

Platform Architecture for GE-LAV Computation

Session 18 · How an LP analyst would build the system

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Primary Text: Liquidity Illusion (Forthcoming, 2026)

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What we'll cover today

1

System requirements

What we need to compute and serve

2

Data layer

Sources, frequency, validation

3

Modeling layer

L(t) calibration, $\pi(L,T)$ computation

4

Output layer

Reports, dashboards, alerts

5

Build vs. buy decision

Open source vs. proprietary

End-to-end platform architecture (conceptual)

LAYER 5: OUTPUT

IC memos · Allocation dashboards · Stress scenarios · Regulatory reports · Risk alerts

LAYER 4: ANALYTICS

Asset valuation · Optimal exit boundary · Portfolio allocation · Risk attribution

LAYER 3: MODELING

OU calibration · $\pi(L,T)$ surface · Jensen correction · McKean-Vlasov solver

LAYER 2: PROCESSING

Liquidity state estimation · Term-structure fitting · Validation tests

LAYER 1: DATA

Lazard · Evercore · Greenhill · Preqin · Pitchbook · Bloomberg · Internal LP data

Build vs. buy: realistic decision matrix

GE-LAV platform building is not a small project. Realistic options:

<p>Pure build (in-house)</p> <p><i>Best for: large institutional investors (\$10B+ AUM)</i></p>	<p>12-18 months · 4-6 quant developers · \$2-4M annual cost</p>	<p><i>Maximum customization, full IP ownership</i></p>
<p>Buy + customize (vendor)</p> <p><i>Best for: mid-sized institutional (\$1-10B AUM)</i></p>	<p>3-6 months · 1-2 internal · \$200-500K annual license</p>	<p><i>Faster, standardized methodology, vendor lock-in</i></p>
<p>Open-source stack</p> <p><i>Best for: research institutions, smaller AUMs</i></p>	<p>Variable · 1 quant · ~\$50K annual infra cost</p>	<p><i>Maximum transparency, requires internal expertise</i></p>
<p>Outsource (consultants)</p> <p><i>Best for: occasional ad-hoc analyses</i></p>	<p>Per-project · \$50-500K each</p>	<p><i>Lowest commitment, doesn't build internal capability</i></p>

What we mean by 'platform' here

Engineering perspective: a working GE-LAV computation system.

Goal

An LP analyst should be able to ingest data, calibrate, and decide

Scale

Single-LP scale: 50-500 funds, 1000s of historical CFs

Update cadence

Quarterly recalibration, weekly stress runs

Output

Dashboards • IC memos • stress scenarios • reports

Non-goal

Real-time / HFT-style infrastructure (not needed)

Build-vs-buy

Internal build typically; commercial software ~partial

Session 18 summary

What we accomplished today

- 1 GE-LAV platform requires 5 architectural layers: data, processing, modeling, analytics, output
- 2 Calibration of $L(t)$ is data-intensive — needs Lazard/Evercore + internal LP data
- 3 Realistic options: pure build (large), buy+customize (mid), open source (small), outsource (occasional)
- 4 Recommended for course project: open-source implementation in Python with Quantopian-style notebook

Next session

Unit 5 begins: mathematical intuition bridges. Session 19: Brownian motion and Itô calculus

Architecture overview: five layers

From data to decision.

Layer 1: Data

Cash flows, NAV, secondary market data, macro indicators

Layer 2: Modeling

OU calibration, $\pi(L,T)$ estimation, MFG solver

Layer 3: Analytics

$L^*(t)$ computation, portfolio optimization, stress tests

Layer 4: Reporting

Dashboards, IC memos, regulator filings

Layer 5: API

Other systems can query GE-LAV outputs

Cross-cutting

Logging, audit trails, version control, governance

Data layer: sources and pipeline

Internal sources

- ▶ GP-provided quarterly statements (PDFs)
- ▶ Capital call notices
- ▶ Distribution notices
- ▶ Side letters and fund documents
- ▶ Custodian reconciled NAV
- ▶ Internal portfolio tags (vintage, strategy, geo)

External sources

- ▶ Lazard / Greenhill secondary pricing
- ▶ Preqin / PitchBook fund metadata
- ▶ Public market benchmarks (S&P, Russell)
- ▶ Macro indicators (VIX, credit spreads)
- ▶ Regulator-specific (Solvency II EIOPA)
- ▶ Industry surveys (Cambridge Assoc.)

