buildings
   c) research equipment
   d) production equipment
   e) office furniture
   f) motor vehicles
   g) aircraft and equipment
   h) data processing equipment
4. exposure of company, eg risks, sensitivities and financial exposure
Financial life of project, the capital and revenue costs, and other elements and savings. Net Present Value, Internal rate of return, social, needs, leading to business area (loss leader), need to undertake investment to keep key staff, and competitive tactics. The respondent stated that the company was attempting to "get away from purely financial appraisals"

The divisional manager may allocate and spend as he wishes on projects below £1/4 million.

The company employs a "flexible budgeting policy" allowing projects within budget to be carried forward to the next year providing they are below £250,000. However, if they are not then proceeded with they are lost. The substitution of any project within the same asset category as listed above is allowed providing it does not affect the overall budgeting capacity.

As mentioned above the company employs discounted cash flow techniques, usually details of payback are not included. The discount rate is subjectively determined, after a lengthy discussion, with the rate presently set at 15%, then if necessary, there is an escalation value of 6%.

The company has a monthly periodic reporting cycle within which the cash flow is included. There are two schedules, the first monitors actual against budgeted, then each month the divisions
forecast the year end figures to ensure updated forecasts.
Changes in working capital are included in the cash flows.

The residual value of the investment is usually included as the best guess, or the asset register residual value, if, for example, an item of plant and machinery was purchased with a life of 10 years, the residual value would equal 1/10. The company uses the cost of debt as its cost of capital which is at present 10%. Inflation is included in the evaluation by allowing a general increase at present of 6%, but this is reviewed annually.

Risk is very important to the company, and it uses sensitivity analysis, looking at the best, the worse and the datum case, to analyse the riskiness of the project. The management's attitude to risk is favourable, as it has very little exposure on its capital investment.

A few divisions use management science techniques, but they are in the minority.

Implementation Phase.

The company uses variance analysis to check divergences from forecast, and conducts post audits on a periodic basis, depending on the item, but generally looks at specific items after 2 years. The respondent reported that "as far as known a post audit has never been unfavourable".
but added that a change in strategy could lead to some projects and capital equipment becoming redundant.

Divisional Strategy.

The divisions awareness of projects undertaken by other divisions is "not as much as it ought to be, but hopefully changing". However the company does not allow the transfer of capital allowances and losses between the divisions to be taken into account at the evaluation stage.

The performance of each division is assessed using the following criteria:

a) profitability
b) head count
c) order book/back logd) orders received
e) sales.

Taxation

Taxation is taken into account in project appraisal as a cash flow, but is considered to have very little effect. The projects are expected to be justified before tax, and are forwarded before tax. If they are marginal they are considered dubious.
The company has unrelieved advance corporation tax and alters its tax rate according to its tax profile. The respondent stated that the company is "getting more tax aware in capital appraisal", and utilises the marginal tax rate. Sensitivity analysis is not used to assess the effects of different tax rates.

Finance Act 1984

The company did not consider this legislation to have much affect on its capital investment policy.

Group D

Group D achieved a turnover in excess of £2000 million in 1984/85, with main activities in fibres, both manmade and natural. Its profits and turnover have both increased steadily over the last five years.

"Businesses not strategic to the group's future development have continued to be sold as suitable opportunities arise" whilst major expansions have occurred elsewhere.

Their philosophy with respect to capital budgeting is as follows: "Major capital projects will be an integral part of a business strategy, and should therefore be considered in the context of that strategy .......the business strategy is developed in medium term plans and annual budgets. The capital proposal is merely the
final stage of the consideration of a capital expenditure project."

The group thus requires that the place of capital investments be made explicit when presenting medium term plans.

The group has a strategic plan and capital budgeting plan of 3 years with an annual budgeting cycle.

Creation Phase

The employment of a specific search for an investment alternative was considered to be "the exception rather than the rule" with the project normally arising through line management, where the projects are also screened to determine "a crude measure of profitability".

The group sometimes undertakes non-economical projects if necessary to comply with environmental and legislative requirements, or for pilot exercises. As stated in their capital budgeting manual "Sometimes it will not be possible to produce a financial evaluation based on normally expected commercial and technical assumptions. A capital project may be for a speculative venture or may be to support a strategic direction being pursued more by feel than "hard" data. In such cases it would be more helpful if the evaluation showing the required assumptions to achieve a
given set of indicators, and then to comment on the reasonableness of the assumptions."

Decision Phase

Proposals of £5 million or over, or proposals signalling a shift in strategic direction, normally require board approval, whereas proposals of £1 million or over may be authorised by the group chairman in consultation with one other director.

The proposal will include the following information.

Main Documentation:

- proposal summary, duly authorised within the product group
- a short executive summary, summarising the case for the project
- financial evaluations
- project plan concerning implementation
- plus supplementary documentation (if necessary)

The group evaluates its proposals by comparing the forecast performance of the business unit without the proposed investment, with the forecast performance of the business unit with the investment.

"for a project to be viable it is necessary both that the project itself and the business to which it will contribute satisfy criteria of economic viability"
The group considers discounted cash flow techniques to be most relevant, and requires that both the net present value and the internal rate of return be calculated.

"the choice of real discount rate for evaluation of NPVs and to set as the 'hurdle rate' against which to judge IRRs will vary from business to business. The real Weighted Average Cost of Capital for the group has been determined to be about 7%, but even for a business with the same risk characteristics as the group as a whole there will be a proportion of unremunerative projects ...........and some loading of the discount rate to take account of these may well be desirable. More generally, not all the group's businesses will have the same risk characteristics as the group as a whole and in some cases it will be appropriate to think in terms of a higher or lower cost of capital"

However, although the cost of capital is continually examined it is not revised very often. The weighted average cost of capital is based on a convergence between current market value and historical value, but the group was generally forced to use the historical value. The market's perception of the gearing levels was used for the weighting.

The group does not use forecasting models to forecast its cash flow, but may use consultants and inside market research to gain marketing information, depending on the circumstances.

The group includes changes in working capital in its cash flow
forecasts, and the residual value of the investment is included principally, at its market value. If the residual value was critical "it was hoped that sensitivity analysis would be applied" The group uses sensitivity analysis to analyse its risk, requiring a "list of crucial assumptions together with how sensitive the profitability is to changes in each and the likelihood (risk) of such changes occurring." to be included with the evaluation. The group also uses the Capital Asset pricing Model to analyse the risk, but does not use any management science techniques.

Implementation Phase

Post implementation reviews are required "to obtain feedback and to learn from past experience, in order to improve future proposals and decisions" When asked whether a project would be dropped if found to be uneconomic the respondent replied "In theory it is possible for a project to be totally uneconomic to be dropped, but it would be more likely that a project be truncated possibly due to a change in the environment" Group Strategy

The companies in the group are generally aware of projects
undertaken elsewhere, but in project appraisal they are only allowed to use their own capital allowances. On large/important projects the overall tax position is considered, but the information received by the operating divisions will only include broad assumptions on tax.

Due to the group entering a tax paying situation it considered every project to be marginal, nevertheless only large projects are assessed centrally.

Taxation

Taxation is taken into account in the cash flow evaluations. "It is important that tax is computed on a basis that reflects the group's overall position in the tax area covered."

Grants however are ignored in the evaluation. The group has unrelieved advance corporation tax at present and attempts to modify its tax rate accordingly. The group is expecting to enter a tax paying situation in the near future, and is therefore taking interest deductibility into account.

Finance Act 1984

The group considered that the legislation had had a material affect both in terms of the decrease in capital allowances and the abolition of the stock relief, however neither had led to a
change in policy.

Group E

Group E is included as an example of a group of private limited companies. For the 1986 year a turnover in excess of £40 million was achieved. The group is primarily involved in stockholding steel and the distribution of bottled gas.

The group's capital budgeting plan is based on a capital budget provided and agreed before the start of a financial year. Amendments to this plan may be permitted from time to time, and would normally be put before a Board Meeting but where there is an urgent need for capital expenditure to be approved quickly the Managing Director will review the project with appropriate directors and may give immediate approval.

There is a strategic planning committee of directors who take a medium term view looking over a three year period.

Whilst there is some searching for projects, many projects arise through the senior branch manager route. The criteria used in considering these projects are whether they needed to maintain or improve operations and whether an acceptable level of return will be made through approving the expenditure.

The Managing Director and the Board of Directors make the final
acceptance/rejection decisions. Whilst certain projects such as the replacement of vehicles are difficult to analyse from a return of capital viewpoint, other projects are judged based on the return of capital that can be achieved for which purpose cash flows, to include working capital and profitability projections are made.

The capital budgeting decision is centralised with assets being transferred between branches on a net book value basis, with capital allowances and losses being transferable between member companies.

The group has had unrelived advance corporation tax and has not been in a tax paying situation for a number of years. This will change in the next financial year and the tax implications on a project are considered.

Group F

Group F is another group of private limited companies. Its main activities involve engineering, and its latest turnover for 1983/84 was about £3.5 million. The group employs a 5 year informal capital budgeting time span with a one year capital budget in detail. The group also has a one year strategic plan. The average capital budget amounts to £50,000 with most spent on research and development.
Group Strategy

The capital budgeting decision is centralised, but the transfer of capital allowances and losses is not brought into the calculation. Taxation is not taken into account in project appraisal.

Finance Act 1984

This act was considered advantageous due to the lowering of the tax rate.

Group G

Group G is involved in the processing and marketing of food products. For the year 1984/85 it achieved a turnover in excess of £1300 million, with profits before tax up by 41%, due to "the benefits arising from new product development, substantial capital investment, rationalisation and cost control"

The group employs a one year capital budgeting plan with an annual capital budget of around £71 million (purchases) and £5 million (leases). The group's overall strategic plan is made up of the divisional strategic plans, the lengths of which vary.

No systematic search is employed with opportunities arising "as
and when although market pressures do lead to the need for expenditure. The proposals generally originate at the operating unit level where they are screened for return on capital employed, discounted cash flow and payback depending on their size. Uneconomical projects, for example, for health and safety, recreation and welfare are sometimes undertaken.

There are ceilings for approval of projects, with projects costing more than £400,000 requiring the board approval, between £80,000 and £400,000 requiring group managing director approval and those below £80,000 requiring divisional approval. Small projects may be approved by the local manager.

The evaluation methods include return on capital employed, discounted cash flow (considered most important) and payback, with respective hurdle rates of 22.5%, 15% and 4 years. The discount rate represents an average cost of capital plus a margin, with cash flows discounted annually.

As part of the post audits the forecasts and discounted cash flow calculations are reviewed, to assess the financial accuracy "(somewhat limited)".

Working capital changes are included in the cash flows but the residual value of the investment is not included as it is generally considered to be zero, due to the asset being written down to zero over ten years. The group's present cost of
capital is 11%, however it is only used in lease v buy decisions. It is revised very infrequently, but is regularly monitored. It approximates the weighted average cost of capital, although it is not based on any specific calculation. A group wide hurdle rate is employed.

Inflation is only considered on major projects lasting several years, and is then considered at the general rate of inflation rather than specific, as costs and revenues are expected to increase by similar amounts.

Risk is considered, albeit not in a structured way, but in competitive areas it may be necessary to invest even if it is risky, if strategically necessary, and high returns are expected. If the investment involves entering a new area a higher discounted cash flow rate may be required. The management define risk in terms of likelihood of over or under achieving projections, but consider that high project risk may lead to higher than normal returns. Sensitivity analysis is used on marginal projects to identify the break even point.

Recently a system of post audits has been installed with the post audits conducted 18 months to 2 years after start up. The object of the system is to document and learn from previous experience, to "make people more accountable" and to know whether proposals are reliable. The problem arising
when the project is not as successful as expected is that it "is difficult to show whether the assumptions underlying the calculations were incorrect or whether the nature of the project has changed."

