Capital Budgeting Techniques

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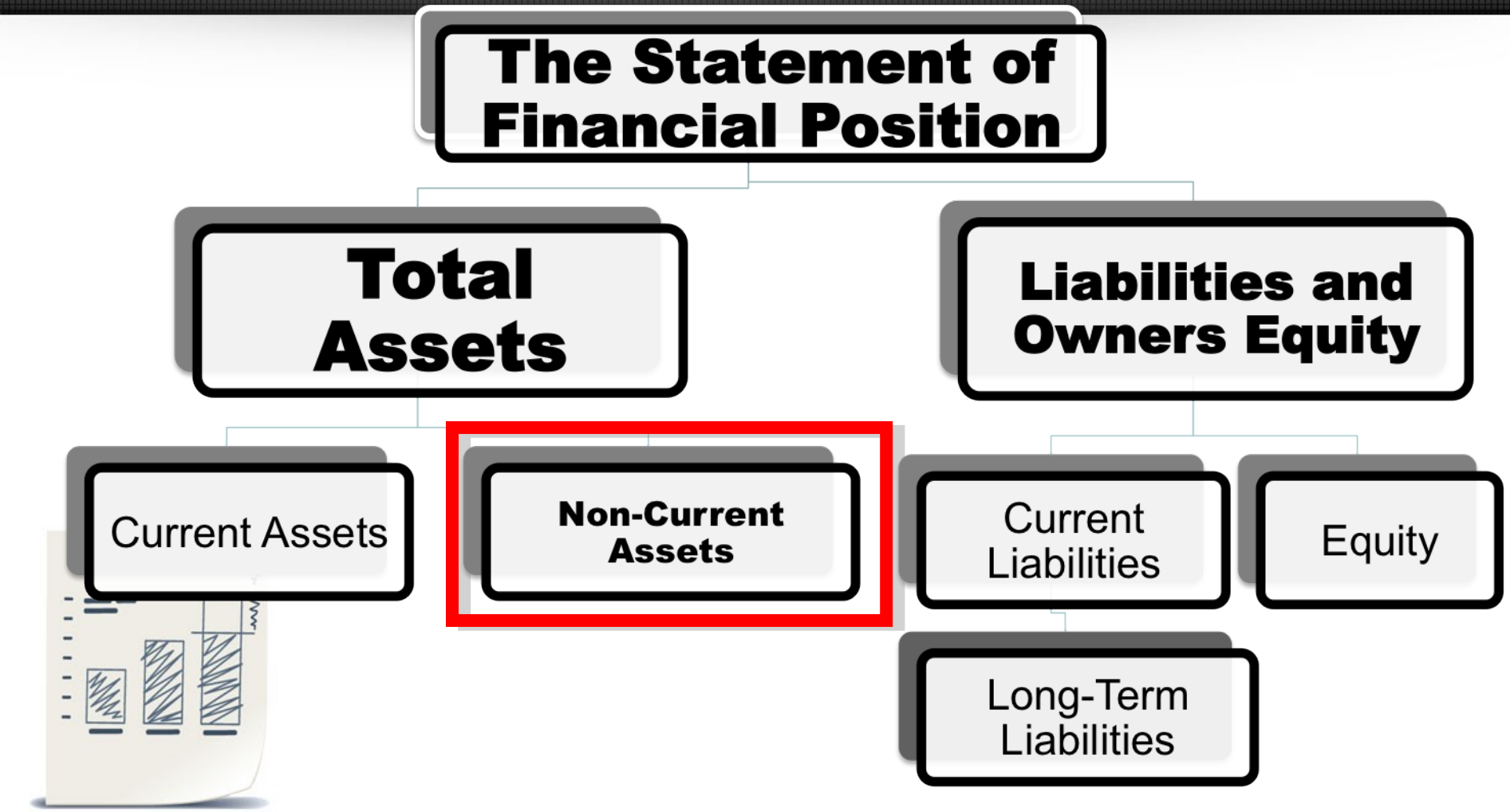
The Statement of Financial Position Illustration



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Section 1
Estimating Cash Flows

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What is Capital Budgeting?

