UNIVERSIDAD DE LONDRES

Capital Budgeting Decisions

M. En C. Eduardo Bustos Farías

UNIVERSIDAD DE LONDRES

PELÍCULA

Capital investment decisions are concerned with the process of planning, setting goals and priorities, arranging financing, and using certain criteria to select long-term assets.

Capital Budgeting

How managers plan significant outlays on projects that have long-term implications such as the purchase of new equipment and introduction of new products.

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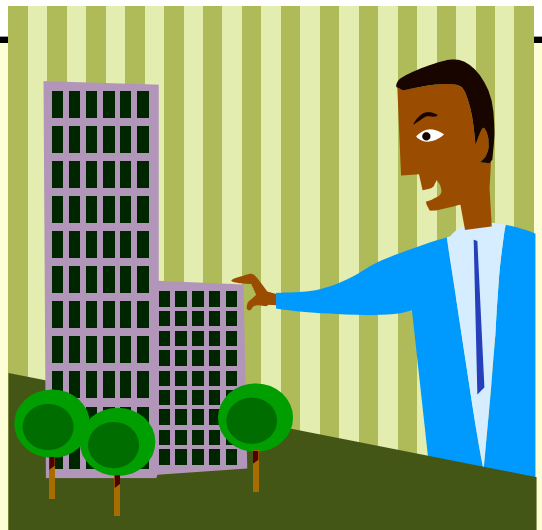

Capital Budgeting

Capital budgeting is the process of making capital investment decisions.

Two types of capital budgeting projects:

Independent Projects	***Projects that, if accepted or rejected, will not affect the cash flows of another project.***
Mutually Exclusive Projects	***Projects that, if accepted, preclude the acceptance of competing projects.***

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Typical Capital Budgeting Decisions

