

RESEARCH INSIGHT

Sector downside risk and market concentration

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Executive summary



Laura Brennan

Independent Researcher

Laura Brennan is an independent researcher specialising in market structure, systemic risk and cross-market transmission

Downside risk is unevenly distributed and changes across market regimes.

Key findings

- Technology currently contributes the largest share of system Expected Shortfall.
- Downside leadership rotates through time.
- Deeper drawdowns can coincide with more concentrated leadership.

Key metrics

Current largest contributor	Technology, 21.9%
Current top-three share	55.4%
Most frequent historical leader	Energy, 25.4%
Sectors analysed	9
Period	2001–2026

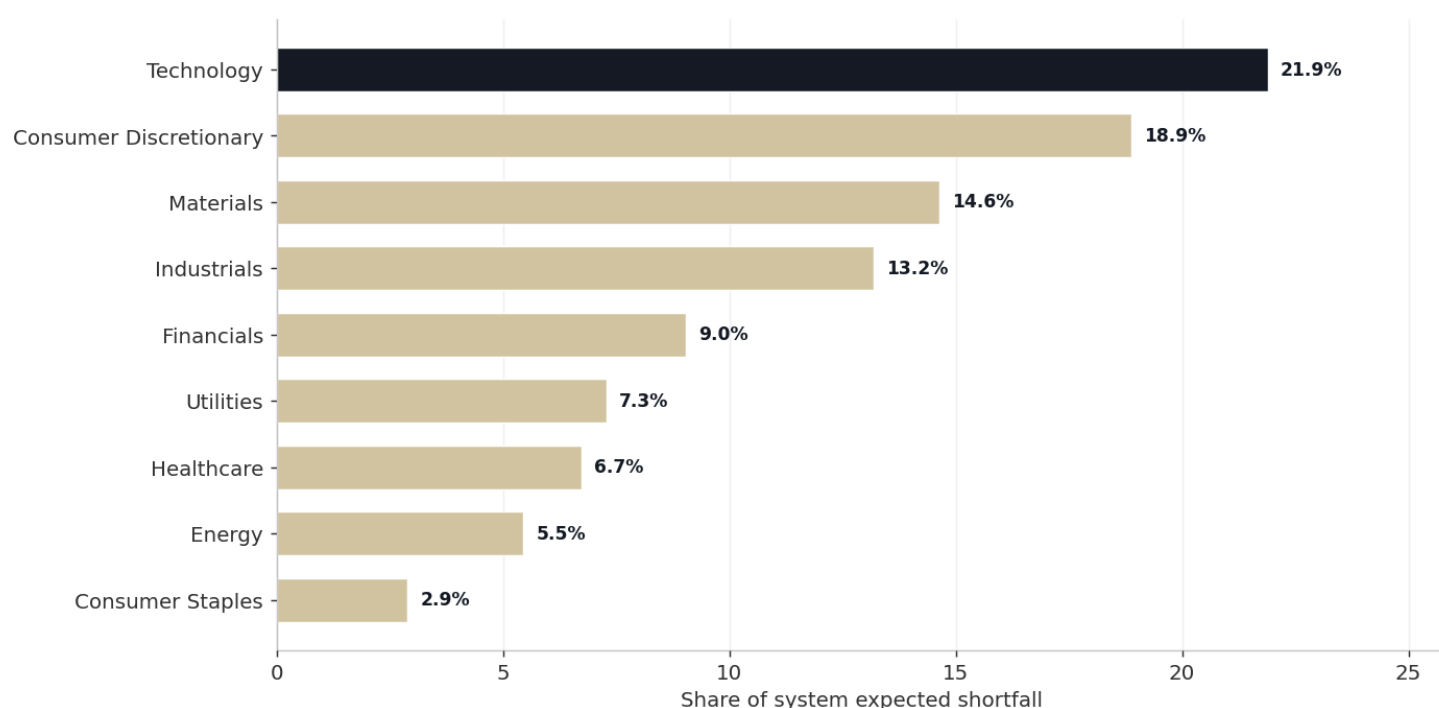
Why it matters

Sector volatility alone does not explain contribution to shared losses. Monitoring who drives downside risk, and how concentrated that leadership becomes, provides a clearer view of changing market structure.