- The process of identifying, analyzing, and selecting investment projects whose returns (cash flows) are expected to extend beyond one year;
- The examples are;

a. New products or expansion of existing products;

b. Replacement of existing equipment or buildings;

c. Research and development;

d. Exploration;

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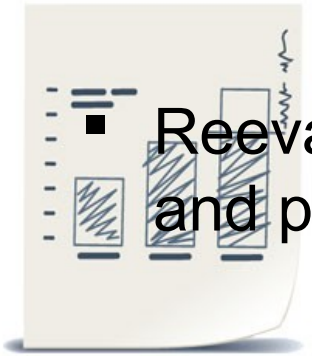
The Capital Budgeting Process

- Generate investment proposals consistent with the firm's strategic objectives;
- Evaluate projected cash flows;
- Select projects based on a value-maximizing acceptance criterion;
- Reevaluate implemented investment projects continually and perform post audits for completed projects;



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Relevant Cost Assumption

- Cash flows of a project must be calculated based on relevant costing assumptions;

- Relevant cost is a decision specific cost which arises as a direct consequence of decision made;

A company produces tires.It can manufacture 1,000 units in a month for a fixed cost of $300,000 and variable cost of $500 per unit. Its current demand is 600 units which it sells at $1,000 per unit. Company B considers to order 200 units of tire at $700 per unit. Should the company accept the order?

Solution

a)700-(300000/1000+500)=**$100 Reject**

b)Relevant costing assumption

(700-500)=$200 Accept

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Relevant Cash Flows

- Basic characteristics of relevant project flows;

a. future cash flows;
b. incremental flows;
c. after-tax flows;
d. operating(not financing)flows;

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Estimating Cash Flows

- Principles that must be adhered to in the estimation;

a. ignore sunk costs;

b. ignore committed costs;

c. include opportunity costs;

d. include project-driven changes in working capital;

e. include effects of inflation;

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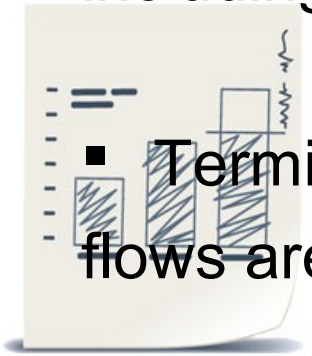
Calculating Project Cash Flows

- Initial cash outflow is the initial net cash investment;

- Interim incremental net cash flows are those net cash flows occurring after the initial cash investment but not including the final period's cash flow;



- Terminal-year incremental net cash flows are the final period's net cash flow;

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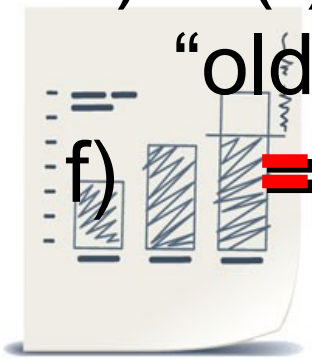
Initial Cash Outflow

a) *Cost of "new" assets*
b) +Capitalized expenditures
c) + (-)Change in NWC
d) -Net proceeds from sale of "old" asset(s) if replacement;
e) + (-)Taxes (savings) due to the sale of "old" asset(s) if replacement
f) **=Initial cash *outflow***



