Managerial Accounting
TOOLS FOR BUSINESS DECISION MAKING

Prepared by
Coby Harmon
University of California, Santa Barbara
Planning for Capital Investments

Managerial Accounting
Fifth Edition
Weygandt • Kimmel • Kieso
study objectives

1. Discuss capital budgeting evaluation, and explain inputs used in capital budgeting.
2. Describe the cash payback technique.
3. Explain the net present value method.
4. Identify the challenges presented by intangible benefits in capital budgeting.
5. Describe the profitability index.
6. Indicate the benefits of performing a post-audit.
7. Explain the internal rate of return method.
8. Describe the annual rate of return method.
preview of chapter 12

Planning for Capital Investments

Capital Budgeting Evaluation Process
- Cash flow information
- Illustrative data

Cash Payback
- Calculation
- Evaluation

Net Present Value Method
- Equal cash flows
- Unequal cash flows
- Choosing a discount rate
- Simplifying assumptions
- Comprehensive example

Additional Considerations
- Intangible benefits
- Profitability index
- Risk analysis
- Post-audit of projects

Other Capital Budgeting Techniques
- Internal rate of return method
- Comparing discounted cash flow methods
- Annual rate of return method
Corporate **capital budget** authorization process:

1. Proposals for projects are requested from each department.
2. Proposals are screened by a capital budget committee.
3. Officers determine which projects are worthy of funding.
4. Board of directors approves capital budget.
Management Insight
Investing for the Future

Monitoring capital expenditure amounts is one way to learn about a company’s growth potential. Few companies can grow if they don’t make significant capital investments. Here is a list of well-known companies and the amounts and types of their capital expenditures in a recent year.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Amount</th>
<th>Type of Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbell Soup Company</td>
<td>$283 million</td>
<td>Acquisitions and plant expansions.</td>
</tr>
<tr>
<td>Barrick Gold Corporation</td>
<td>$228 million</td>
<td>Land acquisition and mine expansion.</td>
</tr>
<tr>
<td>Dell Computer Corporation</td>
<td>$329 million</td>
<td>Manufacturing and office facilities.</td>
</tr>
<tr>
<td>Sears, Roebuck and Co.</td>
<td>$925 million</td>
<td>New stores.</td>
</tr>
<tr>
<td>NIKE, Inc.</td>
<td>$186 million</td>
<td>Warehouse locations, management information systems.</td>
</tr>
</tbody>
</table>

Why is it important for top management to constantly monitor the nature, amount, and success of a company’s capital expenditures?
For purposes of capital budgeting, estimated cash inflows and outflows are the preferred inputs.

Why?

Ultimately, the value of all financial investments is determined by the value of cash flows received and paid.
Cash Outflows
- Initial investment
- Repairs and maintenance
- Increased operating costs
- Overhaul of equipment

Cash Inflows
- Sale of old equipment
- Increased cash received from customers
- Reduced cash outflows related to operating costs
- Salvage value of equipment when project is complete

Illustration 12-2
Typical cash flows relating to capital budgeting decisions

SO 1 Discuss capital budgeting evaluation, and explain inputs used in capital budgeting.
The capital budgeting decision depends on:

1. The availability of funds.
2. Relationships among proposed projects.
3. The company’s basic decision-making approach.
4. The risk associated with a particular project.
**The Capital Budgeting Evaluation Process**

**Illustrative Data**

Stewart Soup Company is considering an investment of $130,000 in new equipment.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial investment</td>
<td>$130,000</td>
</tr>
<tr>
<td>Estimated useful life</td>
<td>10 years</td>
</tr>
<tr>
<td>Estimated salvage value</td>
<td>−0−</td>
</tr>
<tr>
<td>Estimated annual cash flows</td>
<td></td>
</tr>
<tr>
<td>Cash inflows from customers</td>
<td>$200,000</td>
</tr>
<tr>
<td>Cash outflows for operating costs</td>
<td>176,000</td>
</tr>
<tr>
<td>Net annual cash flow</td>
<td>$ 24,000</td>
</tr>
</tbody>
</table>

*SO 1 Discuss capital budgeting evaluation process, and explain inputs used in capital budgeting.*
The cash payback technique identifies the time period required to recover the cost of the capital investment from the net annual cash inflow produced by the investment.

\[
\text{Cost of Capital Investment} \div \text{Net Annual Cash Flow} = \text{Cash Payback Period}
\]

The cash payback period for Stewart Soup is ...

\[
\frac{\text{Cost of Capital Investment}}{\text{Net Annual Cash Flow}} = \text{Cash Payback Period}
\]

SO 2 Describe the cash payback technique.
The shorter the payback period, the more attractive the investment.

