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LEVERAGED LEASING

An Example of the use of Investment Appraisal Techniques

By Michael Sherris

1. THE ORIGINS OF LEVERAGED LEASING

1.1 The origins of leveraged leasing are the trust arrangements used in the 1870's in the United States of America by railroad companies to finance the acquisition of rolling stock (Fritch, 1977, p. 98). A trust was established to purchase the equipment. The trustee issued trust certificates to investors who provided the funds for the equipment acquisition. The trust certificates provided for the repayment of principal and interest at specified dates. The trust then leased the equipment to the railroad company and the rental paid by the railroad company was used to repay the trust certificates as they fell due. These arrangements were in reality conditional sale agreements and not leveraged leases.

1.2 Leveraged leasing as we know it today was introduced in the U.S.A in 1963 after the Comptroller of the Currency permitted national and state chartered banks to own and lease personal property (Weston, 1983, p. 271). The arrangement was used initially by railroad and airline companies to finance the acquisition of large items of capital equipment. Companies within capital intensive industries could not absorb the tax benefits of ownership whereas the banks could. Leveraged leasing meant that the banks owned the equipment and claimed depreciation and other tax deductions associated with ownership. These benefits were passed onto the railroad companies through lower rentals which reflected the value of these taxation benefits.

2. THE DEVELOPMENT OF LEVERAGED LEASING

The market in Australia as an example

2.1 In Australia, the first leveraged lease was completed in July, 1974 for a A$20.7 million copper smelter with Peko-Wallsend as lessee (Anon, 1981, p. 59). Since its introduction this method of financing has become widely used and accepted. This development corresponded with the growth in lease financing in general. Leasing has become such an accepted method of financing capital expenditure that it is used to finance around 25–30% of all such expenditure in Australia (Kavanagh, 1982, p. 127). To put this in perspective lease outstandings totalled A$11,940 million as at December, 1984 (Reserve Bank of Australia Bulletin, June, 1985, Tables D2, G11).

2.2 Leveraged leasing is really only viable for large items of equipment (over A$5–10 million) because of the number of parties involved and the transactions

costs incurred in arranging such a lease. The types of equipment that have been financed include gas pipelines, aircraft, railway carriages, engine lines and buses. Lessees that have used leveraged leasing include General Motors Holden, Theiss Bros., Amatil, Australian Newsprint Mills, Ansett Transport Industries, Mobil Oil Australia, Woolworths, E.Z. Industries, Qantas and AGL (Anon, 1981, p. 59 and Harris, 1982, p. 43). Two recently announced users of the technique have been TAA, which announced a $450 million deal to finance the acquisition of Boeing passenger aircraft (Australian Financial Reviews, Thursday, 23rd May, 1985, p. 2), and a pipeline construction consortium, consisting of CSR Ltd., AGL, Moonie Oil and the Northern Territory Government, which announced a A$380 million deal to finance an Alice Springs to Darwin gas pipeline (Australian Financial Review, Monday, 1st July, 1985).

2.3 Although no official figures are available on the value of equipment financed through leveraged leasing in Australia unofficial estimates suggest it is sizeable and has been growing. The Australian leveraged leasing market was estimated to amount to A$1·5–2·0 billion in the 1981–82 financial year compared to less than A$1·0 billion per annum in the late 1970's (Tibbits, 1982, p. 39).

Factors influencing development

2.4 The major influence upon the growth of leveraged leasing in any market is the level and availability of tax reliefs on capital expenditures. These usually take two forms. Firstly, an investment allowance or tax credit which permits part of the purchase price of the capital goods to be offset against tax liabilities in the year of purchase. Secondly, a depreciation allowance under which varying proportions of the purchase price can be offset against tax liabilities in the succeeding years. Over time governments will vary the level and availability of these tax reliefs as a policy instrument to encourage or discourage investment in general, or investment in particular sectors of the economy, e.g. building industry or in particular types of capital, e.g. aircraft, computers.

2.5 For example, in Australia the investment allowance was reduced in stages from 40% in 1976 to zero after June 1985. Accelerated rates of depreciation allowance, compared to the 'normal' rates, were in effect over the same period. Initially, depreciation rates for eligible equipment were increased by 100%. The current accelerated rates of depreciation allow the writing off of equipment for tax purposes over either three or five years.

2.6 The size of the market is affected by the eligibility of institutions for the taxation reliefs available. On occasions governments will realise that the effects of the policy instrument are not as intended and eligibility will be restricted, thus contracting the available market. For example, part of the growth in the Australian market in the late 1970's and early 1980's came from the use of the technique by the non-tax paying public sector. In December 1981, mainly as a result of the financing of the Eraring power station, the Federal Government disallowed the investment allowance on equipment where a tax exempt statutory authority was the real end user. This was extended to all tax benefits and

deductions in these cases from June 1982. At the time transactions involving tax exempt bodies were thought to account for around one third of the total leveraged lease market (Tibbits, 1982, p. 39). These transactions allowed the tax exempt bodies to gain, through the lower rental charges, federal tax benefits, to which they would not otherwise have been entitled.