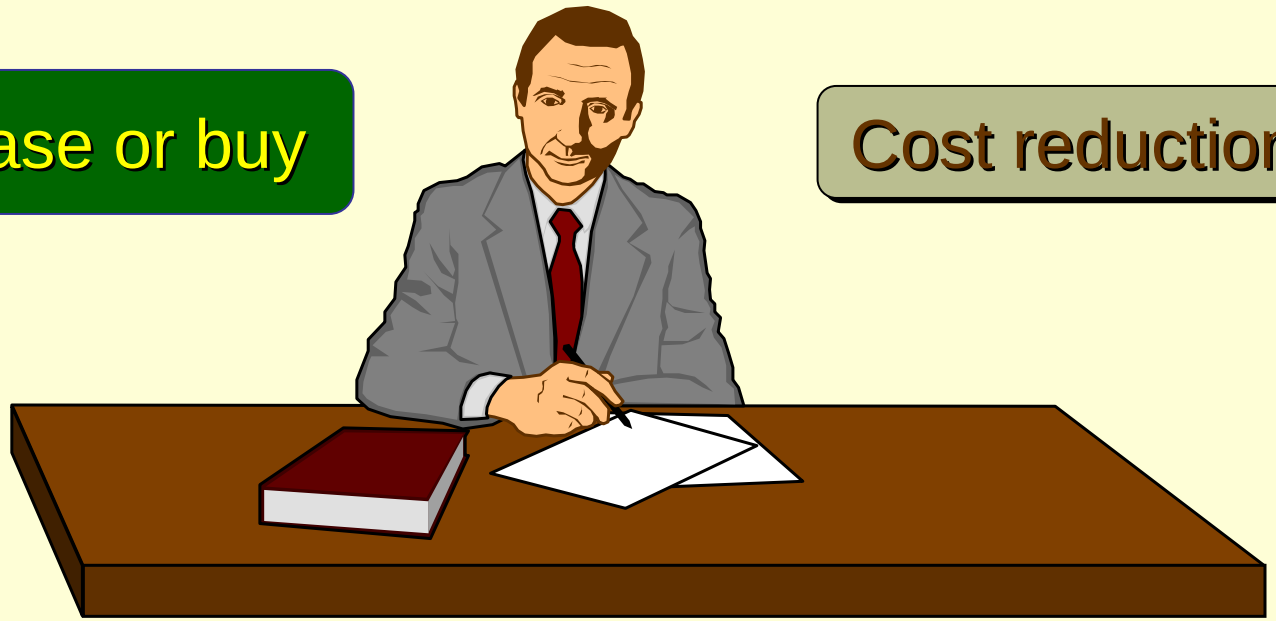
Plant expansion

Equipment selection

Equipment replacement

Lease or buy

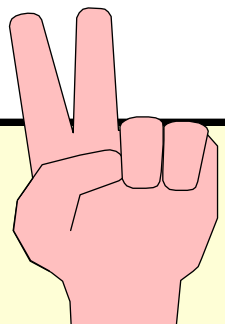
Cost reduction



Typical Capital Budgeting Decisions

Capital budgeting tends to fall into two broad categories . . .

1. **Screening decisions**. Does a proposed project (escrutinio) meet some present standard of acceptance?
2. **Preference decisions**. Selecting from among several competing courses of action.



Typical Cash Outflows

Repairs and maintenance

Working capital

Initial investment

Incremental operating costs

Typical Cash Inflows

Salvage value salvamento

Release of working capital

Reduction of costs

Incremental revenues

Recovery of the Original Investment

Carver Hospital is considering the purchase of an attachment for its X-ray machine.

conexión

Cost	$3,170
Life	4 years
Salvage value	zero
Increase in annual cash inflows	1,000

No investments are to be made unless they have an annual return of at least 10%.

A menos que

Will we be allowed to invest in the attachment?

Recovery of the Original Investment

Item	Year(s)	Amount of Cash Flow	10% Factor	Present Value of Cash Flows
Initial investment(outflow)	Now	(3,170)	1.000	(3,170)
Annual cash inflows	1-4	$ 1,000	3.170	$ 3,170
Net present value				$ -0-

Periods	10%	12%	14%
1	0.909	0.893	0.877
2	1.736	1.690	1.647
3	2.487	2.402	2.322
4	3.170	3.037	2.914
5	3.791	3.605	3.433

Present value of an annuity of $1 table

Recovery of the Original Investment

Item	Year(s)	Amount of Cash Flow	10% Factor	Present Value of Cash Flows
Initial investment(outflow)	Now	(3,170)	1.000	(3,170)
Annual cash inflows	1-4	$ 1,000	3.170	$ 3,170
Net present value				$ -0-

Because the net present value is equal to zero, the investment in the attachment for the X-ray machine provides exactly a 10% return.

Quick Check ✓

Suppose that the investment in the attachment for the X-ray machine had cost $4,000 and generated an increase in annual cash inflows of $1,200. What is the net present value of the investment?

a. $ 800

b. $ 196

c. $(196)

d. $(800)

Quick Check ✓

Suppose that the investment in the attachment for the X-ray machine had cost $4,000 and generated an increase in annual cash inflows of $1,200. What is the net present value of the investment?

a. $ 800

b. $ 196

c. $(196)

d. $(800)

$$- \$4,000 + (\$1,200 \times 3.170)$$
$$= - \$4,000 + \$3,804$$
$$= - \$196$$

Recovery of the Original Investment

Depreciation is not deducted in computing the present value of a project because . . .

1. It is not a current cash outflow.
2. Discounted cash flow methods **automatically** provide for return of the original investment.

Choosing a Discount Rate

- The firm's **cost of capital** is usually regarded as the most appropriate choice for the discount rate.
  considerado
- The cost of capital is the average rate of return the company must pay to its long-term creditors and stockholders for the use of their funds.

The Net Present Value Method

To determine net present value we . . .

1. Calculate the present value of cash inflows,
2. Calculate the present value of cash outflows,
3. Subtract the present value of the outflows from the present value of the inflows.

The Net Present Value Method

General decision rule . . .

If the Net Present Value is . . .	Then the Project is . . .
Positive . . .	Acceptable, since it promises a return greater than the required rate of return.
Zero . . .	Acceptable, since it promises a return equal to the required rate of return.
Negative . . .	Not acceptable, since it promises a return less than the required rate of return.

