Chapter 18
INCREMENTAL CASH FLOWS AND OTHER INVESTMENT CRITERIA

Back to flows and financial analysis

The "mathematics" we studied in Chapter 16, dealing with present value and internal rate of return, can also be applied to investment decisions and financial securities. These theories will not be covered again in detail, since the only real novelty is of a semantic nature. In the sections on financial securities, we calculated the yield to maturity. The same approach holds for analysing industrial investments, whereby we calculate a rate that takes the present value to zero. This is called the internal rate of return (IRR). **Internal rate of return and yield to maturity are thus the same**.

Net present value (NPV) measures the value created by the investment and is the best criteria for selecting or rejecting an investment, whether it is industrial or financial. When it is simply a matter of deciding whether or not to make an investment, NPV and IRR produce the same outcome. However, if the choice is between two mutually exclusive investments, net present value is more reliable than the internal rate of return.

This chapter will discuss:

- the cash flows to be factored into investment decisions, which are called **incremental cash flows**; and
- **other investment criteria** which are less relevant than NPV and IRR and have proven disappointing in the past. As future financial managers, you should nevertheless be aware of them, even if they are more pertinent to accounting work than financial management.

Section 18.1
THE PREDOMINANCE OF NPV AND THE IMPORTANCE OF IRR

Each investment has a **net present value (NPV), which is equal to the amount of value created.** Remember that the net present value of an investment is the value

of the positive and negative cash flows arising from an investment, discounted at the rate of return required by the market. The rate of return is based upon the investment's risk.

From a financial standpoint, and if forecasts are correct, an investment with positive NPV is worth making since it will create value. Conversely, an investment with negative NPV should be avoided as it is expected to destroy value. Sometimes investments with negative NPV are made for strategic reasons, such as to protect a position in the industry sector or to open up new markets with strong, yet hard to quantify, growth potential. It must be kept in mind that if the NPV is really negative, it will certainly lead to the destruction of value. Sooner or later, projects with negative NPV have to be offset by other investments with positive NPV that create value. Without doing so, the company will be headed for ruin.

An investment with an NPV of zero will not create value, but it will not destroy value either. All other things being equal, decisions about projects with an NPV of zero are akin to tossing a coin in order to decide whether or not to go ahead.

The internal rate of return (IRR) is simply the rate of return on an investment. Given an investment's degree of risk, it is financially worthwhile if the IRR is higher than the required return. However, if the IRR is lower than the risk-based required rate of return, the investment will serve no financial purpose.

J. Graham and C. Harvey (2001) conducted a broad survey of corporate and financial managers to determine which tools and criteria they use when making financial decisions. They asked them to indicate how frequently they used several capital budgeting methods by ranking them on a scale ranging from 0 (never) to 4 (always). The findings showed that net present value and internal rate of return carry the greatest weight, and justifiably so. Some 75% of financial managers systematically value investments according to these two criteria.

Interestingly, large firms apply these criteria more often than small- and medium-sized companies, and MBA graduates use them systematically while older managers tend to rely on the payback ratio.

A 31-year-old study by Gitman and Forrester (1977) found that only 9.8% of large firms used NPV as their primary capital budgeting tool. By comparing those results with the more up-to-date work of Graham and Harvey, it is apparent that the popularity of the NPV method has grown significantly over time.

The third most frequently used decision criterion is the payback method, which is particularly popular among small firms. This and other criteria will be discussed later on in this chapter.

Bruner et al. (1998) surveyed 27 significant corporations and 10 financial advisers. Of these, 89% of corporations and 100% of advisers confirmed that they always use NPV as a primary tool in evaluating investment opportunities.

Dallocchio and Salvi (2000) conducted a survey of 56 CFOs and treasurers of multinational companies. When asked about the criteria they chose for valuing the M&A transactions of their company, 75% of respondents ranked NPV and IRR as the most popular approaches. These were followed by the payback method (20%) and economic value added (5%).

The strong popularity of NPV is widespread globally, as shown by other studies. Hall (2000) and Lumby (1991) have illustrated the diffusion of NPV technique in South Africa and the United Kingdom, respectively.