In the case of uneven net annual cash flows, the company determines the cash payback period when the cumulative net cash flows from the investment equal the cost of the investment.
Illustration:  Chen Company proposes an investment in a new website that is estimated to cost $300,000.

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment</th>
<th>Net Annual Cash Flow</th>
<th>Cumulative Net Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$300,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>$60,000</td>
<td>$60,000</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>90,000</td>
<td>150,000</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>90,000</td>
<td>240,000</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>120,000</td>
<td>360,000</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>100,000</td>
<td>460,000</td>
</tr>
</tbody>
</table>

Cash payback period = [ ] years

Cash payback should not be the only basis for the capital budgeting decision as it ignores the expected profitability of the project.
KRC Paper Corporation is considering adding another machine for the manufacture of corrugated cardboard. The machine would cost $900,000. It would have an estimated life of 6 years and no salvage value. The company estimates that annual cash inflows would increase by $400,000 and that annual cash outflows would increase by $190,000. Compute the cash payback period.

Cash payback period = $900,000 = 6 years
Question

A $100,000 investment with a zero scrap value has an 8-year life. Compute the payback period if straight-line depreciation is used and net income is determined to be $20,000.

a. 8.00 years.

b. 3.08 years.

c. 5.00 years.

d. 13.33 years.
Discounted cash flow technique:

- Generally recognized as the best approach.
- Considers both the estimated total cash inflows and the time value of money.

Two methods:

- Net present value.
- Internal rate of return.
Net Present Value (NPV) method

- Cash inflows are discounted to their present value and then compared with the capital outlay required by the investment.
- The interest rate used in discounting is the required minimum rate of return.
- Proposal is acceptable when NPV is zero or positive.
- The higher the positive NPV, the more attractive the investment.

**SO 3 Explain the net present value method.**
A proposal is acceptable when net present value is zero or positive.
Illustration: Stewart Soup Company’s annual cash flows are $24,000. If we assume this amount is uniform over the asset’s useful life, we can compute the present value of the net annual cash flows.

<table>
<thead>
<tr>
<th>Present Value at 12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount factor for 10 periods</td>
</tr>
<tr>
<td>Present value of net cash flows: $24,000 \times 5.65022</td>
</tr>
</tbody>
</table>
**Net Present Value Method**

**Equal Annual Cash Flows**

**Illustration:** Calculate the net present value.

The proposed capital expenditure is **acceptable** at a required rate of return of 12% because the net present value is **positive**.
Net Present Value Method

Unequal Annual Cash Flows

Illustration: Stewart Soup Company expects the same total net cash flows of $240,000 over the life of the investment. Because of a declining market demand for the new product the net annual cash flows are higher in the early years and lower in the later years.
**Net Present Value Method**

**Unequal Annual Cash Flows**

<table>
<thead>
<tr>
<th>Year</th>
<th>Assumed Net Annual Cash Flows</th>
<th>Discount Factor 12%</th>
<th>Present Value 12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$34,000</td>
<td>.89286</td>
<td>(1) × (2) $30,357</td>
</tr>
<tr>
<td>2</td>
<td>30,000</td>
<td>.79719</td>
<td>23,916</td>
</tr>
<tr>
<td>3</td>
<td>27,000</td>
<td>.71178</td>
<td>19,218</td>
</tr>
<tr>
<td>4</td>
<td>25,000</td>
<td>.63552</td>
<td>15,888</td>
</tr>
<tr>
<td>5</td>
<td>24,000</td>
<td>.56743</td>
<td>13,618</td>
</tr>
<tr>
<td>6</td>
<td>22,000</td>
<td>.50663</td>
<td>11,146</td>
</tr>
<tr>
<td>7</td>
<td>21,000</td>
<td>.45235</td>
<td>9,499</td>
</tr>
<tr>
<td>8</td>
<td>20,000</td>
<td>.40388</td>
<td>8,078</td>
</tr>
<tr>
<td>9</td>
<td>19,000</td>
<td>.36061</td>
<td>6,852</td>
</tr>
<tr>
<td>10</td>
<td>18,000</td>
<td>.32197</td>
<td>5,795</td>
</tr>
<tr>
<td></td>
<td>$240,000</td>
<td></td>
<td>$144,367</td>
</tr>
</tbody>
</table>

