

The Three Structural Failures of DCF

Session 2 · Jensen Bias · McKean-Vlasov · LA-CAPM

Samir Asaf, PhD, CFA, CMA, CTP, CM&AA

Senior Partner, Regent Financial LLC, New York

Former Finance Instructor, Stanford University

Primary Text: Liquidity Illusion (Forthcoming, 2026)

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What we'll cover today

1

Recap: where DCF fails

Session 1 anchored the \$73M problem

2

Failure 1: Stochastic premium

Secondary market shows 10× moves vs. constant assumption

3

Failure 2: Jensen convexity bias

$E[f(X)] \neq f(E[X])$ when discount factor is nonlinear

4

Failure 3: McKean-Vlasov externality

Liquidity is collective, not individual

5

LA-CAPM

Connection to portfolio theory you already know

Recap: where Session 1 left us

Five anchor points from last session worth carrying forward:

\$103.6M DCF

Standard discounted cash flow valuation of our benchmark asset

\$30.9M GE-LAV (GFC)

Same asset, GE-LAV valuation during 2008-09 stress regime

\$73M gap

The unexplained difference — the 'liquidity illusion'

Secondary market shows it

3-50% discount range across regimes — directly observable

Three failures explain it

Today we'll name and motivate each one

Today: from diagnosis to mechanism.

The three failures, now with detail

FAILURE 1

Stochastic Premium

Secondary market data shows premia move 3% to 50%. Constant-assumption DCF cannot price what the market clears at. Resolution: Ornstein-Uhlenbeck process for liquidity state.

→ Sessions 3, 4

FAILURE 2

Jensen Convexity Bias

Discount factor $\exp(-rT)$ is convex in r . When r is stochastic, $E[\exp(-rT)] > \exp(-E[r]T)$. DCF substitutes $E[r]$, systematically undervaluing.

→ Sessions 11, 24

FAILURE 3

McKean-Vlasov Externality

Liquidity provision is a collective action problem. The marginal LP's exit affects all others' execution prices. Requires GE framework.

→ Sessions 21, 24

Each failure has a closed-form correction. Together: GE-LAV.

Failure 1: A constant premium contradicts the data

Headline: secondary market discounts move 10× the magnitude of the assumed-constant premium.

Empirical evidence (US PE secondary market):

Regime	Discount	Context
2007 peak	3-8%	Boom: premium near floor
2009 GFC trough	35-50%	Liquidity crisis: 10× normal
2020 COVID	15-25%	Brief shock; 9 months to recover
2022 rate shock	15-20%	Sustained ~24 months
2024 (current)	12-18%	Still well above 3.5% constant

DCF assumes 3.5% constant. Data shows 5-50% range, mean-reverting.

Resolution: model liquidity state stochastically (OU). Premium = function of state.

Failure 2: Jensen convexity bias

Jensen's inequality applied to the discount factor:

$$E[e^{-rT}] > e^{-E[r] \cdot T}$$

What this means

When the discount rate r is stochastic and $\exp(-rT)$ is convex in r , the expected value exceeds the value at the expected rate. The asset is worth more than DCF says.

Why DCF gets it wrong

DCF substitutes $E[r]$ into the discount factor, computing $\exp(-E[r]T)$ — strictly less than $E[\exp(-rT)]$. Calibrated magnitude: 0.8–3.6%/yr by asset class.

Jensen bias: a worked numerical example

Setup: 20-year asset, \$50M annual CF. Premium $\sim N(3.5\%, \sigma^2)$ with σ varying.

Scenario	σ (premium vol)	Mean rate	DCF value	True value	Bias
Deterministic	$\sigma = 0\%$	7.5%	\$103.6M	\$103.6M	0%
Mildly volatile	$\sigma = 1.5\%$	7.5%	\$103.6M	~\$108M	~4%
Highly volatile (GFC)	$\sigma = 5.0\%$	7.5%	\$103.6M	~\$135M	~30%
State-dependent	Varies	Time-varying	\$103.6M	\$30.9M	Negative!

Two opposing forces: Jensen positive, McKean-Vlasov negative. GE-LAV captures both.

Failure 3: Liquidity is collectively determined

The McKean-Vlasov externality — a thought experiment

Individual perspective

One LP decides to sell a \$10M PE stake on the secondary market.

Buyers are deep, time-to-clear ~ 60 days, discount ~ 8%.

LP takes this as the equilibrium price for the asset.

→ DCF logic: *discount = function of asset's individual properties.*

Collective perspective

1,000 LPs each decide to sell a \$10M stake at the same time.

Total supply = \$10B. Secondary market depth ~ \$3B/quarter.

Discount blows out to 35-50%. Time-to-clear ~ 12 months.

→ *Discount = function of the collective state, not the asset.*

Each LP's decision affects every other LP's execution price. No individual internalizes this.

This is the McKean-Vlasov externality. Irreducible to individual-asset DCF analysis.

How LPs behave when liquidity collectively dries up

Calibrated from 2008-09 secondary market activity:

3.1×

Supply expansion

Forced selling exceeds normal 3×

0.4×

Demand contraction

Buyers retreat to 40% of normal capacity

47%

Mean discount peak

Q1 2009 across diversified buyout portfolio

11 mo

Mean clearing time

vs. 60 days in normal markets

None of these numbers can be derived from individual asset properties alone.

