



STRAIGHT LINE DEPRECIATION WITH REVERSE TICKER

In a project finance model, we often need to calculate depreciation of an asset which includes ongoing costs such as maintenance capital expenditure. This tutorial shows how to code the depreciation in one line as opposed to a traditional matrix method – hence reducing complexity and file size.

The straight line depreciation method is the most often used technique and can be formulated as:

$$\text{Depreciation charge} = \text{Original cost of fixed asset} / \text{Useful life}$$

For example, if construction capital expenditure costs \$163.8 million and depreciates over 10 years, then the depreciation charge could simply be calculated as:

$$\begin{aligned} \text{Depreciation per annum} &= \$163.8 \times 10\% \text{ p.a.} = \$16.38 \text{ million or} \\ \text{Depreciation per quarter} &= \$16.38 \text{ million} / 4 = \$4.095 \text{ million} \end{aligned}$$

It is often in project financing that the project needs to maintain an ongoing capital expenditure which will be used to upgrade the existing capital assets or simply to maintain the scope of operations.

Screenshot 1. below shows typical capital expenditure inputs of a project finance transaction. In this example the project will incur \$163.8 million construction capital expenditure and is required to maintain a capital expenditure of \$0.5 million p.a. during operations. The question is how to calculate the depreciation charge of such cost?

Inputs

Assumptions

Construction CapEx

	Value	01-Jan-09				01-Feb-09				01-Mar-09				01-Apr-09					
		31-Jan-09	28-Feb-09	31-Mar-09	30-Apr-09	Cons Mth 1	Cons Mth 2	Cons Mth 3	Cons Mth 4	Cons Mth 1	Cons Mth 2	Cons Mth 3	Cons Mth 4	Cons Mth 1	Cons Mth 2	Cons Mth 3	Cons Mth 4		
Contract A	\$'000	105,000				100.00%	12.50%	12.50%	12.50%	12.50%									
Contract B	\$'000	26,250				100.00%	12.50%	12.50%	12.50%	12.50%									
Contract C	\$'000	5,250				100.00%	12.50%	12.50%	12.50%	12.50%									
Contract D	\$'000	10,500				100.00%	12.50%	12.50%	12.50%	12.50%									
Contract E	\$'000	2,100				100.00%	12.50%	12.50%	12.50%	12.50%									
Contract F	\$'000	3,150				100.00%	12.50%	12.50%	12.50%	12.50%									
Contract G	\$'000	1,050				100.00%	12.50%	12.50%	12.50%	12.50%									
Contract H	\$'000	10,500				100.00%	12.50%	12.50%	12.50%	12.50%									
Contract I	\$'000	-				100.00%	12.50%	12.50%	12.50%	12.50%									
Contract J	\$'000	-				100.00%	12.50%	12.50%	12.50%	12.50%									
Total		163,800																	

Maintenance CapEx

	01-Jan-10		01-Jan-11		01-Jan-12		01-Jan-13		01-Jan-14		01-Jan-15		01-Jan-16	
	31-Dec-10	31-Dec-11	31-Dec-12	31-Dec-13	31-Dec-14	31-Dec-15	31-Dec-16	Op Yr 1	Op Yr 2	Op Yr 3	Op Yr 4	Op Yr 5	Op Yr 6	Op Yr 7
Maintenance CapEx	\$'000	500	500	500	500	500	500	500	500	500	500	500	500	500

Tax & Depreciation

Depreciation	Straight Line		
	Yr(s)	% p.a.	% p.q.
	10.00 Yr(s)	10.00%	2.50%

Screenshot 1: Capital expenditure assumption

Traditional method

In this example, the model period is quarterly and hence we are calculating the depreciation on a quarterly basis. Hence, we are going to calculate the depreciation of the following costs over 10-years or 40 quarterly periods.

- Construction capex of \$163,800
- Maintenance capex of approximately \$125 thousand (\$500 thousand per year / 4) incurred in every quarter

Screenshot 2 shows traditional way to code-in the depreciation.

- Step 1: Transpose the period end in a column as shown in column C30 onwards.
- Step 2: Transpose the construction capex and the ongoing capex in column E30 onwards. In this example the construction capex is \$163,800 at end of construction period (cell E41) and the project incurs ongoing capex of approximately \$125 thousand per quarter (cell E42:E85).
- Step 3: Bring-in depreciation rate in column F30 – it is 10% p.a. or 2.5% p.q.
- Step 4: Depreciation is calculated for each costs incurred in the period. For example:

$$\begin{aligned} \text{Construction capex (row 41)} &= \$163,800 \times 2.5\% = \$4,095 \text{ thousand p.q.} \\ \text{Ongoing capex (row 42:85)} &= \$125 \times 2.5\% = \$3 \text{ thousand p.q.} \end{aligned}$$

- Step 5: Refer to row 86 in the workbook. Add-up the depreciations for each cost and link this to row 23 for calculating the Net book value of the fixed asset.

