

Corporate Valuation with LLMs

Forecasting ROIC, Growth, and Continuing Value

Miao Liu

Boston College

April 15, 2026

Overview

- 1 Forecast architecture
- 2 Forecasting Growth
- 3 Forecasting Margins
- 4 Forecasting Reinvestment, ROIC, and FCFF
- 5 Forecasting Terminal Value

Overview

- 1 Forecast architecture
- 2 Forecasting Growth
- 3 Forecasting Margins
- 4 Forecasting Reinvestment, ROIC, and FCFF
- 5 Forecasting Terminal Value

Forecasting rule: history, economics, assumptions

1. Start with history

trend, volatility, mix,
base-year quality

2. Explain the economics

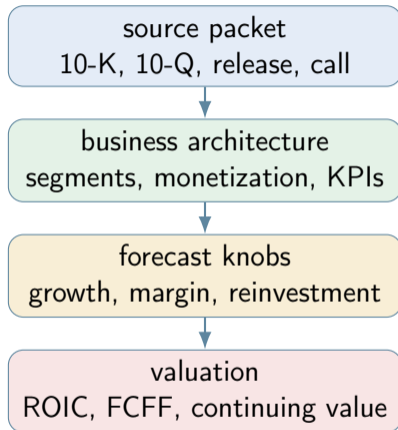
customers, pricing, cost
structure, capital intensity

3. State explicit assumptions

growth, margin, turnover,
fade, steady state

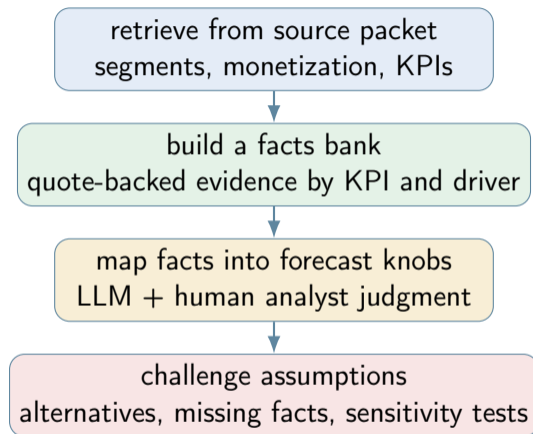
Good forecasts are **causal**. Disclosures and business economics should explain the numbers in the model.

A forecast is a business architecture translated into numbers



- ▶ The bridge from source packet to valuation is the **Business Model Blueprint, Monetization Map, KPI Spine, and Driver Tree**.

LLM workflow: from packet retrieval to challenged forecast assumptions



- ▶ The LLM should not jump straight to forecasts. It should first **retrieve**, then **organize evidence**, then **support judgment**, and finally **pressure-test the assumptions**.

ApexCo: teaching mini-case

ApexCo Climate Solutions

ApexCo sells commercial HVAC systems into schools, hospitals, offices, and light industrial buildings. It also generates recurring revenue from service contracts, replacement parts, and building controls software attached to the installed base.

Equip (70%)

Lower margin,
cyclical,
working-
capital
intensive

Service (20%)

Recurring,
higher margin,
tied to the
installed base

Software (10%)

Fastest growth,
highest margin,
attach-rate
driven

Business Model Blueprint

- ▶ **Customers:** distributors, building owners, facility operators
- ▶ **Value:** uptime, efficiency, climate control, analytics
- ▶ **Cost structure:** materials, labor, service technicians, software
- ▶ **Key assets:** installed base, service network, controls platform

ApexCo source packet: what each document contributes

Synthetic source	What it tells you	Forecast lines affected
2024 10-K	segment definitions, end markets, replacement demand, installed base, controls attach rate, cost structure, capex program	unit of analysis, segment growth, mix, margin quality, capital intensity
Q1 2025 10-Q	backlog normalization, distributor inventory, near-term utilization pressure, working-capital timing	2025 Equipment growth, 2025 margin, 2025 turnover
FY2024 earnings release Q4/FY2024 call transcript	management guide, segment framing, price-cost commentary, 2025 capex peak replacement versus greenfield demand, automation timing, service attachment, controls cross-sell	next-year growth, margin, capex fade path, margin recovery, medium-term economics
Industry snapshot	replacement cycle, retrofit demand, regulation, mature market structure	terminal growth and terminal RONIC framing

Why the unit of analysis comes first

Raw packet

10-K, 10-Q, earnings release, and call disclosures describe the business at different levels of aggregation

Economic engines

Equipment, Service & Parts, and Controls differ in cyclical, margins, working capital, and KPI logic

Forecastable model

A useful forecast begins by separating the parts of the business that behave differently economically

Why this matters

Before forecasting growth, margins, or reinvestment, the model needs the right **unit of analysis**. If the business is modeled only at the company total, the forecast will blur together different revenue engines and hide the mechanisms that actually drive performance. The first task is therefore to convert raw packet disclosures into a clean segmentation logic for the forecast.

LLM prompt: retrieve the unit of analysis from the source packet

Prompt

You are an equity research assistant helping build a forecasting model from a source packet for ApexCo. Read the packet carefully and identify the company's distinct **economic engines**. For each engine, retrieve and organize the evidence needed to define the **unit of analysis** for forecasting.

Focus on four questions for each engine:

1. Who pays, and what exactly is sold?
2. What differs economically relative to the other engines?
3. Which KPIs, operating drivers, or commercial features matter most?
4. Why should the forecasting model separate this engine rather than fold it into the company total?

Use only information supported by the packet. Be concrete and commercially literate. Do **not** forecast yet. Do **not** write generic summaries. Extract facts and organize them into a model-building view. Return the output as a concise table with four columns: **Engine**; **Who pays / what is sold**; **What differs economically**; **Why the model separates it**.

Forecasting begins with unit of analysis

Engine	Who pays / what is sold	What differs economically	Why the model separates it
Equipment	Distributors and end customers buy packaged HVAC systems, chillers, air handlers, and heat pumps	More cyclical; inventory and receivables matter; utilization and price-cost are key	Needs its own growth, margin, and working-capital logic
Service & Parts	Building owners and facility teams buy maintenance contracts, repairs, and parts	More recurring; contract share and renewal matter; higher margin quality	Stabilizes the company and changes the margin story
Controls	Customers buy controls software, monitoring, and retrofit modules	Attach rates and cross-sell matter; highest incremental margin; low working-capital burden	Drives mix uplift and helps explain why ROIC can improve

Why monetization comes before revenue growth

Raw packet

The source packet describes products, customers, service contracts, software attach, and retrofit activity in many different places

Monetization map

A useful forecast organizes those disclosures into who pays, what is sold, and how each revenue line is priced

Revenue tree

Once monetization is clear, growth can be modeled as explicit branches rather than one company-level guess

Why this matters

A growth forecast is only as good as the revenue logic underneath it. Before choosing a growth rate, the model needs to know **what is being sold**, **who pays**, and **which operating levers** actually move each revenue line. The monetization map is what turns packet disclosures into a forecastable revenue tree.