The group attempts to overcome the problem of under/over investment arising through the evaluation of projects in isolation by employing the effective rate of tax, which has been as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>85/86</td>
<td>8%</td>
</tr>
<tr>
<td>86/87</td>
<td>5%</td>
</tr>
<tr>
<td>87/88</td>
<td>35%</td>
</tr>
</tbody>
</table>

Taxation

Tax is included by altering the cash flows by the tax payments, lagged for two years. The group has unrelieved advance corporation tax and alters the statutory tax rate accordingly. The group modifies its tax rate for unrelieved capital allowances and losses, but does not adjust its cost of capital for interest deductibility. The group generally does not use sensitivity analysis to determine the effects of different rates of tax, unless the effective rate of tax is expected to change.

Finance Act 1984

The group consider that this act will have an impact on leasing
"bringing the group and the leasing company into a similar situation"
although the leasing company will still have a cash flow advantage. They expect that their leasing activities will decrease when they enter a tax paying situation.

Group H

Group H is involved chiefly in the refinement and manufacturing industry, achieving a turnover of over £1600 million in 1985 with profits before tax of over £76 million, thus continuing an upward trend.

The group employs a 3 year capital budgeting plan, extending to 10 years on large projects, spending over £30 million per annum on capital projects. Their strategic plan also covers 3 years.

Creation Phase

Projects arise at various levels, but mainly from department managers, or, in the marketing area, anywhere. The group does not employ specific methods of searching for investment alternatives. The projects are initially screened in the operating unit, determining return on capital employed within strategic objectives. As the projects are submitted higher for evaluation other criteria is used as follows:
i) fit with strategic plan
ii) level of risk and return
iii) absolute investment of capital v's availability

Usually only projects satisfying economic criteria are accepted.

Decision Phase

Ceilings for approval of projects apply as follows:

a) less than £50,000 approved at subsidiary level
b) less than £100,000 divisional managing director
c) between £100,000 and £500,000 group managing director
d) above £500,000 approval by the board is required.

If the proposal was not included in the budget, these ceilings are reduced. The group uses the internal rate of return, net present value and payback to evaluate proposals. There is a group wide minimum hurdle rate standard, but it is flexible so projects with low returns may be accepted if little risk is involved, whereas projects with high risk may require a hurdle rate in excess of 20%.

The cost of capital, a consensus agreed weighted average cost of capital (WACC) is used as the discount rate. The WACC is based on the market and future costs, with the planned and expected gearing used as the weightings. The cost of capital may be increased if the project is risky.

The group uses specific forecasting methods, but states that when
they are checked there may be considerable variances.

Changes in working capital are included as cash flows. The residual value of the investment is also included as a cash flow "as far as possible". Plant is generally regarded as having a residual value of zero.

Inflation is included in the investment by inflating each cost specifically where possible.

The management consider risk to be subjective, and are prepared to take risks if there is adequate returns, however attempts are made to decrease risk wherever possible. Risk is analysed by adjusting the required internal rate of return.

Individual operating units use sophisticated project planning models such as resource an network planning on large projects. Sensitivity analysis is used to determine the sensitivity of the following:

a) the life of the project
b) cost assumptions
c) capital investment assumptions

Implementation Phase

Post audits exist on a random basis, due to decentralisation, the group does not monitor each project. The post audit may occur at
any time during the project life but it is unlikely to happen within 1 year of the end of the project. If costs overrun by more than 10% on any project the circumstances must be reported, but although projects may be dropped if found to be uneconomic, it must be particularly bad, and then factors such as cash availability and politics - convincing the board are taken into account.

Taxation

Taxation is included as a cash flow when paid. The group has unrelieved advance corporation tax and uses a marginal rate of 5%.

Group Strategy

Projects are not evaluated in isolation, and the group effect is considered. Capital Allowances and losses are transferable with the claimant paying the full rate of the losses to the surrendering company.

Finance Act 1984

Although this legislation has not led to a change in policy, the respondent considered that the lowering of the capital allowances may now make marginal projects unattractive, he also considered that the greatest effect would be on the extent of leasing.
Group I is involved in the manufacturing and distribution of engineering components, and achieved a turnover in excess of £140 million with total assets amounting to £30 million for the 1985 year.

The group employs a capital budgeting plan of one year, with a strategic plan of 3 years and spends on average £6 million on capital projects.

Creation Phase
Most projects arise at the local managing director level, where the projects are assessed for the following criteria: increase in capacity, increase of product range, cost reduction and asset replacement. The group sometimes undertakes non-economic projects if necessary to maintain operations or for health and safety.

Decision Phase
The acceptance/rejection decision is normally made at the group head office, however ceilings do apply, as follows:

- up to £5,000: local managing director
- to £37,500: divisional chief executive
- to £75,000: group chief executive
- over £75,000: main board
The methods of evaluation used by the group are as follows:

- **payback period**
- **internal rate of return**
- **average return on capital employed**

The internal rate of return is calculated based on end year results, and the payback period has a cut off point at 5 or 10 years, depending on the estimated life of the project.

The forecasted cash flows are based on the normal estimates of revenue and expenditure indexed for future inflation estimates, with a time lag for the payment of tax. The accuracy of the forecasts are checked by means of post audits. Changes in working capital and the residual value of the investment are included in the cash flows.

The company's cost of capital is at present 10%, being the interest + discounted dividend divided by shareholders funds, however it is not revised frequently as it not used for management purposes, instead the cost of debt is used.

The group does not have a group wide hurdle rate.

**Risk**

The group attempts to analyse risk by using sensitivity analysis.
The management define risk as follows: revenues not achieved, costs exceeded and time delay. The group does not use management science techniques in its project appraisals.

Implementation Phase

The group monitors the costs of the project through the annual budgetary control methods, and uses post audits, 1 and 3 years after start up. If the post audit shows the project to be uneconomical it is always possible that the project could be dropped, depending on the group's view of the project's future profits.

The group allows for the transfer of capital allowances between member companies, and generally the companies are aware of projects being undertaken by other group members. The company claiming the transfer is not required to pay a recompense to the transferee. The group attempts to overcome the problems of each company carrying out its evaluations in isolation by conducting an annual review at which a group budget is agreed. The performance of each group member is assessed on return on capital employed.

Taxation

Taxation is taken into account in project appraisal, and the discount rate is altered for the delay in payment/rebate of tax.
The group does not, at present have unrelieved ACT, and uses the standard rate of tax in its evaluations. The group does not use sensitivity analysis to estimate the effects of different tax rates, and does not attempt to forecast changes in the tax rate.

The group welcomed the Finance Act 1984, although it did not lead to a change in policy, the group were however, involved in some tax based leasing as stated

"we did do some leasing when we had surplus ACT and when FYA’s were 100%/75%, but we are no longer in either of these situations."
Group J

Group J is a group of companies, with one major company involved in the motor car industry.

The group employs a time span of 4 years in detail and 10 years in outline in its capital budgeting process, with a strategic plan of the same time period. Its capital budget per annum was on average £54 million, but it expects this to almost double in future.

Creation Phase

The group does not employ a systematic search for projects, with projects arising as required. Sixty five percent of projects arise from the manufacturing division, and providing they are financially justifiable and necessary investment will take place.

The projects are raised at a relatively low level, where they must be first "sold to" the manager before being raised formally.

The group undertakes non economical projects in the replacement area.

Decision Phase

Only one company raises projects, and these may be accepted by
the Capital Planning Manager, if under £50,000, or must be submitted to the board of over £5 million, and in budget, or over £2 million if not in budget.

The groups most important evaluation method is internal rate of return, followed by net present value and then payback period which is used as a quick estimate. The discount rate used for the DCF methods is the "rate which we decide we require to satisfy shareholders".

The cut off points for the acceptance/rejection decision vary, but the group in general takes the risk free rate of return and adds a factor for risk, which could result in a discount rate of between 15% - 30%, however on average it is about 18%.

The group forecasts its cash flows by picking up the volumes included in the corporate plan. The forecasts are not checked for accuracy at the moment but it is hoped that some system will be implemented in the future.

As most projects undertaken by the group result in a decrease in working capital, working capital changes are not included in the evaluation "working capital doesn't really come into it". Also, since most of the projects do not have a residual value this is not included in the evaluation. However, if the machinery being replaced has a scrap value that will be included in the investment. The group does not have a specific cost of capital,
but generally it is around 1.5 times the risk free rate, ie 18%.

Effects of inflation are not specifically included in the evaluation but the budget is inflated for expenditure.

The project's risk is not considered in the evaluation, "as there is little risk attached to most of the projects."

Sensitivity analysis is used in the capital investment appraisal, and if an important variable is sensitive they "would go for the worst case."

The group hopes to implement a system of post audits in the future when, if a project was found to be uneconomical, it is highly likely that it would be dropped unless it was a necessity.

The group consider the transfer of capital allowances and losses between member companies "not applicable" due to only one company raising projects.

**Taxation**

Tax is included in the cash flow when physically paid, and is charged at the average rate of tax.

The group had unrelieved losses and capital allowances at the start of the 1985 financial year, but had relieved them by the
end of the year.

**Leasing**

The group undertakes little leasing apart from some computing equipment.
Group K

Group K is involved in distribution and manufacturing of plumbing materials, plastic products, electrical accessories, and agricultural accessories. During the 1985 accounting year the group achieved a turnover in excess of £527 million with profits before tax of £31 million.

A capital budget plan of one year in detail, and one year projective is employed, with a similar strategic plan. The annual capital budget was £13 million during the previous year, but this is expected to double following an important acquisition.

Creation Phase

A specific search for investment alternatives is not conducted, but the individual companies are always "on the look out", where the majority of projects arise. The proposals are originally screened for profitability at this level. The group does undertake non-economic projects.

Decision Phase

Projects over £10,000 are evaluated centrally, using the following evaluation techniques: Payback period (considered most important), accounting rate of return and internal rate of
return. The hurdle rate for the internal rate of return is 20%,
the company's present cost of capital based on the weighted
average cost of capital. The weighted average cost of capital is
based on planned gearing and book values of debt and equity.

Cash flows are determined from the budgeted balance sheets, and
are checked monthly by variance analysis. The residual value of
the investment is included as the "balancing figure". Changes in
working capital are included in the cash flows.

Inflation is included in the evaluation by inflating the cash
flows at the general rate. Risk is considered subjectively "look
at conservatively". Management science techniques are not used.

Implementation Phase

The group does not use post audits, but checks the accuracy of
the cash flows by means of variance analysis.

The companies within the same division are aware of projects
being undertaken by each other, via close liaison between the
operating divisions and divisional managing directors' meetings.

The group does not allow for the transfer of capital allowances
and losses between member companies requiring the projects to be
"run on a stand alone basis".
Taxation

Tax is included as a cash flow in the evaluation, charged at the average rate of tax, and does not use sensitivity analysis to determine the effects of different rates of tax. The group had unclaimed capital allowances at the end of the 1985 financial year.

The group considered itself to be slightly worse off following the Finance Act of 1984, but the only effect it had on the groups' policies was to bring forward some investments, and possibly to "look a little more at capital acquisitions now". The group does not attempt to forecast changes in the tax system.

The group is not involved in leasing.
Group L is a general industrial group of companies, which achieved a turnover in excess of £300 million and profits before tax in excess of £30 million in 1985, spending around £25 million on capital expenditure.

The capital budgeting plan is for one year in detail and 3 years outline, with a similar strategic plan. Most capital expenditure is on replacement, efficiency and cost saving projects, with expenditure on new ventures to some extent.

Creation Phase

The group has attempted to stay within particular parameters of its general business, so any search for investment alternatives would be within that. Most projects tend to be "run of mill" originating at the works level or departmental manager level in either production or engineering. Such proposals get put forward in the group plan. Non economic projects are sometimes undertaken for health and safety.

Decision Phase

Most projects go forward to the group capital expenditure committee, where they are evaluated for their payback period primarily, and then for their internal rate of return. The cash
flows are forecasted by market research, and include changes in working capital and, the residual value of the investment depending on the project. Discounting occurs at the year end, and there are target rates to be achieved, but these are not stringent, for example if a project is an "immeasurable strategic project". The cost of capital is based on the average cost of debt.

Inflation is not considered in the evaluation, but risk is considered on a "best, worst, most likely" basis where possible. The group does not use sensitivity analysis in its capital investment appraisal.

Implementation Phase

Post audit controls are conducted on major projects 2 to 3 years after start up. There are instances where a project has been dropped following an unfavourable post audit, but sometimes more capital may be poured into a project with an unfavourable post audit in an attempt to boost it.

