

INVESTMENT CRITERIA

Net Present Value (NPV)

- What: NPV is a measure of how much value is created or added today by undertaking an investment (the difference between the investment's market value and its cost).
- How: Estimate future cash flows. Calculate the present value of those cash flows minus the initial cost.

NPV Example

- You plan to buy a machine that will cost \$2,000 today and produce cash flows of \$1,500 in each of the next two years. The salvage value will be zero. The cost of capital is 15 percent. Should you buy the machine?

Net Present Value (NPV)

- The Rule: An investment should be accepted if the net present value is _____ and rejected if it is _____.

**Assumes cash flows are reinvested at _____.*

- **Pros:**

1. Uses _____
2. Adjusts for _____

- **Cons:**

1. Need appropriate _____
2. Relatively more difficult to _____

Internal Rate of Return (IRR)

- What: The internal rate of return is the discount rate that makes the net present value of a project equal to zero.
- How: Set NPV equal to zero and solve for “r”. Calculating IRR is identical to calculating the yield to maturity on bonds.

IRR Example

- You plan to buy a machine that will cost \$2,000 today and produce cash flows of \$1,500 in each of the next two years. The salvage value will be zero. The cost of capital is 15 percent. Should you buy the machine?

Internal Rate of Return (IRR)

- **The Rule:** An investment is acceptable if the IRR exceeds the _____. It should be rejected otherwise.

**Assumes cash flows are reinvested at _____.*

- **Pros:**

1. Closely related to _____
2. Relatively easier to _____

- **Cons:**

1. May result in _____
(nonconventional cash flows)
2. May result in _____
(mutually exclusive investments)

Net Present Value Profile

- What is it?

- What information does it provide?

- 1.
- 2.
- 3.
- 4.

Internal Rate of Return (IRR)

- BEWARE – Nonconventional Cash flows
- Example: Assume you are considering a project with the following cash flows:

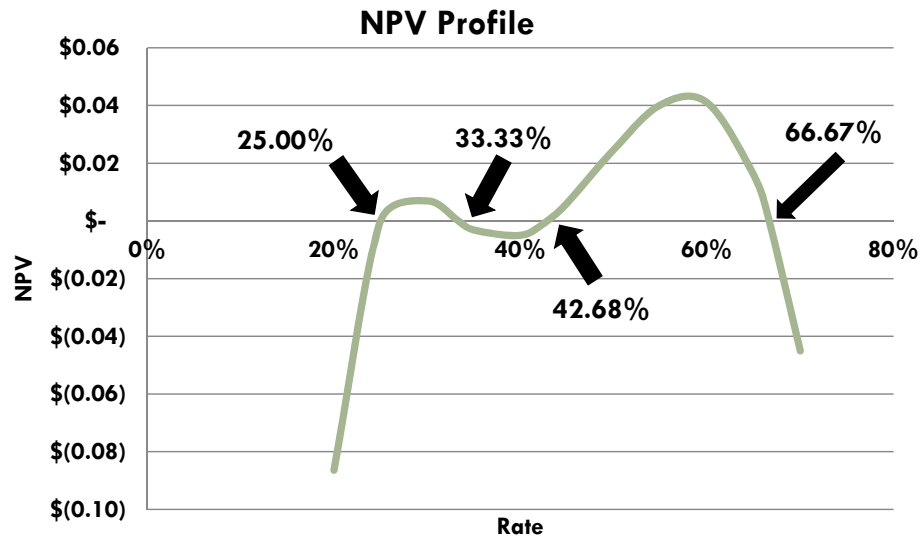
<u>Year</u>	<u>Cash Flows</u>
0	-\$ 252
1	\$1,431
2	-\$3,035
3	\$2,850
4	-\$1,000

Internal Rate of Return (IRR)

Calculate the NPV:

- at 25.00%: NPV = _____
- at 33.33%: NPV = _____
- at 42.86%: NPV = _____
- at 66.67%: NPV = _____

What's the IRR?



Internal Rate of Return (IRR)

- BEWARE – Mutually Exclusive Projects
- Example: Assume you are considering two mutually exclusive investments with the following cash flows:

<u>Year</u>	<u>Project A</u>	<u>Project B</u>
0	-\$350	-\$250
1	\$ 50	\$125
2	\$100	\$100
3	\$150	\$ 75
4	\$200	\$ 50

Internal Rate of Return (IRR)

- Which project should we choose based on the IRR?
- Should we always choose that project?
- What is the crossover rate?

The Crossover Rate

Modified Internal Rate of Return (MIRR)

- What: MIRR is a calculation of IRR on modified cash flows. For the combination approach, it is the discount rate that equates the present value of all cash outflows to the future value of all cash inflows.
- How: For the combination approach, discount all cash outflows to time 0 and compound all cash inflows to the end of the project. Then, calculate the discount rate that makes them equal.

MIRR Example

- You plan to buy a machine that will cost \$2,000 today and produce cash flows of \$1,500, -\$500, and \$1,200 in each of the next three years. The salvage value will be zero. The cost of capital is 15 percent. Should you buy the machine?