LLM prompt: extract the monetization map and revenue tree

Prompt

You are an equity research assistant helping build a forecast for ApexCo from a source packet. Read the packet carefully and extract the company's **monetization map** so that it can be turned into a **revenue tree** for forecasting.

For each distinct revenue line supported by the packet, identify:

1. **Revenue line:** what is the business line called?
2. **Who pays:** which customer or channel pays for it?
3. **Pricing logic:** what is the commercial formula behind the revenue stream? Examples include units times price, contracts and renewal, parts pricing, attach rates, software modules, retrofit penetration, or subscription renewal.
4. **Forecast branch:** what are the most relevant drivers that should appear in a revenue tree?

Use only information supported by the packet. Be concrete and commercially precise. Distinguish clearly between **pricing logic** and **growth logic**. Separate **Equipment Systems**, **Service & Parts**, and **Controls Software** if the evidence supports doing so. Do **not** forecast yet. Do **not** write generic summaries. Retrieve facts and organize them into a model-building view of revenue. Return the output as a table with four columns: **Revenue line**; **Who pays**; **Pricing logic**; **Forecast branch**.

ApexCo monetization map → revenue tree

Revenue line	Who pays	Pricing logic	Forecast branch
Equipment Systems	Distributors, contractors, end customers	Units \times price/mix	Market demand + replacement cycle + share + backlog normalization
Service & Parts	Building owners / facilities managers	Contracts + renewal + service tickets + parts pricing	Installed-base growth + contract share + price
Controls Software	New placements + legacy installed base	Attach rate + software modules + retrofit penetration	Placements + attach + cross-sell + subscription renewal

The revenue tree tells you what a **growth assumption** actually means.

Why the KPI spine comes before forecast assumptions

Raw packet

Disclosures describe backlog, installed base, contract mix, attach, margins, and capital needs in scattered places

KPI spine

A useful model identifies the few metrics that best summarize commercial traction, recurring quality, operating efficiency, and capital intensity

Forecast drivers

Once the KPI spine is clear, growth, margin, reinvestment, and terminal assumptions can be tied to observable evidence

Why this matters

Forecasting improves when raw disclosures are turned into a small set of **decision-useful metrics**. The KPI spine is what links packet evidence to the value drivers that actually move revenue growth, margins, reinvestment, ROIC, and FCFF.

LLM prompt: extract the KPI spine

Prompt

You are building a forecast for ApexCo from a source packet. Extract the company's **KPI spine**: the small set of metrics or proxies that best explain how the business works.

For each KPI or proxy, state:

1. **What it measures**
2. **Which value driver it controls**

Use only packet-supported evidence. Focus on metrics that matter for **growth, margin, reinvestment, and risk**. Prefer concrete operating metrics over generic ratios. Include items such as backlog, installed base, contract share, renewal, attach, working capital intensity, capex, and segment margin if supported by the packet.

Return a concise three-column table: **KPI / proxy; What it measures; Which value drivers it controls**.

ApexCo KPI spine: which metrics actually matter

KPI / proxy	What it measures	Which value driver it controls
Equipment backlog	Near-term demand already committed	2025 Equipment growth and inventory timing
Installed base	Future service and controls opportunity	Service growth, controls growth, terminal durability
Service revenue under contract	Visibility and recurring quality	Margin stability, downside protection, fade speed
Service contract renewal rate	Retention of the recurring base	Growth quality and risk
Controls attach rate on new placements	Software penetration	Mix uplift, incremental margin, terminal economics
Net OWC / sales	Cash tied up in operations	Turnover, reinvestment, FCFF
Capex and D&A	Capacity build versus run-rate maintenance	Reinvestment, turnover, FCFF
Segment margin before corporate costs	Engine-level operating quality	NOPLAT margin path and mix effects

ApexCo blueprint → driver tree: growth, margins, reinvestment, risk

Growth

- replacement demand
- backlog normalization
- contract penetration
- controls attach / retrofit

Margins

- service / controls mix
- price-cost
- plant utilization
- automation savings

Reinvestment

- inventory and receivables
- strategic capex
- maintenance capex
- capital turnover recovery

Risk

- destocking lasts longer
- attach rate stalls
- automation underdelivers
- price-cost turns negative

The driver tree is where narrative becomes operational: each node should map to a KPI and then to a model knob.

Overview

- 1 Forecast architecture
- 2 Forecasting Growth**
- 3 Forecasting Margins
- 4 Forecasting Reinvestment, ROIC, and FCFF
- 5 Forecasting Terminal Value

Forecast growth segment by segment, then weight it up

Equipment

replacement floor, backlog
normalization, channel
timing

Service & Parts

installed base, contract
penetration, renewal

Controls

attach rate, retrofit
opportunity, software mix

- ▶ Start with the **economics that differ by segment**, not with one top-line company guess.
- ▶ For each segment, use one **structural fact** and one **near-term fact**.
- ▶ Company growth should be a **weighted consequence** of the segment build.

LLM prompt: retrieve and organize a growth fact bank

Prompt

You are continuing the ApexCo forecast workflow. Use the completed **segment engine table**, **business blueprint / monetization map**, **KPI spine**, and **driver tree** as the organizing scaffold. Re-read the source packet and retrieve only the facts most relevant to **revenue growth** for each branch: **Equipment Systems**, **Service & Parts**, and **Controls Software**.

For each branch, organize the packet evidence into the following buckets:

1. **Growth logic**: the commercial logic of the revenue line
2. **Structural facts**: durable facts such as replacement demand, installed base, contract penetration, renewal, attach rate, retrofit opportunity, or customer mix
3. **Near-term facts**: backlog conversion, channel inventory, current run rate, management guidance, or recent segment commentary
4. **KPI / proxy**: the operating metric most closely tied to the growth branch

Use only packet-supported evidence. Be concrete, concise, and commercially precise. Distinguish clearly between **durable** and **temporary** facts. Do **not** forecast. Do **not** rank segments. For each fact retrieved, provide **Source anchor**: the packet excerpt or table that supports the fact This step is only to build a clean **fact bank** for later forecasting work.

