

REPLACEMENT ANALYSIS IN CAPITAL BUDGETING

This involves replacing an old and inefficient asset with a new and more efficient asset which is more economical to operate.

- Under replacement analysis, the company will be concerned with the incremental benefit and incremental costs
- For incremental analysis to be carried out, the company will be concerned with the remaining life of the asset which will be equal to economic life of the new asset
- The following steps are followed.

1. Determine incremental outflow (PVCOF)

Cost of new asset	xx
add: Installation cost	xx
Working capital changes	xx
less: Market value of existing asset	(xx)
add: Capital gain tax	
Mkt value of old asset	xx
less: NBV of old asset	(xx)
	$xx \times 30\%$
	xx
	<u>PVCOF</u>
	<u>xx</u>

2. Determine incremental depreciation per annum

Depreciation p.a of the new asset	xx
Depreciation p.a of the old asset	(xx)
	<u>xx</u>

3. Determine incremental salvage value

Salvage value of the new asset	xx
less: Salvage value of the old asset	(xx)
	<u>xx</u>

4. Determine terminal Benefits

Salvage value (incremental)	xx
Working capital changes	xx
	<u>xx</u>

5. Determine incremental annual inflows (cost savings)

Incremental profit	xx
add: Cost savings	xx
less: Incremental cost	(xx)
EBT	xx
tax	
EBT	(xx)
	<u>xx</u>

6. Evaluate using NPV

May 2012 Q 3ef.

Texo Ltd is in the process of modernizing its operations. The factory manager proposed the replacement of the milling machine with a new and fully computerized machine. The milling machine was purchased two years ago at a cost sh 4 million. The economic life of the machine was 5 years. However, a management review has established that the machine has a further useful life of 5 years with zero salvage value. The machine could be disposed of immediately at sh 1.6 million.

The new machine has a purchase price of sh 8 million with an additional cost of sh 1.8 million to install and a salvage value of sh 2 million. The new machine will lead to increased efficiency and annual savings in cost of sh 2.1 million. However, electricity cost will increase by sh 200,000 per annum. The operation of the new machine will also require an increase of sh 810,000 worth of raw materials. The company uses the straight line method of depreciation. The company cost of Capital is 10% and tax rate 30%.

Required:

Advise the mgnt of Texo Ltd on whether to replace the machine (10mks)

Solution.

1. Determine incremental outflows "sh000"

Cost of new machine	8000
add: Installation cost	1800
Working capital changes	810
less: Mkt value of old asset	(1600)
add: Capital gain tax	
Mkt value of old asset	1600
less: NBV of old asset	(2400)
$\sqrt{4000 - (\frac{4000}{5} \times 2)}$	(800)
	0
PRCOF	9010

2. Determine incremental dep p.a sh000

Dep p.a of new asset $[8 + 1.8 - 2] \div 5$	1560
less: Dep p.a of old asset $2400 \div 5$	(480)
	1080

3. Incremental salvage value

Salvage value of new asset	2000
less: Salvage value of old asset	(0)
	2000

4. Terminal Benefits

Salvage value	2000
Working capital	810
	2810

5. Incremental inflows

Cost savings	2100
Electricity cost	(200)
EBT	1900
tax 30%	(570)
EAT	1330
add: Dep tax shield	
$30\% \times 1080$	324
Annual Cashflows	1654

6. Evaluating using NPV

PRCIF	
Annulity $= 1654 \times PVIFA_{10\%}^5$	
$1654 \times 3.7908 =$	6270
Terminal Benefit	+
2810×0.6209	1745
PRCIF	8015
PRCOF	(9010)
NPV	(995)

They should not replace the milling machine.

NOV 2011 Q 3b

Dzitsoni Ltd is considering replacing a machine. The existing machine was bought 3 years ago at a cost of sh 50 million. The machine is expected to have a useful life of 5 more years with no scrap value at the end. The machine could be disposed off immediately at sh 35 million. The new machine will cost sh 80 million, with a useful life of 5 years and an expected terminal value of sh 5 million. With the introduction of the new machine, sales are expected to increase by sh 25 million per annum over the next five years.