2.7 Not withstanding the levels and availability of fiscal advantages, leveraged leasing has remained and is likely to continue to remain a major financing form in many countries. As long as economic growth continues, businesses will have to acquire capital equipment to meet the higher demands for goods and services. Wherever the taxation benefits of such capital acquisitions cannot immediately be absorbed by the potential owner of the equipment, leveraged leasing will be an effective means of financing the acquisition and of ensuring that the most efficient use is made of the taxation benefits.

3. THE STRUCTURE OF A LEVERAGED LEASE

3.1 A leveraged lease is very similar to a non-leveraged lease in that an asset is acquired by a lessor and leased to a lessee for a specified rental. The major differences are that leveraged leases are used for much larger items of equipment, involve more parties and hence have more complex legal and documentation requirements. The parties involved in a typical leveraged lease are set out in Figure 1. In a non-leveraged lease the lessor provides the capital to acquire the asset from *its own* funds. In a leveraged lease the lessor partnership only provides between 20–40% of the required capital and borrows the remainder from institutional lenders, or debt parties, on a non-recourse basis. It is this debt that gives a leveraged lease its name. The lessee will select, use, operate and receive all the revenues from the asset. Rental payments are made to the lessor. For the lessee this position is identical to that under a non-leveraged lease.

3.2 The lessor in a leveraged lease is a partnership of at least two parties commonly referred to as equity participants. A partnership is used in order to take the greatest advantage of tax benefits and to keep the asset separate from the partners' other assets. Equity participants are primarily banks and finance companies. They can include other corporate bodies with long term funds to invest, where these bodies are eligible to claim both the investment and depreciation allowances on leased assets. The lessor (usually through the nominee company) claims all the tax benefits associated with the ownership of the asset, receives the rentals from the lessee and pays the debt service to the lenders. Because of the non-recourse nature of the debt the lessor is only at risk for the balance of its equity contribution in the event of default. The lenders have no recourse to any of the other assets of the lessor.

3.3 As mentioned earlier, the lessor borrows up to 80% of the asset cost from lenders or debt parties. In Australia, these lenders were originally superannuation funds and life insurance companies who lent on a fixed rate basis for long terms. More recently the major lenders have been banks using floating rate

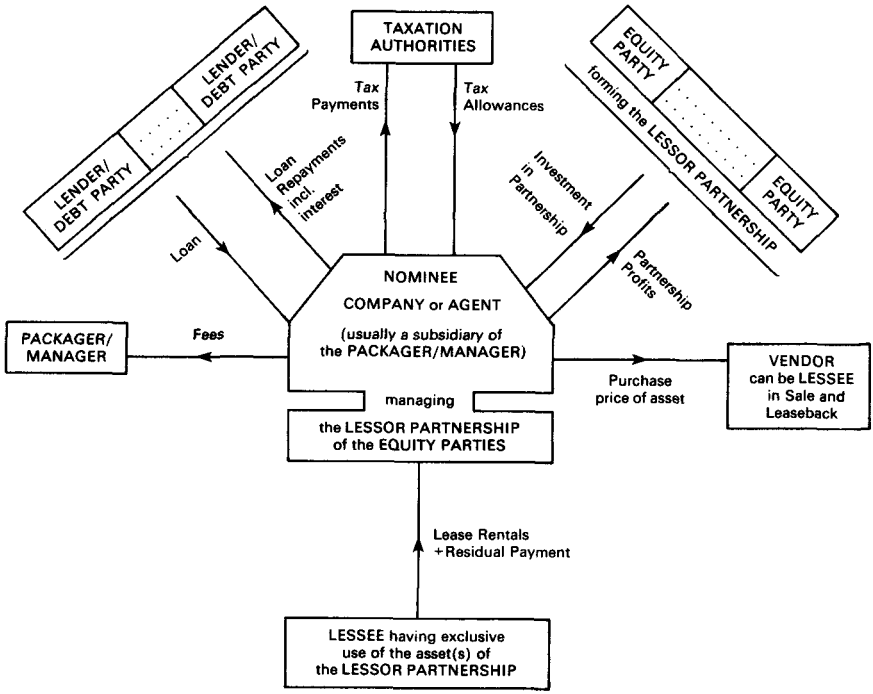

Figure 1. *Parties in a Leveraged Lease showing cash flows generated by the arrangement.*

funding financed through the acceptance and discounting of bills of exchange and offshore borrowing (Tibbits, 1982, p. 43). Offshore financing arrangements may involve the use of foreign currency options or other hedging facilities provided by financing risk takers. Loans are secured by a first lien or mortgage on the equipment, an assignment of the lease, and an assignment of the lease rentals. Thus lessees must have impeccable credit ratings in the eyes of the lenders.

3.4 The other two parties typically involved in a leveraged lease are the nominee company and the packager/manager. The nominee company facilitates the operation of the lease by purchasing the equipment and leasing it on behalf of the lessor partnership. It also receives the rentals, pays the debt service to the lenders, arranges the tax affairs of the partnership and distributes any excess funds to the equity participants. The lessor partnership remains the legal owner of the equipment.