Companies are aware to a certain extent of projects being undertaken elsewhere in the group, but the transfer of capital allowances and losses between members is not allowed. However attempts are made to overcome the problem of carrying out the project in isolation by evaluating centrally, "strong tax planning".
Taxation

Taxation is taken into account when the group uses the internal rate of return, by treating it as a cash flow, and charging tax at the average rate. The group does not use sensitivity analysis to assess the effects of different tax rates.

The Finance Act of 1984 had a major impact on capital expenditure with several projects brought forward to take advantage of the higher allowances. Cash flows were affected by the reduction in the capital allowances. The act did not lead to a change in policy. The group does not attempt to forecast changes in the tax system.

The group was involved in some external leasing, as a lessor, but is not taking advantage of it now since the reduction in the capital allowances.
Group M

Group M is involved in the manufacture of machinery for the food processing and packaging, printing and the chemical industry., achieving a turnover of £261 million and profit before tax of £16 million in 1985/6.

A capital budget of one year in detail and five years outline is employed with a similar strategic plan. The annual capital budget for 1985 was £12.5 million, but the respondent expected this to decrease, with £10.5 million in the budget for 1986/87.

Creation Phase

A systematic search for investment opportunities is not generally undertaken, although the divisions are expected to put forward alternatives to proposals. Most projects originate from the manufacturing side of subsidiaries or the head office, or expenditure on technology may be undertaken.

Decision Phase

Projects over £50,000 are evaluated centrally, using the following evaluation techniques: net present value(1), internal rate of return(2). The cost of marginal debt is used for the discount rate, which is revised on a day to day basis, with a view to the future rates. The rate is based on the overdraft
rate - at present 11% post tax, because the group generally borrows to finance investments. The group forecasts its cash flows on a year to year basis purely on costs and expected income. The forecasts were checked for accuracy up to 5 years ago on a selective basis but are not now. Changes in working capital are included in the cash flows, and the residual value is included, if there is one. The residual value is also considered for tax purposes. The group employs a group wide hurdle rate.

Inflation is not included in the investment appraisal. Risk is generally not considered. The group uses sensitivity analysis to estimate the effects of altering the discount rates, but it is not used for demand. Management science techniques are not used.

**Implementation Phase**

The group has not used post audit controls for 5 years, but intend to start using them again, but it is unlikely that projects will be dropped, as the intended purpose of the post audits is to establish controls.

Companies are generally not aware of projects being undertaken elsewhere in the group, and the transfer of capital allowances and losses between group members is not allowed to be included in project appraisal. The main UK companies are traded for the holding company, and the group attempts to overcome the problems of evaluating projects in isolation by producing a combined tax
computation.

**Taxation**

Tax is included in the evaluation as a cash flow when physically paid, and is charged at the marginal rate. Prior to 1985 the group did not include tax in its evaluations.

The group did not consider the Finance Act 1984 to have had much affect on their appraisals, and attempts to forecast changes in the tax system are not made.

The group had unrelieved ACT and losses at the start of the 1985 accounting year, but had relieved them by the end.

Leasing has not been conducted for over 2.5 years, but the respondent stated they were considering to lease to benefit cash flow, if "interest rates fall any more and a lease for up to 10 years can be obtained at a reasonable rate."

The group does not use any specific standard form in its capital budgeting procedures.
Group N has recently been taken over, but for the 1985-1986 accounting period it achieved a turnover in excess of £642 million, with profits before tax of £70 million plus.

The group has a program and corporate plan of four years, which is fairly flexible due to the group not being in "a capital rationing situation". The average size of the annual budget is between £50 - £75 million.

Creation Phase

The group does not have a systematic method of searching for investment opportunities, but has an "opportunistic" approach. There are three levels in the hierarchy where projects may originate, board level, the executive committee which consists of the "general board, in day to day business", and the operating level consisting of the board and the senior management. If the projects arising give rise to efficiencies in terms of cost savings, new technology or new business opportunities through new sites or new ways of selling, the projects will be put forward for full approval.

The group undertakes non-economic projects if strategically necessary, for example a project with a negative net present
value may be accepted if it is "seen necessary to experiment strategically", or if the project leads to other things. Also, if legislation requires a specific investment the project will be adopted, for example if legislation requires the provision of a staff canteen the costs will be included in the development costs of the site.

**Decision Phase**

The group employs ceilings for approval of projects, as follows:

- **up to £100,000** director
- £100,000 to £250,000 the company board
- over £250,000 the group board.

If a project is truly individual it will be submitted to the appropriate level of authorisation singularly, however if the investment forms part of a larger project it will be submitted to the level appropriate to the total cost of the investment. For example, 132 PC computers were evaluated, which had they been evaluated individually would have been submitted to the director level, however they were evaluated jointly and thus required group board approval.

The following evaluation techniques are used by the group, in order of importance: NPV, IRR and the effect on short term profit and loss account. The respondent considered the latter
important for very large developments requiring a quick return. The payback period and the ARR were required for board information only.

The group uses the WACC for the discount rate adjusted for specific risk on non average projects, for example cost saving projects where savings are certain. The WACC is based on the current gearing ratio, and is weighted by a "bit of both" the book value and the market value of the different sources of finance. The CAPM and the dividend growth model were also used to calculate the discount rate, and the rate determined was required to be "politically acceptable to all parties". The discount rate is at present 18%, which although it is classed by the group head office as a hurdle rate, is varied for different projects. The group discounts the cash flows yearly on the half year.

The group forecasts its cash flows by testing the reasonableness of sales projections, and the cost of labour are based on the average cost of labour for the group, or the average for that particular type of development.

The cash flows are checked for accuracy by the use of post audits, informally at present, and formally very shortly. The cash flows include changes in working capital, and the residual value of the investment is included with the "property element stripped out".
Although the group's cost of capital, at present 18%, is thought about yearly, it is revised less frequently.

The effects of inflation are built into the cash flows.

Risk

Risk is considered in an evaluation by accepting a lower return for low risk projects. The management defines risk as intrinsic, due to the "lack of certainty of knowledge", and considers its risk at present to be of a medium level. The respondent stated that if a development was unsuccessful the group would be affected, but providing the development was not too large the effect would not be too great.

The group uses sensitivity analysis in its capital investment, and employs decision tree analysis for investments in computers.

Implementation Phase

As stated previously, post audits are used informally, but the respondent stated that it is unlikely that a project found to be uneconomic would be dropped, but if the investment involved a rented asset, it may pull out.
Group strategy

The companies forming the group are generally not aware of projects undertaken elsewhere in the group. The group does not allow for the transfer of capital allowances and losses between member companies, but all the companies are in a profit making situation.

Taxation

Taxation is taken into account in the evaluation by treating it as a cash flow when paid. The group does not have unrelieved ACT, losses or unclaimed capital allowances. The average rate of tax is used in the evaluation.

Finance Act 1984

The groups reaction to this legislation was neutral, and it did not lead to a change in policy. The group does not attempt to forecast changes in the tax system, but looks at the forecasts of the economy to determine possible effects on the group.

The group is not heavily involved in leasing but recently considered leasing a computer, instead of buying, however, the latter was chosen.
The production of food and other branded and packaged consumer goods are the main activities of the group of companies, which achieved a turnover in excess of £16,000 million for the 1984 accounting year. The capital investment budget for 1984 exceeded £600 million.

The group considers capital investment very important in the success of the business, which it states as follows:

"in any business, future success depends on today's investment decisions. The importance of these decisions stems from the level of resources committed and their largely irrevocable nature. Major capital investments are fundamental to a business and will, if successful, create a solid base for future earnings. Mistakes can only be rectified slowly and expensively and lead not only to a waste of cash but also to an uncompetitive cost structure and a consequent deterioration in market strength and earnings potential. It is important, therefore, that a disciplined approach is used in the assessment of all capital investment proposals."

The group identifies four major factors in its capital appraisal procedures: 1. strategy - does the proposed investment 'fit' with the existing activities and aims of the group; 2. scope - are all interrelated projects included in the appraisal; 3. profitability - does it achieve agreed financial targets for the unit and the
group i.e. yield, margin, trading profits and cash flow; and, 4. alternatives must be considered before approving a particular investment.

Non-economic projects are sometimes undertaken by the group if necessary for example for social or environmental reasons. In such cases the most effective solution must be chosen (in terms of cost and/or flexibility) to the relevant constraint.

There are a further four criteria requiring consideration, when a project is proposed. i.e the nature of the activity, the form of benefit expected, the type of resource required and the degree of risk involved.

The group employs DCF (IRR) evaluation techniques in project appraisal: DCF(IRR), though NPV techniques may be used where appropriate. PP is calculated as a supplementary indicator. The following: margin, trading results and ROCE are required to determine the effect on corporate performance.

The group allows for inflation in its project appraisal by building the cash flows first in current money terms, and converting the flows to constant terms by dividing by the general inflation index.

An overall corporate target return, based on the planned future capital structure, the return expected by the shareholders, and
the cost of both long and short term debt interest rates, is employed by the group. The group usually assesses a project over a life span of 10 years. Changes in working capital, and the residual value of the investment are included in the cash flows. The residual value of the investment is based on the remainder life replacement value, where the technology is likely to remain unchanged over the life of the project.

The risk of the project is assessed by using sensitivity analysis.

Tax is included, as a cash flow when actually paid. Distribution tax is also included, based on a 100% distribution. Tax is calculated taking account of available fiscal allowances. If the capital allowances cannot be absorbed either by the project's flows or elsewhere they are deferred.

The group states that it bases its evaluation methods on the assumption of an "unlimited supply of capital available at a well defined cost" which the group further states that "in practice this has generally been the case".

Implementation Phase

The group sometimes makes disinvestment decisions, although they are "not common" partly because "there are obvious social, political and even psychological reasons why disinvestment
decisions are not readily taken."

Leasing

The group is involved in leasing for operational reasons, but financial leasing is rarely used.
The main activities of Group P include food production. The group utilises a 5 year corporate plan and a 5 year capital budgeting plan, with major proposals mentioned primarily in the 5 year plan, then specifically in each year's budget. The annual capital budget for the group is approximately £100 million.

The group does not employ a systematic search for investment opportunities, but projects normally originate at the operating level, unless the project involves acquisitions. The projects are screened to ensure that they fulfil certain financial requirements, for example the group's hurdle rate, unless the investment is undertaken for statutory, social amenities etc where benefits may be unquantifiable.

There are specific ceilings for the approval of projects, as follows:

- £200,000 or less: local board
- £200,000 - £1 million: chief executive
- £1 million to £2 million: executive committee
- £2 million or more: board

The group employs an investment hurdle rate, which varies between countries. The discount rate is based on the cost of capital,
and other factors such as whether the investment involves essential replacement. The cash flows are discounted at the year end. The cash flows are forecasted using for example, market research for a new product investment. Changes in working capital are included as a cash flow, and if the project has a finite life either the market value of the fixed asset, or, a multiple factor is applied to the cash inflow of the last year to include the residual value of the investment in the cash flows.

The cost of capital is revised periodically, and is based on a standard gearing ratio, 70% equity and 30% debt, and the current market value of the debt and equity.

Inflation is included specifically for key factors, such as labour, raw materials, and retail prices.

Risk is assessed by using sensitivity analysis, and the payback period, although the latter is not considered very important. Simulation is used on a few occasions. The management's attitude to risk is that attempts should be made to decrease risk, and if a project "outside normal activities" is being undertaken, the management may look at involving others in the project in order to spread the risk.

Implementation Phase

If the actual costs vary significantly from the budgeted costs,
the operating unit is required to notify the head office although this "does not happen a lot".
This group of companies is involved in the construction materials supply industry, and achieved a turnover in excess of £150 million in the 1985 year, with trading profits in excess of £7 million.

A one year capital budgeting plan and a one year strategic plan are employed by the group. The group's annual capital budget is approximately £4 million.

**Decision Phase**

The group employs a systematic search for investments in new businesses. The projects usually originate at the corporate planning department and the committee (ie chairman, managing director and the financial director).