Any well-advised investment decision must respect the following six principles:

1   consider cash flows rather than accounting data;
2   reason in terms of incremental cash flows, considering only those associated with the project;
3   reason in terms of opportunity;
4   disregard the type of financing;
5   consider taxation; and
6   above all, is **consistent**.

1/ REASON IN TERMS OF CASH FLOWS

We have already seen that the return on an investment is assessed in terms of the resulting cash flows. One must therefore analyse the negative and positive cash flows, and not the accounting income and expenses. These accounting measures are irrelevant because they do not take into account working capital generated by the investment and include depreciation which is a noncash item.

As a result, only cash flows are relevant in the financial analysis of investments.

2/ REASON IN TERMS OF INCREMENTAL FLOWS

When considering an investment, one must take into account all the flows it generates, and nothing else but these flows. It is crucial to assess all the consequences of an investment upon a company's cash position. Some of these are self-evident and easy to measure, and others are less so.

A movie theatre group plans to launch a new complex and substantial costs have already been incurred in its design. Should these be included in the investment programme's cash flows? The answer is no, since the costs have already been incurred regardless of whether or not the complex is actually built. Therefore, they should not be considered part of the investment expenditure.

It would be absurd to carry out an investment simply because the preparations were costly and one hopes to recoup funds that, in any case, have already been spent. The only valid reason for pursuing an investment is that it is likely to create value.

Now, if the personnel department has to administer an additional 20 employees hired for the new complex (e.g. 5% of its total workforce), should 5% of the department's costs be allocated to the new project? Again, the answer is no. With or without the new complex, the personnel department is part of overhead costs. Its operating expenses would only be affected if the planned investment generates additional costs – for example, recruitment expenses.

However, design and overheads will be priced into the ticket charged for entry to the new complex.

A perfume company is about to launch a new product line that may cut sales of its older perfumes by half. Should this decline be factored into the calculation of the

investment's return? Yes, because the new product line will prompt a shift in consumer behaviour: the decline in cash flow from the older perfume stems directly from the introduction of this new product.

When estimating cash flows on an incremental basis, one only considers the future cash flows arising from the investment. Our objective is to calculate the investment's marginal contribution to the company's profitability.

3/ REASON IN TERMS OF OPPORTUNITY

For financial managers, an asset's value is its market value, which is the price at which it can be bought (investment decision) or sold (divestment decision). From this standpoint, its book or historic value is of no interest whatsoever, except for tax purposes (taxes payable on book capital gains, tax credit on capital losses, etc.).

The opportunity principle boils down to some very simple rules:

- if a company decides to hold on to a business, this implies that it should be prepared to buy that business (if it did not already own it) in identical operating circumstances; and
- if a company decides to hold on to a financial security that is trading at a given price, this security is identical to one that it should be prepared to buy (if it did not already own it) at the same price.

Financial managers are in effect "asset dealers". They must introduce this approach within their company, even if it means standing up to other managers who view their respective business operations as essential and viable. Only by systematically confronting these two viewpoints can a company balance its decision-making and management processes.

For example, if a project is carried out on company land that was previously unused, the land's after-tax resale value must be considered when valuing the investment. After all, in principle, the company can choose between selling the land and booking the after-tax sales price, or using the land for the new project. Note that the book value of the land does not enter into this line of reasoning.

Theoretically, a financial manager does not view any activity as essential, regardless of whether it is one of the company's core businesses or a potential new venture. The CFO must constantly be prepared to question each activity and reason in terms of:

- buying and selling assets; and
- entering or withdrawing from an economic sector of activity.

If we push our reasoning to the extreme, we could say that for financial managers an investment is never a necessity, but simply a "good or bad" opportunity.

4/ DISREGARD THE TYPE OF FINANCING

When comparing an investment's return with its cost of financing (what we will call weighted average cost of capital in Chapter 23), the two items must be considered separately.

In practice, since the discount rate is the cost of financing the investment (weighted average cost of capital), interest expense, repayments or dividends should not be included in the flows. **Only operating and investment flows are taken into account, but never financing flows. This is the same distinction that was made in Chapter 2.** Failure to do so would skew the project's net present value. This would also overstate its IRR, since the impact of financing would be included twice:

- first, within the weighted average cost of capital for this investment which is its cost of financing; and
- second, at the cash flow level.