Modified Internal Rate of Return (MIRR)

- **The Rule:** An investment is acceptable if the MIRR exceeds the _____. It should be rejected otherwise.

*Assumes cash flows are reinvested at _____.

- **Pros:**

1. Closely related to _____
2. No longer possible to get _____

- **Cons:**

1. May result in _____
(mutually exclusive investments)

The Profitability Index (PI)

- **What:** The profitability index is the *present value* of an investment's future cash flows divided by its initial cost (absolute value). Also called a benefit-cost ratio.
- **How:** Calculate the present value of the future cash flows (the PV not the NPV) and divide by the initial cost. If a project has a positive (negative) NPV, the PI will be greater (less) than 1.

PI Example #1

- You plan to buy a machine that will cost \$2,000 today and produce cash flows of \$1,500 in each of the next two years. The salvage value will be zero. The cost of capital is 15 percent. What is its profitability index? Should you buy the machine?

PI Example #2

- You must choose between the two following mutually exclusive projects:
A: Cost is \$ 25 and PV is \$ 50.
B: Cost is \$100 and PV is \$150.
- Which one should you choose?

The Profitability Index (PI)

- The Rule: Only accept projects with a PI greater than _____, and invest in projects with the largest PI's first.
- **Pros**:
 1. Closely related to _____
 2. May be useful when investment funds are limited
- **Cons**:
 1. May result in _____
(mutually exclusive investments)

The Payback Rule

- What: The payback is the length of time it takes to recover our initial investment.
- How: Assume cash flows are received uniformly throughout the year. Calculate the number of years it will take for the future cash flows to match the initial cash outflow.

Payback Example

You plan to buy a machine that will cost \$2,000 today and produce the following cash flows: \$500 in year 1, \$750 in year 2, \$300 in year 3, \$1,000 in year 4, and \$5,000 in year 5. Our firm only accepts projects with a payback of 4 years or less. Should you purchase the machine?

The Payback Rule

- **The Rule:** An investment is acceptable if its calculated payback period is _____ some pre-specified number of years.
- **Pros:**
 1. Simple/Easy to do
 2. Biased toward _____
- **Cons:**
 1. Ignores _____
 2. Ignores cash flows _____
 3. Requires an _____
 4. Biased against _____

The Discounted Payback Rule

- What: The discounted payback period is the length of time it takes for the sum of the discounted cash flows to equal the initial investment.
- How: Assume cash flows are received uniformly throughout the year. Calculate the number of years it will take for the present value of the future cash flows to match the initial cash outflow.

Discounted Payback Example

You plan to buy a machine that will cost \$2,000 today and produce the following cash flows: \$500 in year 1, \$750 in year 2, \$300 in year 3, \$1,000 in year 4, and \$5,000 in year 5. Our firm only accepts projects with a discounted payback of 4 years or less. The cost of capital is 20%. Should you purchase the machine?

The Discounted Payback Rule

- The Rule: An investment is acceptable if its discounted payback is _____ some pre-specified number of years.
- **Pros:**
 1. Adjusts for _____
*Does not accept _____ projects
 2. Biased toward _____
- **Cons:**
 1. Ignores cash flows _____
 2. Requires an _____
 3. Biased against _____

The Average Accounting Return (AAR)

- What: The average accounting return is the ratio of the average net income of the project to the average book value of the investment.
- How: Calculate the average net income and divide it by the average book value.

AAR Example

You plan to buy a machine that will cost \$18,000 today and produce the following *net income*: \$500 in year 1, \$750 in year 2, \$300 in year 3, \$1,000 in year 4, and \$5,000 in year 5. The machine is worthless at the end of its 5 year life. Our firm only accepts projects with an average accounting return greater than 15%. Should you purchase the machine?

The Average Accounting Return (AAR)

- The Rule: An investment is acceptable if its average accounting return is _____ some pre-specified benchmark.
- **Pros:**
 1. Simple/Easy to do
- **Cons:**
 1. Ignores the time value of money
 2. Requires an arbitrary benchmark
 3. Accounting numbers and book values

Chapter 9 Suggested Problems

- Concepts Review and Critical Thinking Questions:
 - ▣ 1, 2, 3, 4, 5, 6, 7, and 8
- Questions and Problems:
 - ▣ 2, 4, 9, 10, 11, 12, 13, 15, 17, 19 (just Method #3: The Combination Approach), and 21

Additional Practice

- You are considering a project that costs \$1,500 and has the following after-tax cash flows:

Year 1	\$400
Year 2	\$500
Year 3	\$650
Year 4	\$700
- The cost of capital for this project is 15 percent, and your firm only accepts projects with a payback period or discounted payback period of less than 3.5 years.

Additional Practice (continued)

- What is the payback period for this project? Would you accept the project according to this criterion?
- What is the discounted payback period for this project? Would you accept the project according to this criterion?
- What is the internal rate of return (IRR) for this project? Would you accept the project according to this criterion?

Additional Practice (continued)

- What is the modified internal rate of return (MIRR) for this project (using the combination approach)? Would you accept the project according to this criterion?
- What is the profitability index (PI) for this project? Would you accept the project according to this criterion?
- What is the net present value (NPV) for this project? Would you accept the project according to this criterion?