Illustration 12-9
Computation of present value of unequal annual cash flows

**SO 3** Explain the net present value method.
Net Present Value Method

Unequal Annual Cash Flows

Illustration: Calculate the net present value.

<table>
<thead>
<tr>
<th></th>
<th>12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present value of net cash flows</td>
<td>$144,367</td>
</tr>
<tr>
<td>Capital investment</td>
<td>130,000</td>
</tr>
<tr>
<td><strong>Net present value</strong></td>
<td><strong>$ 14,367</strong></td>
</tr>
</tbody>
</table>

The proposed capital expenditure is acceptable at a required rate of return of 12% because the net present value is positive.

SO 3 Explain the net present value method.
Net Present Value Method

Choosing a Discount Rate

In most instances a company uses a required rate of return equal to its cost of capital — that is, the rate that it must pay to obtain funds from creditors and stockholders.

Discount rate has two elements:

- Cost of capital.
- Risk.

Rate also known as:
- required rate of return.
- hurdle rate.
- cutoff rate.

SO 3 Explain the net present value method.
Illustration: Stewart Soup used a discount rate of 12%. Suppose this rate does not take into account the risk of the project. A more appropriate rate might be 15%.

<table>
<thead>
<tr>
<th>Present Values at Different Discount Rates</th>
<th>12%</th>
<th>15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount factor for 10 periods</td>
<td>5.65022</td>
<td>5.01877</td>
</tr>
<tr>
<td>Present value of net cash flows:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$24,000 \times 5.65022</td>
<td>$135,605</td>
<td></td>
</tr>
<tr>
<td>$24,000 \times 5.01877</td>
<td></td>
<td>$120,450</td>
</tr>
<tr>
<td>Capital investment</td>
<td>130,000</td>
<td>130,000</td>
</tr>
<tr>
<td>Positive (negative) net present value</td>
<td>$ 5,605</td>
<td>$(9,550)</td>
</tr>
</tbody>
</table>

SO 3 Explain the net present value method.
Simplifying Assumptions

- All cash flows come at the end of each year.
- All cash flows are immediately reinvested in another project that has a similar return.
- All cash flows can be predicted with certainty.
Net Present Value Method

Question

Compute the net present value of a $260,000 investment with a 10-year life, annual cash inflows of $50,000 and a discount rate of 12%.

a. $(9,062).
b. $22,511.
c. $9,062.
d. $(22,511).

SO 3 Explain the net present value method.
KRC Paper Corporation is considering adding another machine for the manufacture of corrugated cardboard. The machine would cost $900,000. It would have an estimated life of 6 years and no salvage value. The company estimates that annual cash inflows would increase by $400,000 and that annual cash outflows would increase by $190,000. Management has a required rate of return of 9%. Calculate the net present value on this project and discuss whether it should be accepted.
## Net Present Value Method

**Do it!** Calculate the net present value on this project and discuss whether it should be accepted.

<table>
<thead>
<tr>
<th>Net annual cash flow</th>
<th>Cash Flow</th>
<th>9% Discount Factor</th>
<th>Present Value</th>
</tr>
</thead>
</table>

Net present value

*Table 4, Appendix A.

Since the net present value is [Missing Value], Watertown should [Missing Value] the project.
**Net Present Value Method**

**Comprehensive Example**

Best Taste Foods is considering investing in new equipment to produce fat-free snack foods.