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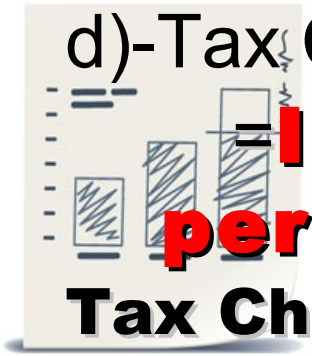
Incremental Cash Flows

a)Cash inflow

b)-Cash outflow

c)Net Change in Operating Income

d)-Tax Charge****



=**Incremental net cash flow for period**

Tax Charge=(Cash Inflow-Cash Outflow-Depreciation)x Tax Rate

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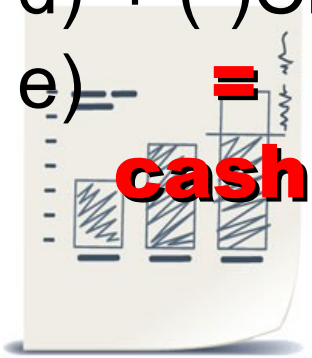
Terminal-Year Incremental Cash Flows

a) Calculate the incremental net cash flow for the terminal period
b) + (-)Salvage value (disposal/reclamation costs) of any sold or disposed assets
c) - (+)Taxes (tax savings) due to asset sale or disposal of "new" assets
d) + (-)Change in NWC
e) = **Terminal year incremental net cash flow**



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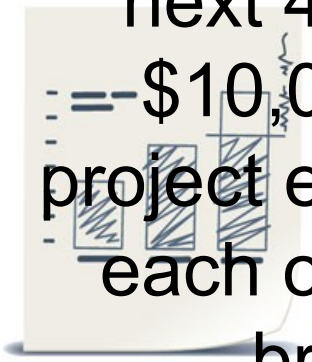
Example of an Asset Expansion Project

Basket Wonders (BW) is considering the purchase of a new basket weaving machine. The machine will cost $50,000 plus $20,000 for shipping and installation and falls under the 3-year MACRS class. NWC will rise by $5,000. Lisa Miller forecasts that revenues will increase by $110,000 for each of the next 4 years and will then be sold (scrapped) for $10,000 at the end of the fourth year, when the project ends. Operating costs will rise by $70,000 for each of the next four years. BW is in the 40% tax bracket.(MACRS 33.3,44.45,14.81,7.41)



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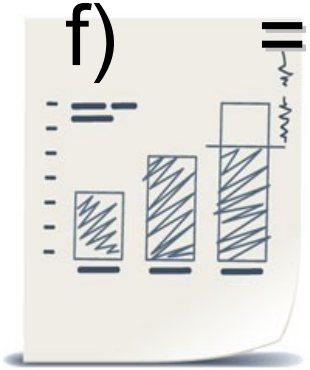
Initial Cash Outflow

a)		$50,000	
b)	+	20,000	
c)	+	5,000	
d)	-	0	(not a replacement)
e)	+ (-)	0	(not a replacement)
f)	=	**$75,000**	



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Incremental Cash Flows

		Year 1	Year 2	Year 3	Year 4
a)		$40,000	$40,000	$40,000	$40,000
b)	-	23,331	31,115	10,367	5,187
c)	=	$16,669	$ 8,885	$29,633	$34,813
d)	-	6,668	3,554	11,853	13,925
e	=	$33,332	$36,446	$28,147	$26,075

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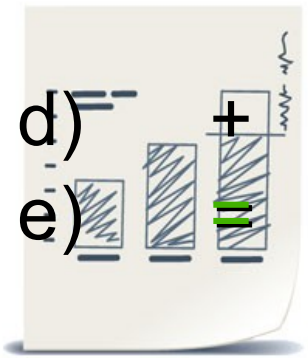
Terminal-Year Incremental Cash Flows

a) $26,075 The incremental cash flow from the previous slide in Year 4.

b) +10,000 Salvage Value.

c) - 4,000 .40*($10,000 - 0) Note, the asset is fully depreciated at the end of Year 4.



d) + 5,000 NWC - Project ends.

e) = **$37,075** Terminal-year incremental cash flow.

