



## DEBT SCULPTING ACHIEVE TARGET DSCR WITHOUT VBA

### Debt Sculpting Introduction

**Debt Sculpting is a commonly used term in project finance. It means that the principal repayment obligations have been calculated to ensure that the principal and interest obligations are appropriately matched to the strength and pattern of the cashflows in each period.**

Sculpting can be achieved in several ways, the most common being

- Manually adjusting the principal repayment in each period;
- Algebraically solving the principal repayment to achieve a desired DSCR.

The manual adjustment is often unnecessarily overcomplicated using a combination of Visual Basic and the Goal Seek functionality within Excel. The algebraic approach is simpler than it sounds and generally should be the first attempted solution.

### The Algebraic Approach to Debt Sculpting

We need to keep in mind that either of the following two relationships can be re-arranged

$$DSCR = \text{Cash Available} / (\text{Principal} + \text{Interest})$$

$$LLCR = \text{NPV}(\text{Cash Available}) / \text{Debt Balance}$$

In turn, this means that assuming we are targeting a DSCR or an LLCR

$$\text{Principal} = \text{Cash Available} / DSCR(\text{Target}) - \text{Interest}; \text{ or}$$

$$\text{Debt Balance} = \text{NPV}(\text{Cash Available}) / LLCR(\text{Target})$$

Or, for a target DSCR of 2.00x

$$\text{Principal} = \text{Cash Available} / 2.00 - \text{Interest}$$

$$\text{Principal} = \text{Bal}(\text{Period } 2) - \text{Bal}(\text{Period } 1) = [\text{NPV}(\text{Cash})]_1 / 2.00 - [\text{NPV}(\text{Cash})]_2 / 2.00$$

### Debt Sculpting Applications

Common instances where sculpting is required include:

- Irregular, but well understood cashflows, for example in Oil and Gas projects;
- Seasonal demand factors (common in power, agriculture, manufacturing industries);
- The ramp-up period of a new project, such as a toll road;
- An unusual but expected payment, such as a major overhaul of an asset.

The interest cost, always being calculated as Interest Rate x Opening Balance is not sculpted directly, although its amount and timing will be directly influenced by the principal repayment schedule in all preceding repayment periods.

### Example of Debt Sculpting to Achieve Target DSCR

An example below illustrates a project with irregular cashflow and how to debt sculpt to achieve the target DSCR of 1.50x.

#### Step 1: Solve the Principal Repayment

To recap, the Principal Repayment is calculated as:

$$\text{Principal} = \text{CFADS} / \text{DSCR}(\text{Target}) - \text{Interest}$$

#### Step 2: Adjust the Principal calculated in Step 1

To ensure that the debt is fully repaid by the final maturity date (31-Dec-17 in this example), the Principal Repayment calculated using the formula above is further adjusted as:

$$\text{Principal}(\text{Applied}) = \text{Minimum}(\text{Calculated Principal}, \text{Debt Balance B/f})$$

Period Start	Jan-15	Jan-16	Jan-17	Jan-18
Period End	Dec-15	Dec-16	Dec-17	Dec-18
Construction				
Operations				
<b>Hard-coded external links</b>				
CFADS	130.00	141.89	21.13	-
<b>Tutorial Calculations</b>				
<b>Debt Account</b>				
Balance B/f	172.53	99.67	13.04	-
Principal Repayment	(72.86)	(86.62)	(13.04)	-
Balance C/f	99.67	13.04	-	-
<b>Base Lending Rate</b>				
Base Lending Rate	6.00%	6.00%	6.00%	0.00%
Margin	2.00%	2.00%	2.00%	0.00%
Total Interest Rate	8.00%	8.00%	8.00%	0.00%
Interest Charge	13.80	7.97	1.04	-
<b>Principal Repayment</b>				
Repayment Flag				
CFADS	130.00	141.89		
Target DSCR	1.50 x	1.50 x		
Debt Service	86.67	94.60		
Interest Charge	(13.80)	(7.97)	(1.04)	-
Principal Repayment	72.86	86.62	13.04	-
Principal Repayment (Applied)	72.86	86.62	13.04	-

**STEP 1:**  
 $P = 141.89 / 1.50x - 7.97$   
 $= 86.62$

**STEP 2:**  
 $P = \text{MIN}(P \text{ in STEP 1}, \text{Balance B/f}) = 13.04$

Screenshot #1: Example of Debt Sculpting to Achieve Target DSCR



"If you would like to learn more about debt sculpting mechanics then you should attend the Debt Modelling Masterclass, this course focuses on solving problems with simplicity rather than brute strength as the main instrument.