<table>
<thead>
<tr>
<th>Initial investment</th>
<th>$1,000,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of equipment overhaul in 5 years</td>
<td>$200,000</td>
</tr>
<tr>
<td>Salvage value of equipment in 10 years</td>
<td>$20,000</td>
</tr>
<tr>
<td>Cost of capital (discount rate)</td>
<td>15%</td>
</tr>
<tr>
<td>Estimated annual cash flows</td>
<td></td>
</tr>
<tr>
<td>Cash inflows received from sales</td>
<td>$500,000</td>
</tr>
<tr>
<td>Cash outflows for cost of goods sold</td>
<td>$200,000</td>
</tr>
<tr>
<td>Maintenance costs</td>
<td>$30,000</td>
</tr>
<tr>
<td>Other direct operating costs</td>
<td>$40,000</td>
</tr>
</tbody>
</table>

*Illustration 12-12*
Investment information for Best Taste

*SO 3 Explain the net present value method.*
Net Present Value Method

Comprehensive Example

Compute the net annual cash flow.

Illustration 12-13
## Net Present Value Method

### Comprehensive Example

**Compute the net present value.**

<table>
<thead>
<tr>
<th>Event</th>
<th>Time Period</th>
<th>Cash Flow</th>
<th>× 15% Discount Factor</th>
<th>= Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment purchase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment overhaul</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net annual cash flow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salvage value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Net present value</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Illustration 12-14

SO 3 Explain the net present value method.
Intangible Benefits

Intangible benefits might include increased quality, improved safety, or enhanced employee loyalty.

To avoid rejecting projects with intangible benefits:

1. Calculate net present value ignoring intangible benefits.

2. Project rough, conservative estimates of the value of the intangible benefits, and incorporate these values into the NPV calculation.
**Example** - Berg Company is considering the purchase of a new mechanical robot.

<table>
<thead>
<tr>
<th>Initial investment</th>
<th>$200,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual cash inflows</td>
<td>$50,000</td>
</tr>
<tr>
<td>Annual cash outflows</td>
<td>20,000</td>
</tr>
<tr>
<td><strong>Net annual cash flow</strong></td>
<td><strong>$30,000</strong></td>
</tr>
<tr>
<td>Estimated life of equipment</td>
<td>10 years</td>
</tr>
<tr>
<td>Discount rate</td>
<td>12%</td>
</tr>
</tbody>
</table>

Based on the negative net present value of $30,493, the proposed project is not acceptable.

**Illustration 12-15**

Cash Flows $30,000 × 12% Discount Factor 5.65022 = Present Value $169,507

Initial investment 200,000

Net present value $(30,493)
Example - Berg estimates that sales will increase cash inflows by $10,000 annually as a result of an increase in perceived quality. Berg also estimates that annual cost outflows would be reduced by $5,000 as a result of lower warranty claims, reduced injury claims, and missed work.

Illustration 12-16

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial investment</td>
<td>$200,000</td>
</tr>
<tr>
<td>Annual cash inflows (revised)</td>
<td>$60,000</td>
</tr>
<tr>
<td>Annual cash outflows (revised)</td>
<td>15,000</td>
</tr>
<tr>
<td><strong>Net annual cash flow</strong></td>
<td><strong>$45,000</strong></td>
</tr>
<tr>
<td>Estimated life of equipment</td>
<td>10 years</td>
</tr>
<tr>
<td>Discount rate</td>
<td>12%</td>
</tr>
</tbody>
</table>

\[
\text{Present value of net annual cash flows} = \frac{\text{Cash Flows} \times 12\% \text{ Discount Factor}}{\text{Initial investment}}
\]

- Present value of net annual cash flows: $45,000 \times 5.65022 = $254,260
- Initial investment: $200,000
- **Net present value**: $54,260

Berg would accept the project.
Ethics Insight

It Need Not Cost an Arm and a Leg

Most manufacturers say that employee safety matters above everything else. But how many back up this statement with investments that improve employee safety? Recently a woodworking hobbyist, who also happens to be a patent attorney with a Ph.D. in physics, invented a mechanism that automatically shuts down a power saw when the saw blade comes in contact with human flesh. The blade stops so quickly that only minor injuries result.