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Summary of Project Net Cash Flows

Asset Expansion

Year 0	Year 1	Year 2	Year 3	Year 4
-$75,000*	$33,332	$36,446	$28,147	**$37,075**

* Notice that this value is a ***negative*** cash flow as we calculated it as the initial cash outflow

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SECTİON 2

Capital Budgeting Techniques

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Project Evaluation: Alternative Methods

- Payback Period (PBP)
- Internal Rate of Return (IRR)
- Net Present Value (NPV)
- Profitability Index (PI)

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Proposed Project Data

Julie Miller is evaluating a new project for her firm, *Basket Wonders (BW)*. She has determined that the after-tax cash flows for the project will be $10,000; $12,000; $15,000; $10,000; and $7,000, respectively, for each of the Years 1 through 5. The initial cash outlay will be $40,000.

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Independent Project

- For this project we will assume that it is independent of any other potential projects that *Basket Wonders* may undertake;

- Independent project is a project whose acceptance (or rejection) does not prevent the acceptance of other projects under consideration;

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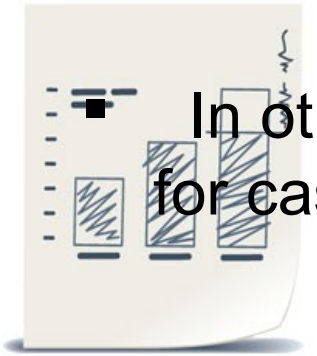
Payback Period

- The payback method of investment appraisal is popular appraisal technique despite of it's limitations;

- It is the time it takes the cash inflows from a capital investment project to equal the cash outflows, usually expressed in years;



- In other words payback is the amount of time it takes for cash inflows = cash outflows;

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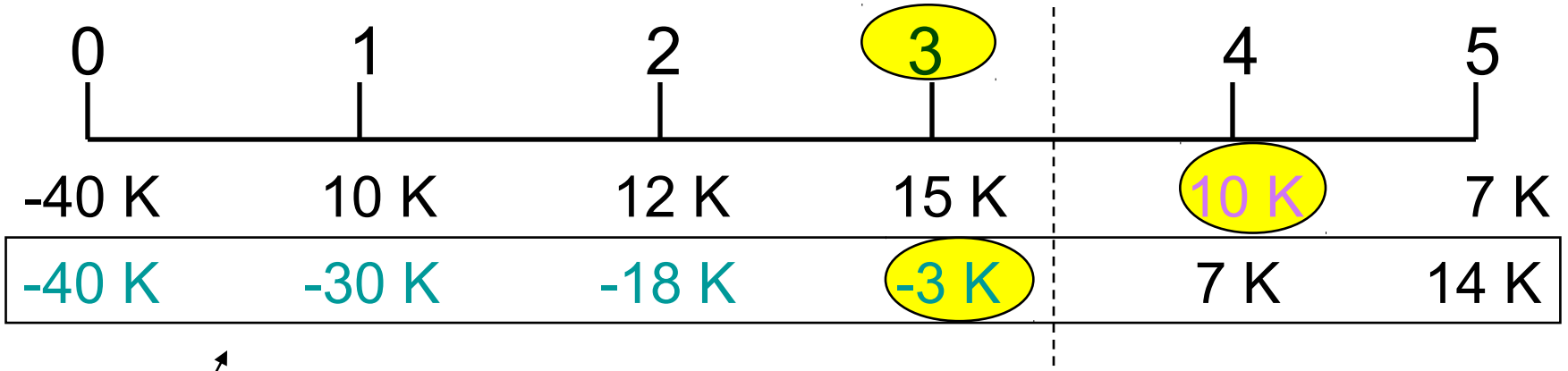
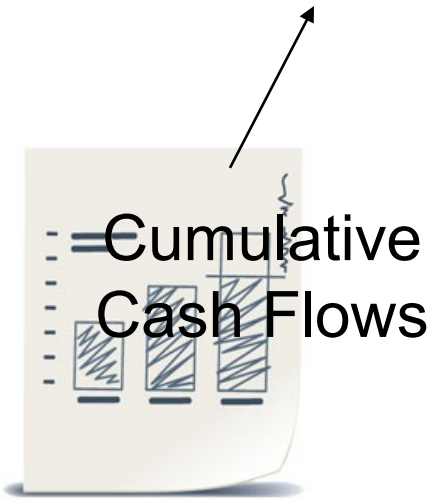
Payback Solution of Example





PBP = 3 + (3K) / 10K

= 3.3 Years

Note: If the required payback time by company is 4 years then the project will be accepted

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Payback Period (cont.)