Modeling layer: estimation pipeline

How calibrated values get produced.

Step 1: OU estimation

Fit κ, σ via MLE on historical L_t time series

Step 2: $\pi(L,T)$ calibration

Cross-section fit to secondary discount data

Step 3: Term structure

Combine OU + $\pi(L) \rightarrow \pi(L,T)$ for all (L,T)

Step 4: HJB solve

Compute $L^*(t)$ numerically on a grid

Step 5: MFG iteration

Self-consistent (μ, V) via fixed-point

Step 6: Outputs

Tables of $L^*(t)$, term structure, etc.

Analytics layer: portfolio applications

What the analyst actually computes daily.

Per-fund valuation

Mark each fund: $NAV \times (1 - \pi(L_t, T_t))$

Portfolio MTM

Aggregate state-adjusted values

Concentration

Identify funds near $L^*(t)$ — exit candidates

Hedging recommendations

Suggested hedges given current exposures

Stress scenarios

Run $L=-1$, $L=-1.5$ scenarios on portfolio

Liquidity ladder

Project cash flow timing under different L scenarios

Stress scenarios: standard set

Pre-built stress scenarios for an LP platform.

Scenario	L shock	Duration	Use case
Mild downturn	L: 0 → -0.5	12 months	Tactical rebalance
Recession	L: 0 → -1.0	24 months	Liquidity planning
GFC-equivalent	L: 0 → -1.5	18 months	Tail risk · capital adequacy
COVID-like rapid	L: 0 → -1.2 → recovery	6 months	Whipsaw scenario
Persistent low	L: -0.5 (mean) for 5y	60 months	Long-stagnation
Reverse stress	L: +1.0	12 months	Capital release · rebalance

Reporting layer: what stakeholders see

Different views for different audiences.

CIO dashboard

Portfolio MTM · L_t · $L^*(t)$ gauge · alerts

IC memo template

Auto-populated per-fund analysis · GE-LAV adjustments

Regulator filing

Pillar 2 ORSA · stress test results

LP advisory board

Quarterly performance with state-adjusted metrics

Audit trail

Every calibration version logged; reproducibility

Stress reports

On-demand scenario analysis

API layer: integrations

What other systems pull from GE-LAV.

Risk system

Portfolio MTM with state-adjusted values

Treasury

Cash flow projections under different L scenarios

Accounting

NAV adjustments for fair-value reporting

CRM

GP performance scoring; share with relationship team

Regulator

Auto-generated filings

Bloomberg/3rd party

Optional exports for benchmarking

Build effort and timeline

Realistic timeline for a working GE-LAV platform.

Phase 1: data pipeline

3-4 months · ingest, normalize, store

Phase 2: modeling

4-6 months · OU, $\pi(L,T)$, MFG solver

Phase 3: analytics

3-4 months · $L^*(t)$, portfolio, stress

Phase 4: reporting

2-3 months · dashboards, memos

Total: ~12-18 months

Team: 3 quants, 2 engineers, 1 data person

Cost

\$2-4M annual run-rate; meaningful but tractable

Bridge to Session 19 (Unit 5)

Engineering covered. Now math intuition.

Unit 4 complete

Regulatory and platform implementation

Unit 5 (S19-24)

Mathematical intuition bridges

Audience

Both tracks; T1 students get intuition, T2 get foundation

S19

Brownian motion and Itô calculus

S20

HJB and optimal stopping

Reading prep

Karatzas-Shreve Ch. 1 or Shreve II Ch. 4