Power saws injure 40,000 Americans each year, and 4,000 of those injuries are bad enough to require amputation. Therefore, one might think that power-saw companies would be lined up to incorporate this mechanism into their saws. But, in the words of one power-tool company, “Safety doesn’t sell.” Since existing saw manufacturers were unwilling to incorporate the device into their saws, eventually the inventor started his own company to build the devices and sell them directly to businesses that use power saws.


In addition to the obvious humanitarian benefit of reducing serious injuries, how else might the manufacturer of this product convince potential customers of its worth?
Profitability Index for Mutually Exclusive Projects

- Proposals are often mutually exclusive.
- Managers often must choose between various positive-NPV projects because of limited resources.
- Tempting to choose the project with the higher NPV.
Additional Considerations

Profitability Index for Mutually Exclusive Projects

Illustration: Two mutually exclusive projects, each assumed to have a 10-year life and a 12% discount rate.

Illustration 12-17

<table>
<thead>
<tr>
<th></th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial investment</td>
<td>$40,000</td>
<td>$90,000</td>
</tr>
<tr>
<td>Net annual cash inflow</td>
<td>10,000</td>
<td>19,000</td>
</tr>
<tr>
<td>Salvage value</td>
<td>5,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Present value of net annual cash flows</td>
<td>58,112</td>
<td>110,574</td>
</tr>
</tbody>
</table>

Illustration 12-18

<table>
<thead>
<tr>
<th></th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present value of net annual cash flows</td>
<td>$58,112</td>
<td>$110,574</td>
</tr>
<tr>
<td>Initial investment</td>
<td>40,000</td>
<td>90,000</td>
</tr>
<tr>
<td>Net present value</td>
<td><strong>$18,112</strong></td>
<td><strong>$20,574</strong></td>
</tr>
</tbody>
</table>
Profitability Index for Mutually Exclusive Projects

Illustration: One method of comparing alternative projects is the **profitability index**.

<table>
<thead>
<tr>
<th>Illustration 12-18</th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present value of net annual cash flows</td>
<td>$58,112</td>
<td>$110,574</td>
</tr>
<tr>
<td>Initial investment</td>
<td>40,000</td>
<td>90,000</td>
</tr>
<tr>
<td>Net present value</td>
<td>$18,112</td>
<td>$20,574</td>
</tr>
</tbody>
</table>

**Illustration 12-20**

Profitability Index = \[
\frac{\text{Present Value of Net Cash Flows}}{\text{Initial Investment}}
\]

- Project A: \[
\frac{\text{Present Value of Net Cash Flows}}{\text{Initial Investment}} = \quad \]
- Project B: \[
\frac{\text{Present Value of Net Cash Flows}}{\text{Initial Investment}} = \quad \]

SO 5 Describe the profitability index.
Assume Project A has a present value of net cash inflows of $79,600 and an initial investment of $60,000. Project B has a present value of net cash inflows of $82,500 and an initial investment of $75,000. Assuming the projects are mutually exclusive, which project should management select?

a. Project A.
b. Project B.
c. Project A or B.
d. There is not enough data to answer the question.

SO 5 Describe the profitability index.
Risk Analysis

A simplifying assumption made by many financial analysts is that projected results are known with certainty.

- Projected results are only estimates.
- Sensitivity analysis is used to deal with uncertainty.
  - Sensitivity analysis uses a number of outcome estimates to get a sense of the variability among potential returns.

SO 5 Describe the profitability index.
Management Insight

Are You Ready for the 50-Inch Screen?

Building a new factory to produce 50-inch-plus TV screens can cost $4 billion at a time when prices for flat screens are tumbling. Now the makers of those giant liquid-crystal displays are wondering whether such investments are worth the gamble.

If LCD makers decide to hold off on building new factories, price declines for widescreen TVs could slow in two or three years as production falls behind added consumer demand. Experts also say a slowdown in factory building could also bring welcome relief for the industry by reducing its volatile profit swings.