Equipment 2025 growth: positive, but below company growth

Structural floor

About **65% of Equipment revenue** is tied to replacement demand. Equipment is therefore **not** a pure greenfield macro call.

Near-term headwind

Backlog normalization and distributor inventory adjustment temper the 2025 run rate. Q1 also showed only **+2%** Equipment growth.

Forecast implication

- ▶ **Direction:** still positive
- ▶ **Rank order:** below Service and below Controls
- ▶ **Supportable range:** low single digits
- ▶ **Teachable point estimate:** 4%–5%

Why not lower? Why not higher?

Not lower: replacement demand provides a floor.

Not higher: management explicitly says backlog normalization tempers near-term growth.

Service 2025 growth: steadier than Equipment

Structural evidence

Service is supported by a **95,000-system installed base**. More than **60% of Service revenue** is under contract, and renewal has remained above **90%**.

Near-term evidence

Management says Service should outgrow Equipment in 2025, and Q1 Service growth was **+7%** with resilience in education and healthcare.

Forecast implication

- ▶ **Direction:** steady growth
- ▶ **Rank order:** above Equipment, below Controls
- ▶ **Supportable range:** high single digits
- ▶ **Teachable point estimate:** **7%–8%**

Why not lower? Why not much higher?

Not lower: contract mix and renewal reduce cyclicality.

Not much higher: this is still a mature HVAC service engine, not a pure software business.

Controls 2025 growth: fastest growth, driven by penetration

Structural evidence

Controls attach rose from **34% to 40%** in two years, and the legacy base still offers retrofit opportunity, especially in education and healthcare.

Near-term evidence

Management continues to frame Controls as the fastest-growing business, and Q1 Controls growth was **+11%**.

Forecast implication

- ▶ **Direction:** strongest growth
- ▶ **Rank order:** above Service and above Equipment
- ▶ **Supportable range:** low teens
- ▶ **Teachable point estimate:** 11%–13%

Why not lower? Why not far higher?

Not lower: attach-rate trend and Q1 momentum are both strong.

Not far higher: the runway is real, but this is still penetration inside a mature market.

Packet anchors: 10-K excerpt 4; earnings release excerpt 2; 10-Q excerpt 1; Q4/FY2024 call excerpt 4; industry

Company growth is a weighted result, not a guess

2024 segment mix

- ▶ Equipment = **70%**
- ▶ Service & Parts = **20%**
- ▶ Controls = **10%**

Illustrative 2025 segment build

- ▶ Equipment = **+4%**
- ▶ Service & Parts = **+8%**
- ▶ Controls = **+12%**

Weighted company growth

$$0.70 \times 4\% + 0.20 \times 8\% + 0.10 \times 12\% = 5.6\%$$

This lands inside management's **5%–7%** guide and shows how an educated top-line forecast is built.

Teaching takeaway

The company forecast is **not** a separate opinion. It is the weighted consequence of the segment logic.

The growth lesson

- ▶ **Equipment:** positive, but held back by backlog normalization.
- ▶ **Service:** steadier because the installed base and contracts improve visibility.
- ▶ **Controls:** fastest because attach and retrofit still provide penetration runway.
- ▶ **Company growth:** a weighted result of segment economics, not a free-floating guess.

A good growth forecast is a **because-clause**: each number should point back to a structural fact and a near-term fact in the packet.

Packet anchors: 10-K excerpts 2–4; earnings release excerpts 1–2; 10-Q excerpts 1–3

Overview

- 1 Forecast architecture
- 2 Forecasting Growth
- 3 Forecasting Margins**
- 4 Forecasting Reinvestment, ROIC, and FCFF
- 5 Forecasting Terminal Value

Forecast margins by separating help from drag

Help

- ▶ Service and Controls carry better economics than Equipment.
- ▶ Mix should keep improving as Service and Controls outgrow Equipment.
- ▶ Automation supports productivity and factory execution.

Drag

- ▶ Temporary under-absorption weighs on the near-term margin.
- ▶ Launch costs delay the full benefit of new capacity.
- ▶ Price-cost remains positive, but is no longer the main margin lever.

- ▶ Margin forecasting improves when students separate **economic direction** from **timing of realization**.
- ▶ The packet supports a business that is improving, but still transitional in 2025.

Packet anchors: 10-K excerpt 5; earnings release excerpt 3; CFO on price-cost; CFO on automation timing; 10-Q excerpt 1

2025 margin: improve modestly, not heroically

What supports improvement?

- ▶ Service and Controls are higher-margin businesses.
- ▶ Mix keeps shifting toward those businesses.
- ▶ Automation savings begin to appear.

What keeps 2025 from looking mature?

- ▶ Management explicitly says margin is only flat to up modestly.
- ▶ Under-absorption and launch costs still offset part of the benefit.
- ▶ Q1 confirms that mix helps, but temporary costs are still present.

Forecast implication

- ▶ **Direction:** margin should improve
- ▶ **Timing:** only modestly in the first forecast year
- ▶ **Teachable bridge:** 9.0% in 2024A → 9.2% in 2025E

Teaching takeaway

A good forecast does not jump to the destination. It lets the economics improve while respecting the timing frictions described in the packet.

Why mix is a real mechanism rather than a slogan

2024 segment economics

- ▶ Equipment segment margin = **9.0%**
- ▶ Service segment margin = **19.0%**
- ▶ Controls segment margin = **30.0%**

Illustrative mix shift

- ▶ 2024 mix = **70 / 20 / 10**
- ▶ Later mix = **66 / 22 / 12**
- ▶ Service and Controls gain share because they grow faster.

Directional weighted-margin bridge

$$0.70 \times 9.0\% + 0.20 \times 19.0\% + 0.10 \times 30.0\% = 13.10\%$$

$$0.66 \times 9.0\% + 0.22 \times 19.0\% + 0.12 \times 30.0\% = 13.72\%$$

That is about **+62 bps** of directional help from mix alone.

Interpretation

Even before assuming a dramatic Equipment recovery, the company can earn a better consolidated margin because the revenue mix tilts toward the better businesses.

Why the margin can keep improving in 2026–2027

Timing logic

The automation program is most visible in late 2025 and 2026. The investment is recorded before the full productivity and revenue benefit appears.

