Hypothetical multifamily underwriting and risk analysis

A fictional 80-unit acquisition demonstrates how independent assumption review can change a deal assessment. This is a reproducible marketing sample, not a client engagement, appraisal, investment recommendation or calibrated market forecast.

The key finding

The sponsor-style base case shows a 21.7% LP IRR. Independently adjusted assumptions reduce it to 1.4% and require $487,768 of additional deal equity after the modeled reserve is used. The principal weakness is the interaction of refinancing capacity, operating performance and exit valuation.

Measure	Sponsor base	Adjusted case
Purchase price	$15,000,000	$15,000,000
Initial deal equity	$6,000,000	$6,000,000
LP annual IRR	21.7%	1.4%
LP equity multiple	2.43x	1.06x
Refinanced principal	$10,500,000	$9,403,664
Additional deal equity after reserves	$0	$487,768
Year 1 deal cash-on-cash	8.7%	8.0%

Interpretation

A high initial cash yield does not establish that a future refinance can retire the acquisition loan. Larger equity contributions can be required even when NOI remains positive. A higher refinance rate produces a much larger capital need in this example, while the resulting lower loan balance partly offsets its effect on terminal equity.

Audience and intended use

For sponsors, operators and acquisition teams evaluating an analytical service. It illustrates questions to ask and calculations to verify. No actual property, market, sponsor or client is represented. Figures are pretax and rounded; the JSON results and Python model preserve underlying precision.

Every page is hypothetical. The modeled probabilities later in this report depend entirely on the stated inputs and dependencies.

Assumptions and capital structure

Assumption	Sponsor base	Adjusted case
Units / average monthly rent	80 / $1,600	80 / $1,600
Annual rent and other-income growth	5.0%	2.5%
Physical vacancy / separate bad debt	5.0% / 0.5%	7.0% / 1.0%
Year 1 other income	$40,000	$40,000
Year 1 operating expenses	$590,000	$590,000
Annual operating-expense growth	3.0%	4.5%
Initial loan / initial interest-only rate	$10.5m / 3.5%	$10.5m / 3.5%
Refinance at end of year / loan rate	3 / 4.5%	3 / 6.5%
Refinance constraints	75% LTV; 1.25x DSCR	75% LTV; 1.25x DSCR
Refinance amortization / fee	30 years monthly / 1.5%	30 years monthly / 1.5%
Cap for refinance and terminal scenarios	5.0%	6.0%
Hold / initial renovation allowance	5 years / $800,000	5 years / $800,000

Initial uses and funding	Amount
Acquisition price	$15,000,000
Closing costs, 2%	$300,000
Sponsor acquisition fee, 1%	$150,000
Renovation budget	$800,000
Liquidity reserve	$250,000
Total uses / debt / equity	$16,500,000 / $10,500,000 / $6,000,000

Fees and reserves

Operating expenses include property management; an additional sponsor asset-management fee is 1% of effective gross income and is deducted below NOI. Sale costs are 2% plus a 0.5% sponsor disposition fee. The reserve earns no interest; it funds negative annual cash flow before outside equity is called, and unused reserve is released at exit. Renovation costs are funded at inception. No cash-out refinance is assumed.

Cash flow and investor distributions

Adjusted case, USD thousands	0	1	2	3	4	5
Effective gross income	-	1,453	1,489	1,527	1,565	1,604
NOI	-	863	873	882	892	900
Debt service	-	368	368	368	713	713
Year-end loan balance	-	10,500	10,500	9,404	9,299	9,186
Deal equity cash flow	-6,000	481	491	-488	163	5,753
LP cash flow	-5,400	433	441	-439	146	5,178
GP cash flow	-600	48	49	-49	16	575

How refinancing creates the capital need

The acquisition loan is interest-only through year 3. Refinance capacity is the smaller of the outstanding loan, 75% of modeled value, and the loan supported by a 1.25x DSCR using year 4 NOI and a 30-year amortization schedule. Refinance fees are 1.5% of new principal. In the adjusted case, gross debt replacement and fee needs are $1,237,391. Operating cash and the initial reserve reduce the outside-equity requirement to $487,768.

