Alternative Investment Rules in Capital Budgeting

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**NPV vs.**

Payback Period (PP), Accounting ROR, and Internal Rate of Return (IRR)
How Important is CB to a firm?

Why is Capital Budgeting (CB) so critical to a firm’s long-term survival?

- Magnitude of $s involved:
  - Amplifies both, the positive impact of “good” decisions, and negative impact of “poor” decisions

- Repercussions of CB decisions extend over long periods of time
Evaluation of Investment Rules

 Criterion to be used to judge investment rules:

- Uses \textit{Cash Flows} and NOT earnings
- Uses \textit{ALL} Cash flows
- Does NOT ignore Time Value of $ 
- Makes Accept/Reject decisions that are \textit{consistent with S/H wealth Max.}
NPV-- A benchmark for other Investment Rules!

- NPV: PV of future CFs - Initial Investment
- Accept if NPV > 0 (Independent Projects)
  - In case of mutually exclusive (M.E.) projects, choose the highest NPV
- Accepting +NPV projects will *Always* increase S/H wealth and *vice versa*.
- Why look at other rules??
Payback Period (PP) Rule

- Length of time it takes for a firm to recover its investment
  - if PP < a cutoff time: Accept

- Disadvantages
  - Ignores Time Value of money
  - Ignores CFs beyond Payback Period.
  - Biased against Long-term projects
  - Cutoff time is arbitrarily decided
PP Rule (continued)

Advantages

- Easy to understand/use
- Favors liquidity
- Might be appropriate for quick decisions for repetitive or low budget projects

Read: discounted PP (sec. 6.3) & Average Accounting Return (sec. 6.4)
Internal Rate of Return (%)(IRR)

-The discount rate for which:
  PV of future CFs = Initial Investment OR
  NPV of the project = 0

-Accept if IRR > Required return
  M.E.: select alternative with the highest IRR.

-IRR is independent of discount rate

-NPV profile: Discount rate, NPV graph
  downward sloping
Potential Problems with IRR (Independent OR M.E.)

- **CF$_0 =$100, CF$_1 =$-$130; r = 10%
  - NPV = -$18.20, IRR = 30%; Accept???
    - **NO; This is a Financing project**
      - for Financing, accept if IRR < r

- **CF$_0 =$-$60, CF$_1 =$155 CF$_2 =$-$100; Multiple IRRs
  - Neither has any economic meaning
  - Possible if >1 reversal of sign of CFs
- **NPV does not have these 2 problems**
Potential Problems with IRR (M.E. projects only)

Scale Problem: Comparing small and large projects:

A: $C_F_0 = -$100, $C_F_1 = $150; r = 0$

NPV = $50, IRR = 50$

B: $C_F_0 = -$1,000, $C_F_1 = $1,250;

NPV = $250, IRR = 25$

‘A’ or ‘B’???
IRR problems (continued)

*Timing Problem:* CFs occur at differing times:

- $\text{CF}_0 = -$1,000, $\text{CF}_1 = $500, $\text{CF}_2 = $400,$
- $\text{CF}_3 = $300, $\text{CF}_4 = $100

- $\text{IRR}_S = 14.5\%$

- $\text{CF}_0 = -$1,000, $\text{CF}_1 = $100, $\text{CF}_2 = $300,$
- $\text{CF}_3 = $400, $\text{CF}_4 = $600

- $\text{IRR}_L = 11.8\%$

- If ‘r’ = 10\%, ‘S’ or ‘L’???

- if r = 5\%?
Reinvestment Assumption

NPV: NPV rule assumes that all future CFs can be reinvested at the discount rate

IRR: IRR calculation assumes that all future CFs can be reinvested at the IRR

Which is more Realistic?

IRR is easy to understand and communicate
Profitability Index (PI) & Capital Rationing

- **PI: PV of future CFs/Initial Investment**
  - Accept if >1 (independent projects)
  - Can lead to incorrect decision for M.E. (choosing highest PI)
  - Similar to NPV

- **Capital Rationing: Limited funds**
  - PI useful for making optimal decisions

H.W. 1, 3, 7, 8, 10 (a-c, f), 12, 13, 19