When the projects first arise they are assessed for profitability over 5 years. If the investment involves an acquisition the P/E ratio and the group's knowledge are used to assess whether the investment merits further evaluation.

The group does not undertake non-economic investments.

**Decision Phase**
Projects exceeding £10,000 require central approval. The net present value method is used to evaluate the investment with the discount rate based on the 3 month London Interbank Rate less the current inflation rate. The group uses this rate because the management consider it the "most stable of bank rates." The discount rate is, at present 8%, calculated as follows: the interbank rate is $10 \frac{1}{2}$% less the inflation rate of $2 \frac{1}{2}$% = 8%. This rate is also the group's cost of capital, and is revised occasionally, probably "when something startling happens".

The group bases its net present value forecasts on sales projections and overhead economies relevant to the project. The forecasts are audited to check for accuracy. Changes in working capital and the residual value of the investment (depending on the project) are included in the cash flows.

**Inflation**

Inflation is included in the evaluation by altering the discount rate.

**Risk**

Risk is assessed in the evaluation by considering the accuracy of the estimates. Sensitivity analysis and management science are not used in the group's investment appraisal procedures.
Implementation Phase

The group employs post audits usually 2 years after the start up of the project, but if the money has been spent it is more a case of cost cutting.

Group strategy

There are only two companies forming the group, but they are generally not aware of projects being in the other company. The transfer of capital allowances and losses between member companies is not relevant as both are mainstream corporation tax payers.

Taxation

Tax is taken into account by including it as a cash flow when paid, which results in a tax lag of 19 months, from the end of the accounting period. The group does not have unrelieved advance corporation tax. The average rate of tax is used in the appraisal, and the group does not use sensitivity analysis to assess the effects of different tax rates.

Finance Act 1994

The respondent stated that the legislation led to an initial increase in investment, and to more complicated calculations.
The group does not attempt to forecast changes in the tax system.

Leasing

The group was involved in leasing as it provided a "home for surplus funds", however the lowering of the allowances led to the sale of the leasing company.
This group of companies is involved in the manufacturing industry. The time span in capital budgeting involves looking at the current year, and two years ahead, which is similar to the group's strategic plan. An exercise was conducted to try to project further forwards, the curve showed the group as always "doing better", but the respondent stated that the management considered that this to be unreliable.

Creation Phase

The respondent stated that the group had sought investment opportunities in the United States, and had a systematic "shopping list" overseas, but although the group has sought opportunities in the United Kingdom, due to its low P/E ratio, no major acquisitions had been achieved since 1980.

Many projects arise at the work's level, but acquisitions are originated higher in the hierarchy. The projects are first screened using the accounting rate of return, which is required as part of the group's plan, however some projects are done according to policy, for example car replacement. The respondent stated that if a project becomes part of the plan, "it has a much better chance of getting done".

The group undertakes non economic projects, for such things as
health and safety.

Decision Phase

The level of approval required for a project depends on its size, with the following ceilings:

- £1 million: Main Board
- £1 - £250,000: chairman/managing director
- £250,000 - £750,000: chief executive/managing director

Authority is delegated further down for smaller projects.

The group employs the following techniques to assess a capital project:

- IRR for projects exceeding £100,000
- NPV for smaller projects
- PP
- ARR

The discount rate for the discounted cash flow techniques is based on the weighted average cost of capital, with discounting taking place at the year end. The weighted average cost of
capital is based on the market costs of the sources of finance, but the respondent stated that the costs can be volatile, with a very high beta, due to high fixed overheads, and fixed assets. The weightings used are based on the actual gearing ratio at the time of the last published results.

The group has a cut off point of 15% post tax real rate of return. The respondent stated that the objective for remunerative projects is rounded up to cover projects such as those for health and safety, where there may be no financial gain.

The respondent stated that the cash flows are forecasted by consulting the engineers etc, and allowing for a build up in sales. The group uses the convention that the capital expenditure occurs in year 0, and the first profits occur in year 1, the respondent stated this approach was rather conservative because some benefits could occur in year 0.

Changes in working capital, and the residual value of the investment (if appropriate), are included in the cash flows.

The group's cost of capital is the same as the discounted cash flow discount rate, and was considered for revision quite recently, although, the management decided not to change it.

The group has a group wide objective, but there is some element
of flexibility, for example, if a project has a particularly low risk, it should be stated, and the project may be adopted even if it does not quite achieve the objective, whereas, a high risk project may be rejected even if it satisfies the objective.

**Inflation**

The cash flows are stated at today's prices, with no inflation built in, because the objective rate of return does not include inflation. The rate of return required is calculated by determining what the stock market requires, and using the weighted average cost of capital, and deducting the retail price index.

**Risk**

If the project is marginal the group will look at the project's risk, and accept a higher or lower rate of return as appropriate. Sensitivity analysis and subjective judgement are used to decide whether to go ahead or not. The past track record of the originator of the project is also examined.

The respondent stated that the group did not use management science techniques because "there had never been enough information to do capital rationing in the text book manner."

**Implementation Phase**
The group maintains overall control of capital projects by reporting against the total on a project basis. When the corporate plan is drawn up, an estimate is made of how much cash is being spent in the coming year on a project by project basis.

The group uses post audits in a restricted way, carrying out 3 to 4 per year on projects which required board approval. The post audit usually occurs 1 to 2 years after start up.

**Group Strategy**

The respondent reported that the group did allow for the transfer of capital allowances and losses between group members, 'by looking at the the project on its own, and if it makes tax losses it is assumed that they can be absorbed elsewhere, but if the project makes profits it is assumed that tax is payable on the projects with a one year tax lag.'

**Taxation**

Tax is taken into account as a cash flow when paid. The group at present has unrelieved advance corporation tax, but does not alter the tax rate used accordingly. No modification is made to the tax rate, for unrelieved losses, ACT and unclaimed capital allowances, with the statutory tax rate being used in the project appraisal.
Sensitivity analysis is not used to determine the effects of different tax rates, as it is assumed that the current rate will continue.

**Finance Act 1984**

The group analysed a few projects for the effects of this legislation, by considering the returns pre and post the act, but it was found that there was very little difference. No projects were brought forward at group level. The group does not attempt to forecast changes in the tax legislation.

**Leasing**

The group is involved in leasing both as a lessee and a lessor. The group uses leasing for tax planning by leasing inter group.
This group is an international engineering group producing a diverse range of engineering products. During the 1985/1986 year a turnover of just under £130 million was achieved, with capital expenditure amounting to over £5 million.

The group requires information on the specific objectives of the proposal, and where the project is expected to have a direct effect on changing the company's performance justification in terms of the following criteria is required:

- Fit of the proposal within the company's strategy and current operational plan
- Alternative options considered
- Marketing factors and competitive environment
- Technological factors
- Production facilities
- Management and organisational issues
- Threats and opportunities to the business in undertaking the project

The group undertakes non economic projects to meet legislative requirements and for welfare.

Decision Phase

The authorisation of projects is subject to ceilings, with items
below £20,000 requiring authorisation by the divisional managing directors, and above requiring authorisation by the group managing director.

The group uses the internal rate of return and the payback period in its capital investment appraisal. The projects are appraised either for their life or for 10 years whichever is the shorter. Changes in working capital are included in the cash flows.

Inflation is built into the appraisal by "deflating the net cash flow by a deflator equivalent to the expected level of general inflation, in the UK represented by the Retail Price Index, to convert net cash flow into its real value in today's terms."

**Taxation**

The group had unrelieved act, losses and unclaimed capital allowances at the start and the end of the 1985 financial year. The respondent reported that the group treats tax as a cash flow, when it is paid. The group includes tax in the appraisal if it is likely that a tax payment arises for the "tax group of which the individual company is a member". It does not, however, allow for the transfer of capital allowances and losses between member groups.
Group I

This group is primarily involved in engineering, achieving a turnover of about £540 million in the 1985 financial year. A time span of 2 years is employed in the capital budgeting process, with a five year strategic plan. The average size of the capital budget is £12 million.

Creation Phase

The group employs a systematic search for investment opportunities, and most projects emanate from operating companies. Only projects costing over £50,000 are subject to approval centrally. The projects are originally screened for short term profitability, and whether they are necessary to maintain operations.

Non economic projects are not undertaking intentionally other than those required by law or for considerations of public relations.

Decision Phase

The group uses the following evaluation techniques in project appraisal: NPV, IRR, PP and ARR in order of importance. The discount rate is based on the weighted average cost of capital which at present is 10.5% after tax. It is based on the current
market values of the sources of finance, and on the existing
debt/equity ratio. The cost of capital is revised twice yearly,
after the publication of the results. Discounting takes place
quarterly for the first two years and then annually.

The forecasted cash flows are based on estimates which undergo
further checking if deemed necessary, and the actual outcomes are
monitored against the forecasts. Changes in working capital are
included in the forecasts, and, where appropriate, the residual
value of the investment is also included. The group employs a
group wide hurdle rate for investments in the UK. Inflation
effects are included by adjusting the cash flows and the discount
rate.

Risk

Risk is analysed in project appraisal by using a risk adjusted
discount rate, the coefficients attached to the different risk
classes, is given in the appendix. Sensitivity analysis is also
used to determine the effects of varying key variables, including
tax. The management define risk as "the degree of divergence of
the actual outcome from that projected." Projects are broadly,
but not rigidly classified in accordance with their estimated
riskiness.

The group does not use other management science techniques.
Implementation Phase

The group conducts post audits on projects exceeding £300,000, 3 years after start up. As to whether the project is likely to be dropped "the decision will depend on the estimated comparative costs (including intangibles eg employee and public relations) of continuation, retrenchment or liquidation."

Group strategy

In most cases the companies in the group are aware of projects undertaken elsewhere, although the group does not allow for the transfer of capital allowances and losses between member companies.

Taxation

The group includes tax as a cash flow when it is physically paid. The group at present has unrelieved ACT, but does not alter the tax rate used in the evaluation as it expects the situation to be short term. The group does not alter the cost of capital if interest deductibility is unobtainable. The group stated that it used the marginal tax rate in its appraisals.

Finance Act 1984

Following this legislation, wherever it was possible, all capital
expenditure was brought forward. The legislation has led to
greater emphasis being "placed on the control of working capital,
since stock relief is no longer available." The group does not
attempt to forecast changes in the tax system, "but possible
changes are incorporated in sensitivity analyses. Most of the
1984 changes were probably not foreseen."

Leasing

The group stated the following with respect to the companies
involvement in leasing: "the group has no preconceived views on
leasing. A substantial portion of fixed assets employed by the
more recently acquired companies is leased. Of more than 1000
motor vehicles used by the group in the UK nearly one half are
leased. Periodic evaluations of leasing vs owning are carried
out in respect of motor vehicles and some leased premises. Cash
flows resulting from leasing and owning of capital assets are
discounted at an appropriate rate (in the case of the motor
vehicles the rate is currently at 7.5% pa after tax.)
This group of companies is involved in the retail industry, with an annual capital budget of around £120 million. The time span employed in the capital budgeting process is one year and the group has a five year strategic plan.

**Creation Phase**

The group looks for investment opportunities, which usually arise at the operating level. Targets for investments are set and it is then the responsibility of the operating unit to find suitable projects to fully utilise the target investment. The group allows for quick decisions to be made, based on knowledge and judgement, and then later requires confirmation.

The group may invest in support projects which may not show a direct return.

**Decision Phase**

The individual companies may approve projects under £5000 if they were included in the approved plan, otherwise, and projects above £5000 require approval up to the chairman.

The group uses the payback period, the internal rate of return and the accounting rate of return in project appraisal. The
respondent stated that if it is necessary to squeeze, the management will look for a lower payback, or if it is necessary to justify something the payback will be used, otherwise all investment are required to achieve a minimum determined rate of return. Subsidiary criteria may be used for other investments. The group attempts to simplify the process for the divisions. The rate of return required is based on the expected return on company equity, with discounting occurring at the year end, annually. The cut off point is 20% after tax.

Forecasts of the cash flows are made based on external forecasts of sales, costs and inflation. The divisions are not asked to do a cash flow analysis if the project assumes a certain profile, for example if it reaches 40% in the first year the group is satisfied that the project will achieve a 20% IRR. Major projects are more critically reviewed with a full cash flow analysis undertaken.