Medium-term economics

Service and Controls remain the larger source of incremental profit dollars, while Equipment margins improve more gradually through automation and mix.

Coherent path

- ▶ **2025E: 9.2%**
- ▶ **2026E: 9.5%**
- ▶ **2027E: 9.8%**

The key is to spread the benefit over time instead of pulling all of it into 2025.

Why this matters

Students should learn that improving economics and delayed realization can coexist. That is often what makes a forecast disciplined rather than optimistic.

The margin lesson

- ▶ **Mix helps.** Service and Controls are structurally better businesses.
- ▶ **Automation helps.** Productivity gains support later margin expansion.
- ▶ **Timing matters.** Under-absorption and launch costs keep 2025 transitional.
- ▶ **Forecast discipline.** Let margins improve, but do not let the first forecast year pretend the transition is already finished.

A good margin forecast is not “higher because better mix.” It is **higher by this much, on this timetable, for these operational reasons.**

Packet anchors: 10-K excerpt 5; earnings release excerpt 3; CFO on price-cost; CFO on automation timing; 10-Q excerpt 1

Overview

- 1 Forecast architecture
- 2 Forecasting Growth
- 3 Forecasting Margins
- 4 Forecasting Reinvestment, ROIC, and FCFF**
- 5 Forecasting Terminal Value

Reinvestment is where operating stories meet cash flow

Working capital

inventory, receivables, and backlog timing determine how much growth absorbs cash

Capex

strategic investment can rise before the operating payoff becomes visible

Turnover and cash flow

capital intensity affects ROIC and delays FCFF conversion

- ▶ A business can show improving operating prospects and still produce muted near-term free cash flow.
- ▶ The key question is not whether cash flow is soft, but **why** it is soft.
- ▶ In ApexCo, 2025 is a transition year in capital intensity rather than a deterioration in business quality.

Packet anchors: historical working capital and capex table; 10-K excerpt 6; earnings release excerpt 3; 10-Q excerpt 4; CFO on automation timing

2025 reinvestment: the packet points to a peak-build year

Capex evidence

Historical capex has already stepped up, and management frames **2025 as the peak year of strategic capex**. The Ohio automation program is the main driver.

Working-capital evidence

Inventory remains elevated because of staged components and commissioning activity. Receivables also rise with growth, even as backlog normalizes.

Forecast implication

- ▶ **Capex:** remain elevated in 2025
- ▶ **Working capital:** stay somewhat heavy
- ▶ **Cash conversion:** remain temporarily restrained

Interpretation

The operating story is improving, but the balance sheet still carries the cost of building that improvement. Cash flow lags the business narrative for a period.

Packet anchors: historical working capital and capex table; 10-K excerpt 6; earnings release excerpt 3; 10-Q excerpt 4; CFO on automation timing

Turnover can dip before it recovers

Economic logic

Invested capital rises as inventory and capex build. Revenue and margins improve, but the full utilization benefit arrives later.

What that means for 2025

When capital goes onto the balance sheet before the operating payoff fully arrives, **capital turnover can weaken temporarily**.

Illustrative turnover path

$$\text{Turnover} = \frac{\text{Revenue}}{\text{Average invested capital}}$$

- ▶ 2024A: healthy base level
- ▶ 2025E: modest dip as capital intensity peaks
- ▶ 2026E–2027E: recovery as utilization and mix improve

Teaching takeaway

A temporary turnover dip is coherent when a company is installing capacity ahead of the revenue and productivity benefit.

ROIC can pause before it improves

ROIC decomposition

$\text{ROIC} = \text{NOPLAT margin} \times \text{Invested capital turnover}$

ROIC improves when margins improve, turnover improves, or both.

ApexCo logic

Margins begin to improve in 2025, but turnover is still under pressure because capital is peaking ahead of utilization.

Forecast implication

- ▶ **2025:** ROIC may pause or improve only modestly
- ▶ **2026–2027:** ROIC improves more clearly as both margin and turnover help

Interpretation

A good forecast does not force ROIC to jump just because the operating story sounds better. It respects the lag between investment, utilization, and cash productivity.

FCFF is where the timing lag becomes visible

FCFF bridge

$$\text{FCFF} \approx \text{NOPLAT} - \Delta\text{NOWC} - \text{Capex} + \text{D\&A}$$

FCFF stays soft when working capital and capex absorb cash faster than NOPLAT grows.

Why 2025 FCFF stays muted

- ▶ NOPLAT improves only modestly
- ▶ Working capital remains somewhat elevated
- ▶ Capex is still near peak

Why FCFF can recover later

- ▶ Margin expands further
- ▶ Turnover begins to recover
- ▶ Strategic capex fades toward a more normal level

Interpretation

Weak near-term FCFF does not automatically signal a weak business. In this case it reflects the timing of reinvestment.

Packet anchors: historical working capital and capex table; 10-K excerpt 6; earnings release excerpt 3; 10-Q excerpt 4

From packet evidence to reinvestment, ROIC, and FCFF

Logic chain

1. Strategic capex peaks in 2025 and inventory stays somewhat elevated.
2. Invested capital rises ahead of the full operating payoff.
3. Turnover softens temporarily.
4. ROIC improves only gradually at first because margin help is partly offset by turnover pressure.
5. FCFF remains muted in 2025, then improves as capex normalizes and utilization catches up.

ApexCo is a useful case because it shows how **better business economics** and **weaker near-term cash conversion** can coexist.

Packet anchors: 10-K excerpt 5; 10-K excerpt 6; earnings release excerpt 3; 10-Q excerpt 4; CFO on automation timing

The reinvestment, ROIC, and FCFF lesson

- ▶ Reinvestment is not a plug. It follows from the operating setup in the packet.
- ▶ Peak capex and somewhat heavy working capital make 2025 a transition year in cash conversion.
- ▶ ROIC can improve with a lag because capital is deployed before utilization fully catches up.
- ▶ FCFF often tells a timing story rather than a quality story.

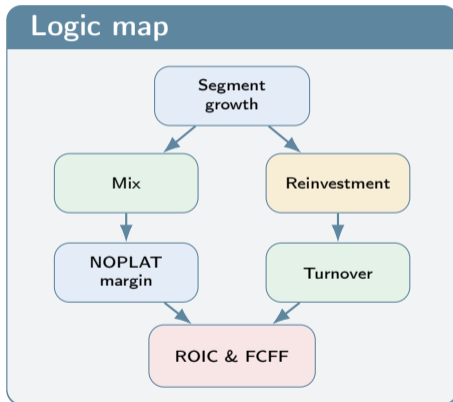
A disciplined forecast connects the operating narrative to the balance sheet, and then to cash flow.