LA-CAPM: the partial-equilibrium precursor

Acharya & Pedersen (2005) — *Liquidity-Adjusted CAPM, Journal of Financial Economics*

Standard CAPM:

$$E[r_i] - r_f = \beta_i(E[r_m] - r_f)$$

One source of risk: comovement with market.

LA-CAPM:

$$E[r_i] - r_f = E[c_i] + \beta^{(1)}(E[r_m] - r_f) + \beta^{(2)} + \beta^{(3)} - \beta^{(4)}$$

β^1 : market beta

comovement with market return

β^2 : liq-liq

asset liquidity vs market liquidity

β^3 : return-liq

asset return when market is illiquid

β^4 : liq-return

asset liquidity when market is down

GE-LAV generalizes LA-CAPM with full GE, McKean-Vlasov dynamics, and term structure.

Where GE-LAV sits in the literature

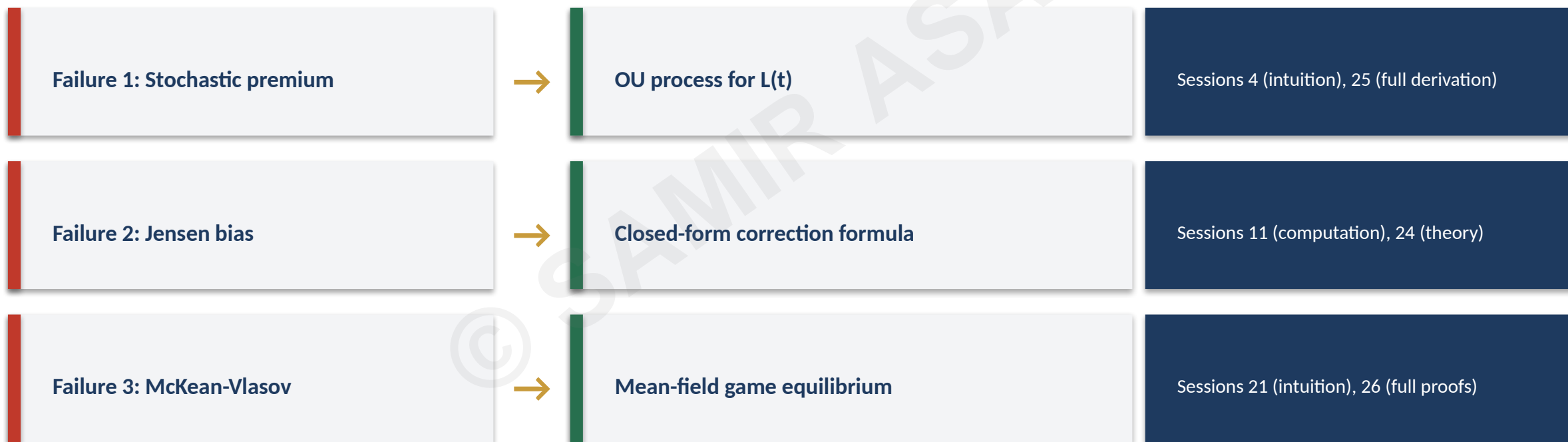
Five major contributions to illiquidity pricing, and where each stops short:

Author(s) / Year	Contribution	Where it stops
Amihud-Mendelson (1986)	Bid-ask spread as illiq proxy	Cross-sectional, not time-varying
Pastor-Stambaugh (2003)	Liquidity as priced risk factor	Aggregate, no asset-level dynamics
Acharya-Pedersen (2005)	LA-CAPM with 4 betas	Partial equilibrium
Brunnermeier-Pedersen (2009)	Funding \leftrightarrow market liquidity	No general equilibrium for private assets
Sorensen-Wang-Yang (2014)	PE in MVO framework	No collective dynamics
GE-LAV (Asaf, 2026)	GE + MFG + closed-form pricing	Forthcoming

Each step closer to a complete theory. GE-LAV is the synthesis.

Three failures, three resolutions, three later sessions

Roadmap for the three corrections:



Why this matters: a practitioner perspective



The discount rate isn't a number. It's a process. And until we treat it that way, we'll keep mispricing private capital by tens of billions per year.

— Anonymous LP at \$30B endowment, after reviewing GE-LAV results

Quoted in the manuscript, Chapter 2, Section 2.3.

Preparing for Session 3

Before the next class, complete these short readings and exercises:

Read

Book Chapter 1, sections 1.8–1.11 (~15 pages on secondary markets)

Browse

Latest Lazard or Evercore secondary market report (any year)

Reflect

Identify one observable price you trust more than DCF in your own work

Optional (T2)

Skim Sorensen-Wang-Yang (2014) — abstract and discussion section

Project

Begin thinking about which asset class to focus on for the proposal

Discussion: bring one example of liquidity illusion from your professional experience.

Session 2 summary

What we accomplished today

- 1 Three structural failures of DCF: stochastic premium, Jensen bias, McKean-Vlasov externality
- 2 Each failure has empirical support and a mathematical resolution
- 3 Jensen bias is positive ($LAV > DCF$), McKean-Vlasov negative — GE-LAV captures both
- 4 LA-CAPM (Acharya-Pedersen) is the partial-equilibrium precursor; GE-LAV its GE generalization

Next session

Session 3: Liquidity Illusion · the secondary market evidence in depth · LA-CAPM in practice