Oil & Gas Modeling 101: The Full Crash Course

Upstream, Midstream, Downstream, and More

The Return of the ~~King~~ Oil & Gas Modeling

If you've watched this channel before, you know that I'm not exactly "concise."

And this is a **crash-course video** covering dozens of topics! But you will be well-prepared for Oil & Gas interviews if you watch until the end.

The Return of the ~~King~~ Oil & Gas Modeling

Since this video will be longer, I'll start with a **short summary** of all the verticals in Oil & Gas.

And if you want to **watch/learn more**, you can keep going past that; each vertical has its own **mini-tutorial**.

The Return of the ~~King~~ Oil & Gas Modeling

For the Excel files and resources, go to:

https://mergersandinquisitions.com/oil-gas-modeling-101/

(This is a **summary** from our full Oil & Gas Modeling course.)

Oil & Gas Modeling 101

- **Upstream (Exploration & Production or E&P):** Very CapEx-intensive companies; highly sensitive to commodity prices and a lot of specialized lingo, metrics, and methodologies

- **Midstream (Storage & Transportation or S&T):** Utilities companies with high margins, predictable revenue and cash flows, and far less sensitivity to commodity prices

- **Downstream (Refining & Marketing or R&M):** Low-margin industrials companies with less predictable revenue and cash flows, and moderate sensitivity to commodity prices

Oil & Gas Modeling 101



	Upstream	Midstream	Downstream
Revenue:	Split into Proved Developed and "Undeveloped" Reserves and forecast decline rates, commodity prices, and new wells drilled	Capacity * Utilization Rate * Fees per Unit	Capacity * Utilization Rate * Price per Ton of Fuel
COGS & OpEx:	Mostly per-production ($ / Mcfe or $ / BOE) metrics that increase modestly over time	Mostly per-capacity metrics ($ / Mcfe or $ / BOE) that increase modestly over time	Per-production metrics that trend heavily with oil/gas prices; huge fluctuations
CapEx:	Primarily Growth CapEx from new wells drilled (D&C CapEx); some Maintenance	Primarily Maintenance CapEx for existing capacity; some Growth to expand pipelines/storage	Primarily Maintenance CapEx; very difficult to build new refineries, but expansions are possible
Production & Reserves:	Critical; 1P vs. 2P vs. 3P categories and conversion into Mcfe or BOE always required	Not important / relevant (unless the company also has Upstream operations)	Not important / relevant (unless the company also has Upstream operations)
Commodity Price Sensitivity:	Highly sensitive to commodity prices; scenarios required in all models	Not sensitive; there is an *indirect* effect because volumes tend to increase at higher prices	Moderately sensitive because prices affect refining margins; scenarios useful
Valuation Metrics & Multiples:	TEV / EBITDAX, TEV / Proved Reserves, TEV / Daily Production, and the NAV Model	TEV / EBITDA, Equity Value / Distributable Cash Flow, Distribution Yield, DCF Model, and the DDM/DDA Model	TEV / EBITDA, P / E, and the DCF Model; SOTP valuation may be more relevant
Legal / Tax / Accounting:	Almost always C-Corporations; Successful Efforts vs. Full Cost Accounting	Many U.S. Midstream firms are structured as MLPs (no corporate-level taxes), but they have become less common over time	Most are standard C-Corporations; MLPs exist but are typically for multi-segment companies

Plan for This Tutorial

- **Part 1:** Upstream Crash Course **4:34**
- **Part 2:** Midstream Crash Course **14:26**
- **Part 3:** Downstream Crash Course **22:51**
- **Part 4:** Oilfield Services, Integrated Majors, and Royalty Co's **29:00**