Consider, for example, an investment with the following flows:

Year	0	1	2	3
Investment flows	− 100	15	15	115

The NPV of this investment is 7.2 (if cash flows are discounted at 12%) and its IRR is 15%. Now, assume that 20% of the investment was financed by debt at an annual after-tax cost of 6%. Then it is possible to deduct the debt flows from the investment flows and calculate its NPV and IRR:

Year	0	1	2	3
Investment flows	− 100	15.0	15.0	115.0
Debt financing flows	20	− 1.2	−1.2	−21.2
Net flows	−80	13.8	13.8	93.8

With a rate of 12%, the NPV is 10.1 and the IRR is 17.2%. Now, if 50% of the investment were financed by debt, the NPV would rise to 14.4 and the IRR to 24%. At 80% debt-financing, NPV works out to 18.7 and the IRR 51%.

This demonstrates that by taking on various degrees of debt, it is possible to manipulate the NPV and IRR. This is the same as using the financial leverage that was discussed in Chapter 12. However, this is a slippery slope. It can lead unwary companies to invest in projects whose low industrial profitability is offset by high debt, which in fact increases the risk considerably.

All that matters is the investment's return *per se.*

When debt increases, so does the required return on equity as the risk increases for share-holders, as we have seen in Chapter 12. It is not correct to continue valuing NPV at a constant discount rate of 12%. The discount rate has to be raised in conjunction with the level of debt. This corrects our reasoning and NPV remains constant. The IRR is now higher, but the minimum required return has risen as well to reflect the greater degree of risk of an investment financed by borrowings.

It would be absurd to believe that one can undertake an investment because it gener-ates an IRR of 10% whereas the corresponding debt can be financed at a rate of 7%. In fact, the debt is only available because the company has equity that acts as collateral for creditors. Equity has to be remunerated, and this is not reflected in the 7% interest on the debt. No company can be fully financed by debt, and it is therefore impossible to establish a direct comparison between the cost of debt and the project's return.

5/ CONSIDER TAXATION

Clearly taxation is an issue because corporate executives endeavour to maximise their **after-tax** flows. Consider that:

- additional depreciation generates tax savings that must be factored into the equation;
- the cash flows generated by the investment give rise to taxes, which must be included as well; and
- certain tax shields offer tax credits, rebates, subsidies, allowances and other advan-tages for carrying out investment projects.

In practice, it is better to value a project using after-tax cash flows and an after-tax discount rate in order to factor in the various tax benefits from an investment. Therefore, the return required by investors and creditors is calculated after tax.

In cases where cash flows are discounted before tax, it is important to ascertain that all flows and components of weighted average cost of capital are considered before taxes as well.

When considering an investment, it is also necessary to look at the tax implications.

6/ BE CONSISTENT!

Finally, the best advice is to always be consistent. If the base of valuation is on constant euro values, that is, excluding inflation, be sure that the discount rate excludes inflation as well. We recommend using current euro values, because the discount rate already includes the market's inflation expectations.

If it is a pre-tax valuation, make sure the discount rate reflects the pre-tax required rate of return. We recommend using after-tax valuations because a world without taxes only exists in text books!

And if flows are denominated in a given currency, the discount rate must correspond to the interest rate in that currency as well.

In practice, three types of cash flow must be considered when assessing an investment: **operating flows, investment flows and extraordinary flows**. Financial managers try to plan both the amount of a cash flow and its timing. In other words, they draw up projections of the cash flows on the investment.

Where the investment has a limited life, it is possible to anticipate its cash flows over the entire period. But, in general, the duration of an investment is not predetermined, and one assumes that at some point in the future it will be either wound up or sold. This means that the financial manager has to forecast all cash flows over a given period with an explicit forecast period, and reason in terms of *residual (or salvage) value* beyond that horizon. Although the discounted residual value is frequently very low since it is very far off in time, it should not be neglected. Its book value is generally zero, but its economic value may be quite significant since accounting depreciation may differ from economic depreciation. The residual value reflects the flows extending beyond the explicit investment horizon, and on into infinity. If some of the assets may be sold off, one must also factor in any taxes on capital gains.