3.5 The packager/manager is responsible for arranging the whole transaction. Lessees typically place their leveraged lease transactions out for tender to packagers/managers who bid on the basis of the lease conditions that they can arrange for the lessee (Sullivan, 1985). The successful packager/manager

arranges the equity and debt financing, attends to the legal requirements and manages the transaction throughout its term. The nominee company is often a subsidiary company of the packager/manager.

3.6 An example showing the participants in a leveraged lease is given in Figure 2.

4. AN EXAMPLE

4.1 Table 1 sets out the characteristics of a simple example of a leveraged lease in the Australian market in 1985. This example is illustrative of transactions carried out. The 20% equity financing and the *level* lease repayments are in line with the requirements of the Australian Taxation Office. The assumption that the equipment has a useful life of ten years produces the zero residual value and the 20% depreciation rate for tax purposes. The debt rate is around the current debt rates for fixed rate ten year funds. No investment allowance is assumed since this ceased for equipment acquisitions after 30 June 1985.

Figure 2. *Example of Leveraged Lease Arrangement. (Source: Australian Financial Review, June 1985).*

Table 1. *Characteristics of Leveraged Lease Example*

Equipment Cost:	$10,000,000
Equity Financing (20%):	$2,000,000
Depreciation of Assets:	20% straight line
Investment Allowance:	Nil
Tax Rate (of Lessor Partnership):	46% payable one year after year of income
Debt Financing (80%):	$8,000,000
Debt Rate:	15% p.a.
Debt Service:	$1,594,016 in ten equal annual payments
Lease Term:	10 years
Lease Rate:	14% p.a.
Lease Rentals:	$1,917,135 in ten equal annual payments in arrear
Residual Value of Assets:	Nil

4.2 The evaluation of the lease from the lessor's point of view requires the determination of the cashflows in Figure 1. These are made up of:

(i) the equipment acquisition cost paid to the vendor,
(ii) the proceeds of the non-recourse borrowing from the debt parties,
(iii) repayments of principal and interest to the debt parties,
(iv) receipts of rentals from the lessee,
(v) taxation benefits received from or payments made to the authorities.

The magnitude of these flows are set out in Table 2.

4.3 The lessor's taxation benefits and payments are derived in Table 3. The lessor's taxable income in each year is the income from rental receipts less the deductions allowed for depreciation and interest on the debt. The depreciation claimed will be 20% of the equipment cost in each of the first five years. The interest deduction in each year is determined from an amortization schedule for

Table 2. *Lessor Cashflows*

Time (yrs)	*Cost* ($)	*Debt Finance* ($)	*Rentals* ($)	*Taxation Benefit* ($)	*Net (After Tax) Cashflow* ($)
0	−10,000,000	8,000,000	0	0	−2,000,000
1	0	−1,594,016	1,917,135	0	323,119
2	0	−1,594,016	1,917,135	590,118	913,237
3	0	−1,594,016	1,917,135	562,931	886,049
4	0	−1,594,016	1,917,135	531,665	854,784
5	0	−1,594,016	1,917,135	495,710	818,829
6	0	−1,594,016	1,917,135	454,362	777,481
7	0	−1,594,016	1,917,135	−513,188	−190,069
8	0	−1,594,016	1,917,135	−567,871	−244,752
9	0	−1,594,016	1,917,135	−630,757	−307,638
10	0	−1,594,016	1,917,135	−703,075	−379,956
11	0	0	0	−786,241	−786,241

Table 3. *Taxation Cashflows*

Time (yrs)	*Rentals* ($)	*Depreciation Deduction* ($)	*Interest Expense* ($)	*Taxable Income* ($)	*Net Tax Payable* ($)
1	1,917,135	2,000,000	1,200,000	−1,282,865	0
2	1,917,135	2,000,000	1,140,898	−1,223,762	−590,118
3	1,917,135	2,000,000	1,072,930	−1,155,794	−562,931
4	1,917,135	2,000,000	994,767	−1,077,631	−531,665
5	1,917,135	2,000,000	904,879	−987,744	−495,710
6	1,917,135	0	801,509	1,115,627	−454,362
7	1,917,135	0	682,632	1,234,503	513,188
8	1,917,135	0	545,925	1,371,210	567,871
9	1,917,135	0	388,711	1,528,424	630,757
10	1,917,135	0	207,915	1,709,220	703,075
11	0	0	0	0	786,241

Note: Taxable income is the first column less the sum of the second two columns. The tax payable column is the taxable income times ·46 and lagged one year. Thus for year 3 taxable income is −$1,155,794 which is $1,917,135 minus $2,000,000 and $1,072,930. This is a tax loss which gives rise to a tax benefit of ·46 times $1,155,794 or $531,665 in year 4.

the debt. This schedule is set out in Table 4. Tax payable is determined as the taxable income times the tax rate of 46%. There is also assumed to be a lag of one year from the end of the financial year of income to the date of payment of tax. This corresponds roughly to the lag in payment which occurs in practice.

