



DP IB Business Management: HL



Your notes

3.8 Investment Appraisal

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- * Simple Payback Period
- * Average Rate of Return (ARR)
- * Net Present Value (NPR)



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Simple Payback Period

Introduction to Investment Appraisal

- Investment appraisal involves comparing **the expected future cash flows of an investment with the initial expenditure** on that investment
- A business may want to analyse
 - How soon** the investment will recoup the initial outlay
 - How profitable** the investment will be
- Before an investment can be appraised key data will need to be collected, including
 - Sales forecasts
 - Fixed and variable costs data
 - Pricing information
 - Borrowing costs
- The collection and analysis of this data is likely to **take some time**
 - It requires **significant experience** to interpret the data appropriately **before the investment appraisal can take place**
- Two methods **used to appraise the value of an investment**, include:
 - The simple payback period
 - The average rate of return (ARR)

Simple Payback Period

- The payback period is a calculation of the **amount of time** it is expected an investment will **take to pay for itself**
- Where **net cash flows** are expected to be **constant over time**, the payback period can be calculated using the formula

$$\frac{\text{Initial Outlay}}{\text{Net Cash Flow per Period}} = \text{Years / Months}$$





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Worked Example

1. Simple Payback Calculation

Gomez Carpets is considering an investment in a new storage facility at a cost of \$200,000. It expects additional net cash flow of \$30,000 per year as a result of the investment.

Calculate the Payback period for the investment. [3]

Answer:

Step 1 - Substitute the values into the formula

$$\frac{\$ 200,000}{\$ 30,000} = 6.67 \text{ years [1 mark]}$$

Step 2 - Convert the outcome to years and months

6 years

0.67 years = 8.04 months [1 mark]

Payback period = 6 years and 8 months [3 marks for the correct answer]



Worked Example

2. Payback calculation for varying cash flow over time

Hammer and Son provides a household repairs service that has recently employed a new handywoman who requires her own van. The new van will be purchased for \$32,000

The net cash flows are expected to vary over the five years following its purchase and are shown in the table below.

Year	Net cash Flow (\$)	Cumulative Cash Flow (\$)
0	(32,000)	(32,000)
1	14,000	(18,000)
2	10,000	(8,000)
3	6,000	(2,000)
4	3,000	1,000



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5	2,000	3,000
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Calculate the payback period for the van. [4]

Answer:

Step 1 – Identify the final year where the cumulative cash flow is negative

In this case, the cumulative cash flow figure is -\$2,000 at the end of Year 3

This is the remaining amount (outlay) outstanding. [1 mark]

Step 2 – Calculate the monthly net cash flow for the next year (year 4)

$$\$3,000 \div 12 \text{ (months)} = \$250 \text{ [1 mark]}$$

Step 3 – Divide the remaining amount outstanding by the monthly net cash flow

$$\$2000 \div \$250 = 8 \text{ months [1 mark]}$$

Step 4 – Identify the payback period

In this case the Payback period is 3 years and 8 months [1 mark]

Evaluation of the Payback Method

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ It is a simple method to calculate and understand ▪ It is particularly useful for businesses where cash flow management is vital ▪ Businesses can identify the point at which an investment is paid back and contribute positively to cash flow ▪ It is also useful when new technology is introduced regularly ▪ Businesses purchasing equipment can calculate whether an investment 'pays back' before an upgrade is available 	<ul style="list-style-type: none"> ▪ It provides no insight into the profitability of investments ▪ Payback only considers the total length of time to recover an investment ▪ Neither the timing nor the future value of cash inflows is considered ▪ This method may encourage a short-termism approach ▪ Potentially lucrative investments may be dismissed as they take longer to pay back than alternatives



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Average Rate of Return (ARR)

Average Rate of Return (ARR)

- The Average Rate of Return compares the average **profit** per year generated by an investment with the value of the **initial capital cost**
- The average rate of return is calculated using the formula and is **expressed as a percentage**
 - This makes it easy to **compare different investment options**

$$\frac{(\text{total returns} - \text{capital cost}) \div \text{years of use}}{\text{capital cost}} \times 100$$



Worked Example

Creative Frames, a small artwork framing business based in Bermuda, is considering an investment of \$40,000 in new machinery. Megan, the business owner, believes that total returns over a 6-year period will be \$76,000

Calculate the Average Rate of Return of the proposed investment. [4 marks]

Answer:

Step 1 - Deduct the capital cost from the total returns

$$\$76,000 - \$40,000 = \$36,000 \quad [1 \text{ mark}]$$

Step 2 - Divide the outcome by the number of years of use

$$\$36,000 \div 6 \text{ years} = \$6,000 \quad [1 \text{ mark}]$$

Step 3 - Substitute the values into the formula

$$= \frac{6,000}{40,000} \times 100 \quad [1 \text{ mark}]$$

$$= 0.15$$

Step 4 - Multiply the outcome by 100 to find the percentage

$$0.15 \times 100 = 15\% \quad [1 \text{ mark}]$$

Evaluation of Average Rate of Return (ARR)