The forecasted cash flows are checked for accuracy using both variance analysis and post audits. Working capital changes are included in the cash flows, as is the residual value of the investment if there is one. However, usually there is no residual value.

The respondent stated that the company's present cost of capital is somewhat less than 20%, based on the stock exchange expectations. The group has a group wide hurdle rate of 20%.
which is based on what the stock exchange requires.

Inflation is built into the appraisal.

Risk is analysed by using sensitivity analysis on major projects. The management define the major risk as to whether the density of sales will be achieved. The group does not use other management science techniques.

Implementation Phase

Post audits are conducted one year after start up. It is possible that the group could pull out of a project, but this would depend (a) on the investment, and (b) how far commitments have been progressed.

Group Strategy

Although the member companies could discover what projects are being undertaken elsewhere, the respondent stated that it is unlikely they will bother as they are probably not interested. The group allows for the transfer of capital allowances and tax losses between member companies, although the respondent stated that the situation is not appropriate now. If the transfer was to take place, there is no recompense payable by the claimant, as the respondent stated that tax is treated as a group issue.
Taxation

Tax is taken into account when paid, with a one year tax lag. The respondent stated that tax is not calculated for every project, as the divisions do not consider it because they are given a pre tax criteria which leads to a satisfactory after tax return, except for "one off property evaluations". The group has unrelieved ACT and alters the tax rate used in project appraisal accordingly, which is at present 5%. The group also had unrelieved losses and unclaimed capital allowances at the end of the 1985 financial year.

Finance Act 1984

This legislation led to a change in calculations, and the group generally considered the lowering of capital allowances bad. The main effect of the legislation was on leasing, but that was marginal. Although the group has a tax adviser the status quo is generally assumed, however the group is sensitive to tax changes.

Leasing

The group leases internally, and also leases property.
Retailing is the primary activity of this group of companies. The group utilises a three year capital budgeting plan with a similar strategic plan. The group spends, on average £60 million, excluding acquisitions, on capital investment.

**Creation Phase**

The group systematically seeks new store locations, but other capital projects arise as and when they are required. There is a development group in each of the retailing divisions, which seek opportunities, in connection with the divisional management and corporate planning group. Each division has computer models to assess the proposals.

Non economic projects are generally not undertaken unless there is a "strong strategic reason".

**Decision Phase**

Projects over £750,000 require approval centrally, and below this amount there are varying levels of authority depending on the divisions.

The group uses the following evaluation techniques in capital investment appraisal: IRR, NPV, and PP in order of importance.
The discount rate is derived from the capital asset pricing model, that is the market cost of capital adjusted for risk and gearing. Each division uses the same discount rate. The cash flows are discounted yearly unless it makes a material difference, for example the early merits of a new site, when discounting will take place more regularly. The cut off points for the methods are as follows: NPV and IRR 10% real rate, 15% including inflation but there is no hardfast rule for payback. The forecasted cash flows are based on best estimates which may be checked with reasonability tests. The forecasts are audited by comparing the actual profit and loss account with that forecasted. The group includes changes in working capital in the cash flows. The group includes the residual book value of the investment in the cash flows at the end of ten years, which is the time span the group uses in the evaluation. The company's present cost of capital is 10%, and is revised annually. As previously stated the group employs the capital asset pricing model, adjusted for gearing based on the planned debt equity ratio. The costs of the sources of finance are based on the current market value of equity with the historical cost of debt. The group employs a group wide hurdle rate.

**Inflation**

The pre and post inflation cash flows are calculated, although the respondent stated they are likely not to be significantly different.
Risk

Risk is inherent in using the capital asset pricing model. The group defines risk as the possibilities of under or over achieving the level of sales required. The group also uses sensitivity analysis, but does not use management science techniques.

Implementation Phase

A monthly cost control system is used to audit the forecasted cash flows, and a post audit exercise is conducted annually. If a project is found to be uneconomic at the post audit, and action cannot improve the situation the investment may be sold or relocated.

Group Strategy

The group does not allow for the transfer of capital allowances and losses between member companies because "all projects are evaluated under the same tax assumption for direct comparison. The timing of the investment, anyway, could not be predicted with the required accuracy."

Taxation
Tax is taken into account in project appraisal when it is actually paid, with a tax lag of one year. The group is in a tax paying situation and does not have unrelieved advance corporation tax. The group uses the marginal tax rate in capital appraisal, which at present is 35%. The group does not employ sensitivity analysis to assess the effects of different rates.

Finance_Act_1984

The respondent stated that she was not aware of the group's reaction to this legislation and did not know whether it had led to a change in policy. The group does not attempt to forecast changes in the tax system, but assumes a status quo.

Leasing

The group is involved in leasing through rented property.
Group W.

This group of companies is involved in manufacturing. It has a three year rolling capital budgeting plan, with the first year detailing profits is excess of £25,000 and requiring the divisions to state the priority ranking for the projects. The strategic plan is based on a 5 year rolling plan in broad detail, which does not require priorities. The annual budget for the group is between £35 to £40 million.

Creation Phase

The group has a corporate planning department which liaises with the companies in the search of potential acquisitions. Investment plans for plant and machinery are left to the individual companies, who must include projects in their budgets. Subsequently, if they require plant for a new project they are required to apply for it before the project proceeds.

Most projects arise at the "grass roots level", and only projects exceeding £50,000 are approved centrally.

The group sometimes invests in non economical projects, for example investment for health and safety in the factories.

Decision Phase

£459
Projects are approved at different levels depending on the size of the investment and whether it has previously been approved in the budget. The ceilings are as follows:

- £50,000: management board member
- £50,000 - £250,000: chief executive
- £250,000 - £500,000: chairman
- >£500,000: main board

The group uses the accounting rate of return, the payback period and the internal rate of return in project appraisal. The cost of the marginal debt is used as the discount rate on borrowed funds which is increased to take account of the gearing effect based on a target return on capital of 20%. The cut off point for the payback period is flexible.

The company forecasts its cash flows using particular models taking into account fixed capital expenditure, working capital and the interest charge, as well as incremental revenues and costs from the project. The effect of tax is calculated on a marginal basis, by looking at the marginal impact on the business. The forecasts are checked for accuracy against the actual.

The residual value of the investment is not normally included as a cash flow, because the evaluation is considered over 5 years, whereas plant and machinery may be depreciated over a long
The cost of capital is based on the marginal cost of debt for each project, although the respondent stated that it generally did not vary, as all the companies in the group had access to funds at the same borrowing rate.

There is usually a group wide hurdle rate, although there is some flexibility if there is an "interesting project", providing the long term rates were satisfactory.

**Inflation**

Inflation is included on a "rule of thumb expectation of inflation" basis. The respondent stated that the marginal cost of capital is in money terms, so inflation must be included.

**Risk**

The group incorporates risk into the analysis by using sensitivity analysis, and looking at + and - 10%. The management define risk as the uncertainty of sale volume which is the major variable influencing profits in the business. The group does not use management science techniques.

**Implementation Phase**
The group requires monthly statements of actual costs, to be compared against authorised limits. Post audits are not used to a great extent. If a project is found to be uneconomical, the respondent stated that it would probably be too late to do anything about it, due to most projects having a short gestation period of between 12 - 18 months, for even important new product lines.

Group strategy

The companies are usually aware of projects being undertaken in other member companies, albeit unofficially. The group does use group relief where possible to transfer capital allowances and losses between member companies, but this is not taken into account in project appraisal.

Taxation

Taxation is treated as a cash flow when it is paid. The group does not have unrelieved ACT at present, and uses the marginal rate of tax in project appraisal. The respondent stated that the existence of capital gains tax roll over relief may accelerate the purchase of plant and machinery.

Finance Act 1984

The group's reaction to this legislation was "initially
marvellous", but it led to a deferred tax problem. The respondent stated that the effective rate of tax was getting closer to the statutory rate. The group's reaction to this legislation was to accelerate capital expenditure before first year allowances were curtailed. The group does not attempt to forecast changes in the tax system.

The group is involved in leasing as a lessee and a lessor, leasing vehicles, computer equipment but not major items of plant.
This group of companies is involved in engineering and has an annual capital budget of £6 - 10 million. It employs a 5 year long term capital budgeting plan which forms part of the strategic plan, and requires a 12 month budget for capital expenditure in detail.

When the group has surplus funds new products or new acquisitions are sought. Proposals generally arise at the subsidiary level, or, the divisional level within the subsidiary, depending on the size of the company.

Each subsidiary is given a total annual budget which is assessed in relation to the past growth of the business and whether it will give rise to an increase in the net or gross value. It is the responsibility of the individual subsidiaries to decide which projects to adopt.

The group may undertake non economic projects "could be forced into it" for example to comply with Local Authority requirements.

The payback period and the accounting rate of return are used by the group to evaluate projects, but the respondent stated that there is not standard cut off point, because each business differs, instead the criterion adopted is "what is currently being achieved by the business".

F464
Forecasts are prepared, based on a combination of detailed cash plans leading to a balance sheet and a profit and loss account, along with the production of a source and application of funds statement. Ratios are also prepared to determine the type of finance required. The forecasted cash flows are checked against the actual flows and weekly reports prepared. If there are differences an explanation is expected.

The group includes changes in working capital in the appraisal, and treats the residual value of the investment, usually the book value as a cash flow. The market value is used for motor cars. The respondent stated that the book value is generally small due to the policy of depreciating the assets more quickly than perhaps is necessary, rather than appearing to have assets worth more than their actual value.

The respondent stated that the group itself did not have a specific cost of capital but that it differed between the different companies, due to some having an equity base, whilst others were more heavily geared. The various costs of capital are looked at annually in the 5 year plan.

Inflation is incorporated in the individual projects, but is not considered in the overall plan.

It was stated that risk should be looked at in project appraisal.
although whether it actually happened depended on the individual businesses. Sensitivity analysis is used to an extent, the respondent stated that more emphasis had been put into it recently. The management define risk as the likelihood of not achieving the project's objectives, which may be affected by technical feasibility, competition, market potential and obsolescence.

Management science techniques are generally not used but the respondent stated that there "might be a situation where we could use it".

Cost control is achieved by the weekly reports previously mentioned, and a report produced bimonthly consisting of the profit forecast for the current year, which goes to the divisional board. The respondent stated that a lot of work undertaken was on long term contract, which may be broken down into small parts, and the costs monitored against each part. Post audits are not conducted formally, although if there were inconsistent results, or completely different results the group would "dig back into it".

As stated previously there is a ceiling on the annual capital budget of each company, and if a company is likely to exceed it an application must be made to the Head Office.

Companies are generally not aware of projects being undertaken by
other companies, and the group does not allow for the transfer of unclaimed capital allowances or unrelieved losses between member companies.

The group has unrelieved advance corporation tax, and unrelieved losses and unclaimed losses in some subsidiaries, but uses the average rate of tax in its project appraisals. Tax is included when it is actually paid. The group does not use sensitivity analysis to determine the effects of different tax rates.

The group brought forward some capital projects following the Finance Act of 1984. The legislation has not curtailed capital expenditure to any great extent, but the respondent stated that it may be more difficult to justify projects now, as they required financing for longer. The group takes advantage of the allowances for scientific research which were not affected by this legislation.

The group's tax advisors may have an idea of possible changes in the tax system, but the group does not attempt to forecast changes other than recognising political effects.

The group is involved in leasing to a limited extent, in that a small leasing company was set up for tax purposes, although the group does not consider this effect quite so significant now. The group used to lease most of its computer equipment but hire purchase arrangements are now preferred. The respondent stated
that the group would lease assets with relatively short lives although vehicles are not leased.

The respondent stated that the group had attempted to take advantage of the allowances available to Development Areas, but that in general the disadvantages outweighed the advantages. One attempt was made to move a business to a Development Area, but, due to the problems of communications and a depressed locality it was not successful. The respondent added that in future the group would be more selective and would not move so far away from the South East.
Group Y

This group is involved in electronics, and has an average annual capital budget of £8 - £16 million, the amount partly depending on the state of the economy. The group's capital investments fall into two classes, normal expenditure, which may include the refinancing of the existing product range, with the group having up to 25% growth in the existing range, and special expenditure such as new buildings and new products. A quarterly list of proposals is required, with proposals under £10,000 only needing information concerning what the project actually is, but projects over £10,000 require a financial evaluation. More detail is required for some projects including market research, the technical feasibility of the proposal, an assessment of the competition and an assessment of the risk and lifetime of the project. A rate of return is then required in relation to the lifetime of the investment.