Illustrative waterfall

LPs contribute 90% and the GP 10% of initial equity and later capital calls. Positive cash first pays an 8% simple, noncompounding preferred return pari passu, then returns contributed capital pro rata, then splits residual distributions 70% to LPs and 30% to the GP. Unpaid preferred returns do not compound. This chosen structure is illustrative; a real operating agreement must be modeled on its actual terms.

IRR and equity multiple

IRR uses annual end-of-year cash flows, including additional contributions. LP equity multiple equals total positive LP distributions divided by all LP contributions. GP figures include its equity distributions/promote; acquisition, asset-management and disposition fees are separately deducted in the property cash flows and are not added to the GP-equity IRR.

Refinance break-even thresholds

Holding other adjusted assumptions fixed, full replacement of the $10.5m loan requires a refinance rate no higher than approximately 5.47% under the DSCR constraint. At 6.5%, the same test would require approximately 99.3% physical occupancy with 1% separate bad debt. These are conditional model thresholds, not financing quotes.

Deterministic stress tests

Scenario	LP IRR	LP multiple	Added deal equity
Sponsor low-rate base	21.7%	2.43x	$0
Independent adjusted case	1.4%	1.06x	$487,768
Higher refinance rate	1.1%	1.04x	$2,136,258
Exit cap expansion	-7.2%	0.74x	$487,768
Operating and renovation stress	-29.8%	0.33x	$3,204,353
Combined severe downside	Not meaningful	0.05x	$5,714,596
Extended hold only	3.1%	1.20x	$487,768

What changed

Higher-rate case: refinance rate 8.5%. Cap-expansion case: cap 7.0%. Operating/renovation stress: zero rent growth, 6.5% expense growth, 12% vacancy, 2% bad debt, 30% renovation overrun and 3 additional delay months. Combined downside: -1.5% rent growth, 7% expense growth, 15% vacancy, 2.5% bad debt, 8.5% refinance rate, 7.5% cap, 40% renovation overrun, 4 delay months and a 7-year hold. Extended hold changes only the adjusted hold from 5 to 7 years.

LP IRR sensitivity with other adjusted inputs held fixed

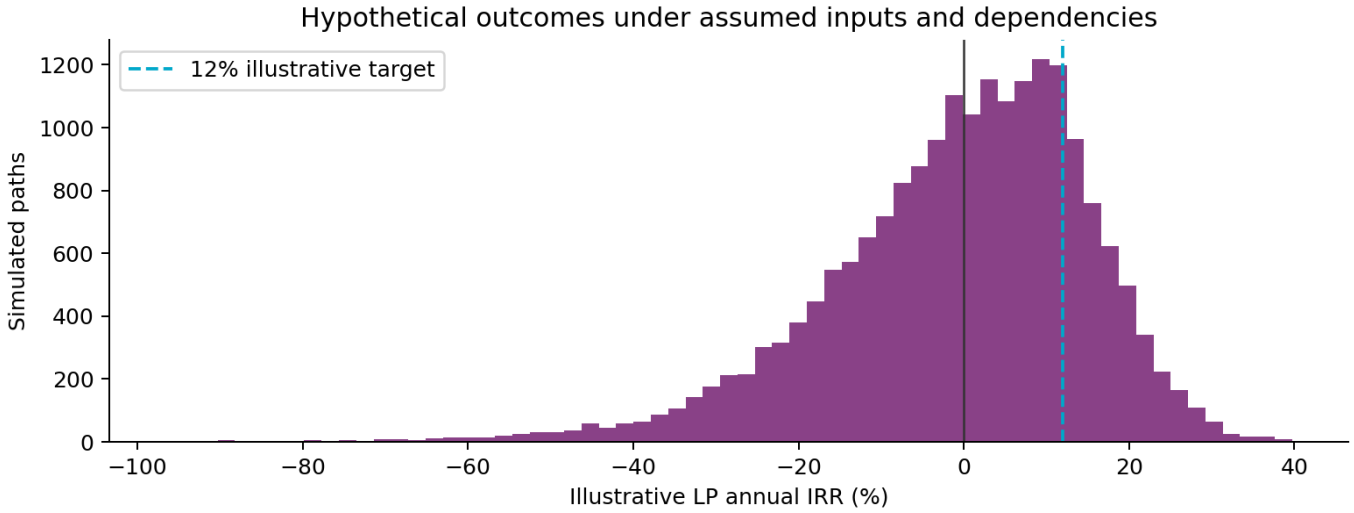
Cap / refi rate	4.5%	5.5%	6.5%	7.5%	8.5%
5.0%	10.4%	10.0%	9.5%	9.1%	8.7%
5.5%	6.8%	6.1%	5.7%	5.3%	5.0%
6.0%	2.4%	1.7%	1.4%	1.2%	1.1%
6.5%	-1.8%	-2.7%	-2.8%	-2.8%	-2.8%
7.0%	-5.6%	-6.5%	-7.2%	-6.9%	-6.6%