Sector contribution to downside risk

Who Is Driving the Downside?

Technology currently contributes the largest share of losses on the market's worst days



Source: Yahoo Finance via yfinance. Author analysis — Laura Brennan

Figure 1. Sector contribution to system Expected Shortfall.

Technology contributes the largest share of system Expected Shortfall at 21.9%, followed by Consumer Discretionary and Materials. Together, the three sectors account for 55.4% of aggregate downside contribution. Utilities, Healthcare, Energy and Consumer Staples contribute substantially less, indicating that current downside risk is unevenly distributed across sectors.

Downside leadership rotates over time

Downside Leadership Keeps Rotating

The sector contributing most to shared losses changes with the market regime

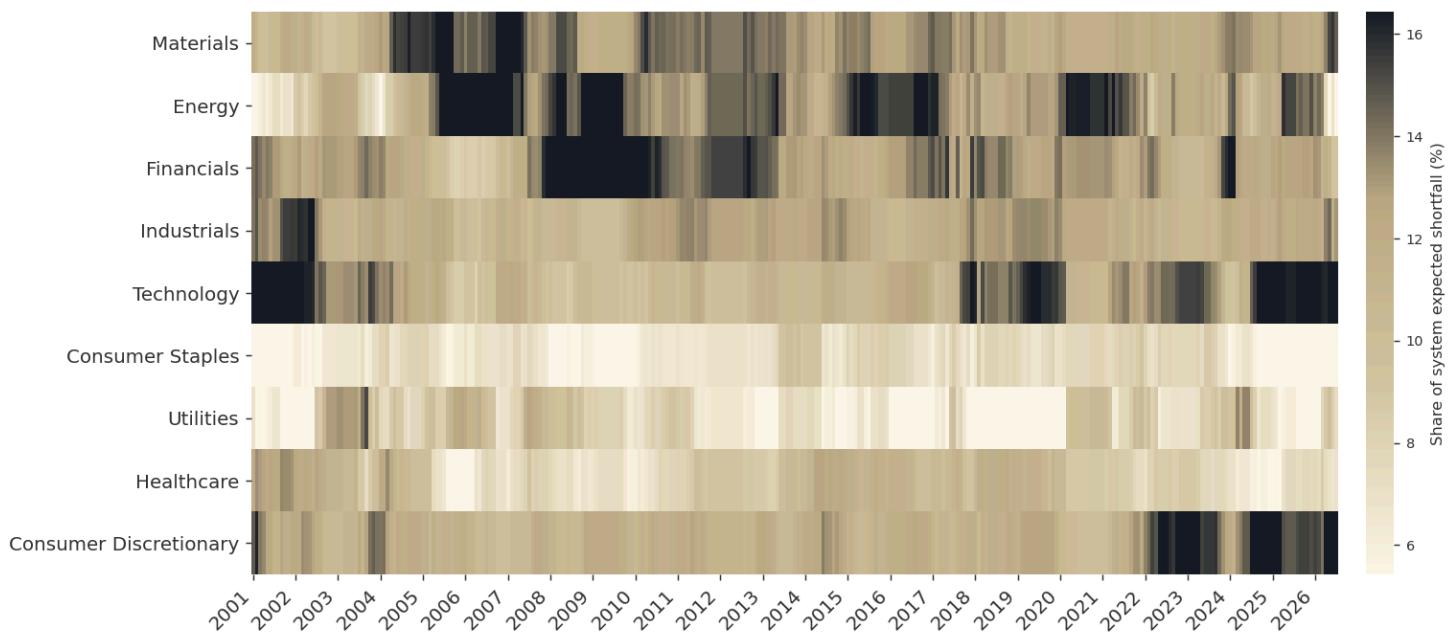


Figure 2. Sector contribution to system Expected Shortfall through time.