There are 23 subsidiaries in the group, each of which is required to submit a yearly budget. Each November a budgeted profit and loss account is prepared and a capital expenditure budget is undertaken.

The group's policy plan consists of the current year plus three, and looks at the product markets taking full advantage of the the opportunities up to date, prices, what development costs are required to sustain products, employee/management relations and
how much money is needed for growth etc. The respondent stated that the capital budgeting plan should resemble the policy plan.

The group searches for projects falling into both the normal class and the special, with projects arising through development, and looking to the next generation of products for the next 5 years. The group also looks for desirable opportunities either for the individual companies or the group, to bring in something new, for example the respondent stated that the group may be entering a licensing agreement in order to get their products out on time and at a marketable standard.

The projects are usually screened at the operating unit level, with the main criteria being expected growth.

The group sometimes invests in non economic projects, for example test products which may be a technical necessity could have payback periods but be difficult to justify financially.

Most of the projects are received by the Capital Budgeting Committee on a kind of shopping list each quarter, where they are generally approved by the Capital Budgeting Committee which will assess the company based on past experience, but, if necessary more information will be requested. Marginal projects of say £12,000 may be treated quite simply if they are for such as replacements, although a standard form will be required for them.
Net Present Value is the main criteria used for evaluating projects, although discounted payback may be used as a secondary method. A return of 17% post tax is required, and if a payback of 2.5 years is achieved the project will be considered good, although a payback of 3 years will not be considered bad, but it will depend on what the project actually is. The discount rate used is based on the weighted average cost of capital, 26% pre tax and 17% post tax, weighted by assuming a 50% gearing and based on the current rates of debt and equity. The current rates are estimated on the 1st of January each year as to what is expected to be the mid June rates. The respondent stated that this rate was fixed when the tax rate was 52%, but stated that although the tax rate has decreased, the difference to the cost of capital was small. The rate also allows for 15% growth and is based on the assumption of paying a reasonable dividend with a small surplus. The discount rate is used as a group wide hurdle rate.

If the project shows a good payback it will be discounted yearly, but if the project is particularly large discounting will occur monthly.

The cash flows are estimated partly through using market research, and include actual costs and incomes. The forecasted cash flows of large projects are checked for accuracy but the respondent stated that it may be difficult through trying to apportion overheads, however the most important criteria is
whether the required return on capital employed has been achieved, and if so the group does not go back into that particular company's projects.

Changes in working capital are included in the cash flows. The respondent stated that in a good project achieving a zero NPV after say 2.5 years, the residual value of the investment is not included, but is mentioned by assuming an "alternative value". If the project was in the special purpose class where say a building cost more than its market value, say £1 million and £700,000 respectively, a residual value would be put in not lower than 70%.

Inflation is included by adjusting the cash flows.

Risk is included in the appraisal by using the payback period and looking at particular risks. The respondent stated that sometimes it is the life of the project which is the risk, suppliers may be another problem and whether there is a sufficient quantity of staff to support the new product. Market potential may be another source of risk. The respondent stated that proposers of projects were not allowed to show an increase in the growth of the project above 2 - 3 %, other than if orders were already in hand.

Sensitivity analysis is not used in all cases especially if the project shows a good payback period. When it is used the best
case and the worst case are examined particularly in terms of turnover, the respondent stated that people can be too optimistic. Management science techniques are not used for normal projects but the group did have computerised models for very large projects.

Cost control is achieved at the operating company level. Post audits are conducted on the larger projects, but the respondent replied when questioned about the likelihood of a project which is found to be uneconomic being dropped, that it was usually a complex situation, but if necessary the project may be closed, after the situation has been analysed.

The companies within the group are generally not aware of projects being undertaken elsewhere in the group. The transfer of unclaimed capital allowances and unrelieved losses between member companies is not allowed for in project appraisal, with each company being assessed for tax separately.

Tax is included in project appraisal when it is actually paid, and charged at the average rate of tax. The group does not have unrelieved advance corporation tax, and would not consider the effects of such on the appraisal of projects if it did have unrelieved advance corporation tax. Sensitivity analysis is not used in project appraisal. The group does not have unrelieved losses or unclaimed capital allowances.
The group considered that the Finance Act of 1984 had increased the expense of capital projects, but did not consider that it had lead to a change in policy. The group does not attempt to forecast changes in the tax system.

The group is not involved in leasing having previously sold its leasing company.
This group of companies employs a 10 year global product replacement cycle, a 10 year strategic plan, with a £20 million annual capital budget. The group is divided into four divisions and 12 trading legal entities.

Creation Phase

The group looks out for projects in the following categories:

- normal replacement as it arises;
- research and development; and,
- acquisitions

with many of its projects being "leading edge one offs".

The projects arise at all levels in the hierarchy, and are first identified within the corporate plan. The project then receives a full evaluation. The budget plan is the initial screening process. A higher view will be taken of the particular proposal if it involves an acquisition.

Non-economic projects are sometimes undertaken in health and safety, the working environment and some speculative research and development areas.

Decision Phase
The levels at which projects may be accepted are subject to ceilings as follows:

- <50,000: local management
- 50,000 - 100,000: divisional board, on which a group representative sits
- 100,000 - 250,000: group management board (executive)
- >250,000: PLC board

The internal rate of return and the payback period are used to evaluate projects. The hurdle rate for the internal rate of return is 25% post tax, derived from the weighted average cost of capital multiplied by two for risk, i.e., $10\% - 15\% \times 2$. The weighted average cost of capital is based on the cost of debt including preference shares, and the cost of equity, as estimated by a merchant banker. The weighted average cost of capital is revised infrequently. The respondent stated that the changes in the cost of equity were very frequent and therefore it would be difficult to keep in line with the changes. Discounting occurs at the year end. The hurdle rate for the payback period is 3 years, undiscounted. The hurdle rates are group wide guidelines, assuming moderate risk, but say a project had no risk but only achieved an internal rate of return of 15%, it may be accepted.

The forecasts are based on a subjective view of incremental cash flows. The respondent stated that the forecasts should be checked against the actual for accuracy, but in practice it
depended on the availability of resources. Changes in working capital are included in the cash flows, and if the residual value of the investment can be estimated, it will also be included in the cash flows. The internal rate of return is based on cash flows on 10 years, and the residual value of the investment at this stage is usually zero, however if there was a remaining book value it would be included.

Inflation is not included unless it is considered significant, everything is included at constant prices, and, only if specific inflation had a great effect would it be included.

Risk is included by altering the hurdle rate required. Risk is defined by the management to be the failure to achieve and produce what was expected, or if market assumptions are wrong. Sensitivity analysis is not used, but the respondent stated that he had asked for it to be done. Management science techniques are not used, but the respondent stated that in a capital rationing situation it may be used, however the decision would still be subjective.

Implementation Phase

The respondent stated that although the group did not conduct post audits at the moment, it would be doing in the future depending on resources. The respondent stated that it is unlikely that a project found to be uneconomic at the post audit
stage, because it would probably be "too far down the line", but that the situation may be different in the future.

The group however only conducts project appraisals if it involves multiplant investment, whereas if it is for a single contract, the investment is treated as work in progress.

**Taxation**

The transfer of capital allowances and losses between member companies is not allowed by the group, but the respondent stated that they were aware of the problems of companies evaluating proposals in isolation.

Tax is included in the project appraisal and is charged at the average tax rate, and treated as a cash flow when paid. The group at present has losses.

The Finance Act of 1984 has led to a reduction in spending, as the reduction in tax rates has not been as great as the lower capital allowances. However, the legislation has not lead to a change in policy.

The group does not attempt to forecast changes in the tax system.

The group is involved in leasing as a lessee, and was involved as a lessor when capital allowances were 100%.
Group AA

This group is involved in the production of a wide range of consumer products, and provides consumer services. It employs a 5 year capital budgeting plan and a 5 year strategic plan, with an annual capital budget of £10 million.

Creation Phase

The group actively searches for potential acquisitions, but does not search for investment in fixed assets, which tend to arise through the marketing plan. Most of the proposals arise at the operating unit level, but very large strategic acquisitions arise at the head office.

The business plan is used to draw out the strategy of various proposals. Some of the capital expenditure is used to maintain the strategy. The management considered the marketing of its products to be more important than the capital expenditure.

The group may undertake some non economic projects for environmental reasons or legisatory requirements. The respondent stated that where "replacements" were needed to keep in business the profitability of the business did not change, and thus there was no return, but the investment was necessary.

£479
Projects are accepted at various levels according to their size. Projects up to £50,000 may be accepted at the divisional level, providing they have been included in the budget. The sub unit may determine the levels of delegation for projects under £50,000.

Projects are generally submitted singularly, but if a project is part of a larger project, for example the provision of computers in laboratories, the project will be submitted to the relevant approval level as a whole.

The NPV and the PP are used by the group to evaluate projects. The hurdle rate for the NPV model is a discount rate of 15% post tax, based on the weighted average cost of capital. The weighted average cost of capital is based on a gearing level of 33.3%, a rate preferred by the management, although the current rate of gearing is lower. The rates used are historical, about a year old. The respondent stated that a decrease in interest rates was often offset by an increase in the cost of equity. The weighted average cost of capital is looked at annually, but it has not been revised.

Forecasts are estimated using all the information available, for example market research and a knowledge of the product and the market. Forecasts showing a growth rate in excess of 15%, are
only accepted if they can be supported.

Post audits are conducted on very large projects, but otherwise projects are controlled by a bonus system operating on the basis of the return on capital employed, ensuring that money is spent correctly.

Changes in working capital are included as cash flows. The residual value of the investment is included on the larger and longer projects, but generally most of the assets are considered to be "worn out" by the end of the project. The residual value is included when acquisitions are evaluated.

The hurdle rate of 15% includes inflation and the cash flows are inflated.

Risk is not always included in the appraisal of a project for example, if it is a yes/no decision, otherwise it is included by adjusting the discount rate or by judgement. The management only considers disastrous things that are outside the control of the group, as risk. The group is marketing biased and as such considers that it should know the market, but other changes may occur such as governmental changes or changes in the interest rate. The group uses sensitivity analysis, and sometimes uses linear programming, for example to match demand and supply.

Post audits are the responsible of the operating unit, and are
conducted 1 year after start up. The respondent stated that it is highly unlikely that a project found to be uneconomic will be dropped, as it will probably better to keep it than to drop it.

**Group Strategy**

The companies within the group are generally aware of projects being undertaken elsewhere, with the Group Managing Director coordinating the information. The group has two separate sides, one which is fairly integrated, within which the companies are kept well informed, and the other side which has very little in common.

The group does not generally allow for the transfer of capital allowances and losses between member companies, but would allow it if a company was temporary on hard times. The management do not hold people responsible for tax flows.

**Taxation**

Tax is considered in project appraisal when it is physically paid, and an average tax rate of, at present, 35% is adopted. The group does not have unrelieved advance corporation tax, but has unrelieved losses in some of the units. The respondent stated that they were difficult to get back. The tax rate is not altered to take account of tax losses, nil taxable profits and capital allowances. Sensitivity analysis is used to assess the
effects of different tax rates, if they are varied enough. The respondent stated that the group did not have many long term projects and therefore the tax rate was predictable at the moment.

The respondent stated that the Finance Act of 1984 had a positive effect, due to an increase in the effective rate of tax, and the company not being greatly involved in capital projects. The legislation has lead to some subtle changes in the group's policies, for example the financing decision.

The group does not attempt to forecast changes in the tax system.
This group of companies is involved in the transport industry. Due to the type of sector it is in, it employs a short time span in its capital budgeting process, however, once an asset has been obtained it remains within the company for a long time. The gestation period for assets is usually about two to three years.