The cap assumption affects both refinance-value capacity and terminal value. Refinance rates change loan sizing and later debt service. The table therefore includes financing effects, not just a terminal sale-price adjustment.

The severe case has no economically meaningful unique annual IRR: subsequent calls and poor terminal proceeds make the usual percentage return misleading. Its 0.05x equity multiple is retained rather than assigning an invented IRR.
Limited-recourse equity is assumed; personal guarantees, enforcement costs and a distressed-sale process are not modeled.

Conditional Monte Carlo outcomes

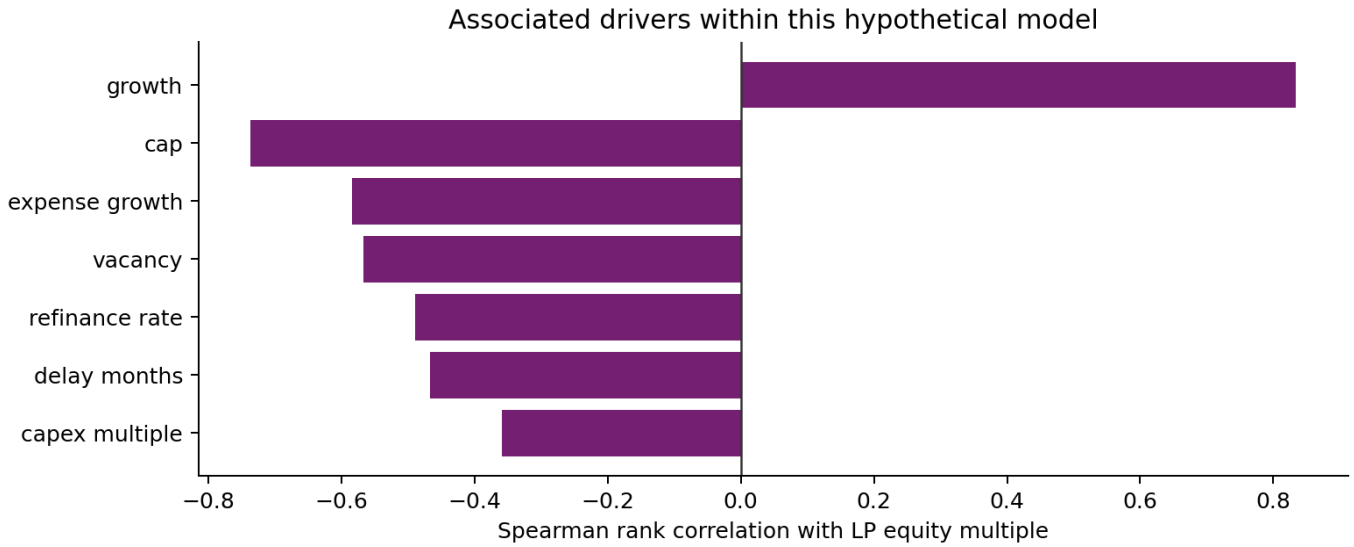
20,000 paths; reproducible seed 20261109. These are assumed scenario frequencies, not estimated real-world probabilities for an actual investment.



