3.5 Investment appraisal and budgets

Name: _____ Class: _____ Date: _____ **Total: 30 marks**

KEY WORDS payback period • average rate of return • net present value • discount factor • budget • variance

Objective

Build the skills to answer exam questions on **investment appraisal** (payback period and average rate of return; NPV at HL) and, at HL, **budgets** and variance analysis.

You must be able to:

- calculate and interpret the payback period
- calculate and interpret the average rate of return (ARR)
- compare investment projects using numbers and non-financial factors
- calculate and interpret net present value (NPV) using discount factors
- explain budgets, cost and profit centres, and calculate and interpret variances

1 Key knowledge and worked examples

■ Investment appraisal

Payback period: the time it takes for the net cash flows from a project to repay its cost. Add the net cash flows year by year (the **cumulative** cash flow) until it reaches the cost; for part of a year, $\text{months} = \dfrac{\text{amount still needed}}{\text{net cash flow in that year}} \times 12$.

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Average rate of return (ARR):

$$\text{ARR} = \frac{(\text{total net cash flows} - \text{cost}) \div \text{years}}{\text{cost}} \times 100$$

method	strengths	limitations
payback	simple; favours quick returns, which lowers risk and helps cash flow	ignores cash after payback; ignores the time value of money
ARR	uses all cash flows; easy to compare with interest rates	ignores timing and the time value of money

Non-financial factors: effects on staff and morale, the environment, the firm's image and objectives, the accuracy of forecasts, and risks such as changes in demand or costs.

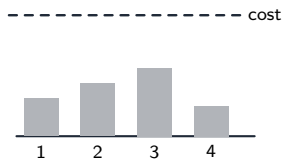
AHL – net present value: money received in the future is worth less than money today (it could earn interest). Each year's net cash flow × the **discount factor** gives its **present value**. NPV = sum of present values − cost. If NPV > 0, the project earns more than the chosen interest rate.

AHL – budgets: a **budget** is a financial plan for a future period (e.g. sales revenue, costs). **Cost centres** are parts of a firm where costs are recorded (e.g. a department); **profit centres** also earn revenue (e.g. a branch). A **variance** = actual − budget: **favourable** if it raises profit (higher revenue or lower cost), **adverse** if it lowers profit. Budgets help planning, control, coordination and motivation, but can be inflexible or based on weak forecasts.

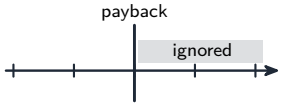
Answer shapes: cumulative table → payback in years and months → ARR with working → compare → judgement with non-financial factors.

2 Practice

2.1 Define **payback period**. [2]



2.2 State **two** limitations of the payback method. [2]



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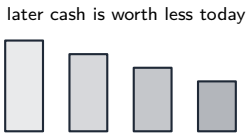
2.3 Project A costs \$50,000. Its net cash flows are \$15,000, \$20,000, \$25,000 and \$10,000 in years 1–4. Calculate its payback period in years and months. [4]

year	0	1	2	3	4
net cash flow (\$000)	−50	15	20	25	10

2.4 Calculate the average rate of return (ARR) for project A. [2]



2.5 Using discount factors at 10% of 0.909, 0.826, 0.751 and 0.683 for years 1–4, calculate the net present value of project A. [4]



3 Exam-style questions

3.1 Peak Print can buy one of two machines, each costing \$50,000. Machine A (project A above) is cheaper to run but produces lower quality. Machine B's net cash flows are \$10,000, \$15,000, \$25,000 and \$30,000 in years 1–4; it is more automated, so two jobs would be cut. Peak Print has a weak cash position.

Using payback, ARR and other information, recommend which machine Peak Print should buy. [10]

\$000	0	1	2	3	4
machine A	−50	15	20	25	10
machine B	−50	10	15	25	30

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3.2 Peak Print's marketing department has the budget and actual figures shown for last quarter ($000).

(a) Calculate the variance for each item and state whether it is favourable or adverse. [3]

$000	budget	actual
sales revenue	120	110
materials	40	36
wages	30	33

(b) Distinguish between a cost centre and a profit centre, with an example from Peak Print. [3]

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Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

the length of time; for the net cash flows from an investment to repay its initial cost

2.2

any two: ignores cash flows after the payback point; ignores the time value of money; does not measure profitability; relies on forecasts

2.3

cumulative: 15 000, 35 000 after 2 years; still needed 15 000 of year 3's 25 000; $15\,000 \div 25\,000 \times 12 = 7.2$ months; payback = **2 years 7 months**

2.4

total net cash flows = 70 000; $(70\,000 - 50\,000) \div 4 = 5\,000$ per year; ARR = $5\,000 \div 50\,000 \times 100 =$ **10**%

2.5

present values: 13 635, 16 520, 18 775, 6 830; total = 55 760; NPV = $55\,760 - 50\,000 =$ \$**5 760** (positive)

3.1

award up to [10]: machine A: payback 2 years 7 months, ARR 10%; machine B: cumulative 10 000, 25 000, 50 000: payback exactly 3 years; ARR = $(80\,000 - 50\,000) \div 4 \div 50\,000 \times 100 = 15\%$; A pays back sooner: important given the weak cash position; B is more profitable overall; non-financial: B cuts two jobs: lower morale, redundancy costs, image; B's higher quality may win customers; forecasts for later years are less certain; judgement, e.g. A if cash is the priority, B if long-term profit is; recommendation justified by the case

3.2

(a) sales revenue: $110 - 120 = -10$, adverse; materials: 36 against 40, 4 below budget, favourable; wages: 33 against 30, 3 above budget, adverse

(b) cost centre: a part of the firm where costs are recorded but no revenue is earned, e.g. the HR or maintenance department; profit centre: a part where both costs and revenues are recorded, so profit can be measured, e.g. a branch or a product line; correct examples from the case

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