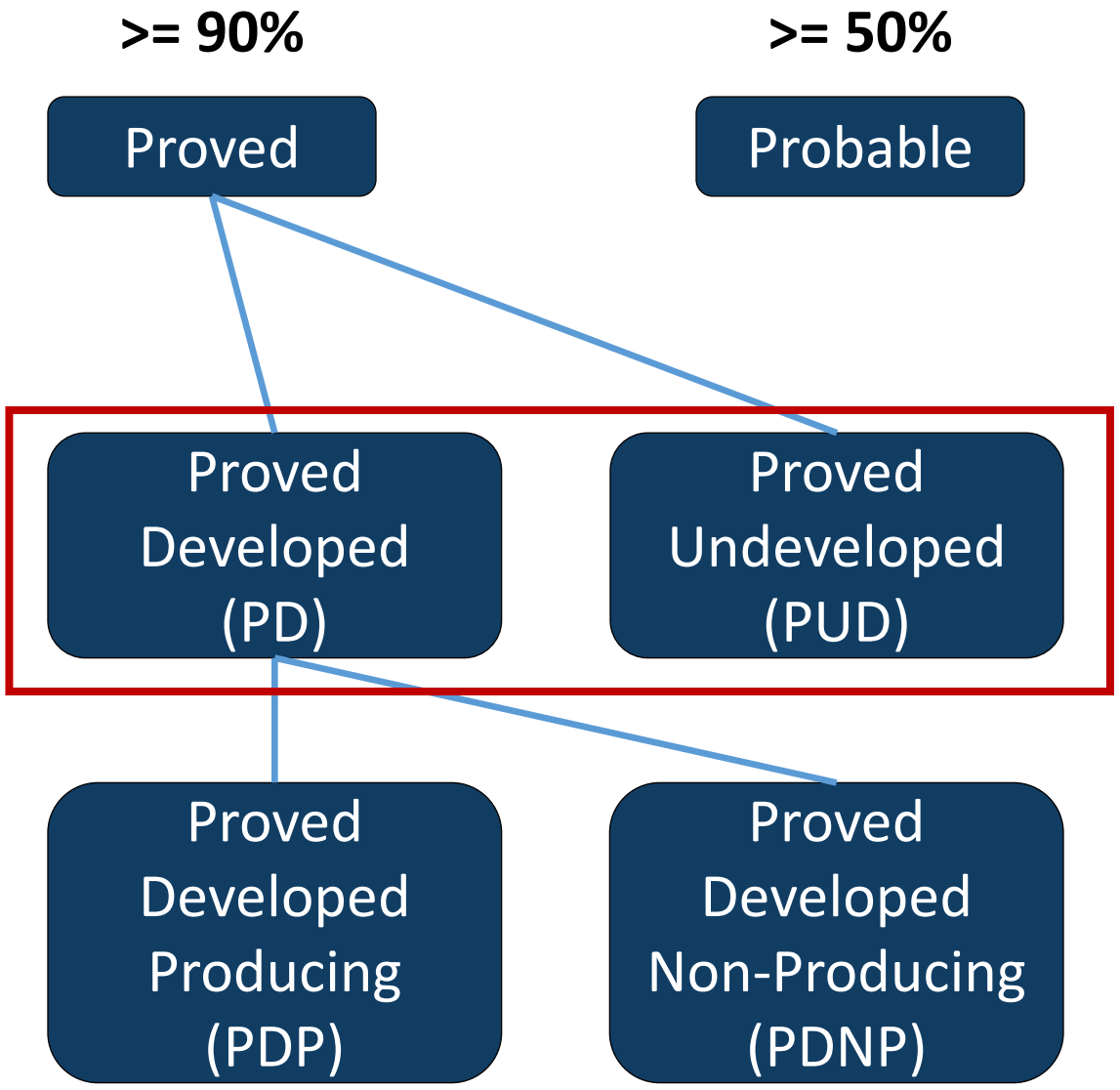
Part 1: Upstream (E&P) Crash Course

- **Basics:** E&P companies have "**Reserves**" of oil and gas in the ground; they **produce** a certain amount each year

- **Goal:** As companies **produce**, they also try to **replace** their Reserves via **exploration** and **acquisitions** – otherwise, their Reserves eventually fall to ~0, and cash flow ends

- **Complexity:** There are different **types** of Reserves, and **natural gas** is measured in different units than **oil** and **natural gas liquids (NGLs)**; must be able to **convert**

Part 1: Upstream (E&P) Crash Course



1P = Proved

2P = Proved + Probable

3P = Proved + Probable + Possible

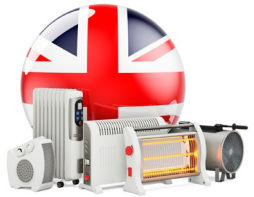
Nuances: Some questions about the probabilities – individual for each category or *cumulative*?

