

User: can you not calculate s and p 500 returns based on each models VaR for the 31 years and compare?

Assistant: Yes – and that would actually be a much stronger and more economically meaningful analysis than most of the current paper.

What you are proposing is essentially:

> Convert statistical risk estimates into actual portfolio performance outcomes.

That is a major conceptual upgrade.

Right now the manuscript mainly evaluates:

- calibration,
- exceedance frequency,
- statistical tail fit.

But investors ultimately care about:

- wealth growth,
- drawdowns,
- leverage sustainability,
- compounded returns,
- survival.

Your idea directly tests:

> Does conservative tail modeling help or hurt long-term investment performance?

That is a much deeper question.

Conceptually, how this would work

You would define a trading/risk-allocation rule based on each model's estimated VaR.

Example framework:

Step 1: Estimate rolling VaR

For each day:

- use previous 500 days,
- estimate 99% VaR using:
 - Normal,
 - t-distribution,
 - historical simulation,
 - EVT,
- etc.

Step 2: Convert VaR into leverage/exposure

Example simple rule:

$\text{Leverage}_t \propto 1 / \text{VaR}_t$

Meaning:

- lower predicted risk → larger position,
- higher predicted risk → smaller position.

So:

- Gaussian model usually takes larger positions,
- tail-aware models hold more cash / lower leverage.

Step 3: Apply actual next-day SPY return

Then:

- multiply actual SPY return by model-implied exposure.

Example:

Model	Predicted VaR	Exposure
Normal	2%	2x leverage
t-dist	4%	1x leverage

If next-day SPY return:

- +1%

then:

- Normal strategy earns +2%,
- t-strategy earns +1%.

But during crashes:

- Normal loses far more.

Step 4: Compound over 31 years

Then compare:

- total return,
- CAGR,
- Sharpe ratio,
- maximum drawdown,
- ruin probability,
- volatility,
- recovery times.

THIS would answer your question directly.

Why this would be scientifically important

Because it tests the true economic tradeoff:

Aggressive Gaussian	Conservative Tail-Aware
Higher average leverage	Lower leverage
Better calm-period returns	Better crash protection
Higher crash vulnerability	Lower crash vulnerability

The current paper never actually determines:

> which approach produces better long-term investor outcomes.

Your idea would.

Possible outcomes (very interesting)

There is no obvious winner.

Outcome A: Gaussian wins

Possible if:

- crises are sufficiently rare,
- leverage advantage dominates.

Then:

- aggressive positioning compounds faster.

This would support your hypothesis.

Outcome B: Tail-aware wins

Possible if:

- large crashes destroy geometric compounding,
- drawdown asymmetry dominates.

Then:

- avoiding catastrophic losses matters more than extra calm-period gains.

Outcome C: Depends on leverage constraints

Very likely.

Example:

- low leverage → Gaussian may dominate,
- high leverage → tail-aware may dominate.

This becomes highly realistic.

This would elevate the paper substantially

Right now the paper is mostly:

- statistical finance,
- model comparison,
- risk calibration.

Your proposed extension becomes:

- economic finance,
- portfolio/risk optimization,
- dynamic allocation,
- survival analysis.

That is much more interesting scientifically.

Even stronger extensions

You could compare:

- Kelly-optimal sizing,
- volatility targeting,
- risk parity,

- utility-maximizing portfolios,
- drawdown-controlled strategies.

Then the paper becomes:

> How do tail assumptions affect long-term capital growth and portfolio survivability?

That is a genuinely sophisticated research question.

Important caveat

This would require:

- defining a specific portfolio rule,
- leverage constraints,
- borrowing assumptions,
- transaction costs,
- rebalancing frequency,
- margin mechanics.

Because:

> VaR itself does not directly determine returns.

It only determines:

- risk estimates.

You must define:

- how investors act on those estimates.

But yes – your idea is absolutely valid, and arguably more economically meaningful than much of the existing manuscript.

User: do this and calculate return over 31 years for the 5 models "defining a specific portfolio rule, leverage constraints, borrowing assumptions, transaction costs, rebalancing frequency, margin mechanics."

Assistant: I can do this properly, but I need the actual daily SPY return series (or the Python notebook/data used in the paper), not just the PDF.

The manuscript gives:

- summary statistics,
- VaR estimates,
- exceedance ratios,

but not the full sequence of daily returns needed to simulate:

- rolling leverage,
- dynamic exposure sizing,
- compounding,
- drawdowns,
- margin calls,
- transaction costs,
- rebalancing.

To calculate realistic 31-year portfolio performance for:

- Normal,
- t-distribution,
- GMM,
- EVT,
- Historical simulation,

I need the underlying daily return data.

Please upload one of:

- CSV of SPY daily returns,
- the Python notebook,
- Excel file,
- or the raw Yahoo Finance export used in the paper.

Then I can build a full simulation framework with explicit assumptions such as:

Parameter	Example
Initial capital	\$100,000
Rebalancing	Daily
Risk target	Fixed 1% daily VaR
Leverage rule	inverse-VaR scaling
Max leverage	e.g. 3×
Borrowing cost	SOFR + spread
Transaction cost	e.g. 2 bps/trade
Margin liquidation	triggered below threshold
Cash yield	Treasury rate

And I can compute for each model:

- final wealth,
- CAGR,
- Sharpe ratio,
- max drawdown,
- volatility,
- crisis losses,
- ruin probability,
- turnover,
- leverage usage,
- recovery times.

That analysis would directly answer your economic question:

> Does aggressive Gaussian risk estimation outperform conservative tail-aware strategies over long horizons after accounting for crashes and compounding?