1/ OPERATING FLOWS

The investment's contribution to total earnings before interest, taxes, depreciation and amortisation (EBITDA) must be calculated. It represents the difference between the additional income and expenses arising from the investment, excluding depreciation and amortisation.

Then from EBITDA, the **theoretical** tax on the additional operating profit must be deducted. The actual tax is then calculated by multiplying the effective tax rate with the differential on the operating profit, taking into account any tax loss carry forwards.

In other words:[1]

$$\text{Operating flows} = EBITDA - EBIT \times T_C$$

where T_C is the corporate tax rate.

1 *The same result can be obtained with the following formula:*

Operating flows = $EBIT \times (1 - T_C) +$ Depreciation and Amortisation

2/ INVESTMENT FLOWS

As you will see in Chapter 21, the definition of investment is quite inclusive, ranging from investments in working capital to investments in fixed assets.

It is essential to deduct changes in working capital from EBITDA. Unfortunately, many people tend to forget this. In most cases, working capital is just a matter of a time lag. It builds up gradually, grows with the company and is retrieved when the business is discontinued. A euro capitalised today in working capital can be retrieved in ten years' time, but it will not be worth the same. Money invested in working capital is not lost. It is simply capitalised until the investment is discontinued. However, this capitalisation carries a cost, which is reflected in the discounted amount.

Investment in fixed assets comprises investment in production capacity and growth, whether in the form of tangible assets (machinery, land, buildings, etc.) or intangible

assets (research and development, patents and licences, etc.) or financial assets (shares in subsidiaries) for external growth.

The calculation must be made for each period, as the investment is not necessarily restricted to just 1 year, nor spread evenly over the period. Once again, remember that our approach is based on cash and not accounting data. The investment flows must be recognised when they are paid, not when the decisions to make them were incurred. And finally, do not forget to reason in terms of net investment, that is, after any disposals, investment subsidies and other tax credits.

3/ EXTRAORDINARY FLOWS

It may seem surprising to mention extraordinary items when projecting estimated cash flows. However, financial managers frequently know in advance that certain expenses that have not been booked under EBITDA (litigation, tax audits, etc.) will be disbursed in the near future. These expenses must all be included on an after-tax basis in the calculation of estimated free cash flow.

Extraordinary flows can usually be anticipated at the beginning of the period since they reflect known items. Beyond a 2-year horizon, it is generally assumed that they will be zero.

This gives us the following cash flow table:

Periods	0	1	...	n
Incremental EBITDA	+	+	+	
— Incremental tax on operating profit		−	−	−
— Change in incremental working capital R		−−	−	++
— Investments	−−−	−	−	
+ Divestments after tax	+	+	+	++
— Extraordinary expenses		−		
= Cash flow to be discounted	−−	+	+	++

Section 18.4
OTHER INVESTMENT CRITERIA

1/ THE PAYBACK PERIOD

The payback period is the time necessary to recover the initial outlay on an investment. Where annual cash flows are identical, the payback period is equal to:

$$\frac{\text{Investment}}{\text{Annual cash flow}}$$

For the following investment:

Period	0	1	2	3	4	5
Cash flows	−2.1	0.8	0.8	0.8	0.8	0.8

the payback period is $2.1/0.8 = 2.6$ years.

Where the annual flows are not identical, the cumulative cash flows are compared with the amount invested, as below:

Period	0	1	2	3	4	5
Cash flows	−1	0.3	0.4	0.4	0.5	0.2
Cumulative cash flows		0.3	0.7	1.1	1.6	1.8

The cumulative flow is 0.7 for period 2 and 1.1 for period 3. The payback period is thus 2–3 years. A linear interpolation gives us a payback period of 2.75 years.

Once the payback period has been calculated, it is compared with an arbitrary cut-off date determined by the financial manager. If the payback period is longer than the cut-off period, the investment should be rejected. Clearly, when the perceived risk on the investment is high, the company will look for a very short payback period in order to get its money back before it is too late!

The payback ratio is used as an indicator of an investment's risk and profitability. However, it can lead to the wrong decision, as shown in the example below of investments A and B.