The group’s strategic plan is very short, approximately 12 to 18 months, beyond that the group assumes a "bedrock of business". The respondent stated, however, that the group was quite reactive to changes. Longer term plans have been drawn up in the past, for example for finance, and the management had found them useful on a subjective basis.

The group’s annual capital budget is between £5 and £10 million.

Creation Phase

The group tends not to be a "front runner" at the start of innovation, but if there appears to be potential in the investment, the group may enter it, and grow in the area. The group sometimes ventures into new areas, and looks out for opportunities. The group is often approached by other companies with investment opportunities.

Most projects originate within the directorate.
When the projects are originally screened, profitability, and the fit or link of the project with the present strategy and business areas are considered. The group "draws it into its net and grows from it".

The group undertakes non economic projects for strategic reasons, but there are problems as to how such projects are to be supported. The group prefers the projects to "be transparent".

**Decision Phase**

All projects are evaluated at the head office, the respondent stated that sometimes it almost reaches "a silly stage", and cited an example of a buyer who had tacit approval to purchase £50 million of goods, but required approval for purchasing computer facilities.

Projects in excess of £4 million would be well scrutinised, and would have to be really super for approval.

The group uses the accounting rate of return to evaluate projects, and considers whether a better return or payback will be achieved. The group also prefers balanced cash flows throughout.

The hurdle rate for projects is 10% to 20% in absolute terms.
based on subjective estimates, and the rate previously enjoyed by the company. A lower rate would be accepted if the investment would be ongoing for a long time.

Forecasts of cash flows are based on current experience and knowledge of how things may go, and a reasonable pattern is assumed in relation to the past. The group's activities are such that it receives a large amount of money in advance, however the group also has to pay out in advance.

The forecasts are checked against the actual flows on a continuous basis, due to possible large changes in operating costs having an enormous effect on cash flows.

Changes in working capital are usually included in the cash flows but not to any great extent, with stocks providing the largest changes in working capital. If the change has a large impact on the cash flows it will be automatically taken into account when using the accounting rate of return.

The residual value of the investment is not included in the evaluation, even though the asset may have a residual value, however a note is made of it. The group's cost of capital is based on its return on capital employed, and determined from the balance sheet, which shows the total capital employed. The hurdle rate required from the companies differs within the group.
Inflation is not recognised in the capital project evaluations, but the group is aware of it. The respondent stated that "all it did was create problems in assessment", however it is considered important because of the type of business, that is receiving cash "up front". Risk is acknowledged by looking at the down side of the investment and considering contingencies, sensitivity analysis is not used. The management define risk as obsolescence and changes in costs. The group does not use management science techniques in project appraisal.

**Implementation Phase**

The group uses post audits, but as the respondent stated, not as well as it should. Whether performance measures up to what was expected is considered more than actual costs. A project found to be uneconomic at the post audit will not be dropped, the respondent stated that "it was too hard, but the companies may opt out of assets with a life of 10 years, if a good alternative was available to replace it". The group considers environmental factors important.

**Group Strategy**

The member companies are aware of projects arising elsewhere within the group at the directorate level, however, because the business is very competitive, the number of people who are aware is restricted.
The group does not allow for the transfer of capital allowances and losses between member companies in project appraisal.

Taxation

The group does not consider tax in project appraisal but takes an overview on taxation on all asset acquisitions. The respondent stated that "the group was not in a tax paying situation, but would not mind paying it if the group were making large profits."

The group at present has unrelieved losses, advance corporation tax and unclaimed capital allowances.

The respondent stated that the group's reaction to the changes brought about by the Finance Act of 1984 was enormous and the lowering of the tax rate was excellent. The group had had considerable options in assets which were leased, but following this legislation were purchased.

The group does not attempt to forecast changes in the tax system.

Leasing

The group is still involved in leasing a great deal, both financial and operating leases, which are cheaper because of the capital allowances. The group however likes to have an equity in
the leases, due to there being little flexibility in leasing.

The respondent stated that the group was trying to preserve its non tax paying situation. The company had previously wanted to relieve both its associate and consortium companies but, because of s.258(2) of the Income and Taxes Act 1970 was unable to do so. Assets were therefore transferred to another company for commercial reasons which indirectly provided tax benefits enabling all the profits to be relieved.
This group of companies is involved in the provision of distribution services to industry. The group employs a capital budgeting plan of 1 to 2 years. The first year is given in detail listed under each month and the second year is divided into two half years. The planning process occurs mid yearly, when summary capital budgeting figures for the 3 years beyond the current financial year are determined. The respondent stated that beyond that the figures tend to become extrapolations and are not essential as the timetable for implementation of projects fits comfortably within a three year forecast period. Large items or new developments are listed separately in the capital budgeting plan, and may be accepted/rejected or noted at the budget review. The average size of the capital budgeting plan is £30 million.

Creation Phase

The group systematically searches for investment opportunities. The proposals arise throughout the group, in the corporate head office, the divisional units or within the individual businesses. Proposals arising at the divisional level tend to be more strategic and the large scale acquisitions arise at the head office level.
The projects receive an initial screening, and the internal rate of return and the payback period are calculated. They are then forwarded for a formal evaluation.

Non-economical projects are sometimes undertaken, for strategic environmental requirements, to upgrade and change equipment and to meet standards as they get tighter, otherwise a licence will not be granted. Health and safety investments were also cited as examples of non economical projects.

**Decision Phase**

Projects between £300,000 and 500,000 are approved by the executive committee which meets weekly, whereas projects above £500,000 are approved by the main board which meets monthly. Projects up to £300,000 may be approved by the Divisional Managing Director or Financial Director, who may delegate down responsibility for lower ceilings.

The group uses the internal rate of return primarily, followed by the payback period and finally the net present value method to evaluate capital projects.

The weighted average cost of capital is used as the discount rate based on the current market rates of debt and equity and the planned target gearing ratio. The weighted average cost of
capital is looked at annually, but is found to fairly insensitive to changes. Discounting occurs at the year end. The cut off point is 14 - 15% post tax with a fairly flexible payback period of 5 years. The respondent stated that the group's cost of capital is also 14% to 15%.

The group forecasts its cash flows using its own resources based on project volumes, rates, costs, working capital requirement and capital expenditure requirements. If the investment involves a new market external resources are sometimes used. The forecasts are checked for accuracy by conducting a post audit as soon as is feasibly possible after start up, which usually occurs after 12 months. Monthly financial reports are produced which particularly reflect the project's performance, especially if the projects is a "stand alone" project, otherwise the company is questioned as to the project's performance. When the proposal is submitted information about contingency plans is also asked for, and on occasions small projects have been abandoned.

The group includes changes in working capital in the cash flows. Whether the residual value should be included in the cash flows is left to the proposer, but the proposer must be able to justify it. The respondent stated that it may be the "most important thing in the project paper" and that the difference between a good and a bad project may depend on the assumptions made on the residual value. If the current value of the investment is used as the residual value, the assumption is scrutinised very
closely.

At present the group has a group wide hurdle rate, but this is in the process of changing, with the management looking at where the main strategic growth and development is for the future, and considering which projects are cash generators and which are useful for the portfolio. The respondent stated that there may be different rates for the two different classifications of business.

Inflation is included in the evaluation.

The respondent stated that the group's weakness in capital budgeting was their treatment of risk, 5% and 10% changes are examined but the respondent would like to see probability analysis used. Management science techniques are not used.

Implementation Phase

Post audits and monthly budgetary controls are used as described above.

Group Strategy

The divisional head offices within the group are generally aware of projects being undertaken elsewhere in the group, but the group does not allow for the transfer of capital allowances and
losses to be taken into account in project appraisal.

**Taxation**

The group includes tax in project appraisal when it is physically paid. The group charges the average rate of tax on its cash flows, although it has unrelieved advance corporation tax.

The Finance Act of 1984 coincided with a change in the group, which presented an extra factor in something being done anyway. Traditionally, because of capital allowances, tax has been considered important, but the early 1980's saw a reduction in the exposure to the assets attracting the 100% allowance, and there are no medium term plans for the purchase of such assets. On the whole the group found the changes brought about by the legislation advantageous.

The group does not attempt to forecast changes in the tax system.

**Leasing**

The group is involved in leasing at present, but does not intend to enter any new leasing agreements, apart from possibly motor vehicles and computing equipment.
This group of companies conducts research and develops, manufactures and sells pharmaceuticals and foods. It has a five year planning cycle including related capital expenditure and one year budget process. It spends between £200 to £300 million per annum on capital investment and 3/4 of this was spent in 1986 in the United Kingdom, principally on new and improved primary and secondary manufacturing capacity but also included investment to support the Group's research and development programme.

Creation Phase

Projects originate mainly from group companies involving new product facilities, factories, joint ventures, acquisitions and local expansion but there are projects which can originate from group involving major acquisitions, licensing and global products. These latter projects usually involve a major new product where primary and secondary manufacturing strategy has to be decided.

Projects are originated by companies usually as part of their capital and budgeting process though some do arise because of specific need which have not been budgeted. Projects may arise for financially non quantifiable reasons such as health and
safety, government legislation and current standards of good manufacturing practice.

To be included in the plan and budget projects are assessed in terms of priority and local resources. When a project is required a full justification is then prepared.

Decision Phase

Projects require approval at different levels depending on their size, but all have to be approved by the local board and regional controller or director before submission to Group. There are various ceilings of approval but most projects over £150,000 have to be submitted to Group for consideration by the relevant functional committee before transmission to the Group Management Committee and depending on the size of the projects to the Board.

In carrying out a financial evaluation of a project alternative courses of action are considered and incremental cash flows appraised. In doing this the internal rate of return is calculated and payback period methods can be used along with, in some instances the return on capital employed. There is no predetermined rate of return required for projects but companies should assess the minimum rate of return a project should offer with regard to risk of the project and prevailing interest rates. The project return is then compared to this. Payback periods are
often used to quickly assess project attractiveness and relative priorities.

In calculating cash flows it is normally appropriate to assume that the first year's cash flow occurs at the start of the period of appraisal and that subsequent cash flows occur at yearly intervals thereafter. Both the residual value and changes in working capital are included in the cash flows, although the respondent stated that it is sometimes very difficult to determine the residual value.

Inflation is included in the evaluations by inflating each constituent part by its particular rate of inflation. There is no group wide hurdle rate, though in times of capital rationing it might be necessary to effect such a measure. At the moment, however, there is no form of capital rationing and the group is in any event considerably undergeared. The respondent stated that the group does have an overriding philosophy that if a project is considered attractive then finance will never be a problem.

Sensitivity of a project is tested and these calculations provide a measure of the risk of a project. In overall terms the principal risk facing the group is "never getting a new product again". If the group "falls down on research and development there may be a need to compensate for what may or may not turn
Implementation Phase

All cash flows are checked against the project and there is provision for post audits within the capital expenditure process. The respondent stated that some form of post audit was desirable in order to gain knowledge for the next project and that new authorisation had to be sought if project costs exceede the authorised cost by a fixed percentage.

Group Strategy

The member companies are aware of projects being undertaken elsewhere in the group "when necessary". The transfer of capital allowances and losses between member companies is allowed "in theory but in practice never happens", however the tax department looks at each proposal to determine whether the effective rate used is correct, and if necessary makes adjustments.

Taxation

The respondent stated that the group was interested in the "overall commercial aspects" of the projects rather than specific aspects such as tax, but that information concerning tax is required.
Tax is included in the cash flow when it is physically paid, and it is charged at the marginal rate of tax. There is unrelieved advance corporation tax at present. As stated above all projects are forwarded to the tax department.

Sensitivity analysis would be conducted to assess the effects of different tax rates if it was considered material.

The respondent stated that the Finance Act of 1984 had affected the group and some projects were submitted taking account for favourable tax allowances which were due to be phased out.

The group does not attempt to forecast changes in the tax system, although new changes are taken into account when assessing projects.

**Leasing**

The group is involved in leasing some assets. In capital investment there is often a first decision to be made between leasing and buying an asset and an example of this is in relation to computers.
Group ae

This group of companies is involved in merchandising. It employs a 5 year capital budgeting plan and strategic plan, and spends £4 million per annum on capital investments.

