



Project Finance Ratios
Tutorial
February 2017

1.0 General

Please note the following guidance and instruction is to be used as an accompaniment to the 'Project Finance Ratios' Excel file.

Please feel free to get in touch at contact@lentransolutions.com if you would like additional guidance or to discuss the methodologies represented here and in the Excel file.

2.0 Tutorial

2.1 Aim and audience

The aim of this tutorial is to illustrate what the most common project finance debt ratios found in loan documentation and term sheets are and how to set them up correctly in a financial model. The intended audience are those preparing, analysing and reviewing project finance transaction models.

2.2 Tutorial conventions

The three project finance ratios that are covered here include:

- Debt service coverage ratio (DSCR),
- Loan life coverage ratio (LLCR), and
- Project life coverage ratio (PLCR)

Essentially, all three ratios are a measure of a project's ability to produce sufficient cashflow to cover its debt obligations.

Given that loans are non-recourse in project finance, lenders can only rely on the projected cashflows of the project rather than balance sheet of its sponsors to repay its debt obligations. Therefore, lenders pay very close attention to project finance ratios in models and it is imperative that these ratios are set up correctly.

The terms debt and loan are used interchangeably in this tutorial. Cashflow available for debt service is represented by the acronym CFADS. Sheet references are displayed as '**Sheet**' while section headings and line references are displayed as '*Item*'.

2.3 Debt service coverage ratio (DSCR)

The DSCR is calculated as:

DSCR = CFADS / debt service

- CFADS = qualifying cashflows available for debt service
- Debt service = interest paid + principal repayment

Essentially, the DSCR is a period by period ratio that measures how much headroom the project's cashflow has in order to repay the scheduled debt service in any one period. Or more specifically, the DSCR measures how many times the CFADS can repay the scheduled debt service of that period.

DSCR represents the most common used ratio in project finance deals and it would be very hard to find a debt term sheet which did not include this ratio in some major way as it is often used to determine anything from debt default levels, to cash lock-ups, releases and lender reserve sizing.

Given that the DSCR is a period by period ratio, lenders normally focus on two main outputs:

- The minimum DSCR to identify a period of weak CFADS relative to its debt obligations.
- The average DSCR to have an understanding of the overall health of the project cashflows relative to its total debt service.

Note that a variation of the DSCR is the interest cover ratio (ICR):

ICR = CFADS / interest payable

The only difference compared to DSCR is that the ICR only takes into account the interest paid or payable without considering any principal repayments as part of its denominator.

2.4 Constructing the DSCR

2.4.1 The DSCR formula

For both the numerator and denominator:

- Link in CFADS from the cashflow waterfall¹ – row 20
- Multiply CFADS by the loan life binary flag to determine the qualifying CFADS – row 21
- Bring in the interest and principal repayment² to determine the total debt service – row 25

In calculating the DSCR:

- Divide the qualifying CFADS by the total debt service – row 27

Note: an IF(denominator = 0 , 0 , ...) formula is recommended when calculating ratios to avoid returning #DIV/0! In the event that the denominator is zero.

2.4.2 Minimum DSCR

¹ See our Cashflow Waterfall and CFADS tutorial for more guidance on how to calculate CFADS.

² See our Setting up a Debt Facility tutorial for more guidance on how to set up a debt facility.

Calculating the minimum DSCR is a less than a straight forward task a MIN function alone would always return a zero and given that there is no in-built MINIF Excel formula (unlike SUMIF or AVERAGEIF), the best option is to create an array formula:

- Start by building a nested MIN and IF formula in E27:

=MIN(IF(H27:Q27<>0,H27:Q27))

- Press 'Ctrl + Shift + Enter' to create an array formula.

Note: Excel automatically inserts the formula between a pair of opening and closing brackets { }. This is necessary, otherwise the calculation will return a #VALUE! error given the IF formula is not built to deal with multiple cells, as is the case here.

2.4.3 Average DSCR

A common solution in many financial models for calculating the average DSCR is using either the AVERAGEIF function or a similar approach as the minimum DSCR: { AVERAGE(IF(RANGE <>0, RANGE)) }.

However, this approach can be misleading as it is giving equal importance to the DSCR of each period. In other words, the periodic DSCR which is a ratio in itself, is being given equal weighting in calculating the average. The average DSCR can be distorted when the repayment profile is not flat and more so when there is a very small repayment during the loan life.

The better and more straight forward solution is to divide the qualifying CFADS by the total debt service – F27

1	Calculations									
2	Tutorial: Project Finance Ratios									
3	Forecast year	Num			1	2	3	4	5	
19	DSCR									
20	CFADS	AUD '000	903		130	128	115	132	137	
21	Qualifying CFADS	AUD '000	642		130	128	115	132	137	
22										
23	Interest	AUD '000	48		18	13	9	5	2	
24	Principal repayment	AUD '000	300		80	70	60	50	40	
25	Total debt service	AUD '000	348		98	83	69	55	42	
26										
			Min	Average						
27	Debt service cover ratio (DSCR)	x	1.33x	1.84x	1.33x	1.54x	1.67x	2.38x	3.23x	

2.5 Loan life coverage ratio (LLCR)

The LLCR is calculated as:

LLCR = NPV (of CFADS over loan life) / opening debt balance

Unlike the period by period DSCR, the LLCR is a look forward ratio for lenders to calculate the number of times the discounted project cashflows can repay the outstanding debt balance *over the scheduled loan life*.

In many ways where DSCR allows lenders and sponsors too, the opportunity to identify points of weakness, LLCR provides a truer example of the whole life quality of the project.