Advantages

- Simple to calculate and understand;
- It can be used as a screening device as a first stage in eliminating obviously inappropriate projects;
- It uses cash flows rather than accounting profits;

Disadvantages

- It ignores the cash flows after the end of payback period;
- It ignores the time value of money;
- Unable to distinguish between projects with the same payback period;
- It may lead to excessive investment in short-term projects;

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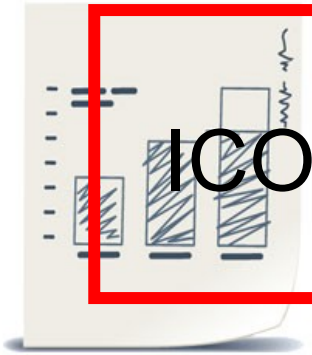
Internal Rate of Return (IRR)

IRR is the discount rate that equates the present value of the future net cash flows from an investment project with the project's initial cash outflow.



$$ICO = \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \ldots + \frac{CF_n}{(1+IRR)^n}$$

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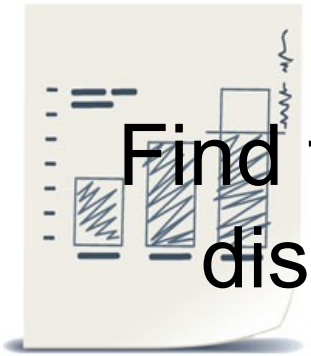
IRR Solution

$$\$40{,}000 = \frac{\$10{,}000}{(1+IRR)^1} + \frac{\$12{,}000}{(1+IRR)^2} + \frac{\$15{,}000}{(1+IRR)^3} + \frac{\$10{,}000}{(1+IRR)^4} + \frac{\$7{,}000}{(1+IRR)^5}$$



Find the interest rate (*IRR*) that causes the discounted cash flows to equal $40,000.

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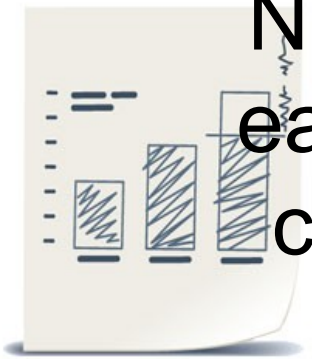
IRR Acceptance Criterion

The management of *Basket Wonders* has determined that the **hurdle rate is 13%** for projects of this type.

Should the project be accepted?

No! The firm will receive 11.57% for each dollar invested in this project at a cost of 13%. [IRR < Hurdle Rate]



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Internal Rate of Return

Advantages

- Accounts for time value of money;
- Considers all cash flows;
- It uses cash flows rather than accounting profits;
- Managers feel more comfortable with a return measure;

Disadvantages

- Multiple IRR problem;
- Difficulty in project rankings;
- It may yield contradicting answers with NPV in mutually exclusive projects;

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Net Present Value (NPV)

NPV is the present value of an investment project's net cash flows minus the project's initial cash outflow.

$$NPV = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \ldots + \frac{CF_n}{(1+k)^n} - ICO$$

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NPV Solution

Basket Wonders has determined that the appropriate discount rate (k) for this project is 13%.