Part 1: Upstream (E&P) Crash Course

- **Oil and NGLs:** Measured in Barrels of Oil (Bbl) (42 Gallons)

- **Natural Gas:** Measured in Thousand Cubic Feet (Mcf)

- **Conversion Factor:** Based on the *energy produced* in Millions of British Thermal Units (MMBTU), 1 Bbl = 5.8 MMBtu, and 1,000 Cubic Feet of natural gas = 1.0 MMBtu



- **So:** As a convention, 1 Bbl of Oil = ~6 Mcfe of Gas

- **EX:** 1 MBbl = 6 MMcfe; 1 MMBbl = 6 Bcfe; 1 BBbl = 6 Tcfe

Part 1: Upstream (E&P) Crash Course

- **Upstream:** *Everything* in your forecasts should flow from the NAV Model, or an asset-level forecast of the company's long-term cash flows with no Terminal Value

- **Step 1:** Split the company into "existing production" (Proved Developed Reserves) and "undeveloped" (Proved Undeveloped; maybe Probable and Possible)

Proved Developed (PD)

Proved Undeveloped (PUD)

- **Step 2:** Assume that the PD Production declines over time until it's no longer economically feasible

- **Step 3:** Assume **new wells are drilled** in undeveloped areas

Part 1: Upstream (E&P) Crash Course

- **Step 4:** Forecast initial production and declines over time from an "average well" in each region (Type Curve!)

- **Step 5:** Forecast oil/gas/NGL prices in different scenarios to project revenue from PD and PUD production (and others?)

- **Step 6:** Forecast the main operating expenses and CapEx line items (maintenance, new wells drilled, production taxes, lease operating expenses) to get the cash flows

- **Step 7:** Aggregate all the cash flows, discount them to Present Value, and add/subtract the usual TEV bridge items

Part 1: Upstream (E&P) Crash Course

- **Valuation:** This NAV Model is the primary valuation methodology for E&P companies and replaces the DCF

- **Main Differences:** No Terminal Value; "industry-standard" 10% Discount Rate; cash flows reach $0; asset/corporate split

- **3-Statement Model:** Should flow directly from the NAV Model; need separate Working Capital, Debt, and Dividend forecasts and Hedging/Tax schedules in advanced models

Part 1: Upstream (E&P) Crash Course

- **Comparable Companies and Precedent Transactions:** Screen based on industry, geography, and Reserves or Production

- **Different Multiples:** Enterprise Value / Proved Reserves or Enterprise Value / Daily Production

- **Possible:** Equity Value / CF from Operations

- **Different:** TEV / EBITDAX, where EBITDAX = EBITDA + Exploration Expense (normalize accounting differences; expensing vs. capitalizing unsuccessful Exploration)