Since 2000, LCD makers have been on a nonstop construction binge, building new factories to produce the latest generation of screens arriving every 18 months or so. . . . Now, with the eighth generation of screens, the cost to build new factories is higher than ever—running between $3 billion to $4 billion each. And this generation of factories is optimized for screens measuring 50 inches or more diagonally, which so far is a much smaller potential market than that targeted by previous screen generations.


In building factories to manufacture 50-inch TV screens, how might companies build risk factors into their financial analyses?
Performing a post-audit is important.

- If managers know that their estimates will be compared to actual results they will be more likely to submit reasonable and accurate data when making investment proposals.
- Provides a formal mechanism to determine whether existing projects should be supported or terminated.
- Improve future investment proposals.

SO 6 Indicate the benefits of performing a post-audit.
Management Insight

Seeing the Big Picture

Inaccurate trend forecasting and market positioning are more detrimental to capital investment decisions than using the wrong discount rate. Ampex patented the VCR, but failed to see its market potential. Westinghouse made the same mistake with the flat-screen video display. More often, companies adopt projects or businesses only to discontinue them in response to market changes. Texas Instruments announced it would stop manufacturing computer chips, after it had made substantial capital investments that enabled it to become one of the world’s leading suppliers. The company dropped out of some 12 business lines in only a few years.


How important is the choice of discount rate in making capital budgeting decisions?
**Other Capital Budgeting Techniques**

**Internal Rate of Return Method**

- Differs from the net present value method in that it finds the **interest yield of the potential investment**.

- **Internal rate of return (IRR)** - interest rate that will cause the present value of the proposed capital expenditure to equal the present value of the expected net annual cash flows (NPV equal to zero).

- How does one determine the internal rate of return?

---

*SO 7* Explain the internal rate of return method.
Internal Rate of Return Method

**Illustration:** Stewart Soup Company is considering the purchase of a new front-end loader at a cost of $244,371. Net annual cash flows from this loader are estimated to be $100,000 a year for three years. Determine the internal rate of return on this front-end loader.

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Annual Cash Flows</th>
<th>Discount Factor 10%</th>
<th>Present Value 10%</th>
<th>Discount Factor 11%</th>
<th>Present Value 11%</th>
<th>Discount Factor 12%</th>
<th>Present Value 12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$100,000</td>
<td>.90909</td>
<td>$ 90,909</td>
<td>.90090</td>
<td>$ 90,090</td>
<td>.89286</td>
<td>$ 89,286</td>
</tr>
<tr>
<td>2</td>
<td>$100,000</td>
<td>.82645</td>
<td>82,645</td>
<td>.81162</td>
<td>81,162</td>
<td>.79719</td>
<td>79,719</td>
</tr>
<tr>
<td>3</td>
<td>$100,000</td>
<td>.75132</td>
<td>75,132</td>
<td>.73119</td>
<td>73,119</td>
<td>.71178</td>
<td>71,178</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>248,686</td>
<td></td>
<td>244,371</td>
<td></td>
<td>240,183</td>
</tr>
<tr>
<td>Less: Initial investment</td>
<td></td>
<td></td>
<td>244,371</td>
<td></td>
<td>244,371</td>
<td></td>
<td>244,371</td>
</tr>
<tr>
<td>Net present value</td>
<td></td>
<td></td>
<td>$ 4,315</td>
<td></td>
<td>$ -0-</td>
<td></td>
<td>$ (4,188)</td>
</tr>
</tbody>
</table>

**Illustration 12-21**
Estimation of internal rate of return

**SO 7** Explain the internal rate of return method.
Other Capital Budgeting Techniques

Internal Rate of Return Method

An easier approach to solving for the internal rate of return when net annual cash flows are equal.