Illustrative measure	Result / denominator
Median LP annual IRR	1.4% among unique-IRR paths
10th to 90th percentile LP IRR	-21.4% to 17.0%
Median / 10th percentile LP equity multiple	1.06x / 0.39x
LP IRR below illustrative 12% target	80% of 19,788 unique-IRR paths
LP distributions below contributed capital	47% of all 20,000 paths
Additional deal equity required	60% of all paths
Full $10.5m refinance fails 1.25x DSCR	69% of all paths
90th percentile additional deal equity	$2,944,365
No unique economically meaningful IRR	212 paths (1.1%); excluded from IRR statistics

Capital-loss and funding statistics include every path. IRR quantiles and target-shortfall frequencies exclude the 212 paths without a unique usable root; those exclusions must not be interpreted as successful investments. New loans are sized to at least 1.25x DSCR by construction, so the debt-risk statistic tests the requested full loan before downsizing.

Assumed uncertainty and associated drivers



Input	Marginal assumption
Annual rent / other-income growth	Normal 2.5%, SD 1.8%; capped at -4% and 7%
Annual expense growth	Normal 4.5%, SD 1.8%; capped at -1% and 10%
Vacancy / separate bad debt	Normal 7%, SD 2.5%; capped at 2%-18%; bad debt fixed 1%
Refinance rate	Normal 6.5%, SD 1.2%; capped at 3%-11%
Refinance / exit cap	Normal 6%, SD 0.7%; capped at 4%-9%
Renovation cost multiplier	Triangular minimum 0.8, mode 1.0, maximum 1.5
Additional renovation delay	Triangular 0, 1, 6 months; affects 25% of units in year 1
Holding period	4/5/6/7 years with 10%/60%/25%/5% marginal weights

Dependence and interpretation

A Gaussian factor construction couples a common adverse-market factor and an inflation/rate factor with independent residuals. Adverse conditions reduce rent growth and increase vacancy, financing rates, caps, expenses, delays and longer holds. The complete loading and correlation matrices are supplied in the JSON and code. Correlations shown above are associations within those assumptions; they are not independent causal effects or a variance decomposition.

Each draw defines a constant growth path and a hold, not annual independent shocks. Bounds create point masses for capped normals. Tail risks, parameter uncertainty and regime changes can differ materially from these choices. Real engagements require defensible property/market inputs and alternative distribution and dependence checks.

Conclusions and further diligence

The example identifies financing and terminal-value vulnerability that a high sponsor base-case IRR can obscure. Before a real acquisition, reconcile the proposed model to source documents and test whether the business can fund downside cash needs without relying on a favorable refinance.

• Obtain lender quotes, maturity dates, amortization, extension conditions, rate-cap terms, covenants and any guarantees.

• Reconcile the rent roll and T-12 to collections, concessions, vacancy, bad debt and lease expirations.

• Verify property-tax reassessment, insurance quotes and expenses under the proposed ownership and operating plan.

• Support rent/expense growth and cap scenarios using appropriate licensed market evidence; do not copy the hypothetical assumptions.

• Independently assess renovation costs, timing and physical/environmental risks using qualified specialists.

• Model actual sponsor fees, operating-agreement waterfalls, capital-call provisions and liquidity constraints.

Historical context

The Federal Reserve cut its target rate to 0-0.25% in March 2020 and raised it to 5.25-5.50% by July 2023. FDIC material describes refinancing pressures alongside higher borrowing/operating costs and weaker property fundamentals. The 3.5% initial loan and later loan-rate scenarios in this report are invented contractual assumptions, not the federal funds rate or reconstructed historical loan quotes.

Reproducibility and validation

Run cre_underwriting_model.py with Python, NumPy, SciPy and Matplotlib. The approval ZIP includes the source, JSON outputs, seed and chart files. Checks reconcile sources/uses, every LP-plus-GP cash flow, loan balances, directional stresses, IRR net-present-value residuals and the positive-definite correlation structure. Independent review of a client-ready implementation is still required; this demonstration is not a certified underwriting system.

Limitations

No current market valuation opinion, taxes/depreciation, hedging contract, loan default/workout process, guarantee exposure, environmental liability, insurance recovery or legal-document interpretation is included. Business plans, cash-flow timing and all cash calls are simplified. Investors are assumed to fund modeled calls; a financing failure without funding can be worse. No probability is validated against an actual property.

Sources

Federal Reserve March 2020 statement; July 2023 statement; FDIC 2025 Risk Review. Property inputs are explicitly hypothetical.