Different lenders often internally and procedurally assign different levels of importance to DSCR and LLCR and as a sponsor it is important to understand where a prospective lenders priorities lie in this sense as it will give greater direction when debt sculpting and sizing comes into play.

Given that the LLCR is essentially a discounted average ratio, lenders normally focus on two main outputs:

- The minimum LLCR
- The LLCR at the start of operations

2.6 Constructing the LLCR

2.6.1 The LLCR formula

The numerator is the net present value (NPV) of the project's CFADS over the loan life (i.e. qualifying CFADS) discounted by the cost of debt:

- Bring in the qualifying CFADS and the discount rate, which in this case is the all in rate – row 30 & 32
- Calculate the start of period NPV of CFADS from 1st principles. This is done by summing the current CFADS and the cumulative future discounted CFADS and discounting them to the start of the period by the current period's discount rate – row 35

Given that the NPV of CFADS is a start of period calculation, likewise, the opening debt balance should be used as the denominator – row 37

In calculating the LLCR:

- Divide the NPV of CFADS by the opening debt balance – row 39
- Similar to how the minimum DSCR is calculated, the minimum LLCR is calculated in E39.
- Another common LLCR metric (not shown in Excel file) is the result at commercial operation date – this is usually the point in time at which the project goes live after the construction phase and represents a quality test for the whole of operations.

1	Calculations					
2	Tutorial: Project Finance Ratios					
3	Forecast year	Num		1	2	3
28						
29	LLCR					
30	Qualifying CFADS	AUD '000	642	130	128	115
31						
32	All in rate	% p.a		6.00%	6.00%	6.00%
33	1+r	Number		1.06	1.06	1.06
34						
35	NPV of CFADS (start of period)	AUD '000		540	442	341
36						
37	Opening debt balance	AUD '000		300	220	150
38			Min			
39	Loan life coverage ratio (LLCR)	x	1.80x	1.80x	2.01x	2.27x

2.6.2 Common errors

The LLCR calculation is prone to mistakes. A few of the most commonly repeated errors including:

- Comparing a start of period NPV as its numerator against the closing debt balance as its denominator (i.e. start of period vs. end of period).
- Using the NPV or XNPV function to calculate the numerator. This limits the discount rate to a single discount rate, which is not normally the case since cost of debt often fluctuates across time based on margin schedules or ratchets or indeed if the base rate has not been fully hedged. This reduces the accuracy of the LLCR which is far from ideal especially if it's required for periodic covenant testing and monitoring.
- Incorrect use of the NPV or XNPV function in calculating the numerator³.
- The project CFADS rather than the qualifying CFADS is discounted in the numerator.
- Discount rate does not represent a weighted average of cost of debt where multiple debt facilities are being considered for the LLCR calculation.

2.7 Project life coverage ratio (LLCR)

The PLCR is calculated as:

$$\text{PLCR} = \text{NPV (of CFADS over project life)} / \text{opening debt balance}$$

The PLCR is very similar to the LLCR, except that, rather than calculating the CFADS over the loan life, the numerator is the NPV of CFADS over the project life.

Note that the definition of project life for the purpose of calculating the PLCR from the lender's perspective does not necessarily equate to the forecasted project life. Rather, to protect the lenders against relying on future cashflows that may be uncertain, the PLCR project life may be shorter than the forecasted project life by the sponsors or operators.

For example, a sponsor or operator may have a projected mine life of 10 years for a copper mine, however, in the term sheet or loan documentation, the project life is only 8 years. This is not strictly what is known as a 'tail'⁴, but performs a similar action and represents a similar process of risk mitigation by the lender.

Ultimately, the PLCR from a lenders perspective is used to highlight the added value that is left in the business post planned term end. In other words the ratio represents a statement on the size of the security blanket that remains if the project runs into issues of paying back debt service and needs to extend into the tail period.

³ See our NPV tutorial for more detail on the right and wrong way of calculating this essential valuation metric.

⁴ A 'tail' is the period between the loan term end and the project term end, both as defined by the loan documentation / lender term sheet.

2.8 Constructing the PLCR

The steps in constructing the PLCR is very similar as to how the LLCR is constructed with two exceptions:

- Cashflows are now based off the project life rather than the loan life – rows 42 & 43
- Discount rate beyond the loan life

2.8.1 Discount rate beyond the loan life

Given that the PLCR project life is normally longer than the loan life, a discount rate beyond the loan life will have to be assumed.

A common mistake done in many financial models is that no discounting has been done to the cashflows post the final maturity of the loan given that cost of debt is now zero. This would be incorrect as the discount rate should be at least equal to the cost of debt at the final maturity date given that cashflows beyond the loan life are even more uncertain.

Therefore, a good solution is to add in an assumption for the discount rate post the final maturity of the loan – row 46

1	Calculations									
2	Tutorial: Project Finance Ratios									
3	Forecast year	Num				1	2	3	4	5
40										
41	PLCR									
42	Project life	[1,0]	6 Yr(s)			1	1	1	1	1
43	Qualifying CFADS	AUD '000				130	128	115	132	137
44										
45	All in rate	% p.a				6.00%	6.00%	6.00%	6.00%	6.00%
46	Discount rate (post loan life)	% p.a	7.00%			-	-	-	-	-
47	Discount rate (applied)	% p.a				6.00%	6.00%	6.00%	6.00%	6.00%
48	1+r	Number				1.06	1.06	1.06	1.06	1.06
49										
50	NPV of CFADS (start of period)	AUD '000				628	536	440	351	240
51										
52	Debt balance (balance b/f)	AUD '000				300	220	150	90	40
53										
54	Project life coverage ratio (PLCR)	x	Min	2.09x		2.09x	2.44x	2.93x	3.90x	6.01x