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The Net Present Value Method

The Net Present Value Method

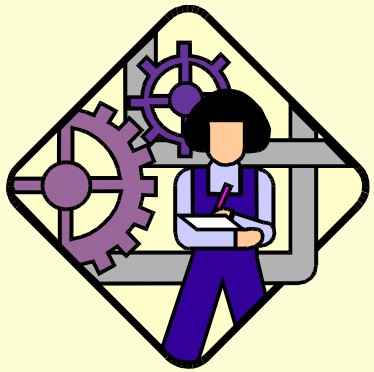
Lester Company has been offered a five year contract to provide component parts for a large manufacturer.

Cost and revenue information	
Cost of special equipment	$160,000
Working capital required	100,000
Relining equipment in 3 years	30,000
Salvage value of equipment in 5 years	5,000
Annual cash revenue and costs:	
Sales revenue from parts	750,000
Cost of parts sold	400,000
Salaries, shipping, etc.	270,000

The Net Present Value Method

- At the end of five years the working capital will be released and may be used elsewhere by Lester.
  liberado
  En otra parte
- Lester Company uses a discount rate of 10%.

Should the contract be accepted?



The Net Present Value Method

Annual net cash inflows from operations

Sales revenue	$ 750,000
Cost of parts sold	(400,000)
Salaries, shipping, etc.	(270,000)
Annual net cash inflows	$ 80,000

The Net Present Value Method

	Years	Cash Flows	10% Factor	Present Value
Investment in equipment	Now	$ (160,000)	1.000	$ (160,000)
Working capital needed	Now	(100,000)	1.000	(100,000)
Net present value				

The Net Present Value Method

	Years	Cash Flows	10% Factor	Present Value
Investment in equipment	Now	$ (160,000)	1.000	$ (160,000)
Working capital needed	Now	(100,000)	1.000	(100,000)
Annual net cash inflows	1-5	80,000	3.791	303,280
Net present value				

Present value of an annuity of $1 factor for 5 years at 10%.

The Net Present Value Method

	Years	Cash Flows	10% Factor	Present Value
Investment in equipment	Now	$ (160,000)	1.000	$ (160,000)
Working capital needed	Now	(100,000)	1.000	(100,000)
Annual net cash inflows	1-5	80,000	3.791	303,280
Relining of equipment	3	(30,000)	0.751	(22,530)
Net present value				

Present value of $1 factor for 3 years at 10%.

The Net Present Value Method

	Years	Cash Flows	10% Factor	Present Value
Investment in equipment	Now	$ (160,000)	1.000	$ (160,000)
Working capital needed	Now	(100,000)	1.000	(100,000)
Annual net cash inflows	1-5	80,000	3.791	303,280
Relining of equipment	3	(30,000)	0.751	(22,530)
Salvage value of equip.	5	5,000	0.621	3,105
Net present value				

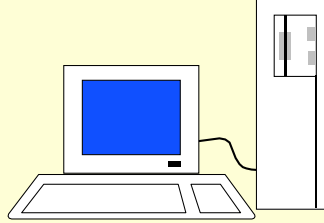
Present value of $1 factor for 5 years at 10%.

The Net Present Value Method

	Years	Cash Flows	10% Factor	Present Value
Investment in equipment	Now	$ (160,000)	1.000	$ (160,000)
Working capital needed	Now	(100,000)	1.000	(100,000)
Annual net cash inflows	1-5	80,000	3.791	303,280
Relining of equipment	3	(30,000)	0.751	(22,530)
Salvage value of equip.	5	5,000	0.621	3,105
Working capital released	5	100,000	0.621	62,100
Net present value				$ 85,955

Accept the contract because the project has a **positive** net present value.

Quick Check Data

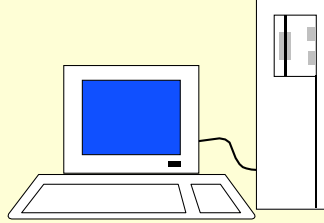


Denny Associates has been offered a four-year contract to supply the computing requirements for a local bank.

Cash flow information	
Cost of computer equipment	$ 250,000
Working capital required	20,000
Upgrading of equipment in 2 years	90,000
Salvage value of equipment in 4 years	10,000
Annual net cash inflow	120,000

- The working capital would be released at the end of the contract.
- Denny Associates requires a 14% return.