	C	E	F	H	I	U	V	W	X	Y	Z
1	Depreciation										
2	Period Start					1-Dec-09	Jan-10	Apr-10	Jul-10	Oct-10	Jan-11
3	Period End				31-Dec-08	31-Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11
4											
5	Construction										
6	Operations										
20	Traditional Method										
21	Balance B/f					-	163,800	159,828	155,855	151,880	147,901
22	Addition					168,803	163,800	123	125	126	123
23	Depreciation Charge					(166,238)	-	(4,095)	(4,098)	(4,101)	(4,104)
24	Balance C/f						163,800	159,828	155,855	151,880	147,901
25											
26	Comparison				Ok						
27											
28	Depreciation matrix										
29	Period End	CapEx	Rate	p.q.							
30	31-Jan-09	-	2.50%								
31	28-Feb-09	-	2.50%								
32	31-Mar-09	-	2.50%								
33	30-Apr-09	-	2.50%								
34	31-May-09	-	2.50%								
35	30-Jun-09	-	2.50%								
36	31-Jul-09	-	2.50%								
37	=TRANSPOSE(-	2.50%								
38	=\$J\$22:\$B\$M\$22)	-	2.50%								
39	31-Oct-09	-	2.50%								
40	30-Nov-09	-	2.50%								
41	31-Dec-09	163,800	2.50%			163,800	-	4,095	4,095	4,095	4,095
42	31-Mar-10	123	2.50%			120	-	-	3	3	3
43	30-Jun-10	125	2.50%			118	-	-	-	3	3
44	30-Sep-10	126	2.50%			117	-	-	-	-	3
45	31-Dec-10	126	2.50%			113	-	-	-	-	3
46	31-Mar-11	123	2.50%			108	-	-	-	-	-
47	30-Jun-11	125	2.50%			106	-	-	-	-	-
48	30-Sep-11	126	2.50%			104	-	-	-	-	-
49	31-Dec-11	126	2.50%			101	-	-	-	-	-

Screenshot 2: Traditional method



The calculations are pretty straight forward and easy to understand. The drawback is the depreciation matrix involves many rows of calculations. Imagine if you need to repeat the same calculation for each type of asset class.

"If you would like to learn more about smarter depreciation calculations and other critical components of financial models, then you should attend the Project Finance Modelling (B) course.

Nick Crawley, Managing Director
Navigator Project Finance

"Lite" method

This section will demonstrate an alternative way to code the depreciation in one line as opposed to the previous traditional matrix method. The formulas are more complicated but it only requires 3 steps of calculations. Once it is formulated correctly, it can be copied over to calculate depreciation of other types of assets and will be much neater compared to the traditional method.

Look at Screenshot 3 for this method.

- Step 1: Refer to row 12. Code-in the reverse ticker or number of period(s) to look back for the capital expenditure base cost, which will be used in Sum (Offset) calculation in Step 2.

V12 (Mar-10) = $\text{MIN}(\text{COLUMN}()-\text{COLUMN}(\$I12), 1/\$E17) = 13$ periods;
 W12 (Jun-10) = $\text{MIN}(\text{COLUMN}()-\text{COLUMN}(\$I12), 1/\$E17) = 14$ periods;
 X12 (Sep-10) = $\text{MIN}(\text{COLUMN}()-\text{COLUMN}(\$I12), 1/\$E17) = 15$ periods;
 and so on until maximum of $1 / 2.50\%$ or 40 periods

- Step 2: Refer to row 13. In this step, we code in the base cost for depreciation calculation.

V13 (Mar-10) = $\text{SUM}(\text{OFFSET}(U16, 0, 0, 1, -V12)) = \$163,800$
 W13 (Jun-10) = $\text{SUM}(\text{OFFSET}(V16, 0, 0, 1, -W12)) = 163,800 + 123 = \$163,923$
 X13 (Sep-10) = $\text{SUM}(\text{OFFSET}(W16, 0, 0, 1, -X12)) = 163,800 + 123 + 125 = 164,048$

- Step 3: Code in the depreciation calculation as shown in Row 17.

V17 (Mar-10) = $\text{MIN}(V13 * \$E17, V15) = \text{MIN}(2.5\% * 163800, 163800) = \$4,095$
 W17 (Jun-10) = $\text{MIN}(W13 * \$E17, W15) = \text{MIN}(2.5\% * 163923, 159828) = \$4,098$
 X17 (Sep-10) = $\text{MIN}(X13 * \$E17, X15) = \text{MIN}(2.5\% * 164048, 155855) = \$4,101$

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	C	E	K	U	V	W	X	Y	Z
1	Depreciation								
2	Period Start	1-Dec-09	Jan-10	Apr-10	Jul-10	Oct-10	Jan-11		
3	Period End	31-Dec-09	Mar-10	Jun-10	Sep-10	Dec-10	Mar-11		
4									
5	Construction								
6	Operations								
7									
8	Depreciation								
9	Lite Method								
10	Last Con Period	31-Dec-09							
11									
12	Period(s) to include		12	13	14	15	16	17	
13	Base for depreciation calculation	-	163,800	163,923	164,048	164,174	164,300		
14									
15	Balance B/f	-	163,800	159,828	155,855	151,880	147,901		
16	Addition		163,800	123	125	126	126	123	
17	Depreciation Charge		2.50%	(4,095)	(4,098)	(4,101)	(4,104)	(4,108)	
18	Balance C/f		163,800	159,828	155,855	151,880	147,901	143,917	
19									

Screenshot 3: Lite method

Comparison: Traditional vs. Lite method

Both methods should yield the same result, which is as reconciled in row 26.

V26	=V17-V23					
	A	B	C	V	W	X
1	Depreciation					
2	Period Start			1-Jan-10	1-Apr-10	1-Jul-10
3	Period End			31-Mar-10	30-Jun-10	30-Sep-10
4						
9	Lite Method					
10	Last Con Period					
11						
12	Period(s) to include			13	14	15
13	Base for depreciation calculation			163,800	163,923	164,048
14						
15	Balance B/f			163,800	159,828	155,855
16	Addition			123	125	126
17	Depreciation Charge			(4,095)	(4,098)	(4,101)
18	Balance C/f			159,828	155,855	151,880
19						
20	Traditional Method					
21	Balance B/f			163,800	159,828	155,855
22	Addition			123	125	126
23	Depreciation Charge			(4,095)	(4,098)	(4,101)
24	Balance C/f			159,828	155,855	151,880
25						
26	Comparison					

Screenshot: Reconciliation Traditional and Lite method

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