If you are interested in learning how to set up a fully automated debt analysis tool the VBA Financiers may be of interest to you"

Nick Crawley, Managing Director  
Navigator Project Finance

### Step 3 – Re-Calculate the DSCR

The last step for checking purposes is to re-calculate the DSCR to make sure that the Target DSCR is achieved in every period.

Period Start	Jan-15	Jan-16	Jan-17	Jan-18
Period End	Dec-15	Dec-16	Dec-17	Dec-18
Construction				
Operations				
<b>DSCR (Calculated)</b>				
<u>Numerator</u>				
CFADS	130.00	141.89	21.13	
<u>Denominator</u>				
Interest	13.80	7.97	1.04	
Principal	72.86	86.62	13.04	
Total Debt Service	86.67	94.60	14.09	
DSCR	1.50 x	1.50 x	1.50 x	0.00 x

**STEP 3: The re-calculated DSCR = 1.50x (Target DSCR)**

**Principal repayments calculated in STEP 2**

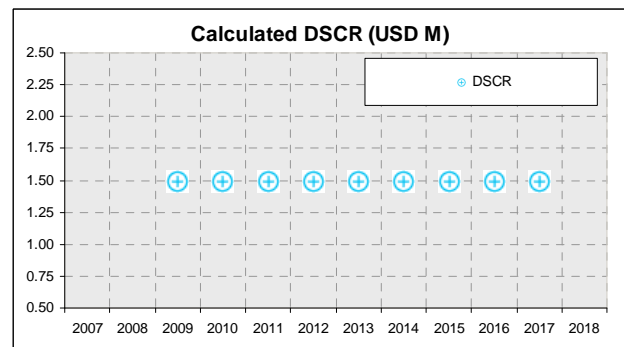
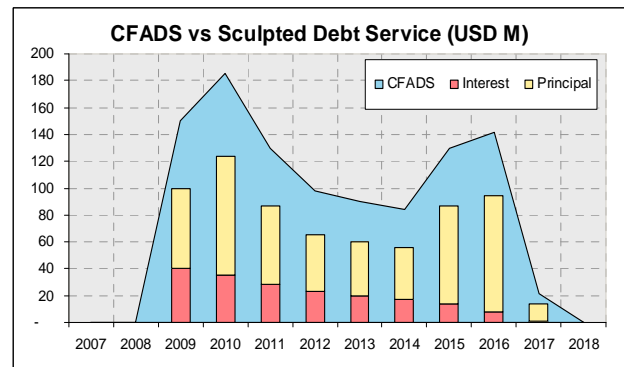
Screenshot #2: Re-calculation of the DSCR

#### Public Courses by Navigator Project Finance

- Project Finance Modelling (A)
- Project Finance Modelling (B)
- Debt Modelling Masterclass
- VBA for Financiers

### Step 4 – Create Graphs as Checking Tool

Graphs are often useful during the debt sculpting process as a checking tool. The graph below clearly demonstrates that the project in this example has irregular cashflow, thus the sculpted debt repayment needs to be matched to the pattern of the cashflow in each period.



Screenshot #3: Graphs

Please refer to our Tutorial titled "Borrowing Base Lending in Resource Projects" to learn about Debt Sculpting to achieve Target LCCR. If you have any feedback or suggestions for future developments we would like to hear from you!

The team at Navigator Project Finance  
[www.navigatorpf.com/training/tutorials](http://www.navigatorpf.com/training/tutorials)

### Summary

Sculpting is often overcomplicated in many financial models, however it can be handled quite simply using the straight forward logic above.

**DSCR (Debt Service Cover Ratio) Definition :** The ratio of the Cash Available to service and repay debt obligations to the Principal and Interest obligations themselves.

**LCCR (Loan Life Cover Ratio) Definition :** The ratio of the Net Present Value of Cash Available for Debt Service during the life of the loan to the Debt Balance outstanding in any period.

## About Navigator Project Finance

Founded in 2004, Navigator Project Finance Pty Ltd (Navigator) is the project finance modelling expert. Headquartered in Sydney, Australia, Navigator is raising the global benchmark in financial modelling services to the project finance sector. Navigator designs and constructs financial models for complex project financings, offers training courses throughout the Middle East, Asia and Europe, and conducts independent model reviews of project finance transaction models. Navigator delivers fast, flexible and rigorously-tested project finance services that provide unparalleled transparency and ease of use.

Customers include market leaders such as Deutsche Bank, ANZ Investment Bank, Bovis Lend Lease, Oxiana, Mirvac Property, Westpac and the Commonwealth Bank of Australia, together with leaders from the finance, mining, property, utilities, banking, chemical and infrastructure sectors.

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