4.4 The interest expense is determined from the debt outstanding by applying the interest rate to the balance outstanding from time to time. The excess of the repayment over the interest expense is used to amortize the debt (Table 4).

4.5 The after tax cashflows of this example demonstrate the usual characteristics of the lessor's cashflows from a leveraged lease investment. Cashflows

Table 4. *Debt Schedule*

Time (yrs)	*Repayment* ($)	*Principal Reduction* ($)	*Interest Expense* ($)	*Principal Outstanding* ($)
0	0	0	0	8,000,000
1	1,594,016	394,016	1,200,000	7,605,984
2	1,594,016	453,119	1,140,898	7,152,865
3	1,594,016	521,087	1,072,930	6,631,778
4	1,594,016	599,250	994,767	6,032,528
5	1,594,016	689,137	904,879	5,343,391
6	1,594,016	792,508	801,509	4,550,883
7	1,594,016	911,384	682,632	3,639,498
8	1,594,016	1,048,092	545,925	2,591,407
9	1,594,016	1,205,305	388,711	1,386,101
10	1,594,016	1,386,101	207,915	0

immediately following the initial investment are positive, however, subsequent cashflows are negative. This is due to the pattern of taxation benefits/payments. In the early years taxable income is negative because allowable expenses, depreciation and interest, exceed the rental income. Thus a tax benefit is gained by the lessor partnership (provided it has sufficient income) since the taxable income of the equity participants will be reduced by the tax loss in the leveraged lease partnership. The reverse applies in the latter stages of the lease. It is this pattern of cashflows which makes the determination of the lessor's rate of return in a leveraged lease a complex problem.

5. EVALUATION

Investment Evaluation Techniques

5.1 Since the pioneering work of Fisher (1907) and Böhm-Bawerk (1891) conventional investments have been evaluated using either a net present value (NPV) approach or by calculating the internal rate of return (IRR) provided by the cashflows. The net present value approach is based on the principle that a firm should maximize its worth by choosing investments with the highest net present value (Fisher, 1907, p. 156). The net present value is determined by discounting the cashflows at the investors marginal or opportunity cost of capital. The internal rate of return is simply the rate of return which produces a zero net present value (Böhm-Bawerk, 1891). In cases where the Net Present Value is a monotonically decreasing function of the discount rate the two methods will not only provide the same accept/reject decision but will also result in the same ranking of investments.

5.2 However, in many cases using an internal rate of return will not produce the same ranking of investments as would the use of net present values (Bierman and Schmidt, 1984, pp. 71–72; Brealey and Myers, 1984, pp. 72–78; Allen, 1983, pp. 193–198). These circumstances occur in cases where:

(*a*) the alternative investments are mutually exclusive, i.e. the choice of one alternative will preclude the choice of at least one other
(*b*) the available capital is rationed
(*c*) the cashflows contain more than one alteration in sign.

5.3 In the event that they are mutually exclusive it has been demonstrated that the IRR method will not rank projects correctly (Bacon, 1977).

5.4 The capital rationing problem was considered by Lorie and Savage (1955). Their solution was to use a profitability index, or the ratio of the present value of the cashflows to cost, to rank projects. Schwab and Lusztig (1969) examined the theoretical relationship between the net present value and profitability index measures. They demonstrated that in cases of capital rationing the profitability index produces a ranking of investments consistent with net present values. When capital is rationed, it is important to choose investments which provide the highest value per dollar invested. Bromwich (1977, pp. 107–110) demonstrates

that, with capital rationing in one time period, selecting projects in order of their benefit-cost ratio is preferable to selecting in order of net present values. It should be noted that the profitability index does not satisfactorily rank mutually exclusive investments (Bierman and Schmidt, 1984, pp. 66–68; Brealey and Myers, 1984, pp. 78–79). It is also inadequate where capital is rationed in more than one time period or where projects are dependent on one another for other reasons (Brealey and Myers, 1984, p. 104). Linear programming methods have been proposed to select the optimum mix of investments where capital is rationed in more than one time period (Weingartner, 1963).

5.5 The use of a net present value or a profitability index requires an assumption about the discount rate to be used in the calculation. The opportunity cost of capital is the appropriate rate to use. Whenever capital is not rationed this rate should reflect the market rate of interest, or going rate of interest, allowing for the riskiness of the cashflows (Brealey and Myers, 1984, pp. 412–414). In conditions of capital rationing the discount rate must reflect the rate of return on future projects that are made possible by the investment (Bacon, 1977, p. 57). This rate is dependent on the optimal selection of projects, which is itself dependent on the discount rate. A mathematical programming technique is needed in such circumstances to determine the optimal solution. In practice a range of discount rates can be used to assess the sensitivity of the result to this assumption.

