**Measures of Economic Worth**

* **Single alternative:**
* Present Worth > 0
* Future Worth > 0
* Annual Worth > 0
* **Multiple alternatives:**

**Ranking approach**: choose the one with the greatest (Pw,Aw,FW) over the planning horizon.

**Incremental approach (main steps):**

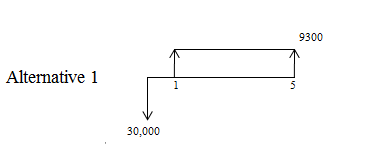
Step one: order alternative (A,B) from lowest to highest initial investment

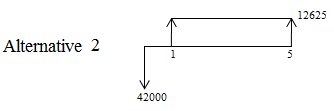
Step two: Compute the cash flow for the difference between the projects (A,B) by subtracting.

* **Ranking Methods or Incremental Methods**
* Present Worth
* Future Worth
* Annual Worth
* **Ranking Methods only**
* Capitalized Worth
* Discounted Payback Period
* Payback Period
* **Incremental Methods only**
* Internal Rate of Return
* External Rate of Return
* Benefit/Cost Ratio

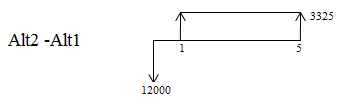
**Example**

|  |  |  |
| --- | --- | --- |
| EOY | Alternative 1 | Alternative 2 |
| 0 | -30000 | - 42000 |
| 1 | 9300 | 12625 |
| 2 | 9300 | 12625 |
| 3 | 9300 | 12625 |
| 4 | 9300 | 12625 |
| 5 | 9300 | 12625 |





**Incremental**



**Find the best alternative if MARR=12%**

1. **Present worth using ranking approach**

Pw1 = -30000+9300(P/A 12,5) = SR 3524.64

Pw2 = -42000+12625(P/A 12,5) = SR 3510.6

Select 1

1. **Present worth using incremental approach**

Pw2-1 = -12000+3325(P/A 12, 5) = SR -14> 0

Select 1

1. **Future worth using ranking approach**

Fw1 = -30000(F/P 12,5) +9300(F/A 12,5)=SR 6212.04

Fw2 = -42000(F/P 12,5) +12625(F/A 12,5) = SR 6187

Select 1

1. **Future worth using incremental approach**

Fw2-1= -12000(F/P 12,5) +3325(F/A 12,5) = SR -24.7 > 0

Select 1

1. **Annual worth using ranking approach**

Aw1 = -30000(A/P12,5) +9300 = SR 978

Aw2 = -42000(A/P12,5) +12625= SR 974

Select 1

1. **Annual worth using incremental approach**

Aw2-1= -12000(A/P 12,5) +3325= SR -38> 0

Select 1

1. **Capitalized worth Cw**

Cw =

Cw =

Cw =

Select 1

1. **PBP payback period**

PBP1 = -30000 +9300+9300+9300+9300 = SR 7200

PBP2 = -42000+12625+12625+12625+12625= SR 8500

1. **Discounted Payback Period(DPBP)**

n= 3 Pw1 = -30000+9300(P/A 12,3 ) = SR -7662.981

n=4 Pw1 = -30000+9300(P/A 12,4 ) = SR -1752.654

n=5 Pw1 = -30000+9300(P/A 12,5) = SR 3524.64

n=3 Pw2 = -42000+12625(P/A 12,3) = SR -11676.90

n=4 Pw2 = -42000+12625(P/A 12,4) = SR -3653.46

n=5 Pw2 = -42000+12625(P/A 12,4) = SR 3510.6

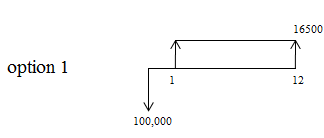
Select 1

* **One-shot investment**

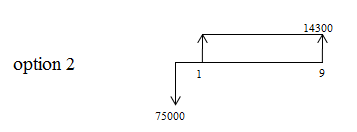
|  |  |  |
| --- | --- | --- |
|  | Option 1 | Option2 |
| Initial investment | **$ 100,000** | **$ 75000** |
| Estimated life | **12 year** | **9 year** |
| Expected annual return | **$16,500** | **$14,300** |

**Based on a present worth analysis which option is preferred? (Two alternative are one-shot investment and MARR=12%)**

Solution

****

Pw1 = -100,000 +16500(P/A 12, 12) = $ 2207.105

****

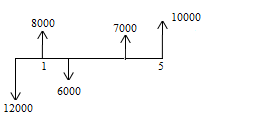
Pw2 = -75,0000 +14300(P/A 12, 9) = $ 1193.97

Select 1

* **Capital recovery cost**

|  |
| --- |
| CR = P(A/P i, n) – F(A/F i, n) |

**Ex**



**Find CR if i=15%**

CR = P(A/P i, n) – F(A/F i, n) =12000 (A/P 15, 5) – 10000 (A/F 15, 5) =SR 2096.66

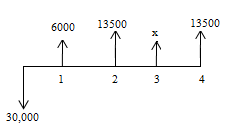


**What is the capital recovery cost if i=8%**?

CR = 50000(A/P 8, 10) – 10000(A/F8, 10) = $ 6761.2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| End of year | 0 | 1 | 2 | 3 | 4 |
| Cash flow | -30000 | 6000 | 13500 | X | 13500 |

**What is the minimum value of x such that the investment is attractive based on annual worth if MARR=12%?**



Pw= -30000+6000(P/F,12,1)+13500(P/F,12,2)+X(P/F12,3)+13500(P/F12,4)

=-5301.255 + 0.71178X

AW=-5301.255 + 0.71178X (A/P 12,4) , Aw≥0

x= = $ 7447.88 , X≥ $7447.88

**Home work**

**Chapter 5: problems (10, 12, 25)**

**Chapter 6: problems (20, 47)**

**Chapter 7: problems (8, 23, 25)**