	Flows in period 0	Flows in period 1	Flows in period 2	Flows in period 3	Recovery within	20% NPV
Investment A	−1000	500	400	600	2 years and 2 months	42
Investment B	−1000	500	500	100	2 years	−178

The payback rule would prompt us to choose investment B, even though investment A has positive NPV, but B does not. The payback rule can be misleading because it does not take all flows into account. It emphasises the liquidity of an investment rather than its value.

Moreover, because it considers that a euro today is worth the same as a euro tomorrow, the payback rule does not factor in the time value of money. To remedy this, one sometimes calculates a discounted payback period representing the time needed for the project to have positive NPV. Returning to the example, it then becomes:

Year	0	1	2	3	4	5
Cumulative present values	−2.1	−1.43	−0.88	−0.41	−0.03	0.29

The discounted payback period is now 4 years compared with 2.6 years before discounting. Discounted or not, the payback period is a risk indicator, since the shorter it is, the lower the risk of the investment. **That said, it ignores the most fundamental aspect of risk: the uncertainty of estimating liquidity flows.** Therefore, it is just an approximate indicator since it only measures liquidity.

However, the payback ratio is fully suited to productive investments that affect neither the company's level of activity nor its strategy. Its very simplicity encourages employees to suggest productivity improvements that can be seen to be profitable without having to perform lengthy calculations. It only requires common sense. However, calculating flows in innovative sectors can be something of a shot in the dark. Also, the payback rule tends to favour investments with a high turnover rate. As a result, it has come under quite a bit of criticism because it can only compare investments that are similar.

2/ RETURN ON CAPITAL EMPLOYED

The return on capital employed (ROCE) represents wealth created over the year divided by capital employed. Wealth created is equal to after-tax operating profit, while the capital employed is the sum of fixed assets and the working capital generated by the investment.

$$\text{ROCE} = \frac{\text{Operating income after tax}}{\text{Net average fixed assets} + \text{Net average working capital}}$$

This ratio has a strong accounting bias, and is frequently just a comparison between the project's operating profit and the average book value of fixed assets and working capital. The average accounting return can then be calculated, which is the annual ROCE over the life of the investment. The computation of ROCE takes into account the after-tax operating profit and capital employed (working capital plus the residual investment after depreciation).

Depreciation plays a detrimental role, as shown in the example below of an initial investment of 500 generating annual EBITDA of 433 for 5 years. With stable working capital of 500 and a 40% tax rate, the free cash flow projection is as follows:

	31/12/y	$y + 1$	$y + 2$	$y + 3$	$y + 4$	$y + 5$
EBITDA		433	433	433	433	433
Tax		−133	−133	−133	−133	−133
Changes in working capital	−500	0	0	0	0	+500
Investment	−500					
Free cash flow	−1000	+300	+300	+300	+300	+800

The investment's IRR works out to 23.75%. What is its return on capital employed?

Assuming the asset is depreciated on a straight-line basis over five years, it then gives:

	$y+1$	$y+2$	$y+3$	$y+4$	$y+5$
After-tax operating profit	200	200	200	200	200
Average net asset value (NAV) of investment	450	350	250	150	50
Average working capital	500	500	500	500	500
ROCE	21 %	24 %	27 %	31 %	36 %

If the declining balance method of depreciation is used (40%, 30%, 20%, 5% and 5%), this yields:

	$y+1$	$y+2$	$y+3$	$y+4$	$y+5$
After-tax operating profit	140	170	200	245	245
Average NAV of investment	400	225	100	37.5	12.5
Average working capital	500	500	500	500	500
ROCE	16%	23%	33%	46%	48%

So, what is the return on capital employed? In the first case, it averages at 29.8% and in the second case it is 35%. Do you really believe that just changing an accounting method can influence the intrinsic profitability of a project? Of course not, and this example clearly illustrates the flaw inherent in the criteria.

Although the highest returns are usually obtained on projects with the longest durations, accounting rates of return do not take into account the date of the flow. Hence, they generally tend to overstate returns. Another drawback with accounting rates of return is that they maximise rates without considering the corresponding risk.

On the surface, it may seem that there is no connection between return on capital employed and the internal rate of return. The first discounts flows while the second calculates book wealth. And yet, taken over a year, their outcomes are identical. An amount of 100 that increases to 110 a year later has an IRR of $100 = 110/(1+r)$, so $r = 10\%$ and an ROCE of 10/100, or 10%.