Packet anchors: historical working capital and capex table; historical invested capital table; 10-K excerpt 6; 10-Q excerpt 4; CFO on automation timing

ApexCo: summarized forecast build

Forecast item	2025E	2026E	2027E	Packet-to-forecast logic
Equipment growth	4.5%	5.0%	4.5%	Replacement demand provides a floor, but backlog normalization and channel timing restrain the near-term run rate.
Service & Parts growth	7.5%	7.0%	6.5%	Installed base, contract penetration, and renewal support steadier growth than Equipment.
Controls growth	12.0%	11.0%	10.0%	Attach-rate gains and retrofit runway keep Controls as the fastest-growing segment.
Company revenue growth	5.6%	5.8%	5.3%	Company growth is a weighted consequence of segment logic rather than a separate top-line guess.
NOPLAT margin	9.2%	9.5%	9.8%	Mix and automation help, but under-absorption and launch costs keep 2025 transitional.
NOWC / Revenue	10.7%	10.4%	10.1%	Inventory and receivables stay somewhat heavy in 2025, then improve as operations normalize.
Capex / Revenue	3.3%	3.0%	2.7%	2025 is the peak year of strategic capex, followed by normalization.
Invested capital turnover	1.56x	1.60x	1.65x	Turnover dips as capital builds ahead of utilization, then recovers as productivity catches up.
ROIC	14.4%	15.2%	16.2%	Margin improvement arrives first, while turnover recovery contributes more clearly later.
FCFF conversion	muted	improving	stronger	Near-term cash flow lags because working capital and capex absorb cash before the full operating payoff appears.

The forecast is a connected system



Illustrative connected forecast table

Forecast item	2025E	2026E	2027E
Company revenue growth	5.6%	5.8%	5.3%
NOPLAT margin	9.2%	9.5%	9.8%
NOPLAT (index)	9.7	10.6	11.5
Reinvestment (index)	3.8	4.1	3.8
ROIC	14.4%	15.2%	16.2%
FCFF (index)	5.9	6.6	7.8

Segment growth drives mix, mix supports margin, reinvestment shapes turnover, and turnover helps determine when ROIC and FCFF improve.

Overview

- 1 Forecast architecture
- 2 Forecasting Growth
- 3 Forecasting Margins
- 4 Forecasting Reinvestment, ROIC, and FCFF
- 5 Forecasting Terminal Value**

Steady-state conditions

Stable growth

Growth is positive but below the earlier improvement phase.

Normalized economics

Margins and returns reflect a competitive, mature state rather than a peak year.

Consistent reinvestment

The growth rate must be supported by a reinvestment rate and a return on new capital.

No hidden heroics

The terminal year should look mature, not heroic.

Real-world anchor: Coca-Cola and Visa remind us why continuing value matters

Coca-Cola intuition

A durable consumer franchise rarely looks explosive in the next two years, but a large share of value sits in long-duration cash flows.

Visa intuition

Network advantages and steady reinvestment can keep mature growth and returns attractive, which is why continuing value often dominates.

Not every company looks like Coca-Cola or Visa

Exxon Mobil intuition

Continuing value still matters, but a larger share of the valuation debate often sits in the explicit forecast: commodity prices, capital spending, reserve replacement, and cycle position.

Delta Air Lines intuition

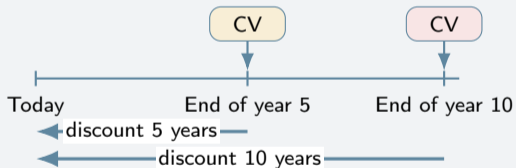
An airline can create value over time, but margins, fleet investment, labor, and cyclical-ity make near- and medium-term cash flows more important relative to the perpetuity.

Continuing value is usually important. It is simply **less dominant** when the business is more cyclical, more capital-intensive, or harder to extrapolate far into the future.

Continuing value's weight depends on horizon and WACC

Present-value logic

$$PV_0(CV) = \frac{CV_t}{(1 + WACC)^t}$$



The same business can show a very different **continuing-value share of EV** depending on forecast horizon and WACC.

Longer explicit forecast

Pushing continuing value farther into the future means it is discounted for more years, so it contributes **less** to value today, all else equal.

Higher WACC

A higher discount rate shrinks the present value of every distant cash flow, which also reduces the share of enterprise value coming from continuing value.

Overview: what terminal value forces you to assume

Terminal growth

How fast can the mature business grow once temporary forecast-period effects have faded?

Terminal margin

Which mix and operating improvements are durable, and which are temporary?

Terminal turnover / reinvestment

How much capital will the mature business need to support that growth?

Terminal RONIC

What should the *next* dollar of capital earn once the easy gains have been captured?

WACC

What discount rate fits the risk of the mature operating cash flows?

Forecast horizon

At what point is it reasonable to say the business has reached a mature-state pattern?

Continuing value is not one assumption. It is a bundle of assumptions about **mature cash flow**, **mature reinvestment**, and **mature discounting**.

Forecasting terminal growth: preserve what is durable, fade what is temporary

What can survive into maturity

- ▶ Recurring demand, replacement cycles, or repeat-purchase behavior
- ▶ Installed-base, contractual, subscription, or renewal economics
- ▶ Durable customer relationships, switching costs, or network effects
- ▶ Structural advantages that can plausibly remain in a mature state

What usually fade before terminal

- ▶ Backlog catch-up, channel normalization, or short-cycle timing effects
- ▶ Temporary under-absorption, unusually strong price-cost, or one-time cost wins
- ▶ Early penetration catch-up, launch surges, or post-downturn rebounds
- ▶ Peak margins, peak mix shifts, or unusually low reinvestment intensity

Economic guardrail

Terminal growth should fit the firm's **mature industry structure**, market saturation, size, and long-run economic environment. Mature businesses usually belong in a **more modest growth regime** than the explicit forecast period.

Why high ROIC usually fades

Forces that push ROIC down

- ▶ Competition copies the attractive part of the model.
- ▶ Easy cost wins disappear after the first improvement cycle.
- ▶ New projects earn less than the original installed base.
- ▶ Mature markets leave less room for price and mix gains.

