



Paper LBO Model – 30 Minutes

ABQ Capital is considering a leveraged buyout of Ozymandias, a leading provider of generic pharmaceuticals, with distribution in all 50 states of the U.S.

ABQ plans to purchase the company for 10.0x LTM EBITDA, and it will fund 50% of the purchase price with debt and fund the remainder with equity. The company's management team plans to roll over its existing shares, which represent 10% of the Purchase Enterprise Value.

The weighted average interest rate on the debt is 5%, and 1% of the *initial* debt principal must be repaid each year. ABQ plans to use all excess free cash flow to repay additional principal beyond the 1%.

Ozymandias' LTM revenue is \$800 million, and it has achieved EBITDA margins of 30% historically.

The company's revenue is expected to grow at 7% annually, and its EBITDA margin will increase to 35% over five years. New generics products that the company plans to acquire will drive its revenue growth.

The company plans to spend 4% of its revenue on Capital Expenditures (CapEx), 3% on the Purchases of Intangible Assets (primarily the rights to new drugs), and 3% on Working Capital (i.e., assume the Change in Working Capital is a use of funds).

Ozymandias expects Depreciation & Amortization to represent 5% of its annual revenue, and its effective tax rate is 40%.

If ABQ Capital is targeting a 20% IRR over five years, would you recommend this deal? Calculate the multiple and IRR and show the FCF and debt pay-down calculations to support your answer.

You MAY not use Excel or a calculator for this exercise. Complete all the calculations using pencil and paper, and round the numbers to simplify the calculations.

SOLUTION:

STEP 1 – Determine the End Goal

With a "paper LBO" test, **start with the end in mind.**

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You know from the technical sections that a 20% IRR over five years means a **2.5x multiple** (since a ~15% IRR is a 2x multiple and a ~25% IRR is a 3x multiple).

The company's LTM revenue is \$800 million, and its EBITDA margin is 30%, so its LTM EBITDA is, therefore, \$240 million (10% of \$800 = \$80, and multiply that by 3).

A 10x purchase multiple means a Purchase Enterprise Value of \$2.4 billion, and 50% Equity means an equity contribution of \$1.2 billion.

Management is rolling over shares, **but this information is irrelevant because the ownership split stays the same throughout.**

In other words, management contributes 20% of the initial equity and gets back 20% of the equity at the end – so we can just look at the TOTAL equity in both cases.

We can say that the deal must generate \$1.2 billion * 2.5x = **\$3.0 billion** in total equity proceeds to be viable.

We need to determine the Year 5 EBITDA and the Year 5 Debt to see if that's possible.

STEP 2 – Project Revenue and EBITDA

You should project revenue and EBITDA **FIRST** because these two numbers drive everything else. Even if you cannot *finish* the FCF projections, you can always use EBITDA to make a very rough estimate of the Year 5 Debt (e.g., make FCF a simple percentage of EBITDA).

Here are the numbers they gave us:

	LTM	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue:	\$800					
Growth:		7%	7%	7%	7%	7%
Margin:	30%	31%	32%	33%	34%	35%
EBITDA:	\$240					

To approximate a 7% growth rate, you can say that it's "halfway" between 5% and 10%. Since 10% * \$800 = \$80 and 5% * \$800 = \$40, 7% growth in Year 1 is, therefore, "approximately \$60."

You can apply that logic, along with some rounding, to calculate revenue in each year:



- $\$860 * 7\% \rightarrow$ Halfway between $\$86$ and $\$43$, which you can round to $\$65$.
- $\$925 * 7\% \rightarrow$ Halfway between $\$92$ and $\$46$, which you can round to $\$70$.
- $\$995 * 7\% \rightarrow$ Halfway between $\$100$ and $\$50$, which you can round to $\$75$.
- $\$1,070 * 7\% \rightarrow$ Halfway between $\$107$ and $\$53$, which you can round to $\$80$.

	LTM	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue:	\$800	\$860	\$925	\$995	\$1,070	\$1,150
Growth:		7%	7%	7%	7%	7%
Margin:	30%	31%	32%	33%	34%	35%
EBITDA:	\$240					

Revenue is $\$1,122$ in Year 5 if you calculate it in Excel or with a calculator. We're off by **2.5%**, but who cares? It's close enough!