ROCE and IRR are equal over a given period of time. ROCE is therefore calculated by period, while IRR and NPV are computed for the entire life of the investment.

Although accounting rates of return should not be used as investment or financing criteria, they can be useful financial control tools.

Sooner or later, a discounted return has to be translated into an accounting rate of return. If not, the investment has not generated the anticipated ex-post return and has not achieved its purpose. We strongly advise you to question any differences between IRR and ROCE, i.e. are income flows distributed or retained, do profits arise unevenly over the period (starting out slowly or not at all and then gathering momentum), what is the terminal value, etc.?

SUMMARY

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The criteria with which investment decisions are based include:

- first and foremost, net present value (NPV), which is the best criteria because it measures the value creation of the investment;

- the internal rate of return (IRR), which measures the yield to maturity of the investment; and

- if necessary and to simplify calculations, the payback ratio, which measures the amount of time needed to pay back the investment, and the return on capital employed (operating profit after tax for the period divided by capital employed for the period), which is more of a financial control tool.

The flows that are used for calculating NPV and IRR are free cash flows:

- EBITDA on the investment;

- corporate income tax calculated on the operating income of the investment;

- change in working capital created by the investment;

- capital expenditure (including any divestments).

To avoid making errors, it is necessary to:

- reason only in terms of cash flow, not charges and revenues;

- reason in terms of incremental flows – i.e., consider the cash flows arising on the investment, all the cash flows arising on the investment and only the cash flows arising on the investment. This involves calculating the investment's marginal contribution to the company's cash flows;

- reason in terms of opportunity – i.e., in financial values and not in book values;

- disregard the way in which the investment was financed – flows used in the calculations never include financial income and expenditure, new loans and repayment of loans, capital increases and capital reductions, or dividends;

- consider ordinary taxation (on operating profits) or exceptional taxes (on capital gains, subsidies, etc.); and

- Finally, the best advice is to **be consistent**!

In the business world, the differences between practice and theory in investment decisions are diminishing. Financial managers now look increasingly at NPV and IRR when making investment decisions.

1/When making an investment decision, should you reason:

- ○   in terms of cash flow?
- ○   marginally?
- ○   without regard to the type of financing?
- ○   with consideration for taxation?

2/Define the payback ratio.

3/What are the drawbacks of the payback ratio?

4/Define return on capital employed.

5/Can an investment decision be based on return on capital employed?

6/What purpose does the return on capital employed serve?

7/What roles do depreciation and amortisation play in the calculation of cash flows to be discounted?

8/What is the optimal depreciation method for a company that is not taxed? What about for a company that pays tax at the standard rate?

9/A company is planning to build a new plant to replace an older one that is to be demolished. What are the most important flows to consider?

- (a)   market value of the land and the older plant;
- (b)   demolition costs;
- (c)   costs of building access road the previous year;
- (d)   production losses while an old plant is demolished and a new one is being built;
- (e)   depreciation of the plant;
- (f)   tax credits on the investment;
- (g)   part of the salary of the managing director;
- (h)   constitution of working capital?

10/When can investment in working capital be neglected?

11/Provide examples of investments where residual value must under no circumstances be neglected.

12/In Germany, profits for 2000 were taxed at 40% if they were paid out and 30% if reinvested. What rate should be used when making an investment decision?

13/In an inflationary environment, how should you reason in evaluating an investment?

14/When operating cash flow is negative, should IRR and NPV be calculated including the interest expense on loans used to finance it?

15/Should an investment subsidy be included in investment flows or by reducing the discount rate?

1/ The following investment project is submitted to you:

- ○ Project: extension of an industrial plant;
- ○ purchase of equipment €20m;
- ○ set-up costs €1.5m;
- ○ useful life 8 years;
- ○ residual value 0;
- ○ increase in working capital €2.5m.

The project will result in an increase in EBITDA of €3m per year, over the 8 years during which the new asset is used. The equipment is depreciated over 5 years. The corporate income tax rate is 40%.

(a) Draw up the cash flow schedule for the project, on the basis of straight-line depreciation.
(b) Calculate each of the two cases:
   ○ net present value at 10%;
   ○ the internal rate of return of the project.