ApexCo application

Peak returns in 2027 should not be treated as perpetual economics. A mature replacement-and-service business can still earn good returns, but the peak is not the terminal year.

Introducing RONIC: the return on the next dollar of capital

Definition

$$\text{RONIC} = \frac{\Delta \text{NOPLAT}}{\Delta \text{Invested capital}}$$

RONIC measures the return on **new** capital. It is not the return on the whole historical capital base.

Why it is useful here

Continuing value requires a mature growth assumption. RONIC tells you how much reinvestment that growth consumes.

Terminal intuition

If the next dollar earns a lower return than the old capital base, growth needs more reinvestment and less of NOPLAT turns into FCFF.

ApexCo application

ApexCo's installed base can keep average ROIC healthy, but the terminal question is what *new* mature projects earn once the easiest mix and productivity gains have faded.

ROIC and RONIC answer different questions

ROIC

$$\text{ROIC} = \frac{\text{NOPLAT}}{\text{Average invested capital}}$$

ROIC is the return on the **whole operating base**. It is useful for judging the economics that the business has already built.

RONIC

$$\text{RONIC} = \frac{\Delta\text{NOPLAT}}{\Delta\text{Invested capital}}$$

RONIC is the return on the **next dollar** of capital. It is useful for judging whether future growth creates value.

In continuing value, **ROIC** helps describe the mature business you already have, while **RONIC** helps describe the economics of the growth you still want to assume.

A terminal growth assumption without a terminal RONIC assumption is usually an incomplete terminal story.

Starbucks shows why average ROIC is not RONIC

Concept	Simple form	Why it matters
Average ROIC	$\text{NOPLAT} / \text{average invested capital}$	Judges the economics of the existing operating base.
RONIC	$\Delta\text{NOPLAT} / \Delta\text{invested capital}$	Judges whether future growth creates value.

Teaching intuition

A mature store base can keep average ROIC high even when the next store in a weaker location earns a lower incremental return.

Why this matters for terminal value

Continuing value depends on the return earned by *future* reinvestment. That is why RONIC matters more than average ROIC when linking growth to free cash flow.

Key identities for terminal value: from growth to reinvestment to FCFF

Step 1: growth requires reinvestment

If new capital earns **RONIC**, then every dollar of reinvestment creates **RONIC** dollars of additional NOPLAT. To support growth at rate g ,

$$\text{Reinvestment rate} = \frac{g}{\text{RONIC}}$$

Step 2: FCFF is what is left over

Once the required reinvestment is set aside, the remainder of NOPLAT becomes free cash flow:

$$\text{FCFF} = \text{NOPLAT} \times \left(1 - \frac{g}{\text{RONIC}}\right)$$

Simple ApexCo-style example

Assume mature growth is **3.0%** and terminal RONIC is **12.5%**.

$$\text{Reinvestment rate} = \frac{3.0\%}{12.5\%} = 24.0\%$$

If mature NOPLAT is 100, then:

- ▶ reinvestment = 24
- ▶ FCFF = 76

Why these identities matter

They stop the model from assuming high growth and high distributable cash flow at the same time without paying the reinvestment bill.

Gordon growth intuition: capitalize the first mature cash flow

At the end of the explicit forecast

$$CV_t = \frac{FCFF_{t+1}}{WACC - g}$$

Numerator: the first mature cash flow

Use **FCFF**_{t+1}: the formula capitalizes the first year *after* the explicit forecast, when the business has reached a mature-state pattern.

Denominator: required return - growth

WACC - *g* is the spread between what investors require and how fast the cash flow can grow forever. Smaller spreads produce much larger CV.

How to use it

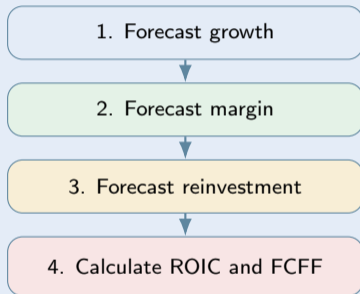
1. Forecast through the explicit period.
2. Convert the mature assumptions into **FCFF**_{t+1}.
3. Capitalize that cash flow at the end of year *t*.
4. Discount the continuing value back to today.

Common mistake

The formula looks simple, but it becomes misleading if terminal cash flow still contains temporary margins, temporary working-capital relief, or a growth rate that is not supported by reinvestment.

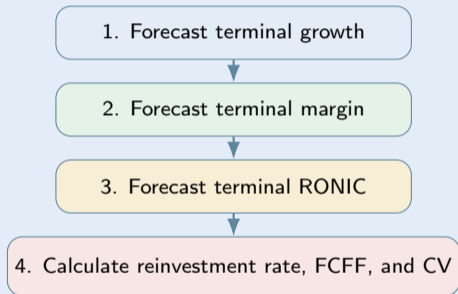
Explicit forecast period vs. continuing value: same logic, different inputs

Explicit forecast period



During the explicit period, reinvestment is usually forecast **directly** from working capital, capex, and operating plans.

Continuing value



In continuing value, reinvestment is usually inferred **indirectly** from terminal growth and terminal RONIC.

ApexCo: Terminal assumptions must fit mature economics

Terminal growth g

What can a mature replacement-and-service business reasonably grow at once backlog noise and early penetration gains have faded?

Terminal turnover

Does post-capex utilization normalize, and how much working capital remains tied to the installed base?

Terminal margin

Which mix gains are durable, and which price-cost or under-absorption effects should disappear?

Terminal RONIC

What should the next dollar earn once the easiest mix, pricing, and productivity gains are already captured?

Terminal assumptions should describe the **mature business that remains** after temporary forecast-period effects have rolled off.

LLM prompt: translate the terminal fact bank into terminal assumptions

Prompt

You are continuing the ApexCo forecast workflow. Use the fact bank as the input and separate the evidence into two groups: **facts that should plausibly survive into maturity** and **facts that should fade before the terminal period**.

Then organize the evidence into the following buckets:

1. **What survives into maturity:** durable demand, recurring economics, installed-base or renewal logic, structural advantages, or other facts that plausibly remain in steady state
2. **What fades before terminal:** temporary backlog effects, under-absorption, unusually favorable price-cost, peak capex intensity, early penetration catch-up, or other forecast-period effects
3. **Terminal growth implication:** facts most relevant to a mature growth assumption
4. **Terminal RONIC implication:** facts most relevant to the return on new capital in maturity
5. **Cash-conversion implication:** facts most relevant to terminal reinvestment needs and FCFF

Use only fact-bank-supported evidence. Be concrete, concise, and economically precise. Distinguish clearly between **durable** and **temporary** facts. Do **not** use shortcut terminal heuristics. For each fact used, provide **Source anchor**: the packet excerpt or table that supports the fact. This step is to organize the terminal evidence into a clean input for later terminal-value assumptions.