Creation Phase

The group does not systematically search for investment opportunities. Projects arise at all levels, and there is a project group to investigate new ideas arising.

At the initial screening the strategic worth of the project is considered to ensure it is geared to the main business. The group undertakes non economic projects in the health and safety area.

Decision Phase

Projects may be approved at the management level, but most are submitted to the board.

The payback period and the net present value method are used to evaluate projects. The respondent stated that most leasing companies had subsidiaries within the group each with accounting periods ending at different months, to enable the group to
benefit from higher first year allowances (when the rates were decreasing), and enabling the group to enjoy capital allowances up to one year earlier than if there were only one leasing company. This often allowed leasing companies to offer competitive rates to the group.

The group uses the overdraft borrowing rate as the discount rate and discounts monthly using a spreadsheet. The cost of borrowing is around 11% before tax relief, though the respondent stated that the group "usually pays less". It manages its borrowing on a day to day basis, borrowing if necessary and lending finance if the group has any surplus. If the lending rate is greater than the overdraft rate the group will lend money rather than pay back the overdraft. The respondent stated that a day's interest could amount to £12,000. The rate used in the net present value model is changed when the bank rate changes. The group "does not aim to have money in its current account". The ability of the group to withstand levels of borrowing is tested using sensitivity analysis.

The group calculates its cash flows "precisely" through knowing the amount of expenditure, tax rates, leasing quote, wages and likely increases, rent and rent reviews, likely inflation rate and to some extent the likely inflows. The forecast are checked for accuracy by using detailed budgets.

The respondent stated that there is likely to be little effect on
working capital, except possibly some new debtors. The residual value of the investment is included in the cash flows "if there is any".

The group's cost of capital is 11%, and is based on the borrowing rate. The cost of capital is revised when the bank rate changes and, "as the business increase, so must the borrowing rate, due to expenditure occurring a long time before cash is received".

The group has a group wide hurdle rate due to all borrowings occurring at the same rate. On average the group expects to pay a rate below the overdraft rate, and has an agreed facility with the bank to borrow at any point in time.

Inflation is included in the evaluations by adjusting the cash flows.

The group uses sensitivity analysis to determine risk, but is more concerned with the risk on merchandising than on capital expenditure.

Implementation phase

The group uses detailed monthly budgets to maintain cost controls but does not use post audits.

Group Strategy
The capital budgeting decision is centralised but the transfer of capital allowances and losses between member companies is not allowed for, although the respondent stated that if the group had unrelieved losses or unclaimed capital allowances it would consider it. The group had been approached by a loss making company, but did not agree to a take over due to there being no other commercial reason for the action other than tax saving.

**Taxation**

Tax is included in the capital appraisal when it is physically paid, and is charged at the statutory rate due to the group being in a full tax paying situation. The respondent stated that if the group had unrelieved advance corporation tax, it is likely that the tax rate charged would be reduced to account for it. Sensitivity analysis has been used to assess the effects of different tax rates, when there has been some doubt over tax rates in the past.

The group considered the abolishing of stock relief following the Finance Act of 1984, to be quite important, although it has not affected capital investment, although leasing is not considered as interesting now. The respondent stated that the group "would not base a capital project purely on tax".

The group does not attempt to forecast changes in the tax system.
The group considers the effects of projects on VAT to be more important than corporation tax in capital project appraisal.
This group of companies is involved in natural resources and industrial activities. The capital budgeting plan is for three years, but usually only includes routine items such as replacements, or specific opportunities if they have been identified and approved. The life of the projects varies greatly with projects concerning natural resources having a potential life of between 20 to 50 years. Other projects are evaluated over 5 to 20 years depending on the proposer’s assessment. The management do not necessarily restrict the level of total expenditure to the budget figure acknowledging that projects arise on an opportunistic level, and if they are justifiable financially they are proceeded with irrespective of whether they are included in the budget. Projects with a gestation period of 3 to 5 years are included in the budget, and may be for quite large amounts. The strategic plan is also for 3 years, and £400 million is spent annually on capital investments.

Creation Phase

The group employs a systematic search for projects, and the probables are then included in the plan. Replacement projects arise at the operating level, some speculative projects also tend to rise at the operating level due to decentralisation. Some projects originate at the group level and tend to be for major changes or acquisitions.
The initial screening of the project depends on where they have been originated.

Non economic projects are not purposefully adopted, although the respondent stated that although economic factors are always the most important, they may not be overriding.

**Decision Phase**

Major subsidiaries may undertake projects up to £10 million whereas smaller companies may undertake projects up to £1.5 million without reference to the parent.

The net present value model and the internal rate of return are used primarily in capital appraisal followed by the payback period. The discount rate is based on the estimated cost of equity (long run historic rate of return on the market) applied to ungeared cash flows. Discounting occurs annually "due to long life" of projects. The cut off point is 10% net of tax in real terms.

The group forecasts its cash flows using financial modelling computer programs at the operating level, the head office then scrutinises the cash flows to ensure they are realistic. The cash flows are checked for accuracy using budgets for each subsidiary, monitoring performance against each monthly budget.
The respondent stated that this was "not a useful method" due to the project getting buried with the accounting unit, although sometimes a project is reported separately.

Changes in working capital and, usually, the residual value of the investment are included in the cash flows. The respondent stated that a project may sometimes have residual costs such as rehabilitation.

The group's cost of capital is 10% post tax, based, as stated earlier on the estimated cost of equity. It is revised infrequently, due to the group's belief that the cost of equity is a "stable long run phenomenon", although the variances of annual returns is high." The respondent stated that "changes in the tax system may change expected cash flows but not the cost of capital due to it being defined on a post tax basis." The hurdle rate of 10% is group wide.

**Inflation**

Inflation is included when determining the cash flows, by deflating the money cash flows to real terms and applying the real discount rate, tax is treated in money terms, and the inflationary effects of working capital are included. Assumptions are made on each country's currency.

The group uses sensitivity analysis to assess the projects's
quantitative risk, and subjective judgement to analyse the qualitative risk such as political risk and other commercial risks. The group had tried using probabilistic analysis such as Monte Carlo simulation, but the decision makers had difficulty in understanding the model, and there had been difficulties in obtaining sensible probabilistic data. The respondent stated that he thought the discount rate adequately reflects the risk of most average projects.

The respondent stated that companies worried about specific risk and it was difficult to get it across that it does not matter. The management define risk as not achieving the minimum rate of return. Management science techniques are used in some of the businesses, and in capital appraisal.

Implementation Phase

The group uses budgets to implement cost controls and post audits 2 to 3 years after start up. The respondent stated that it is unlikely that a project found to be uneconomic at the post audit will be dropped as it is usually too late once capital has been sunk, and it is unlikely that the project will continue to make cash losses. He added that this limits the usefulness of post audits the more capital intensive the group is, although it highlights the mistakes made when evaluating the project.

Group Strategy
Companies are generally not aware of projects being undertaken elsewhere in the group due to the geographical and industry diversity. The transfer of capital allowances and losses between member companies is allowed to be taken into account in project appraisal, in the United Kingdom it is assumed that there is free availability of group relief for immediate relief.

**Taxation**

Taxation is included as a cash flow when it is physically paid, and is charged at the marginal rate of tax, which is at present 6% due to unrelieved advance corporation tax. The group tries "to separate the investment and financing decision" and thus assumes 100% ungeared cash flows, it then considers the financing decision, assuming borrowed money has a net present value of zero.

Sensitivity analysis is used to assess the effects of different tax rates in particular the effect of a reversion to a 35% marginal tax rate in the United Kingdom. The group is unsure how long the unrelieved advance corporation tax will last and may require the companies to evaluate the projects using a 6% and a 35% tax rate. The respondent stated that where other taxes are concerned, such as the changes in the US tax system and changes in underdeveloped countries which may be quite large, more sensitivities are required.
The group considered that the abolishing of stock relief following the finance Act of 1984 had not been terribly important, due to inflation falling at the same time. The lowering of the tax rate had caused the marginal rate of tax to fall from 22% to 5%. Some projects were accelerated following the legislation, and there had been some changes in the estimated cash flows. The group does not seriously attempt to forecast changes in the tax system.

The group is not significantly involved in leasing, especially since the rates capital allowances had decreased.
This group of companies is involved in the leisure industry with an annual capital budget of around £100 million.

Three different time spans are involved in the capital budgeting process, a 5 year strategic plan which is revised every year and includes a capital element, a one year full capital budget, and a specific budget for each project which then requires specific approval. The approach is flexible, enabling new projects to enter the budget if necessary due to environmental changes "market sensitive business", or projects may be reprioritised in the 5 year plan.

**Creation Phase**

The group employs teams to search for investment opportunities within specific areas, and proposals may arise from such teams, the main board or the divisional directors. The respondent described the approach has having an "entrepreneurial flavour" operating in an "organic way".

The originator conducts an initial evaluation to determine whether the project has "commercial sense" the payback period may also be determined at this stage if the project is within the present business, otherwise a more sophisticated evaluation may be made.
**Decision Phase**

The size of the project and the division originating the project determines the level in the hierarchy where projects may be accepted, as follows:

<table>
<thead>
<tr>
<th>in budget</th>
<th>not in budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>board</td>
<td>£1 million +</td>
</tr>
<tr>
<td>divisional board</td>
<td>up to £200,000 depending on which division is originating the project and whether the project is in or out of budget.</td>
</tr>
</tbody>
</table>

The group considers four criteria when evaluating capital projects:

- profitability
- risk exposure
- choice - have alternatives been considered
- strategic factors

The evaluation methods used by the group are, in order of importance, PP, ARR, NPV and IRR. There is not a distinct cut off point, but generally, for established businesses in established areas with a long life expectation a 6.67 payback may
be acceptable, but the requirement varies between divisions and projects and the basic rule is a payback of 5 years, the respondent stated that the management would normally expect a payback of less than 4 years.

The discount rate used by the group is 15% for established businesses and 20% for others, and is based on the WACC, weighted by the actual gearing ratio on the assumption that the ratio will be maintained, and based on current costs of the sources of finance.

The group checks the forecasted cash flows against actual on a sample basis, varying between divisions, and some major ad hoc post audit exercise are undertaken.

Changes in working capital may be included in the cash flows, but are often ignored as the effects may be minimal, for example if creditors increase by the same amount as debtors. If the DCF techniques are used the residual value of the investment will be included but it is unlikely to be included if the PP is the only technique used.

The group's present cost of capital has recently changed and is approximately 12%, the 15% return required is based on the 12% cost of capital plus 3% for risk. The cost of capital is revised when something major happens.
The effects of inflation on the assessment are considered, but, due to lower inflation rates, the effects are less important.

A sophisticated form of sensitivity analysis is used to assess the risk of the project, by looking at different scenarios. Sensitivity analysis is not always conducted if the proposed investment is along the lines of an established operations.

The management of the include in risk
(a) market potential—what happens if everything goes wrong and,
(b) profitability — is it possible to pull out, or find alternative uses.

The group does not employ management science techniques.

**Implementation Phase**

The group conducts ad hoc post audit exercises, and, if the project is found to be uneconomical it is possible that it could be dropped, and what has previously happened is that an alternative use is found. Monthly capital reports, itemising all major projects are used to ensure tight monitoring.

**Group Strategy**

The member companies, 200 in all, although some are dormitory form 6 management divisions and 4 smaller operations and the
respondent reported that the divisions ought to be aware of projects being undertaken elsewhere.

The optimal tax position is the responsibility of the head office, and the group is aware of the need to take tax into account in "such a way" as to optimise the position.

**Taxation**

Taxation is taken into account when it is paid, with a 17 month tax lag on most operations. The group does not have unrelieved ACT, losses or unclaimed capital allowances, and thus usually a tax rate of 35% is used in project appraisal. Sensitivity analysis is generally not used to assess the effects of different tax rates, as the management will "pick up the sensitivity when looking at the 5 year plan."

The respondent stated that concern was expressed following the Finance Act 1984, due to the lowering of the capital allowances, but that it did not lead to much change in policy. Although the group does not attempt to forecast changes in the tax system, it does look at likely changes and considers what contingency plans will be required.

The group is now little involved in leasing because of the tax changes, although management leasing is employed for computers and cars.