5.6 Where the cashflows of an investment change sign more than once during the life of the investment, there can be more than one internal rate of return. These multiple internal rates of return may include a negative result. It is also possible for such cashflows to have no internal rate of return. The interpretation of such multiple rates of return is not clear. Even where such cashflows produce a unique internal rate of return it has been argued that this rate cannot be interpreted as a measure of the project's return on investment (Capettini, Grimlund and Toole, 1984, p. 69). In such cases the net present value approach is the appropriate solution (Brealey and Myers, 1984, p. 75).

Investment evaluation for leveraged leases

5.7 The ability of lessors to undertake leveraged lease investments is limited by the tax shelter they have available since the viability of such investments is dependent on the lessor being able to absorb the associated tax benefits. This can be a major constraint on the value of assets that can be financed using leveraged leases. For this reason capital must be rationed amongst the available leveraged lease investments. In these circumstances it is necessary to choose projects that provide the optimum return. Hence it is important that any method that is used to calculate rates of return on leveraged leases is one that will rank projects correctly.

5.8 A lessor's investment in a leveraged lease is a case where the signs of the cashflows alternate during the life of the investment, e.g. the example of §4. Lessors prefer to use a rate of return to evaluate investments since, amongst other

reasons, it is a concept with which they are familiar and it provides a straightforward way of specifying terms to a packager/manager. This has resulted in a multitude of methods being proposed, each of which will calculate a 'unique' rate of return for a leveraged lease investment. Some of these methods incorporate an assumption about the reinvestment of the cashflows. Others produce a single rate of return without explicitly making such an assumption. These different methods are explained and illustrated below using the example of §4.

Net present value and internal rate of return

5.9 The net present values of the after tax cashflows in Table 2 for a range of discount rates are:

Discount Rate (%)	*Net Present Value* (%)
−10	−500,804
−5	+404,703
0	+664,842
5	+634,441
10	+481,068
15	+284,227
20	+ 81,114
25	−111,679
30	−287,614

It can be seen that there are two internal rates of return. One between −10% and −5% and the other between 20% and 25%. In fact the internal rates of return are approximately −8% and +22% p.a., since at these rates of discount the net present value is zero. There is, therefore, both a positive and a negative rate of return. The interpretation of this result is not clear. Which rate do we use? Do we only use the positive rate of return? The answer to these questions is that we need to use both rates to make our decision. The project would be accepted for costs of capital between −8% and +22% p.a. since the net present value is positive in this range. It is not possible to use just one of these rates. Selecting the positive rate is not satisfactory since it is possible for cashflows to produce multiple positive rates of return (Bacon and Athanasopoulos, 1980, p. 77). In this situation it is necessary to examine the net present values to determine the range of rates over which the project should be accepted or rejected (Capettini, Grimlund and Toole, 1984). The correct use of the internal rate of return is therefore no different to using the net present value in such circumstances.

Profitability index or benefit-cost ratio

5.10 The profitability index is simply the ratio of the present value of the cashflows, excluding the initial investment, to the initial investment. It represents the present value received per dollar invested and for this reason is useful in selecting investments that provide the best value per dollar invested under

conditions of capital rationing. The profitability index of the cashflows for a range of discount rates is:

Discount Rate (%)	*Profitability Index*
−10	·75
−5	1·20
0	1·33
5	1·32
10	1·24
15	1·14
20	1·04
25	·94
30	·86

Projects are accepted when the profitability index exceeds one and rejected otherwise. In our example the accept/reject decision using the profitability index will be the same as that using net present values.

Weighted average rate of return methods

5.11 Wiar (1973) suggested a method for determining a rate of return for a leveraged lease which considered the investment and financing aspects separately. This method produces a unique rate of return which is claimed to be consistent with the cost of capital and with the yields on alternative investments.

5.12 The rate of return is determined as the rate which equates the future value of the equity outlay to the difference between the future value of the unleveraged after tax cashflows, excluding the cost of the equipment, and the future value of the after tax debt repayments. The future value of the unleveraged after tax cashflows is determined using the internal rate of return of the investment cashflows, and the future value of the after tax debt cashflows is determined using the internal rate of return of these debt cashflows. The method produces a rate of return which declines as the after tax debt rate increases.

5.13 For our example the two sets of after tax cashflows are set out in the table overleaf. The internal rate of return for the after tax unleveraged cashflows is 10·0677% p.a. and for the after tax debt cashflows it is 8·6493% p.a. The future value of the unleveraged after tax cashflows is therefore $28,724,919 and the future value of the after tax debt cashflows is $19,924,446. The after tax rate of return using this method is then calculated to be 14·419% p.a. It can be seen that the future value of one dollar at the rate of return on the unleveraged cashflows is a weighted average of the future value of one dollar at the after tax internal rate of return of the debt cashflows and the future value of one dollar at the after tax rate of return on the investment, using the ratios of debt to cost and of equity to cost as the respective weights. Marks (1983) proposed a method in which the rate of return on the unleveraged cashflows (10·0677%) is equated to a weighted average of the after tax debt rate (8·6493%) and the after tax rate of the lessor's equity investment, which is being evaluated. The respective weights used are the ratios