Using round numbers like the ones above will make your life **10x easier** in the FCF calculations, so it's **FAR** better to do this than to make the figures "more accurate."

To project EBITDA, notice how the initial margin of 30% is **very close to 33%, or 1/3**.

So, you can multiply revenue by $1/3$ in each year and then adjust the results up or down.

Here's the math:

- **Year 1:** $\$860 * (1/3) \rightarrow \$900 / 3 = \$300$, and $\$40 / 3 = \13 , so $\$300 - \$13 = \$287$. But we're 2% below 33%, and 2% of $\$860$ is roughly $\$18$. EBITDA = $\$287 - \$18 = \$269$.
 - **Round To:** $\$270$.
- **Year 2:** $\$925 * (1/3) \rightarrow \$900 / 3 = \$300$, and $\$25 / 3 = \8 , so $\$300 + \$8 = \$308$. But we're 1% below 33%, and 1% of $\$925$ is about $\$9$. EBITDA = $\$308 - \$9 = \$299$.
 - **Round To:** $\$300$.
- **Year 3:** $\$995 * (1/3) \rightarrow \$1,000 / 3 = \$333$. But we're *a bit* below $\$1,000$, so we'll knock this down to $\$332$.
 - **Round To:** $\$330$.
- **Year 4:** $\$1,070 * (1/3) \rightarrow \$1,000 / 3 = \$333$, and $\$70 / 3 = \23 , so $\$333 + \$23 = \$356$. But we're 1% above 33% now, and 1% of $\$1,070$ is about $\$11$, so $\$356 + \$11 = \$367$.
 - **Round To:** $\$370$.



- **Year 5:** $\$1,150 * (1/3) \rightarrow \$1,000 / 3 = \$333$, and $\$150 / 3 = \50 , so $\$333 + \$50 = \$383$.
But we're 2% above 33% now, and 2% of $\$1,150$ is $\$23$, so $\$383 + \$23 = \$406$.
 - **Round To:** \$400.

We are rounding **DOWN** because our revenue estimates are high: 7% growth is lower than the 7.5% growth we assumed. To compensate, we round down other figures.

Here's what our pencil-and-paper sketch now looks like:

	LTM	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue:	\$800	\$860	\$925	\$995	\$1,070	\$1,150
Growth:		7%	7%	7%	7%	7%
Margin:	30%	31%	32%	33%	34%	35%
EBITDA:	\$240	\$270	\$300	\$330	\$370	\$400

STEP 3 – Calculate Annual FCF

Free Cash Flow = EBITDA – Interest – Taxes – Change in WC – CapEx – Purchases of Intangibles.

If you don't understand this formula, think about how FCF is defined: **Cash Flow from Operations (CFO) – CapEx.**

CFO starts with Net Income, and Net Income = Pre-Tax Income – Taxes.

Pre-Tax Income = EBITDA – Interest – D&A.

So, we can say that Net Income = EBITDA – Interest – D&A – Taxes.

Within CFO, we start with Net Income, add back non-cash expenses (only D&A here), and reflect the Change in Working Capital (negative here):

CFO = Net Income + D&A – Change in WC.

CFO = EBITDA – Interest – D&A – Taxes + D&A – Change in WC.

The two "D&A" terms cancel each other out, and we're left with:

CFO = EBITDA – Interest – Taxes – Change in WC.

And then, FCF = EBITDA – Interest – Taxes – Change in WC – CapEx.

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“Purchases of Intangibles” is an additional item that’s just like CapEx: The company purchases intangible assets and amortizes them over time. It’s not included in the standard formulas for FCF, but it is a factor here.

Remember that CapEx, Purchases of Intangibles, and the Change in WC are all **simple percentages of revenue**.

Therefore, **it makes no sense to calculate them separately**.

Group them together to save time:

FCF = EBITDA – Interest – Taxes – Change in WC – CapEx – Purchases of Intangibles.

FCF = EBITDA – Interest – Taxes – “Other Items.”

CapEx = 4% of revenue, Intangible Purchases = 3%, and Change in WC = 3%, so the total is **10%**. Very nice!