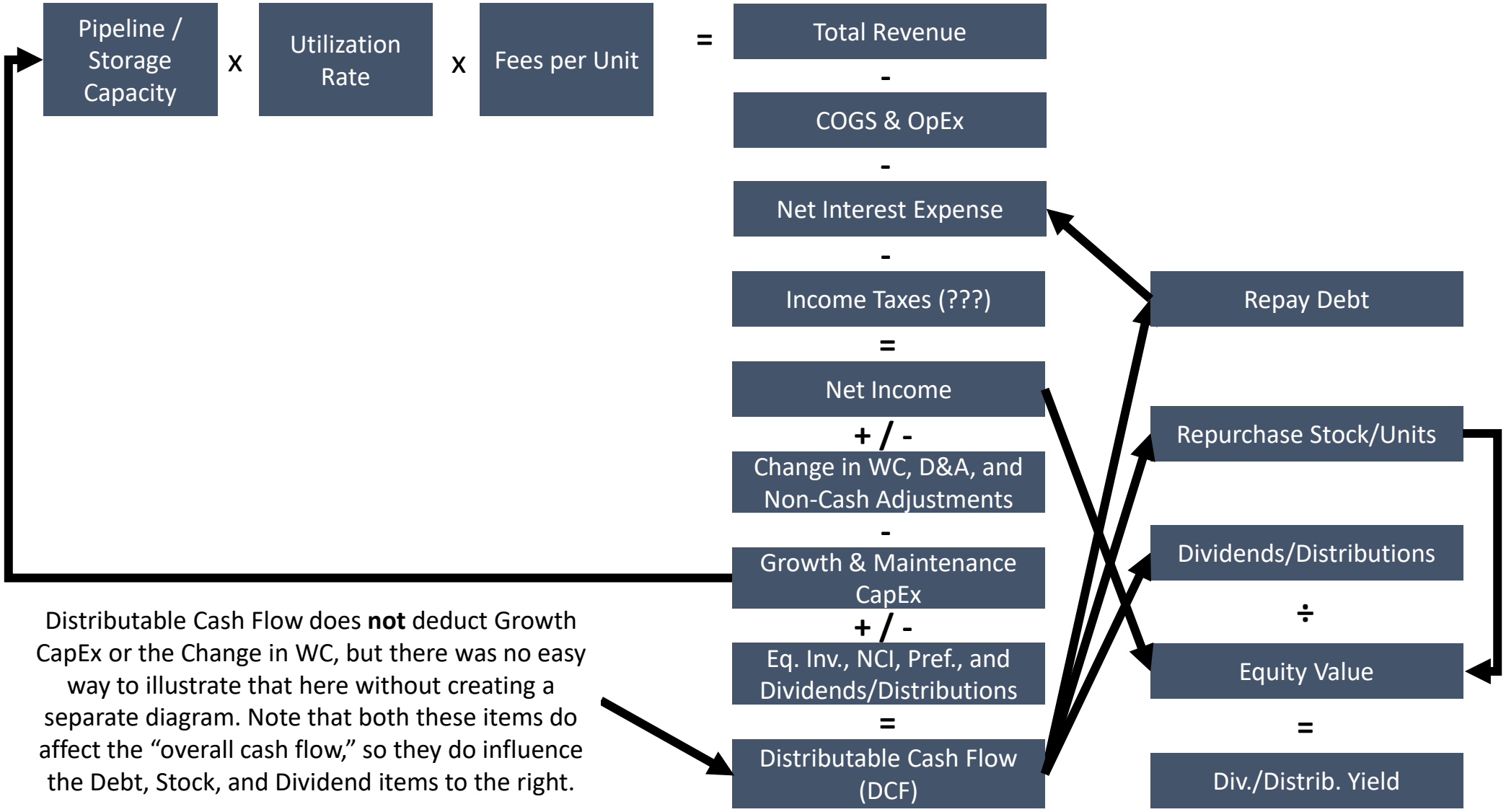
Part 2: Midstream Crash Course

- **Basics:** Midstream companies are like **utilities companies**, earning fees for each "unit" of oil/gas/NGLs/water transported or stored; predictable revenue/cash flows

- **Production and Reserves:** Not relevant unless they also operate in the E&P sector; without depleting Reserves, Midstream companies could operate forever (in theory)

- **Commodity Prices:** Midstream companies are far less sensitive to these because they charge **fixed fees** on energy transported or stored; there is still an *indirect effect* (higher prices → more production)

Part 2: Midstream Crash Course



Distributable Cash Flow does **not** deduct Growth CapEx or the Change in WC, but there was no easy way to illustrate that here without creating a separate diagram. Note that both these items do affect the "overall cash flow," so they do influence the Debt, Stock, and Dividend items to the right.

Part 2: Midstream Crash Course

- **"Master Limited Partnership" (MLP) Structure:** Common in the U.S. but less so recently due to a lower corporate tax rate

- **Idea:** An MLP is a "pass-through entity" that pays 0 or minimal corporate-level income taxes; "unitholders" receive "distributions" and are taxed at their personal rates

- **Complexity:** MLPs have "General Partners" with ~2% ownership who operate the business and "Limited Partners" (unitholders) who are passive investors; distributions may vary and are not necessarily 2% / 98%!

Part 2: Midstream Crash Course

- **Distributable Cash Flow (DCF)** = EBITDA – Cash Interest Expense – Cash Taxes – Preferred Dividends – Maintenance CapEx +/- Distributions from/to Other Entities

- **Distribution Yield:** Distributions / Equity Value

- **Distribution Coverage Ratio** = Distributable Cash Flow / Distributions

- **Others:** Still use EBITDA and TEV / EBITDA, Leverage Ratio, Interest Coverage Ratio, ROE, ROA, ROCE, etc.

Part 2: Midstream Crash Course

- **Financial Statement / Cash Flow Forecasts:** Straightforward, but the ownership may create some complexity

- **STEP 1:** Forecast Capacity, Utilization, and Revenue, focusing on very modest growth expectations

- **STEP 2:** Forecast CapEx (mostly Maintenance) and OpEx; most OpEx is linked to Capacity or Revenue

- **STEP 3:** Project the statements, paying special attention to the Debt, Equity, and Dividend or Distribution assumptions

Part 2: Midstream Crash Course

- **STEP 4:** Calculate the key metrics and ratios, such as Distributable Cash Flow, Distribution Yield, ROE, etc.