Time (yrs)	*Unleveraged after tax cashflows* (%)	*After tax debt cashflows* (%)
0	−10,000,000	+8,000,000
1	1,917,135	−1,594,016
2	1,955,253	−1,042,016
3	1,955,253	−1,069,204
4	1,955,253	−1,100,469
5	1,955,253	−1,136,424
6	1,955,253	−1,177,772
7	1,035,253	−1,225,323
8	1,035,253	−1,280,006
9	1,035,253	−1,342,891
10	1,035,253	−1,415,209
11	−881,882	+95,641

Notes: (i) The after tax cashflows are determined by taking the debt repayments and deducting the taxation on the interest content of each repayment, allowing for the lag in tax of one year. These figures can be derived from Table 4. Thus in year 2 the debt repayment is −$1,594,016 and taxation is $1,200,00 times ·46, based on the interest content in the first year, which equals $552,000. This gives an after tax cashflow of −$1,042,016.

(ii) The unleveraged after tax cashflows are derived from Table 2 by subtracting the after tax cashflows from the total after tax cashflows.

of the market value of the debt cashflows to the market value of the lease (8000000/10000000 = ·8) and the complement of this ratio (·2). This gives a result of 15·741% p.a.

Sinking Fund Methods

5.14 Several methods have been proposed for calculating a unique rate of return in which it is assumed that a sinking fund is established to meet any negative cashflows. By doing this the negative cashflows can be eliminated from the after tax cashflows and an internal rate of return calculated on the residual cashflows. The sinking fund is assumed to be invested at a predetermined earning rate which is different from the rate of return earned on the investment.

5.15 In another context, sinking fund methods have been used to determine the effective cost of a borrowing by assuming a sinking fund is used to repay the borrowed capital at the end of a loan term (Donald, 1970, p. 83–88). They are also used to assess rates of return on leasehold property investments (Baum and Mackmin, 1979). These applications are the probable origin of this idea for the evaluation of leveraged lease investments. The various sinking fund methods differ only in the assumptions made as to *which cashflows* are used to establish the provision for the negative cashflows.

5.16 *The Traditional Sinking Fund Method (TSFM)* assumes that negative cashflows are met by setting aside sufficient of the *immediately preceding* cashflows. The amounts set aside are such that when accumulated at the sinking fund earning rate, they will be sufficient to meet the future negative cashflows. The cashflows which are not used to meet the negative cashflows are available to

provide a return on the investment. As mentioned before, these cashflows will have a single internal rate of return because the negative cashflows have been eliminated through the use of the sinking fund. If we assume that the sinking fund earning rate is 3·5% p.a. after tax (this is a common, though perhaps unrealistic, assumption in practice) then the following calculations show how the TSFM rate of return is obtained.

	Cashflow Allocation		*Investment Balance*	*Sinking Fund Balance*
Time (yrs)	*Investment* ($)	*Sinking Fund* ($)	*(15·3%)* ($)	*(3·5%)* ($)
0	−2,000,000	0	−2,000,000	0
1	+323,119	0	−1,982,181	0
2	+913,237	0	−1,371,524	0
3	+886,049	0	−694,838	0
4	+800,895	+53,889	0	+53,889
5	0	+318,829	0	+874,605
6	0	+777,481	0	+1,682,697
7	0	−190,069	0	+1,551,522
8	0	−244,752	0	+1,361,073
9	0	−307,638	0	+1,101,072
10	0	−379,956	0	+759,653
11	0	−786,241	0	0

5.17 In order to meet the negative cashflows occurring at times 7 to 11 from the sinking fund it is necessary to place $53,889 of the cashflow at time 4 and all of the cashflows at times 5 and 6 into the sinking fund. The third column (of the table) shows the allocation of the cashflows to the sinking fund. These cashflows, when accumulated at 3·5% p.a., will be just sufficient to meet the negative payments as demonstrated by the zero balance at time 11 in the last column which shows the accumulated balance of the sinking fund at each point of time. The remaining cashflows are available to provide a return on the investment. These cashflows are given in the second column. The internal rate of return on these cashflows is 15·3% p.a. and this is the TSFM rate of return. When these cashflows are accumulated with interest at 15·3% p.a. the investment balance (column four) will be zero at time 11.

5.18 *The Modified Sinking Fund Method (MSFM)*, also known as the *Sinking Fund Method with Borrowing* or the *Pool Fund Method* assumes that funds are borrowed against future positive cashflows to meet any negative cashflows. To the extent that this is not possible, previous cashflows are used to establish a sinking fund (as in the TSFM). In the example the same result will be obtained as for the TSFM, since there are no positive cashflows following the negative cashflows against which funds can be borrowed.

5.19 *The Dual Rate of Return Method* is the same as the Traditional Sinking Fund Method except that a pre-tax rate of return is assumed for the sinking fund and taxation payments are explicitly allowed for on the sinking fund earnings. Provided the pre-tax rate and the taxation assumptions are consistent with the after tax sinking fund rate of the TSFM both methods give identical results.