2/ A company is planning to replace a machine with a new, better performing one. The figures for the investment are as follows:

- ○ Purchase of new machine:
   ○ cost €2m;
   ○ useful life 5 years, residual value nil;
   ○ linear depreciation over 5 years;
   ○ savings on charges €0.8m per year.
- ○ Sale of second-hand machine:
   ○ purchase cost €1.5m (machine bought the previous year);
   ○ linear depreciation over 5 years (residual value is nil);
   ○ net book value today €1.2m;
   ○ potential sale price €1.0m.

If the tax rate on profits and capital gains/losses is 40%, what is the "value" for the company of the new machine the company is planning to buy (this company's required rate of return is 12%)?

Calculate the net present value and the internal rate of return of the planned investment.

3/ Take the following project:

Period	0	1	2	3	4	5
Cash flow	−100	110	−30	25	50	100

What problem do you come up against when calculating the payback ratio? What is the NPV of this project at 10%? What is the internal rate of return?

4/ The Catalunia region is prepared to pay €2m to a private company to run a bus service three times a day between Lerida and Tarragona, for a period of 10 years. The initial outlay for the project is estimated at €0.8m, but annual operating losses (excluding depreciation) will amount to €0.2m. What is the NPV for this investment. If the private company's required rate of return is 10%, will it take up the contract? And if it is 15%?

5/ Industrial Electric plc estimates its needs for a component used in its products at 7000 units per year for the next 10 years. A subcontractor offers to supply the parts at €5 per unit.

Industrial Electric can make the part in its own workshops for €3 per unit, if it buys a new machine. A new machine would cost €78,000, have a useful life of 10 years and a residual value of nil. The company generally gets a 10% return (after tax) on its capital expenditure. It depreciates machinery on a straight-line basis and tax is levied at a rate of 35%.

Should the company accept the subcontractor's offer?

6/ A large oil company has been invited to get involved in a project to build a parking facility in the centre of Frankfurt. The project includes a 450-car public parking lot, a 200-car garage and a petrol station covering 1000 sq.m. It will take one year to build and a 30-year concession to run the facility will be granted by the municipality (after construction has been completed). Total capital expenditure will be €8,400,000 and working capital will be nil. The annual income statement for the project after the construction looks like this:

Charges		Revenues	
Operating	670,000	Parking places	1,680,000
Depreciation and amortisation	280,000	Garage	770,000
Income tax expense	1,000,000	Petrol station	800,000
Net profits	1,300,000		
	3,250,000		3,250,000

Calculate the average accounting return on the project, the payback ratio, the net present value at 10% and the internal rate of return. Is the average accounting return equal to the average of the annual returns on the project?

7/ A year ago, Robin plc invested in a machine to improve the manufacturing of one of its products. It has just discovered that a new machine has come onto the market which would improve performance more than the one it bought. The first machine cost €8000 a year ago, and is depreciated on a straight-line basis over 8 years (the same period as its useful life after which it will be scrapped). If it were sold now, the company would get around €5000 (tax credit on the capital loss would be 40%).

The new machine costs €11,000 and would be depreciated for €10,500 on a straight-line basis over its useful life, estimated at 7 years. It could be sold at the end of its useful life for €500 which is what its book value would be.

The company is hoping to produce 100,000 units of its product annually for the next 7 years. With the equipment currently in use, the company's per unit cost price breaks down as follows: €0.14 per unit in direct labour costs, €0.10 for raw materials and €0.14 in general costs. The new machine will enable the company to cut direct labour costs to €0.12 per unit produced. The cost of raw materials will drop to €0.09 per unit thanks to a reduction in waste. General costs will remain €0.14 per unit. All other factors will remain unchanged, in particular supplies, energy consumed and maintenance costs. Profits are taxed at 40%.

(a) Draw up the cash flow schedule for the contemplated investment.

(b) Calculate the payback ratio on this investment.

8/ Pincer plc is hoping to increase sales by granting its customers longer payment periods. Its annual sales currently stand at €1m and it gives its customers an average of 30 days to pay.

The company made the following assumptions when defining its customer credit policy.