Illustration 12-22

\[
\text{Capital Investment} \div \text{Net Annual Cash Flows} = \text{Internal Rate of Return Factor}
\]

Applying the formula:

\[
\text{Capital Investment} \div \text{Net Annual Cash Flows} = \text{Internal Rate of Return Factor}
\]

<table>
<thead>
<tr>
<th>( (n) ) Periods</th>
<th>4%</th>
<th>5%</th>
<th>6%</th>
<th>8%</th>
<th>9%</th>
<th>10%</th>
<th>11%</th>
<th>12%</th>
<th>15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SO 7 Explain the internal rate of return method.
Internal Rate of Return Method

Illustration 12-23
Internal rate of return decision criteria

Internal Rate of Return
Compared to
Required Rate of Return (the Discount Rate)
If equal to or greater than:
Accept Proposal
If less than:
Reject Proposal

SO 7 Explain the internal rate of return method.
KRC Paper Corporation is considering adding another machine for the manufacture of corrugated cardboard. The machine would cost $900,000. It would have an estimated life of 6 years and no salvage value. The company estimates that annual cash inflows would increase by $400,000 and that annual cash outflows would increase by $190,000. Management has a required rate of return of 9%. Calculate the internal rate of return on this project and discuss whether it should be accepted.
Other Capital Budgeting Techniques

Do it! Calculate the internal rate of return.

\begin{align*}
\text{Estimated annual cash inflows} & \quad \text{\$400,000} \\
\text{Estimated annual cash outflows} & \quad \text{\$190,000} \\
\text{Net annual cash flow} & \quad \text{\$210,000} \\
\text{Machine cost} & \quad \text{\$900,000} \\
\text{Net annual cash flow} & \quad \text{\$210,000} \\
\text{PV Factor} & \quad \text{4.28571}
\end{align*}

Calculate the internal rate of return.

Now, find the rate that corresponds to the present value factor.

SO 7 Explain the internal rate of return method.
Calculate the internal rate of return.

PV Factor

4.28571

<table>
<thead>
<tr>
<th>(n)</th>
<th>4%</th>
<th>5%</th>
<th>6%</th>
<th>8%</th>
<th>9%</th>
<th>10%</th>
<th>11%</th>
<th>12%</th>
<th>15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.96154</td>
<td>.95238</td>
<td>.94340</td>
<td>.92593</td>
<td>.91743</td>
<td>.90909</td>
<td>.90090</td>
<td>.89286</td>
<td>.86957</td>
</tr>
<tr>
<td>2</td>
<td>1.88609</td>
<td>1.85941</td>
<td>1.83339</td>
<td>1.78326</td>
<td>1.75911</td>
<td>1.73554</td>
<td>1.71252</td>
<td>1.69005</td>
<td>1.62571</td>
</tr>
<tr>
<td>3</td>
<td>2.77509</td>
<td>2.72325</td>
<td>2.67301</td>
<td>2.57710</td>
<td>2.53130</td>
<td>2.48685</td>
<td>2.44371</td>
<td>2.40183</td>
<td>2.28323</td>
</tr>
<tr>
<td>7</td>
<td>6.00205</td>
<td>5.78637</td>
<td>5.58238</td>
<td>5.20637</td>
<td>5.03295</td>
<td>4.86842</td>
<td>4.71220</td>
<td>4.56376</td>
<td>4.16042</td>
</tr>
</tbody>
</table>

Since the required rate of return is only 9%, the project should be accepted.

**SO 7 Explain the internal rate of return method.**
### Comparing Discounted Cash Flow Methods

<table>
<thead>
<tr>
<th>Net Present Value</th>
<th>Internal Rate of Return</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Objective</strong></td>
<td></td>
</tr>
<tr>
<td>Compute net present value (a dollar amount).</td>
<td>Compute internal rate of return (a percentage).</td>
</tr>
<tr>
<td><strong>2. Decision rule</strong></td>
<td></td>
</tr>
<tr>
<td>If net present value is zero or positive, accept the proposal.</td>
<td>If internal rate of return is equal to or greater than the required rate of return, accept the proposal.</td>
</tr>
<tr>
<td>If net present value is negative, reject the proposal.</td>
<td>If internal rate of return is less than the required rate of return, reject the proposal.</td>
</tr>
</tbody>
</table>

Either method will provide management with relevant quantitative data for making capital budgeting decisions.