Quick Check ✓



What is the net present value of the contract with the local bank?

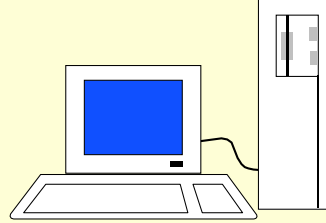
a. $150,000

b. $ 28,230

c. $ 92,340

d. $132,916

Quick Check ✓



What is the net present value of the contract with the local bank?

a. $150,000

b. $ 28,230

c. $ 92,340

	Years	Cash Flows	14% Factor	Present Value
Investment in equipment	Now	$ (250,000)	1.000	$ (250,000)
Working capital needed	Now	(20,000)	1.000	(20,000)
Annual net cash inflows	1-4	120,000	2.914	349,680
Upgrading of equipment	2	(90,000)	0.769	(69,210)
Salvage value of equip.	4	10,000	0.592	5,920
Working capital released	4	20,000	0.592	11,840
Net present value				$ 28,230

Internal Rate of Return Method

- The **internal rate of return** is the rate of return promised by an investment project over its useful life.
- The internal rate of return is computed by finding the discount rate that will cause the **net present value** of a project to be **zero**.

Internal Rate of Return Method

- Decker Company can purchase a new machine at a cost of $104,320 that will save $20,000 per year in cash operating costs.
- The machine has a 10-year life.

Internal Rate of Return Method

Future cash flows are the same every year in this example, so we can calculate the internal rate of return as follows:

Present value → **PV factor for the internal rate of return** = **Investment required / Net annual cash flows**

$$\frac{\$104,320}{\$20,000} = 5.216$$

Internal Rate of Return Method

Using the present value of an annuity of $1 table . . .

Find the 10-period row, move across until you find the factor 5.216. Look at the top of the column and you find a rate of 14%.

Periods	10%	12%	14%
1	0.909	0.893	0.877
2	1.736	1.690	1.647
. . .	. . .	. . .	. . .
9	5.759	5.328	4.946
10	6.145	5.650	5.216

Internal Rate of Return Method

- Decker Company can purchase a new machine at a cost of $104,320 that will save $20,000 per year in cash operating costs.
- The machine has a 10-year life.

The internal rate of return on this project is 14%.

If the internal rate of return is equal to or greater than the company's required rate of return, the project is acceptable.

Quick Check ✓

The expected annual net cash inflow from a project is $22,000 over the next 5 years. The required investment now in the project is $79,310. What is the internal rate of return on the project?

a. 10%

b. 12%

c. 14%

d. Cannot be determined

Quick Check ✓

The expected annual net cash inflow from a project is $22,000 over the next 5 years. The required investment now in the project is $79,310. What is the internal rate of return on the project?

a. 10%

b. 12%

c. 14%

d. Cannot be determined

$79,310/$22,000 = 3.605, which is the present value factor for an annuity over five years when the interest rate is 12%.

Net Present Value vs. Internal Rate of Return

- NPV is easier to use.
- Assumptions
  - NPV assumes cash inflows will be reinvested at the discount rate.
  - Internal rate of return method assumes cash inflows are reinvested at the internal rate of return.

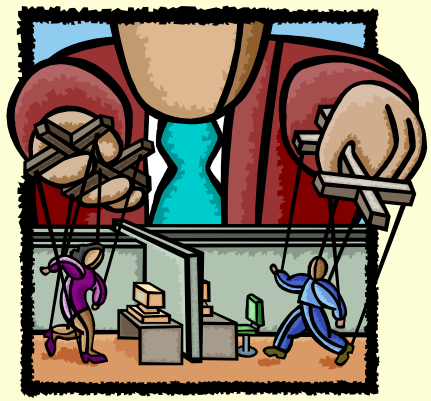
Net Present Value vs. Internal Rate of Return

- NPV is easier to use.
- Assumptions
  - NPV assumes cash inflows will be reinvested at the discount rate.
  - Internal rate of return method assumes cash inflows are reinvested at the internal rate of return.