5.20 *The Multiple Investment Sinking Fund Method (MISFM)* is the most commonly used method for calculating a rate of return on a leveraged lease. The method is derived from a paper by Teichroew, Robichek and Montalbano (1965) which examined the problem of investments with multiple internal rates of return. They define the project balance of an investment as the accumulation of the cashflows with interest. Whenever the project balance is negative there is said to be an investment phase and the rate of interest that is used to accumulate cashflows is the rate of return on the investment. Whenever the project balance is positive there is said to be a financing phase, in that the project is providing funds to the investor, and a financing rate is used to accumulate the cashflows. The rate of return on the investment is the rate which produces a zero project balance at the end of the term of the investment. The financing rate is the cost of capital, so that the rate of return will be a function of the cost of capital whenever an investment has both positive and negative project balances.

5.21 The MISFM treats the financing phase of a leveraged lease investment as a sinking fund accumulating at the sinking fund rate. It is possible for leveraged lease cashflows to produce a number of changes in signs of the project balance so that it is possible to have multiple investment and multiple financing phases in such investments. This is the reason for its name. It is also referred to as the *Multiple Phases Method* for the same reason, and as the *Return on Invested Capital Method (RICM)*. Some authors claim that the RICM is different to the MISFM (Regan, 1976). This is not the case as is demonstrated by Bacon and Athanasopoulos (1979, p. 94). Confusion occurs sometimes between the TSFM and the MISFM (Grimlund and Capettini, 1982).

5.22 When the example is evaluated using the MISFM, assuming a 3·5% p.a. after tax sinking fund rate, identical results to those using the TSFM are obtained. This is because there are only two changes in the signs of the cashflows. Hence there is only one sinking fund phase in the investment. This sinking fund phase corresponds with the sinking fund of the TSFM. Most leveraged lease investments with a non-zero residual value will produce after tax cashflows with more than two changes in signs (Grimlund and Capettino, 1982, p. 70). In these cases the TSFM produces a lower rate of return, and the MSFM a higher rate of return, than the MISFM. Brennan (1974) gives a thorough analysis and comparison of sinking fund methods.

Reinvestment Methods

5.23 *The Terminal Rate of Return Method (TRORM)* assumes that all of the cashflows apart from the initial investment are reinvested at an assumed rate of interest to the end of the lease. This is referred to as the terminal value of the investment cashflows. The terminal rate of return is then the rate which will accumulate the initial investment to this same amount. Another name used for this method is the *Effective Rate of Return Method (ERRM)* (Bacon and Athanasopoulos, 1979). The calculations using this method for the example are given in the table opposite.

Time (yrs)	*Investment Accumulation* ($)	*Cashflow Accumulation at 3½% p.a. (Excludes initial investment)* ($)
0	−2,000,000	0
1	−2,124,498	323,119
2	−2,256,747	1,247,665
3	−2,397,227	2,177,382
4	−2,546,453	3,108,375
5	−2,704,968	4,035,998
6	−2,873,350	4,954,738
7	−3,052,213	4,938,085
8	−3,242,211	4,866,165
9	−3,444,036	4,728,843
10	−3,658,425	4,514,396
11	−3,886,159	3,886,159

The terminal rate of return is the rate at which the initial investment ($2,000,000) will accumulate to the cashflow accumulation at time 11 ($3,886,159), i.e. 6·2% p.a.

5.24 A variation to this method was proposed by Coleman (1981) and is referred to as the *Reinvestment Method (RM)*. Under this method only the positive cashflows are reinvested at the specified rate of interest. This amount is equated to the accumulated value of the negative cashflows, where these cashflows are accumulated at the rate of return on the investment. The method requires an iterative procedure to determine the rate of return. To calculate the RM rate of return, the accumulated value of the positive cashflows is treated as if it occurred at the end of the lease term. These cashflows for the example are:

Time (yrs)	*Cashflows* ($)
0	−2,000,000
1	0
2	0
3	0
4	0
5	0
6	0
7	−190,069
8	−244,752
9	−307,638
10	−379,956
11	−786,241 + 5,884,675 = 5,098,434

Here the positive cashflows at times 1–5 are accumulated using a reinvestment rate of 3·5% p.a. to produce a positive cashflow at time 11 of $5,884,675. An internal rate of return calculation is then performed on the negative cashflows and the net terminal cashflow giving an RM rate of return of 6·05% p.a.

6. A COMPARISON OF METHODS OF EVALUATION

6.1 It is a widely held view that the correct approach to the evaluation of a leveraged lease investment is the use of net present values (Bierman and Schmidt, 1984; Capettini, Grimlund and Toole, 1984; Grimlund and Capettini, 1982; Myers, Dill and Bautista, 1976; Regan, 1976). Under conditions of capital rationing it is not only important to chose projects that provide the highest net present value, but also those that provide the highest ratio of present value to initial outlay. This means that a profitability index determined by correctly incorporating a reinvestment assumption into the present value calculation is to be preferred to the use of net present values. The discount rate used under conditions of capital rationing should be the rate which reflects the rate of return on *future* projects made possible by the current investment.

