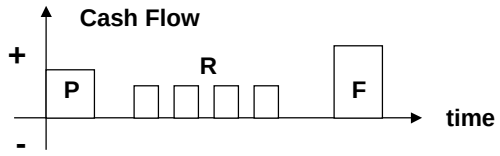
Engineering Economy

- **Objective:**
  - To provide economic comparison of benefits and costs that occur over time
- **Assumptions:**
  - All Benefits, Costs measured in money
  - Single point of view



Issue - Value over time

- **Money now has a different value than the same amount at a different date**
- **Comparable to**

  not equal to } **interest rate**

- **Proper name: Discount Rate, r**

  (because future benefits/costs are reduced to compare with present)

Formulas for N Periods

- **Single amounts**

  a) Future Amount = $P (1 + r)^N = P (caf)$
  caf = Compound Amount Factor

  b) Present Amount = F/caf
  1/caf = Present Worth Factor

- **Finite Series**

  c) $F = \Sigma_i R (1 + r)^i = R [(1 + r)^N - 1] / r$

  d) $R = P (crf) = [P*r (1+r)^N] / [(1 + r)^N - 1]$
  crf = Capital Recovery Factor

Formulas for N Periods (cont')

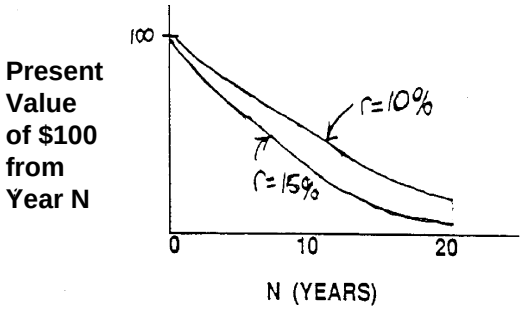
- **Infinite Series**

  $1 << (1 + r)^N = > (1+ r)^N / [(1 + r)^N - 1] - > 1 = > crf - > r$

- **Small Periods**

  $(1 + r)^N - > e^{rN}$

Effect of Different Discount Rates



- Higher r = > smaller value of future benefits; discourages projects whose benefits pay back costs over long time. Advocates of projects try to minimize so projects look good!

Discount Rate Approximation

- To appreciate effect of discounting:
  - "Rule of 72" or "Rule of 70"
  - $e^{rN} = 2.0$ when $rN = 0.72$ (actually = 0.693)
- Therefore, present amount doubles when future amount halves
  - $rN = 72$ with r expressed in percent
- Examples
  - When would $1000 invested at 10% double?
  - What is, at 9%, the value of $1000 in 8 years?