Expanding the Net Present Value Method

To compare competing investment projects we can use the following net present value approaches:

- Total-cost
- Incremental cost



The Total-Cost Approach

- White Co. has two alternatives:
  (1) remodel an old car wash or,
  (2) remove it and install a new one.
- The company uses a discount rate of 10%.

	New Car Wash	Old Car Wash
Annual revenues	$90,000	$70,000
Annual cash operating costs	30,000	25,000
Net annual cash inflows	$60,000	$45,000

The Total-Cost Approach

If White installs a new washer . . .

Cost	$300,000
Productive life	10 years
Salvage value	7,000
Replace brushes at the end of 6 years	50,000
Salvage of old equip.	40,000

Let's look at the present value of this alternative.

The Total-Cost Approach

Install the New Washer				
	Year	Cash Flows	10% Factor	Present Value
Initial investment	Now	$ (300,000)	1.000	$ (300,000)
Replace brushes	6	(50,000)	0.564	(28,200)
Net annual cash inflows	1-10	60,000	6.145	368,700
Salvage of old equipment	Now	40,000	1.000	40,000
Salvage of new equipment	10	7,000	0.386	2,702
Net present value				$ 83,202

If we install the new washer, the investment will yield a positive net present value of $83,202.

The Total-Cost Approach

If White remodels the existing washer . . .

Remodel costs	**$175,000**
Replace brushes at the end of 6 years	**80,000**

Let's look at the present value of this second alternative.

The Total-Cost Approach

Remodel the Old Washer

	Year	Cash Flows	10% Factor	Present Value
Initial investment	Now	$(175,000)	1.000	$(175,000)
Replace brushes	6	(80,000)	0.564	(45,120)
Net annual cash inflows	1-10	45,000	6.145	276,525
Net present value				$ 56,405

If we remodel the existing washer, we will produce a positive net present value of $56,405.

The Total-Cost Approach

Both projects yield a positive net present value.

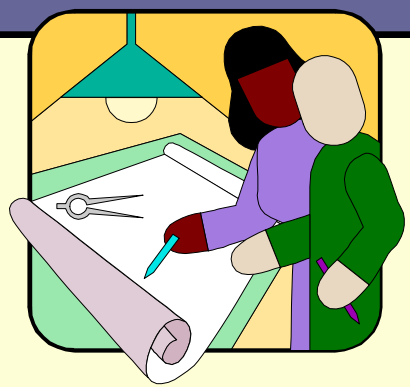
	Present Value
Invest in new washer	$ 83,202
Remodel existing washer	56,405
In favor of new washer	$ 26,797

However, investing in the new washer will produce a higher net present value than remodeling the old washer.

The Incremental-Cost Approach

Under the incremental-cost approach, only those cash flows that differ between the two alternatives are considered.

Let's look at an analysis of the White Co. decision using the incremental-cost approach.



The Incremental-Cost Approach

	Year	Cash Flows	10% Factor	Present Value
Incremental investment	Now	$(125,000)	1.000	$(125,000)
Incremental cost of brushes	6	$ 30,000	0.564	16,920
Increased net cash inflows	1-10	15,000	6.145	92,175
Salvage of old equipment	Now	40,000	1.000	40,000
Salvage of new equipment	10	7,000	0.386	2,702
Net present value				$ 26,797

We get the same answer under either the total-cost or incremental-cost approach.

Quick Check ✓

Consider the following alternative projects. Each project would last for five years.

	Project A	*Project B*
Initial investment	$80,000	$60,000
Annual net cash inflows	20,000	16,000
Salvage value	10,000	8,000

The company uses a discount rate of 14% to evaluate projects. Which of the following statements is true?

a. NPV of Project A > NPV of Project B by $5,230

b. NPV of Project B > NPV of Project A by $5,230

c. NPV of Project A > NPV of Project B by $2,000

d. NPV of Project B > NPV of Project A by $2,000

Quick Check ✓

Differences in cash flows	Years	Cash Flows	14% Factor	Present Value
Investment in equipment	Now	$ (20,000)	1.000	$ (20,000)
Annual net cash inflows	1-5	4,000	3.433	13,732
Salvage value of equip.	5	2,000	0.519	1,038
Difference in net present value				$ (5,230)

Initial investment	$80,000	$60,000
Annual net cash inflows	20,000	16,000
Salvage value	10,000	8,000

The company uses a discount rate of 14% to evaluate projects. Which of the following statements is true?

a. NPV of Project A > NPV of Project B by $5,230

b. NPV of Project B > NPV of Project A by $5,230

c. NPV of Project A > NPV of Project B by $2,000

d. NPV of Project B > NPV of Project A by $2,000

Least Cost Decisions

In decisions where revenues are not directly involved, managers should choose the alternative that has the least total cost from a present value perspective.