- **C-Corp Differences:** DCF would be a lower number due to Cash Taxes and would have fewer deductions; lower Yields

- **Public Comps and Precedent Transactions:** Screen based on industry, geography, and financials (EBITDA); try to avoid mixing MLPs and C-Corporations

- **Key Metrics and Multiples:** TEV / EBITDA, P / DCF or Equity Value / Distributable Cash Flow, and the Distribution Yield

Part 2: Midstream Crash Course

- **Discounted Cash Flow:** The standard Unlevered DCF still works; be careful with the distinctions between UFCF, LFCF, FCF, and "Distributable Cash Flow" (all different!)

- **Dividend Discount Model (DDM):** Also works, but called a "Discounted Distribution Analysis" (DDA) for MLPs

- **Mechanics:** Extend the Distributable Cash Flow and Coverage Ratio assumptions from the 3-statement model; use Cost of Equity and an Equity Value-based Terminal Multiple

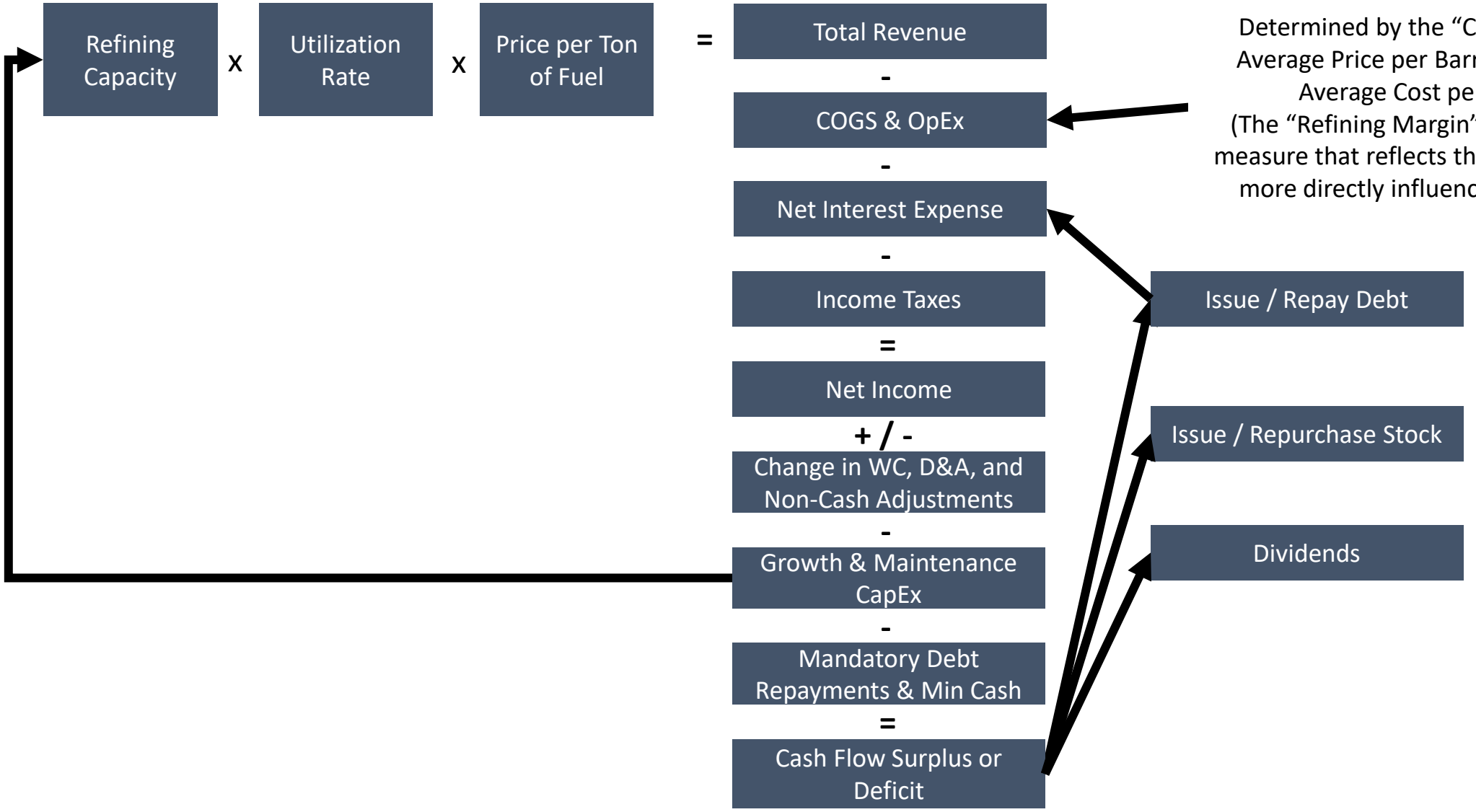
Part 3: Downstream Crash Course

- **Basics:** Downstream companies earn money based on the **margin** between what they *pay* for raw oil/gas and how much they *sell* the processed version(s) for