$$\text{NPV} = \frac{\$10{,}000}{(1.13)^1} + \frac{\$12{,}000}{(1.13)^2} + \frac{\$15{,}000}{(1.13)^3} +$$

$$\frac{\$10{,}000}{(1.13)^4} + \frac{\$7{,}000}{(1.13)^5} - \$40{,}000$$

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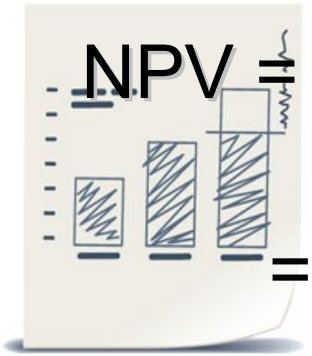
NPV Solution

$$NPV = \$10{,}000(PVIF_{13\%,1}) + \$12{,}000(PVIF_{13\%,2}) + \$15{,}000(PVIF_{13\%,3}) + \$10{,}000(PVIF_{13\%,4}) + \$\ 7{,}000(PVIF_{13\%,5}) - \$40{,}000$$

$$NPV = \$10{,}000(.885) + \$12{,}000(.783) + \$15{,}000(.693) + \$10{,}000(.613) + \$\ 7{,}000(.543) - \$40{,}000$$

$$NPV = \$8{,}850 + \$9{,}396 + \$10{,}395 + \$6{,}130 + \$3{,}801 - \$40{,}000$$

$$= \mathbf{-\ \$1{,}428}$$



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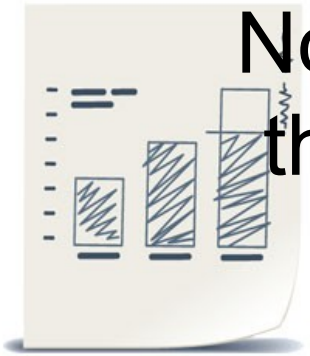
NPV Acceptance Criterion

The management of *Basket Wonders* has determined that the required rate is 13% for projects of this type.

Should this project be accepted?



No! The NPV is negative. This means that the project is reducing shareholder wealth. [*Reject* as *NPV* < *0*]

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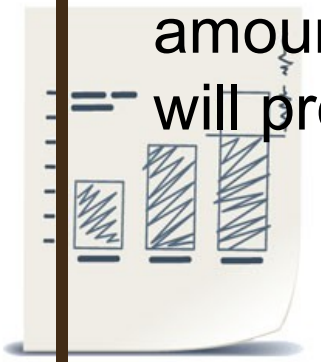
NPV
Pros and Cons

Advantages

- Accounts for time value of money;
- Considers all cash flows;
- Reveals the dollar amount that the project will produce;



Disadvantages

- Project size is not measured;
- Difficulty in calculating discount rate;
- Over sensitivity to change in rates;
- May not include managerial options;

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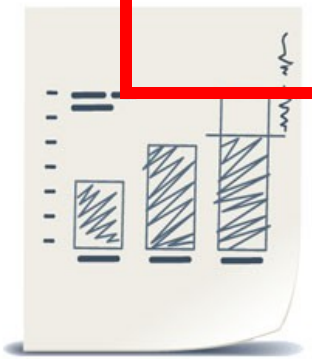
Profitability Index (PI)

PI is the ratio of the present value of a project's future net cash flows to the project's initial cash outflow.

$$PI = \left[\frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \ldots + \frac{CF_n}{(1+k)^n} \right] \div ICO$$



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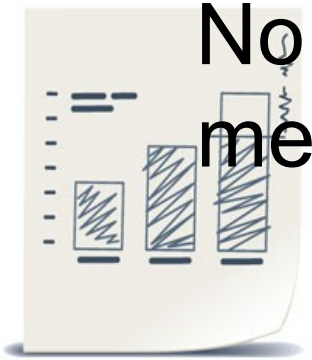
PI Acceptance Criterion

PI = $38,572 / $40,000

= .9643 *(Method #1, 13-34)*

Should this project be accepted?



No! The PI is less than 1.00. This means that the project is not profitable.