ApexCo: Terminal value begins by separating durable from transitory

Durable evidence

- ▶ Replacement demand provides a recurring floor for Equipment.
- ▶ The installed base supports Service & Parts revenue.
- ▶ Contract penetration and renewal support recurring economics.
- ▶ Controls attach has been rising.
- ▶ Retrofit demand extends the runway beyond new placements.

Transitory evidence

- ▶ Backlog normalization affects the near-term growth rate.
- ▶ Temporary under-absorption weighs on the first forecast year.
- ▶ Price-cost tailwinds are moderating.
- ▶ 2025 is the peak year of strategic capex.

The terminal question is not “What number should go into the model?”
It is **which parts of today’s story survive into maturity.**

Terminal growth should preserve the durable economics and fade the temporary lift

What supports terminal growth?

- ▶ Replacement demand is steadier than greenfield demand.
- ▶ The installed base keeps generating Service & Parts revenue.
- ▶ Controls and retrofit activity add a structural source of growth.

Industry constraint

The packet's industry notes frame mature HVAC growth as **low to mid single digits** unless a replacement or retrofit cycle is unusually strong.

Forecast implication

A defensible mature growth rate is **3.0%**.

Why 3.0% works

- ▶ It preserves the installed-base and replacement-demand story.
- ▶ It gives credit to Service, Controls, and retrofit durability.
- ▶ It fades the early-period boost from catch-up mix improvement and near-term penetration gains.

Terminal RONIC should reflect durable quality, not peak conditions

What supports healthy mature returns?

- ▶ Service & Parts is a higher-quality recurring business.
- ▶ Controls carries stronger economics than Equipment.
- ▶ Installed-base monetization supports attractive incremental returns.

What should fade before terminal?

- ▶ Peak mix acceleration
- ▶ Early attach-rate catch-up
- ▶ Temporary cost and capital distortions from the 2025 transition year

Forecast implication

A defensible mature **RONIC** is **12.5%**.

Why 12.5% works

- ▶ It remains above a normal cost of capital, so value creation survives in maturity.
- ▶ It recognizes the durable contribution from Service and Controls.
- ▶ It does not assume that 2027 improvement rates continue forever.

ApexCo terminal framing

Illustrative terminal assumptions

- ▶ Terminal growth = **3.0%**
- ▶ Terminal RONIC = **12.5%**

Why this framing is coherent

- ▶ It keeps the durable installed-base and replacement-demand economics in the story.
- ▶ It keeps Service and Controls valuable in maturity.
- ▶ It removes the temporary peak effects from the first forecast years.
- ▶ It avoids treating 2027 conditions as a permanent steady state.

A good terminal assumption is not a shortcut. It is a summary of what remains after the forecast has matured.

Packet anchors: 10-K excerpts 2–4; 10-K excerpt 6; earnings release excerpt 3; Q4/FY2024 call excerpt 4; 10-Q excerpts 2, 4, 5; condensed industry notes

From terminal framing to terminal FCFF

Terminal assumptions

- ▶ Growth, $g = 3.0\%$
- ▶ RONIC = 12.5%

Economic meaning

ApexCo remains a value-creating mature business, but not a business that keeps compounding at explicit-forecast-period conditions forever.

Step 1: convert g and RONIC into reinvestment

$$\text{Reinvestment rate} = \frac{g}{\text{RONIC}} = \frac{3.0\%}{12.5\%} = 24.0\%$$

This means a mature ApexCo must reinvest about **24 cents of each dollar of NOPLAT** to sustain 3.0% growth.

Step 2: convert NOPLAT into terminal FCFF

$$\text{FCFF}_{T+1} = \text{NOPLAT}_{T+1} - \text{Reinvestment}_{T+1}$$

$$\text{FCFF}_{T+1} = \text{NOPLAT}_{T+1} \left(1 - \frac{g}{\text{RONIC}} \right)$$

$$\text{FCFF}_{T+1} = \text{NOPLAT}_{T+1}(1 - 0.24) = 0.76 \times \text{NOPLAT}_{T+1}$$

The terminal framing implies **76% NOPLAT-to-FCFF conversion**.

From terminal FCFF to terminal value

If the explicit forecast ends in 2027

- ▶ First compute **2028 NOPLAT**
- ▶ Then compute **2028 FCFF**
- ▶ Then capitalize that cash flow into a terminal value at the end of 2027

Step-by-step

$$\text{NOPLAT}_{2028} = \text{NOPLAT}_{2027}(1 + g)$$

$$\text{FCFF}_{2028} = \text{NOPLAT}_{2028} \left(1 - \frac{g}{\text{RONIC}}\right)$$

Terminal value at the end of 2027

$$\text{TV}_{2027} = \frac{\text{FCFF}_{2028}}{\text{WACC} - g}$$

$$\text{TV}_{2027} = \frac{\text{NOPLAT}_{2027}(1 + g) \left(1 - \frac{g}{\text{RONIC}}\right)}{\text{WACC} - g}$$

For ApexCo,

$$\text{TV}_{2027} = \frac{\text{NOPLAT}_{2027} \times 1.03 \times 0.76}{\text{WACC} - 3.0\%}$$

Interpretation

Terminal value is the value of a **mature continuing business**. It is not the value of peak 2027 conditions frozen forever.

What the terminal value is saying

ApexCo terminal interpretation

- ▶ **3.0% terminal growth** says the business keeps growing, but at a mature low-single-digit rate.
- ▶ **12.5% terminal RONIC** says mature growth still creates value because incremental returns remain above the cost of capital.
- ▶ **24.0% reinvestment rate** says not all NOPLAT is distributable. Some cash must be reinvested to support growth.
- ▶ **76.0% FCFF conversion** says the mature business converts most, but not all, of its operating profit into free cash flow.

What is preserved

replacement demand, installed base, Service contracts, renewal, controls penetration, and retrofit economics

What is faded out

backlog normalization, temporary under-absorption, temporary price-cost help, and peak 2025 capital intensity

Terminal value checklist: mature economics, not hidden extrapolation

Checklist 1

Use a mature margin and the correct next-year FCFF.