*SO 7 Explain the internal rate of return method.*
Annual Rate of Return Method

Indicates the profitability of a capital expenditure by dividing expected annual net income by the average investment.

\[
\text{Expected Annual Net Income} \div \text{Average Investment} = \text{Annual Rate of Return}
\]
**Annual Rate of Return Method**

**Illustration:** Reno Company is considering an investment of $130,000 in new equipment. The new equipment is expected to last five years and have zero salvage value at the end of its useful life. Reno uses the straight-line method of depreciation.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$200,000</td>
</tr>
<tr>
<td>Less: Costs and expenses</td>
<td></td>
</tr>
<tr>
<td>Manufacturing costs (exclusive of depreciation)</td>
<td>$132,000</td>
</tr>
<tr>
<td>Depreciation expense ($130,000 ÷ 5)</td>
<td>26,000</td>
</tr>
<tr>
<td>Selling and administrative expenses</td>
<td>22,000</td>
</tr>
<tr>
<td>Income before income taxes</td>
<td>20,000</td>
</tr>
<tr>
<td>Income tax expense</td>
<td>7,000</td>
</tr>
<tr>
<td><strong>Net income</strong></td>
<td><strong>$13,000</strong></td>
</tr>
</tbody>
</table>
Annual Rate of Return Method

Average Investment = \( \frac{\text{Original Investment} + \text{Value at End of Useful Life}}{2} \)

\[
\frac{130,000 + 0}{2} = \$65,000
\]

Expected annual rate of return = \( \frac{\$13,000}{\$65,000} = 20\% \)

A project is acceptable if its rate of return is greater than management's required rate of return.

SO 8 Describe the annual rate of return method.
KRC Paper Corporation is considering adding another machine for the manufacture of corrugated cardboard. The machine would cost $900,000. It would have an estimated life of 6 years and no salvage value. The company estimates that annual revenues would increase by $400,000 and that annual expenses excluding depreciation would increase by $190,000. It uses the straight-line method to compute depreciation expense. Management has a required rate of return of 9%. Compute the annual rate of return.

SO 8 Describe the annual rate of return method.
Other Capital Budgeting Techniques

Do it! Compute the annual rate of return.

Annual net income
Average investment =
Annual rate of return =

The proposed project is

SO 8 Describe the annual rate of return method.
Cornfield Company is considering a long-term capital investment project in laser equipment. This will require an investment of $280,000, and it will have a useful life of 5 years. Annual net income is expected to be $16,000 a year. Depreciation is computed by the straight-line method with no salvage value. The company’s cost of capital is 10%. (Hint: Assume cash flows can be computed by adding back depreciation expense.)

(a) Compute the cash payback period for the project. (Round to two decimals.)
(a) Compute the cash payback period for the project. (Round to two decimals.)

Investment

Annual cash flow

Cash Payback Period  

years
Discount factor (5 periods @ 10%) 

Present value of net cash flows: 

$72,000 \times 3.79079 \approx 272,937$

Capital investment: $280,000$

Negative net present value: $(7,063)$

Compute the net present value for the project. (Round to nearest dollar.)

Comprehensive Solution on notes page
The annual rate of return of 11.4% is good. However, the cash payback period is 78% of the project's useful life, and net present value is negative. Recommendation is to reject the project.

<table>
<thead>
<tr>
<th>Net income</th>
<th>$16,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average investment</td>
<td>($280,000     2) 140,000</td>
</tr>
<tr>
<td>Annual rate of return</td>
<td>11.4%</td>
</tr>
</tbody>
</table>

Comprehensive Solution on notes page (d) Should the project be accepted? Why?

(d) Should the project be accepted? Why?

The annual rate of return of 11.4% However, the cash payback period is 78% of the project's useful life, and net present value is negative. Recommendation is to reject the project.
“Copyright © 2010 John Wiley & Sons, Inc. All rights reserved. Reproduction or translation of this work beyond that permitted in Section 117 of the 1976 United States Copyright Act without the express written permission of the copyright owner is unlawful. Request for further information should be addressed to the Permissions Department, John Wiley & Sons, Inc. The purchaser may make back-up copies for his/her own use only and not for distribution or resale. The Publisher assumes no responsibility for errors, omissions, or damages, caused by the use of these programs or from the use of the information contained herein.”