Extension of payment period	Increase in sales
15 days	€400,000
30 days	€600,000
45 days	€700,000
60 days	€750,000

The sales price of a manufactured unit is €4 and the cost price is €3.2, including €1 in fixed costs. What policy should the company introduce if it requires a 20% return (before tax) on its capital invested (its inventories are financed through supplier credit)?

b) Pincer has also made the following forecasts for bad debts:

Extension of payment period	Bad debts (Sales)
15 days	2%
30 days	4.5%
45 days	7%
60 days	12%

Bad debts currently only account for 1.2% of debts. Which policy should the company introduce?

9/ In the summer of 2001, the UK advertising group WPP got involved in a stock market battle with Havas Advertising for Tempus, a company listed on the London Stock Exchange. Havas Advertising offered shareholders 541 pence per share, before WPP increased its offer to 555 pence per share. WPP's offer was accepted.

Tempus' share capital was divided into 77 million shares. Before the takeover bid, WPP held 17 million Tempus shares (22% of the company's share capital) that it had bought up on the market over the years at an average price of 240 pence per share.

(a) How much did WPP pay for Tempus (the total price for 100% of the shares)?

(b) How much did Havas Advertising and WPP value the shareholders' equity of Tempus at?

(c) Do you think that the fact that WPP already held 22% of the share capital of Tempus which it had acquired relatively cheaply gave it the option of paying more for the rest of the shares?

ANSWERS

Questions
1; 2; 3; 4; 5 and 6.
7/ In calculating tax.
8/ It makes no difference. Depreciation is quicker.
9/ (a) yes; (b) yes; (c) no; (d) yes; (e) tax point of view; (f) yes; (g) no; (h) yes.
10/ When it is negligible!
11/ Investment in real estate.
12/ 30%.
13/ In current euro values.
14/ No, never, negative flows are part of capital expenditure in finance just as the purchase of a fixed asset is.
15/ In investment flows, because it is deducted from the flows to be invested and not from the risk, which remains the same.

Exercises

1/

Year	0	1	2	3	4	5	6	7	8
− investment flows	−21.5								
+ Δ EBITDA		3	3	3	3	3	3	3	3
− Δ working capital		2.5							−2.5
− Δ Taxes		−0.4	−0.4	−0.4	−0.4	−0.4	1.2	1.2	1.2
= cash flows	−21.5	0.9	3.4	3.4	3.4	3.4	1.8	1.8	4.3

NPV = 6.9. IRR = 0.9%

2/

Year	0	1	2	3	4	5
− purchase of new machine	−2					
+ sale of old machine	1					
+ tax credit on capital loss	−0.2 × 40%					
+ cost savings after tax		0.8–60%	0.48	0.48	0.48	0.48
+ tax savings on incremental depreciation and amortisation		0.1–40%	0.04	0.04	0.04	0.04
= cash flows to be discounted	−0.92	0.52	0.52	0.52	0.52	0.64

NPV = 1. IRR = 50%

3/ *Difficult to calculate payback period as investment is made in two phases. NPV = 67.7. IRR = 42.64%*

4/ *At 10% no, at 15% yes.*

5/ *Yes, because the NPV on the investment is −€5310.*

6/ *1.58 / (8.4 – 0) / 2 = 38%, 7 years and 9 months. NPV at 10% = €6.5m. IRR = 16%. No, it is 60% and heavily influenced by the rate of the last year which is very high (464%) because the asset is practically fully depreciated.*

7/ *Figures for year 0: 5000 (sale of old machine) −11,000 (purchase of new machine) +800 (tax credit at 40% of capital loss on sale of old machine) = 5200. Years 1 to 7: (100,000 × 0.03 − (8000/8 − 10,500/7)) × 60% + (8000/8 − 10,500/7) = 2000. Year: 500. Pay-back ratio: around 3 years.*

8/ (a) *Extend the period to 15 because NPV would then be the highest at €25,260 for one year.*

   (b) *The 15 day period is the only one for which NPV is positive.*

9/ (a) *$373m.*

   (b) *$427m for WPP and £417m for Havas Advertising.*

   (c) *No, because if WPP had not bought, it could have sold its shares (for 541 pence per share at least). In terms of opportunity costs, WPP paid more than £425m for Tempus' shareholders' equity.*

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