Once again, we’ll round the numbers to units of 5 or 10, so $\$860 * 10\% = \86 becomes $\$85$:

	Year 1	Year 2	Year 3	Year 4	Year 5
EBITDA:	\$270	\$300	\$330	\$370	\$400
Interest:					
Taxes:					
Other Items:	(\$85)	(\$90)	(\$100)	(\$110)	(\$115)
FCF:					

To calculate the company’s **Taxes**, we need to determine its Taxable Income. $EBITDA - D\&A = EBIT$, and $EBIT - Interest = Taxable Income$; we can then multiply that by 40%.

D&A is 5% of revenue, so that part is easy. To get these numbers, we can take 50% of the “Other Items” above and round to units of 5 or 10:

	Year 1	Year 2	Year 3	Year 4	Year 5
EBITDA:	\$270	\$300	\$330	\$370	\$400
D&A:	(\$45)	(\$45)	(\$50)	(\$55)	(\$60)
Interest:					
Taxable Income:					
Taxes:					



The Interest Expense will be DIFFERENT each year because the company repays Debt with its FCF. Many of the other numbers are interdependent as well:

- **Interest:** Depends on the Debt balance, but the Debt balance depends on FCF.
- **FCF:** Depends on the Interest and Taxes.
- **Taxes:** Depends on the Interest.

You have to do this **iteratively** and go year-by-year, starting with the Interest in Year 1, which you can base on the initial Debt balance of \$1.2 billion:

	Year 1	Year 2	Year 3	Year 4	Year 5
EBITDA:	\$270	\$300	\$330	\$370	\$400
D&A:	(\$45)	(\$45)	(\$50)	(\$55)	(\$60)
Interest:	(\$60)				
Taxable Income:	\$165				
Taxes:	\$65				
EBITDA:	\$270	\$300	\$330	\$370	\$400
Interest:	(\$60)				
Taxes:	(\$65)				
Other Items:	(\$85)	(\$90)	(\$100)	(\$110)	(\$115)
FCF:	\$60				
BoP Debt:	\$1,200				
EoP Debt:	\$1,140				

We do **not** need to factor in the 1% annual principal repayments: The FCF is used to pay the \$12 each year, as well as any amount above that.

In Year 1, for example, the company's FCF is \$60. That covers the \$12 in mandatory repayments, and there's \$48 of FCF left to repay more of the Debt balance.

Instead of wasting time splitting out these payments separately, just use the entire FCF to repay the Debt balance.

Once we have the Year 1 numbers, we can continue to Year 2, where Interest = 5% * \$1,140.



Since 10% of \$1,140 is \$114, we can use $\$114 / 2 = \57 and round it down to \$55 to make the math easier:

	Year 1	Year 2	Year 3	Year 4	Year 5
EBITDA:	\$270	\$300	\$330	\$370	\$400
D&A:	(\$45)	(\$45)	(\$50)	(\$55)	(\$60)
Interest:	(\$60)	(\$55)			
Taxable Income:	\$165	\$200			
Taxes:	\$65	\$80			
EBITDA:	\$270	\$300	\$330	\$370	\$400
Interest:	(\$60)	(\$55)			
Taxes:	(\$65)	(\$80)			
Other Items:	(\$85)	(\$90)	(\$100)	(\$110)	(\$115)
FCF:	\$60	\$75			
BoP Debt:	\$1,200	\$1,140			
EoP Debt:	\$1,140	\$1,065			

We can then repeat the same process for Year 3. Interest = $5\% * \$1,065$, or $\$107 / 2 = \53 . We'll round that down to \$50:

	Year 1	Year 2	Year 3	Year 4	Year 5
EBITDA:	\$270	\$300	\$330	\$370	\$400
D&A:	(\$45)	(\$45)	(\$50)	(\$55)	(\$60)
Interest:	(\$60)	(\$55)	(\$50)		
Taxable Income:	\$165	\$200	\$230		
Taxes:	\$65	\$80	\$90		
EBITDA:	\$270	\$300	\$330	\$370	\$400
Interest:	(\$60)	(\$55)	(\$50)		
Taxes:	(\$65)	(\$80)	(\$90)		
Other Items:	(\$85)	(\$90)	(\$100)	(\$110)	(\$115)
FCF:	\$60	\$75	\$90		
BoP Debt:	\$1,200	\$1,140	\$1,065		
EoP Debt:	\$1,140	\$1,065	\$975		



You do **NOT** need to recalculate the Taxes from scratch each year; just take the previous estimate and add $40\% * \text{Additional Taxable Income This Year}$.