6.2 This latter criterion means that some methods which implicitly incorporate a reinvestment assumption, but use an inappropriate discount rate should not be used. In particular the internal rate of return and weighted average rate of return methods described in § 5 fall into this category.

6.3 Thus the final choice of a preferred method is from amongst the Sinking Fund and Reinvestment Methods described in § 5. We will confine our comparison to the most commonly used Sinking Fund Method, the MISFM method, and the alternative reinvestments methods, using the following criteria:

(*a*) ease of understanding and computational simplicity,
(*b*) comparability with alternative investments, and
(*c*) ability to rank projects under conditions of capital rationing.

Ease of Understanding and Computational Simplicity

6.4 Of all the methods proposed, the method that is the simplest to compute is the TRORM. In all other cases it is necessary to use an iterative procedure to determine the rate of return. The TRORM simply requires the determination of the accumulated value of the cashflows. Of course, with the widespread use of computers and sophisticated financial calculators with inbuilt IRR routines, the calculation of the other rates of return is not as onerous as it used to be. Even so, the MISFM calculation is still computationally complex, especially if there are a number of changes in the signs of the cashflow.

The TRORM is the easiest to understand because it treats the future cashflows in a consistent and sensible manner. All cashflows, excluding the initial investment, are accumulated at the reinvestment rate. In the case of the MISFM, the cashflows are accumulated at the investment rate whenever there is an investment balance, and at the reinvestment rate or sinking fund rate whenever there is a sinking fund balance. As Taylor (1981, p. 115) points out, it is unlikely that the terms for reinvestment of cashflows will be different because a notional project balance changes its sign. The use in practice of a conservative sinking fund rate of 3·5% p.a. with the MISFM makes interpretation of the method more

difficult. The result of doing this is an understatement of the value of a lease to the lessor (Coleman, 1981, p. 24) and a lease structure which reduces the equity investment as quickly as possible and uses the sinking fund as little as possible (Taylor, 1981, p. 115). This may not be what the lessor desires from his investment. A realistic reinvestment assumption or range of values should be used with this method if it is to have any value.

Comparability with Other Investments

6.5 A major use of a rate of return is for comparison with the rates of return on alternative investments. This is one of the advantages claimed by Wiar for his method. He claims that the MISFM does not produce a result that can be validly compared with alternative investments because of the way it combines both financing and investment aspects (Wiar, 1973, p. 1282). The MISFM is not comparable with rates of return on other investments for a variety of reasons, most importantly in its treatment of cashflows. The method uses different reinvestment rates at different times, as already mentioned, and allows for the effects of taxation. Most other rates of return do not allow for the effects of taxation and, when after tax rates of return are used, no explicit reinvestment assumption is made. Whether or not Wiar's method produces a rate of return comparable with other investments is not clear. However, it should be noted that the method involves reinvestment of after tax debt cashflows and unleveraged after tax lease cashflows at their respective internal rates of return. These rates of return will usually differ. Thus the method reinvests cashflows that are indistinguishable, in that they occur at the same point of time at different rates. Methods used to calculate rates of return on alternative investments do not adopt such a procedure. For this reason, it is difficult to understand how a valid comparison can be made with other investments.

6.6 The reinvestment methods can be criticized because their rate of return cannot be *directly* compared with the rate of return on alternative investments. This is because the methods incorporate an explicit reinvestment assumption. A valid comparison can be made using the TRORM by calculating the Terminal Rate of Return (TROR) for the alternative investment using the same reinvestment assumptions. These rates are comparable. The alternative is to express the TROR for the leveraged lease as an equivalent yield on the alternative investment, thus permitting a direct comparison.

Ranking of Projects under Capital Rationing

6.7 Sherris (1985) has completed a study comparing four evaluation methods (PI, MISFM, TROFM and RM) using three common leveraged lease structures and four reinvestment rate assumptions (3·50%, 7·00%, 8·65% and 11·00% p.a). Using the Profitability Index (PI) as a correct ranking of the three leases, he compares the ranking performance of the other three evaluation methods.

6.8 The general conclusion of the study is that the TRORM and the RM both

have good ranking ability except at the lowest reinvestment rate. Overall the RM performs slightly worse than the TRORM in that it gives the correct ranking of the leases in fewer cases. The MISFM is a poor performer in its ability to rank investments.

The preferred method of evaluation

6.9 When assessed against the three criteria the 'best' method to use to calculate a rate of return on a leveraged lease, under conditions of capital rationing, is the TRORM. Not only is it the simplest to compute, but it is easier to understand because of its logical and consistent treatment of cashflows. It can be used to compare a leveraged lease with alternative investments by using the TRORM for these alternative investments and comparing the resulting rates of return. Most importantly, it has been found that the TRORM provides a better ranking of leveraged lease investments than the other proposed methods.

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