The contribution margin is expected to be 40% and the corporate tax rate is 30%. The operation of the new machine will also require an immediate investment of sh 8 million in working capital. Installation cost of the new machine will be amount to sh 6 million. Depreciation is to be provided for on a straight line basis. The company's cost of capital is 12%. Capital gain taxes remain suspended and not applicable.

Required:

- Determine whether the company should replace the asset (9 marks)

Solution

1. Determining incremental outflows:

Cost of new machine	80
Installation cost	6
Working capital	8
less: mkt value of old asset	(35)
	<u>59</u>

Determining incremental salvage value

Salvage value of new asset	5
less: salvage value of old asset	(0)
	<u>5</u>

Terminal Benefits

Salvage value	5
Working capital	8
	<u>13</u>

Determining incremental inflows

Incremental contribution $25 \times 40\%$	10
tax expense 30%	(3)
ENT	<u>7</u>

$$NPV = PVCF - PVCOF$$

$$\text{Annuity} = 7 \times PVIFA_{12\%}^5 \Rightarrow 7 \times 3.6048 = 25.2336$$

$$\text{present value of terminal benefit } 13 \times PVIF_{12\%}^5$$

$$13 \times 0.5674$$

$$25.2336$$

+

$$7.3762$$

$$PVCF \quad 32.6077$$

$$PVCOF \quad (59)$$

$$NPV \quad (26.3923)$$

Don't Replace the asset

May 2018 Q 2b

1. Determining incremental outflows	million
Cost of new machine	12.5
Working Capital	2.6
less: market value of old machine	(4)
add: Capital gain tax	
Mkt value of old machine	4
less: NBV of old machine $8 - (\frac{8}{5} \times 2)$	(4.8)
	(0.8)
	0
PVCOF	11.1

2. Incremental depreciation per annum	
Depreciation p.a of the new asset $(12.5 - 4) \div 5$	1.7
less: Dep p.a of the old asset $(4.8 - 1.5) \div 5$	(0.66)
	<u>1.04</u>

3. Incremental salvage value	
Salvage value of new machine	4
less: Salvage value of old machine	(1.5)
	<u>2.5</u>

4. Terminal Benefits	
Salvage value	2.5
Working Capital	2.6
	<u>5.1</u>

5. Incremental Inflows / Cost Savings

Year	1	2	3	4	5
Incremental EBDT	2.2	2.6	2.4	3	3.4
less: Dep	(1.04)	(1.04)	(1.04)	(1.04)	(1.04)
EBT	1.16	1.56	1.36	1.96	2.36
tax	(0.348)	(0.468)	(0.408)	(0.588)	(0.708)
EBT	0.812	1.092	0.952	1.372	1.652
add back dep	1.04	1.04	1.04	1.04	1.04
Cashflows	1.852	2.132	1.992	2.412	2.692
PVIF _{13%} $(1+r)^{-n}$	0.8850	0.7831	0.6931	0.6133	0.5428
PV	1.639	1.6696	1.381	1.4793	1.4612

Total PV of Cashflows	7.6301
add PV of Terminal Benefits 5.1×0.5428	2.7683
PVClf	10.3984
PVCOF	(11.1)
NPV	<u>(0.7016)</u>

They should not replace the machine

Assign.
 May 2015 Q 39.
 Nov 2016 Q 4C
 Dec 2009 Q 1
 May 2019 Q 2b

OPTIONS IN CAPITAL BUDGETING

An option is a financial contract which gives one party the right but not obligation to undertake a given activity at future date. There are 2 categories of options:

- (a) Financial option.
- (b) Real options

(a) Financial option

This is a financial contract which gives right but not obligation to buy/sell securities at future date at a specified price. They are classified into 2:

(i) Call option

This is an option which gives the buyer the right but not obligation to buy a specific currency/securities at a specified price at a specified maturity period.