[*Reject* as *PI < 1.00*]

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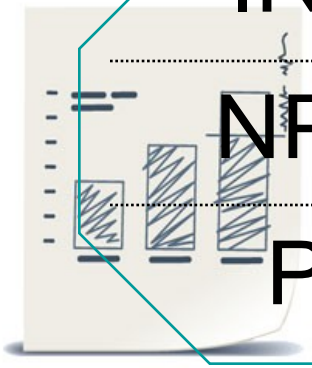
Evaluation Summary

Basket Wonders Independent Project

Method	Project	Comparison	Decision
PBP	3.3	3.5	**Accept**
IRR	11.47%	13%	**Reject**
NPV	-$1,424	$0	**Reject**
PI	.96	1.00	**Reject**



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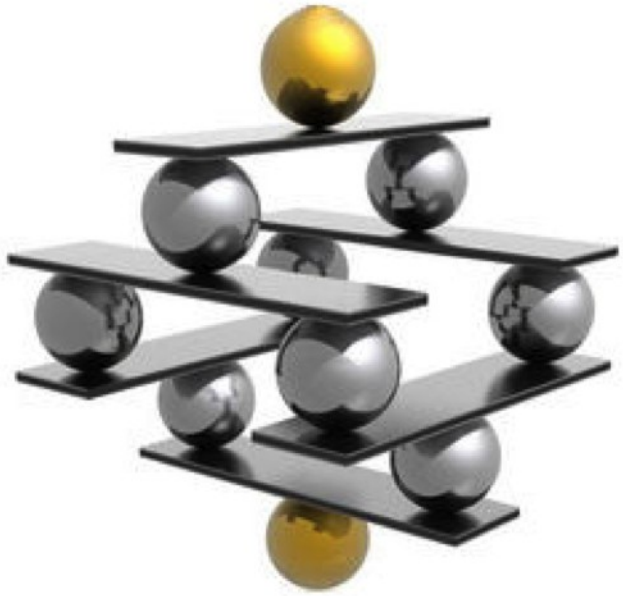
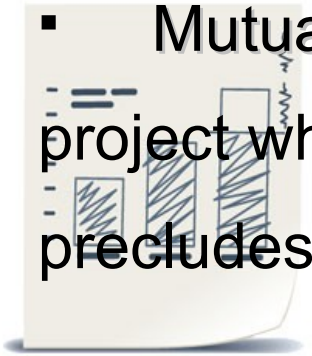
Other Project Relationships

- Dependent -a project whose acceptance depends on the acceptance of one or more other projects;



- Mutually Exclusive - a project whose acceptance precludes the acceptance of one or more alternative projects;



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Potential Problems Under Mutual Exclusivity

- Ranking of project proposals may create contradictory results;

a. scale of investment;

b. cash flow pattern;

c. project life;

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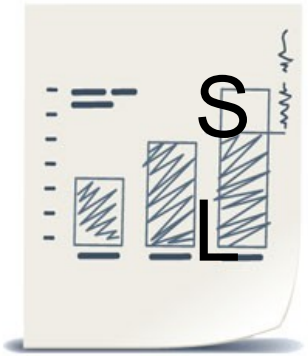
Scale Differences

Calculate the PBP, IRR, NPV@10%, and PI@10%.

Which project is preferred? Why?

Project	IRR	NPV	PI
S	100%	$ 231	3.31
L	25%	$29,132	1.29



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Cash Flow Pattern

Let us compare a *decreasing* cash-flow (D) project and an *increasing* cash-flow (I) project.

END OF YEAR	NET CASH FLOWS Project D	Project I
0	-$1,200	-$1,200
1	1,000	100
2	500	600
3	100	1,080

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Cash Flow Pattern

Calculate the IRR, NPV@10%, and PI@10%.

Which project is preferred?

Project	IRR	NPV	PI
D	23%	$198	1.17
I	17%	$198	1.17

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Project Life Differences

Let us compare a *long* life (X) project and a *short* life (Y) project.

END OF YEAR	NET CASH FLOWS Project X	Project Y
0	-$1,000	-$1,000
1	0	2,000
2	0	0
3	3,375	0

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Project Life Differences

Calculate the PBP, IRR, NPV@10%, and PI@10%.

Which project is preferred? Why?

Project	IRR	NPV	PI
X	50%	$1,536	2.54
Y	100%	$ 818	1.82

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Thank You

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