Let's look at the Home Furniture Company.

Least Cost Decisions

- Home Furniture Company is trying to decide whether to overhaul an old delivery truck now or purchase a new one.
- The company uses a discount rate of 10%.

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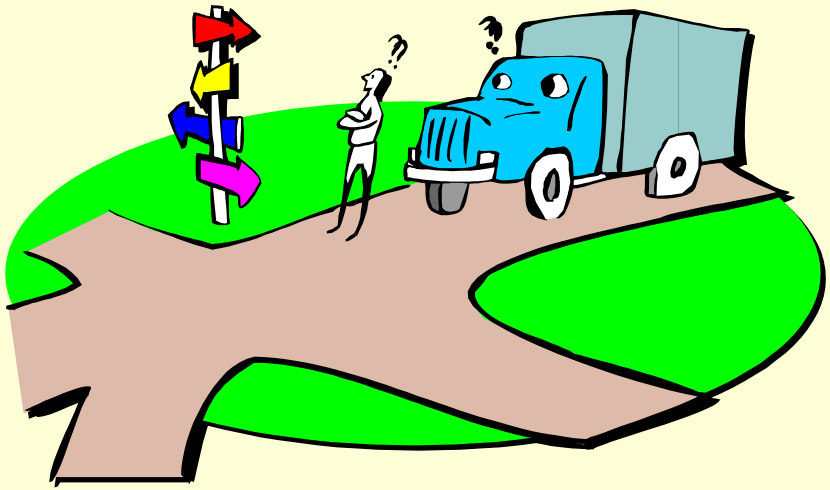

Least Cost Decisions

Here is information about the trucks . . .

Old Truck	
Overhaul cost now	$ 4,500
Annual operating costs	10,000
Salvage value in 5 years	250
Salvage value now	9,000

New Truck	
Purchase price	$21,000
Annual operating costs	6,000
Salvage value in 5 years	3,000

Least Cost Decisions

Buy the New Truck				
	Year	Cash Flows	10% Factor	Present Value
Purchase price	Now	$ (21,000)	1.000	$ (21,000)
Annual operating costs	1-5	(6,000)	3.791	(22,746)
Salvage value of old truck	Now	9,000	1.000	9,000
Salvage value of new truck	5	3,000	0.621	1,863
Net present value				(32,883)

Keep the Old Truck				
	Year	Cash Flows	10% Factor	Present Value
Overhaul cost	Now	$ (4,500)	1.000	$ (4,500)
Annual operating costs	1-5	(10,000)	3.791	(37,910)
Salvage value of old truck	5	250	0.621	155
Net present value				(42,255)

Least Cost Decisions

Home Furniture should purchase the new truck.

Net present value of costs associated with purchase of new truck	**$(32,883)**
Net present value of costs associated with remodeling existing truck	**(42,255)**
Net present value in favor of purchasing the new truck	**$ 9,372**

Quick Check ✓

Bay Architects is considering a drafting machine that would cost $100,000, last four years, and provide annual cash savings of $10,000 and considerable intangible benefits each year. How large (in cash terms) would the intangible benefits have to be to justify investing in the machine if the discount rate is 14%?