Checklist 2

Tie g to market structure, inflation, and the macro base.

Checklist 3

Use a mature RONIC that fits a competitive steady state.

Checklist 4

Make sure the reinvestment rate implied by g and RONIC is believable.

Checklist 5

Ask whether the terminal year still looks like a peak year in disguise.

Terminal value traps: fade, reinvestment, and false precision

Trap 1

Using a temporary peak margin as the permanent margin.

Trap 2

Choosing terminal growth without the reinvestment to support it.

Trap 3

Letting terminal RONIC stay unrealistically high forever.

Trap 4

Forgetting that small changes in $WACC - g$ can dominate value.

Trap 5

Presenting a precise terminal value with a weak economic story underneath it.

What is an implied terminal multiple?

The basic idea

$$\text{Implied terminal EV/NOPLAT} = \frac{CV_t}{\text{NOPLAT}_{t+1}}$$

This converts the DCF's **continuing value** into an **enterprise multiple**. It asks:

“What EV/NOPLAT multiple is my terminal value quietly assuming?”

Why this is useful

A DCF can look precise even when its terminal assumptions are too aggressive. The implied multiple is a quick way to see whether the continuing value looks broadly plausible for a mature business.

How to interpret the formula

- ▶ **CV_t**: the enterprise value coming from the continuing-value formula at the end of the explicit forecast
- ▶ **NOPLAT_{t+1}**: the first mature-state operating profit after the explicit forecast
- ▶ The ratio tells you what multiple investors would effectively be paying for that mature operating profit

The implied multiple is **not** the main valuation method. It is a **reasonableness check** on the DCF.

How to use implied terminal multiples in practice

Step-by-step use

1. Compare it with **public peers** that have similar business mix, growth, margins, and returns.
2. Compare it with the firm's **own history**, if the business model has been reasonably stable.
3. Compare it across your **bull, base, and bear** cases. Better durable economics should justify a higher implied multiple.
4. If the implied multiple looks extreme, revisit g , **RONIC**, **margin**, or **WACC**.

Common mistake

Do not use **P/E** to justify a terminal **enterprise value**. An FCFF DCF produces enterprise value, so the reasonableness check should use an **enterprise multiple**.

What to compare against

Use peers as a **benchmark**, not as a mechanical answer. The goal is not to force the DCF to equal the peer multiple. The goal is to ask whether the terminal assumptions imply a mature valuation level that looks commercially believable.

Transfer rule: architecture first, numbers second

- ▶ The same workflow applies to any real company.
- ▶ First fix the business architecture: segment engines, monetization logic, KPIs, and driver tree.
- ▶ Then translate that architecture into growth, margins, reinvestment, ROIC, and continuing-value assumptions.
- ▶ A spreadsheet is the **output** of this process, not the starting point.

Takeaways

- ▶ Forecasts improve when they move from **source packet** to **business architecture** to **assumptions**.
- ▶ ROIC is easiest to forecast as **NOPLAT margin** times **invested-capital turnover**.
- ▶ Growth, reinvestment, and RONIC should be modeled together.
- ▶ Continuing value should be a **mature-state economics statement**, not a plug.

Next: estimate WACC, bridge enterprise to equity, and stress-test the valuation.

Appendix: why reinvestment rate = g/RONIC

Step 1: define the pieces

$$g = \frac{\Delta \text{NOPLAT}}{\text{NOPLAT}}$$

$$\text{RONIC} = \frac{\Delta \text{NOPLAT}}{\Delta \text{Invested capital}}$$

$$\text{Reinvestment rate} = \frac{\Delta \text{Invested capital}}{\text{NOPLAT}}$$

Interpretation

- ▶ g : how fast operating profit grows.
- ▶ **RONIC**: what *next* \$ capital earns.
- ▶ The **reinvestment rate** tells you how much of NOPLAT must be put back into the business.

Step 2: derive the identity

Start from the definition of RONIC:

$$\text{RONIC} = \frac{\Delta \text{NOPLAT}}{\Delta \text{Invested capital}}$$

Rearrange:

$$\Delta \text{Invested capital} = \frac{\Delta \text{NOPLAT}}{\text{RONIC}}$$

Now divide both sides by NOPLAT:

$$\frac{\Delta \text{Invested capital}}{\text{NOPLAT}} = \frac{\Delta \text{NOPLAT} / \text{NOPLAT}}{\text{RONIC}} = \frac{g}{\text{RONIC}}$$

So,

$$\text{Reinvestment rate} = \frac{g}{\text{RONIC}}$$

Appendix: Deriving the Gordon growth formula

Step 1: continuing value is the present value of all future mature cash flows

At the end of year t , the continuing value is the value of all mature free cash flows from year $t + 1$ onward:

$$CV_t = \frac{FCFF_{t+1}}{1 + WACC} + \frac{FCFF_{t+2}}{(1 + WACC)^2} + \frac{FCFF_{t+3}}{(1 + WACC)^3} + \dots$$

This is just an infinite present-value series.

Step 2: impose constant mature growth

Assume that after the explicit forecast period, free cash flow grows forever at the constant rate g :

$$FCFF_{t+2} = FCFF_{t+1}(1 + g), \quad FCFF_{t+3} = FCFF_{t+1}(1 + g)^2, \quad \dots$$

Substituting these into the infinite series gives:

$$CV_t = \frac{FCFF_{t+1}}{1 + WACC} \left[1 + \frac{1 + g}{1 + WACC} + \left(\frac{1 + g}{1 + WACC} \right)^2 + \dots \right]$$

The bracketed term is the key: it is a geometric series.

Appendix: Deriving the Gordon growth formula

Step 3: recognize the common ratio

Let

$$r = \frac{1+g}{1+WACC}$$

As long as $WACC > g$, we have $|r| < 1$, so the geometric series sums to

$$1 + r + r^2 + \dots = \frac{1}{1-r}$$

Step 4: simplify the expression

$$CV_t = \frac{FCFF_{t+1}}{1+WACC} \cdot \frac{1}{1 - \frac{1+g}{1+WACC}}$$

Now simplify the denominator:

$$1 - \frac{1+g}{1+WACC} = \frac{(1+WACC) - (1+g)}{1+WACC} = \frac{WACC - g}{1+WACC}$$

$$CV_t = \frac{FCFF_{t+1}}{1+WACC} \cdot \frac{1+WACC}{WACC - g} = \boxed{\frac{FCFF_{t+1}}{WACC - g}}$$