(ii) Put option

This is an option which gives the seller the right but not obligation to sell a specific currency/securities at a specified price at a specified period of time.

→ In case of the option contract, the party with the right but not obligation will be required to pay a non-refundable fee known as "premium".

(b) Real options

They are options which gives the managers the right but not obligation to either undertake or not. They include:

- a) Lease or Buy options
- b) Replacement decisions
- c) Abandon option
- d) Delay project option
- e) Expand or not options

August 2009 Q1(a) & b

(i) NPV without real option

period	Cashflows	PVIF ^{12%}	PV
1	(600)	0.8929	(535.740)
2	(600)	0.7972	(478.320)
3	100	0.7118	71.180
4	200	0.6355	127.100
5	400	0.5674	226.960
6	400	0.5066	202.640
7	300	0.4523	135.690
8	100	0.4039	40.390
NPV			<u>(210.100)</u>

(ii) NPV with real option.

period	Cashflows	PVIF _{12%}	PV
1	(600)	0.8929	(535.740)
2	(600)	0.7972	(478.320)
3	100	0.7118	71.180
4	200	0.6355	127.100
5 (400-100)	(600)	0.5674	(340.440)
6 (400+600)	1000	0.5066	506.600
7 (300+600)	900	0.4523	407.070
8 (100+600)	700	0.4034	282.380
9	600	0.3606	216.360
10	600	0.3220	193.200
			<u>449.740</u>

(ii) Under the real option.

Abandonment option

- This means undertaking a project for only portion of its economic life and then liquidating the project.
- This is because, some projects generates more revenues during their earlier period of their economic life and then becoming expensive in terms of maintenance and operating cost towards the end of their economic life.
- The optimal abandonment period is where NPV of the project is maximum and then starts declining.

Dec 2012 Q3b

Bright Ltd undertook project X with the following cashflows over its useful life of 3 years. The cost of capital of project is 10%. The abandonment value of the project have been given below.

year	Cashflow (£000)	Abandonment value (£000)
0	(9600)	9600
1	4000	6000
2	3750	3800
3	3500	0

Required:

Advice the management when to abandon project X.

Solution:

If you replace at end of year T

$$NPV = PVCF - PVCOF$$

period	Cashflow	PVIF _{10%}	PV
0	(9600)	1	(9600)
1 (4+6)	10000	0.9091	9091
		NPV	<u>(509)</u>

if project is undertaken for 2 years

period	Cashflows	pvif _{10%}	PV
0	(9600)	1	(9600)
1	4000	0.9091	3636.4
2 (3750+3500)	7550	0.8264	6239.32
		NPV	275.72

if project is undertaken for 3 years

period	Cashflows	pvif _{10%}	PV
0	(9600)	1	(9600)
1	4000	0.9091	3636.4
2	3750	0.8264	3099
3	3500	0.7513	2629.55
		NPV	(235.05)

the management should replace the project at the end of period 2 since it has the highest NPV

May 2019 Q 5c

Abandon in year 1

period	Cashflows	pvif _{10%}	PV
0	(16)	1	(16)
1 (8+12)	20	0.9091	18.182
		NPV	2.182

Year 2

period	Cashflows	pvif _{10%}	PV
0	(16)	1	(16)
1	8	0.9091	7.2728
2 (6+8)	14	0.8264	11.5696
		NPV	2.8424

Year 3

period	Cashflows	pvif _{10%}	PV
0	(16)	1	(16)
1	8	0.9091	7.2728
2	6	0.8264	4.9584
3 (5+6)	11	0.7513	8.2643
		NPV	4.4955

max NPV

Year 4

period	Cashflows	pvif _{10%}	PV
0	(16)	1	(16)
1	8	0.9091	7.2728
2	6	0.8264	4.9584
3	5	0.7513	3.7565
4	4	0.6209	2.4863
		NPV	2.4713

Comment: Replace or Abandon in year 3