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a. $15,000

b. $90,000

c. $24,317

d. $60,000

	Years	Cash Flows	14% Factor	Present Value
Investment in machine	Now	$ (100,000)	1.000	$ (100,000)
Annual net cash inflows	1-4	10,000	2.914	29,140
Annual intangible benefits	1-4	?	2.914	?
Net present value				$ (70,860)

$70,860/2.914 = $24,317

provide annu ...00 and considerable intangible benefits each year. How

	Years	Cash Flows	14% Factor	Present Value
Investment in machine	Now	$ (100,000)	1.000	$ (100,000)
Annual net cash inflows	1-4	10,000	2.914	29,140
Annual intangible benefits	1-4	24,317	2.914	70,860
Net present value				$ (0)

c. $24,317

d. $60,000

Ranking Investment Projects

$$\text{Profitability index} = \frac{\text{Present value of cash inflows}}{\text{Investment required}}$$

	Investment	
	A	B
Present value of cash inflows	$81,000	$6,000
Investment required	80,000	5,000
Profitability index	1.01	1.20

The higher the profitability index, the more desirable the project.

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Other Approaches to Capital Budgeting Decisions

Other methods of making capital budgeting decisions include . . .

1. The Payback Method.
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2. Simple Rate of Return.

The Payback Method

The **payback period** is the length of time that it takes for a project to recover its initial cost out of the cash receipts that it generates.

When the net annual cash inflow is the same each year, this formula can be used to compute the payback period:

$$\text{Payback period} = \frac{\text{Investment required}}{\text{Net annual cash inflow}}$$

The Payback Method

Management at The Daily Grind wants to install an espresso bar in its restaurant. molido

The espresso bar:

1. Costs $140,000 and has a 10-year life.
2. Will generate net annual cash inflows of $35,000.

Management requires a payback period of 5 years or less on all investments.

What is the payback period for the espresso bar?

The Payback Method

$$\text{Payback period} = \frac{\text{Investment required}}{\text{Net annual cash inflow}}$$

$$\text{Payback period} = \frac{\$140{,}000}{\$35{,}000}$$

$$\text{Payback period} = 4.0 \text{ years}$$

According to the company's criterion, management would invest in the espresso bar because its payback period is less than 5 years.

Quick Check ✓

Consider the following two investments:

	Project X	*Project Y*
Initial investment	$100,00	$100,000
Year 1 cash inflow	$60,000	$60,000
Year 2 cash inflow	$40,000	$35,000
Year 3-10 cash inflows	$0	$25,000

Which project has the shortest payback period?

a. Project X

b. Project Y

c. Cannot be determined

Quick Check ✓

- Project X has a payback period of 2 years.
- Project Y has a payback period of slightly more than 2 years.
- Which project do you think is better?

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	Project X	*Project Y*
Initial investment	$100,00	$100,000
Year 1 cash inflow	$60,000	$60,000
Year 2 cash inflow	$40,000	$35,000
Year 3-10 cash inflows	$0	$25,000

Which project has the shortest payback period?

a. Project X

b. Project Y

c. Cannot be determined

Payback Period

Payback period = Original investment/Annual cash flow

Year	Unrecovered Investment Beginning of year	Annual Cash Flow
1	$200,000	$60,000
2	140,000	80,000
3	60,000	100,000
4		120,000
5		140,000

$60,000 was needed in Year 3 to recover the investment.

Payback Period

The payback period provides information to managers that can be used as follows:

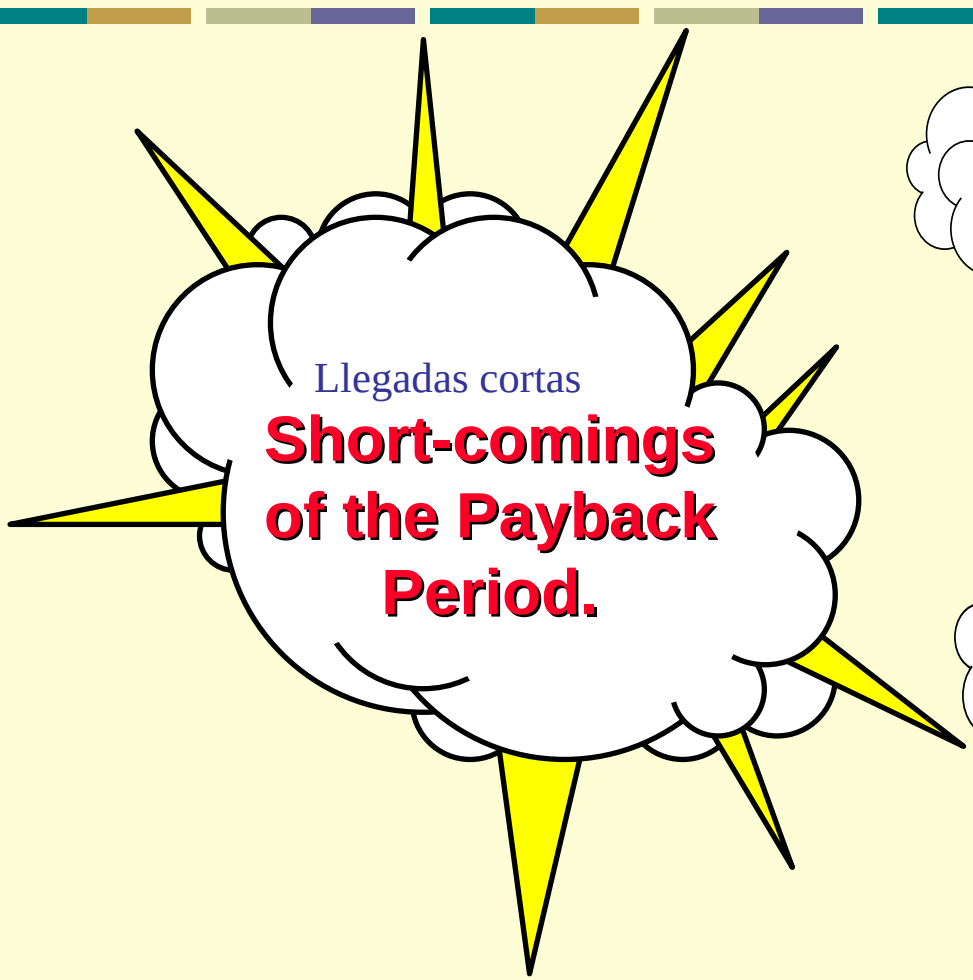
- ✓ To help control the risks associated with the uncertainty of future cash flows.
- ✓ To help minimize the impact of an investment on a firm's liquidity problems.
- ✓ To help control the risk of obsolescence.
- ✓ To help control the effect of the investment on performance measures.

Payback Period

Deficiency

- Ignores the performance of the investment beyond the payback period

Evaluation of the Payback Method



Ignores the time value of money.

Ignores cash flows after the payback period.

Simple Rate of Return Method

- Does not focus on cash flows -- rather it focuses on **accounting income**.
- The following formula is used to calculate the simple rate of return:

$$\text{Simple rate of return} = \frac{\text{Incremental revenues} - \text{Incremental expenses, including depreciation}}{\text{Initial investment}^*}$$

*Should be reduced by any salvage from the sale of the old equipment

Simple Rate of Return Method

Management of The Daily Grind wants to install an espresso bar in its restaurant.

The espresso bar:

1. Cost $140,000 and has a 10-year life.
2. Will generate incremental revenues of $100,000 and incremental expenses of $65,000 including depreciation.

What is the simple rate of return on the investment project?

Simple Rate of Return Method

$$\text{Simple rate of return} = \frac{\$100{,}000 - \$65{,}000}{\$140{,}000} = 25\%$$

The simple rate of return method is not recommended for a variety of reasons, the most important of which is that it ignores the time value of money.

Postaudit of Investment Projects

A postaudit is a follow-up after the project has been approved to see whether or not expected results are actually realized.

Auditoria posterior

Adjusting Forecast for Inflation

The cost of capital is composed of two elements:

1. The real rate
2. The inflationary element

Effects of Inflation on Capital Investment

Without Inflationary Adjustment			
Year	Cash Flow	Discount Factor	Present Value
0	$-10,000,000	1.000	$-10,000,000
1-2	5,800,000	1.528	8,862,400
Net present value			$ -1,137,600

With Inflationary Adjustment			
Year	Cash Flow	Discount Factor	Present Value
0	$-10,000,000	1.000	$-10,000,000
1	6,670,000	0.833	5,556,110
2	7,670,500	0.694	5,323,327
Net present value			$ 879,437