- **Production and Reserves:** Like Midstream, not relevant unless they also have Upstream operations; in theory, they could operate forever

- **Commodity Prices:** Downstream companies are *more sensitive* to these than Midstream companies, but *less sensitive* than Upstream companies → The **margin** matters most, but overall oil/gas prices do affect the margin

Part 3: Downstream Crash Course



Part 3: Downstream Crash Course

- **DIFFERENCE #1:** Lots of new/different metrics and KPIs, such as Crack Spreads, Refining Margins, Throughput Yields, etc.

- **DIFFERENCE #2:** More varied capital structures with different mixes of Debt issuances/repayments, Dividends, Stock repurchases, etc., depending on the macro environment

- **DIFFERENCE #3:** Many Downstream companies operate in other segments as well (retail, renewables, power, etc.)

- **Forecasts:** Capacity/Utilization/Refining Margins, CapEx, Other Business Segments, and Full Statements

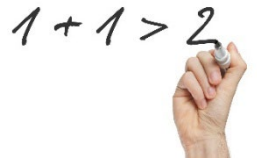
Part 3: Downstream Crash Course

- **Public Comps and Precedent Transactions:** Screen based on EBITDA, geography (may need wider screens), and industry

- **Key Multiples:** TEV / EBITDA and P / E; Revenue, Book Value, and CFO or FCF are either not useful or too inconsistent

- **Discounted Cash Flow:** Standard analysis works, but the Terminal Value assumptions are tricky due to **cyclicality**

- **Others:** The NAV Model and Dividend Discount Model are not relevant here; **Sum of the Parts (SOTP)** could be relevant for firms with significant operations in other segments



Part 4: Other O&G Company Types

- **Oilfield Services:** Main verticals are **drilling** and **equipment and services**; similar to standard business/professional services firms, but with commodity price exposure

- **Drivers and KPIs:** For something like an offshore drilling company, the **operating days**, **utilization rates**, and **daily rates** are all important (can vary based on the "rig type")

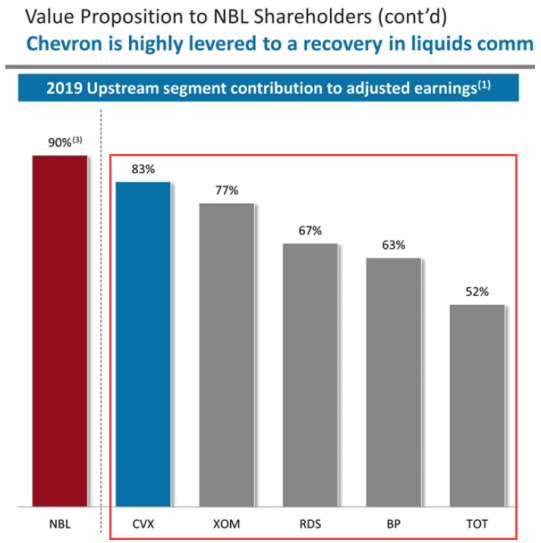
- **Expenses:** # of vessels or teams operating, fuel, employees required, and subcontractor payments

- **Valuation:** TEV / EBITDA, P / E, and P / NAV in some cases

Part 4: Other O&G Company Types

- **Integrated Majors:** Large, diversified companies that do everything (Exxon-Mobil, Shell, and BP); also, many **state-owned entities**, such as Saudi Aramco, CNOOC, and Rosneft

- **Valuation:** Sum-of-the-Parts model since they operate across many segments – but Upstream still tends to dominate



Part 4: Other O&G Company Types

- **Royalty Companies:** Effectively, they're a "subset" of Upstream or E&P since they also earn based on oil/gas production

- **BUT:** They do not do any drilling or production themselves – simply own productive land and collect a % of revenue from it

- **So:** Simple statements, no corporate-level taxes, and need to analyze drilling/production in their region to forecast revenue

- **Valuation:** TEV / Revenue, TEV / EBIT, and possibly a NAV Model variant based on the term of the royalty agreement

Recap and Summary

- **Part 1:** Upstream Crash Course

- **Part 2:** Midstream Crash Course

- **Part 3:** Downstream Crash Course

- **Part 4:** Oilfield Services, Integrated Majors, and Royalty Co's

ExxonMobil