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Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ ARR considers all of the net cash flows generated by an investment over time ▪ ARR is easy to understand and compare the percentage returns with each other 	<ul style="list-style-type: none"> ▪ As it depends on an average of cash flows it ignores the timing of those cash flows ▪ The opportunity cost of the investment is ignored as values are neither expressed in real terms nor adjusted for the impact of interest rates and time

Limitations of using Investment Appraisal

- Each of the investment appraisal techniques **relies upon forecasted future cash flows** which may **lack accuracy**
 - Managers compiling cash flow forecasts may lack experience or may be biased towards a particular investment
 - Incomplete past data may make forecasting imprecise or mean that **confidence** in the data used to compile the forecast is limited
- **Longer-term forecasts** used to predict **returns on investments** are particularly **prone to inaccuracy** for a variety of reasons
 - Unexpected increases in **costs**
 - The arrival of **new competitors**
 - Changes in **consumer tastes**
 - Uncertainties arising as a result of economic growth or **recession**
- Factors other than the cost of investment and the return on investment are not considered
 - Business finances and availability of external finance to fund the investment
 - The overall **corporate objectives**
 - Potential for positive **public relations** or meeting **social responsibilities**



Your notes

Net Present Value (NPR)

Using the Net Present Value (NPV)

- The Net Present Value (NPV) takes into account the **effects of interest rates** and **time**
- It recognises
 - The fact that that **money received in the future is often worth less** than money received today (**inflation**)
 - The **opportunity cost** of not having the money available for other uses
- To calculate the Net Present Value of an investment, **the value of all future net cash flows in today's terms** need to be calculated first and then **discounted using a table**
- The **cost of the initial investment is deducted** from the total of the **discounted net cash flows**
 - If future net cash flows minus the initial investment are **positive**, then the investment is **likely to be worthwhile**
 - If the sum of future net cash flows minus the initial investment is **negative**, then the investment is **unlikely to be worthwhile**
- Discounted cash flows are calculated using **discount tables**, which allow future cash flows to be expressed in today's terms

Table: discount factors at different rates of interest



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INTEREST RATE

YEAR	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386

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Worked Example

Brownsea Sightseeing Tours Ltd is considering purchasing a new pleasure craft at a cost of £325,000. It expects the investment to achieve the following net cash flows over five years of operation

Year	Net cash Flow (£)	10% Discount Factor (2dp)
0	(325,000)	1.00
1	110,000	0.91
2	90,000	0.83
3	75,000	0.75
4	65,000	0.68
5	60,000	0.62

Using the 10% discount factor calculate the NPV of the leisure craft investment. (4 marks)



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Step 1 – Calculate the discounted cash flow for each year by multiplying the net cash flow by the discount factor

Year	Net cash Flow	10% Discount Factor	Discounted cash flow	
0	(£325 000)	1.00	(£325 000)	
1	£110 000	0.91	£100 100	$£110\,000 \times 0.91$
2	£90 000	0.83	£74 700	$£90\,000 \times 0.83$
3	£75 000	0.75	£56 250	$£75\,000 \times 0.75$
4	£65 000	0.68	£44 200	$£65\,000 \times 0.68$
5	£60 000	0.62	£37 200	$£60\,000 \times 0.62$

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(2)

Step 2: Add together the discounted cash flow values for each year, including Year 0

$$(\pounds 325,000) + \pounds 100,100 + \pounds 74,400 + \pounds 56,250 + \pounds 44,200 + \pounds 37,200$$

$$= (\pounds 12,550)$$

(1)

The Net present Value of the investment is -£12,550

This **negative outcome** suggests that the investment in the new pleasure craft is **not financially worthwhile**

(1)

Advantages and Disadvantages of the Net Present Value Method

Advantages	Disadvantages
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Your notes

- | | |
|--|--|
| <ul style="list-style-type: none">▪ Considers the opportunity cost of money▪ Discount tables are used to calculate forecast future values of net cashflows▪ Businesses may choose different discount tables (20%, 10%, 5% etc) to adjust the level of risk involved in a project<ul style="list-style-type: none">▪ Can consider a range of scenarios | <ul style="list-style-type: none">▪ More complicated to calculate and interpret than other methods▪ Accurately forecasting future cash flows is complex▪ Choosing an appropriate discount rate can be 'hit and miss'▪ Ignores non-financial benefits or costs e.g. environmental damage |
|--|--|



Examiner Tips and Tricks

Being able to calculate the payback period, ARR or NPV of an investment is a key quantitative skill

More important, though, is interpreting the outcome of your calculation and using it to make a judgement

- Is an investment worthwhile?
- Which investment is the most profitable?
- The costs of which investment will be recouped first?

Qualitative factors should be considered alongside calculations - review case study material carefully to select relevant information

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