For example, with \$200 in Taxable Income, we had \$80 in Taxes. With \$230, therefore, we get $\$80 + (\$230 - \$200) * 40\%$ in Taxes.

$\$30 * 40\% = \12 , so we can add that \$80 to get \$92 in Taxes. To make it cleaner, we can round it down to \$90, as we did above.

In Year 4, the Interest = $\$975 * 5\%$, or *just under \$50*. But that makes for an ugly number, so let's simplify it and round up to \$50:

	Year 1	Year 2	Year 3	Year 4	Year 5
EBITDA:	\$270	\$300	\$330	\$370	\$400
D&A:	(\$45)	(\$45)	(\$50)	(\$55)	(\$60)
Interest:	(\$60)	(\$55)	(\$50)	(\$50)	
Taxable Income:	\$165	\$200	\$230	\$265	
Taxes:	\$65	\$80	\$90	\$105	
EBITDA:	\$270	\$300	\$330	\$370	\$400
Interest:	(\$60)	(\$55)	(\$50)	(\$50)	
Taxes:	(\$65)	(\$80)	(\$90)	(\$105)	
Other Items:	(\$85)	(\$90)	(\$100)	(\$110)	(\$115)
FCF:	\$60	\$75	\$90	\$105	
BoP Debt:	\$1,200	\$1,140	\$1,065	\$975	
EoP Debt:	\$1,140	\$1,065	\$975	\$870	

To calculate Taxes, we can use the Year 2 results: $\$200 * 40\% = \80 , and then the \$65 on top of that results in another $\sim\$25$, so $\$80 + \$25 = \$105$.

In Year 5, Interest = $5\% * \$870 = \$87 / 2 = \$43$, so we'll round that up to \$45:

	Year 1	Year 2	Year 3	Year 4	Year 5
EBITDA:	\$270	\$300	\$330	\$370	\$400
D&A:	(\$45)	(\$45)	(\$50)	(\$55)	(\$60)
Interest:	(\$60)	(\$55)	(\$50)	(\$50)	(\$45)
Taxable Income:	\$165	\$200	\$230	\$265	\$295



Taxes:	\$65	\$80	\$90	\$105	\$115
EBITDA:	\$270	\$300	\$330	\$370	\$400
Interest:	(\$60)	(\$55)	(\$50)	(\$50)	(\$45)
Taxes:	(\$65)	(\$80)	(\$90)	(\$105)	(\$115)
Other Items:	(\$85)	(\$90)	(\$100)	(\$110)	(\$115)
FCF:	\$60	\$75	\$90	\$105	\$125
BoP Debt:	\$1,200	\$1,140	\$1,065	\$975	\$870
EoP Debt:	\$1,140	\$1,065	\$975	\$870	\$745

STEP 4 – Calculate the Exit Proceeds

We're *almost* done now. To finish, we need to calculate the Exit Enterprise Value, Exit Equity Value, multiple, and IRR.

We know the Year 5 EBITDA, but we do **not** have the exit multiple.

Since the company's growth rates and margins are similar in Year 5, it's safest to assume that the Exit Multiple equals the Purchase Multiple, so we'll use 10x.

Exit Enterprise Value = 10x * \$400 = \$4,000 (AKA \$4 billion).

We have no information on the Cash balance, but we know it has NOT changed at all because all excess FCF was used to repay Debt.

Since \$745 of Debt remains at the end, Exit Equity Value = \$4,000 – \$745 = \$3,255.

To get a 20% IRR over five years, we need at least a 2.5x multiple on the \$1,200 of equity.

From Step 1, we know that corresponds to \$3,000 in proceeds, so **this deal is viable**.

The multiple will be just above 2.5x, and the IRR will be just above 20%.

STEP 5 – Verify These Calculations

This last step is **NOT** part of the case study. But we wanted to use it to illustrate the accuracy of the estimates above.



Take a look at the accompanying Excel file, and you'll see what the "real" numbers look like in a simple Excel model.

Even though we rounded and heavily simplified the numbers, **the results are remarkably close:** A 2.6x multiple and a 21.3% IRR.

You'll get bigger divergences in more complex models, but the point of this exercise is simple: **Always do a quick check of the numbers first.**

If the deal doesn't work with a simple model, it will *never* work with a complex model.