Downside leadership is not static. Technology dominates during some periods, while Financials, Energy and Materials become the largest contributors during others. Rather than a single sector driving every downturn, leadership rotates as market regimes evolve, reinforcing the importance of monitoring changing sources of downside contribution.

Volatility does not tell the whole story

Volatility Does Not Tell the Whole Story

Standalone risk and contribution to shared market losses are related, but not identical

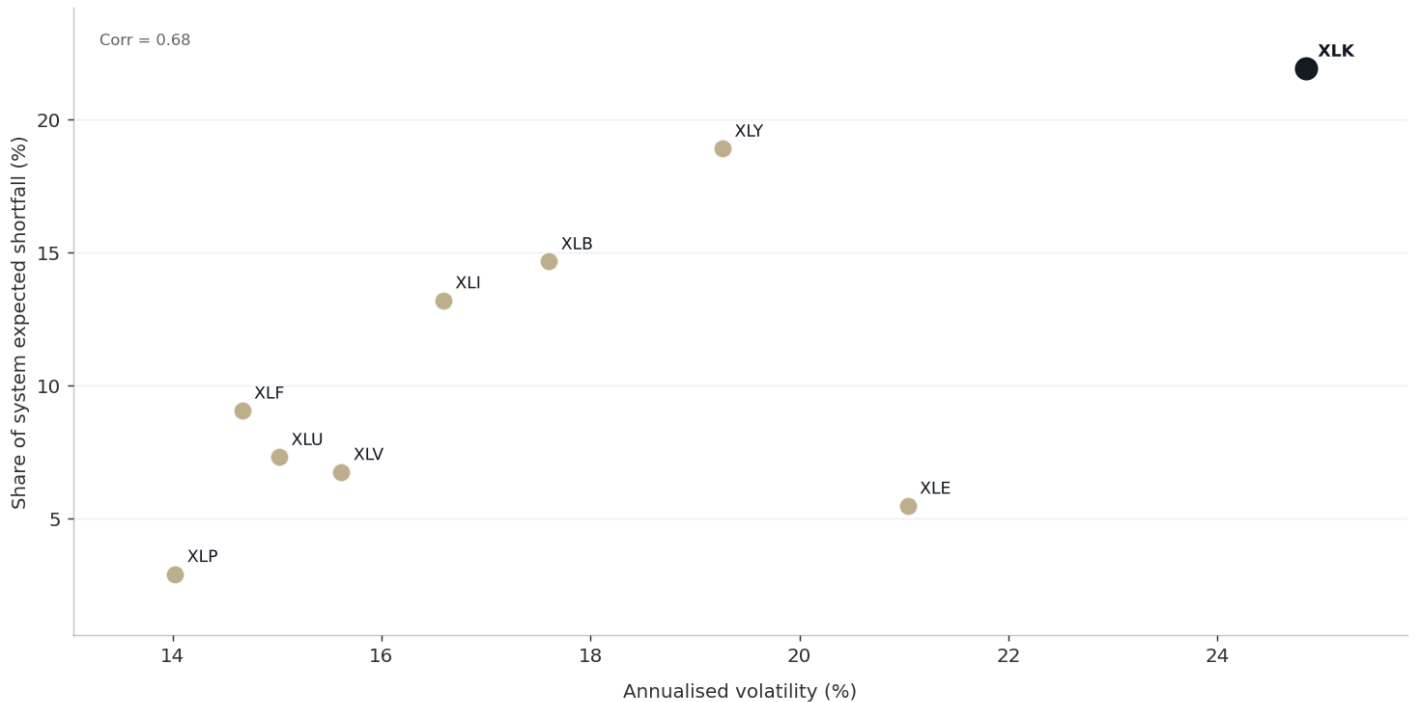


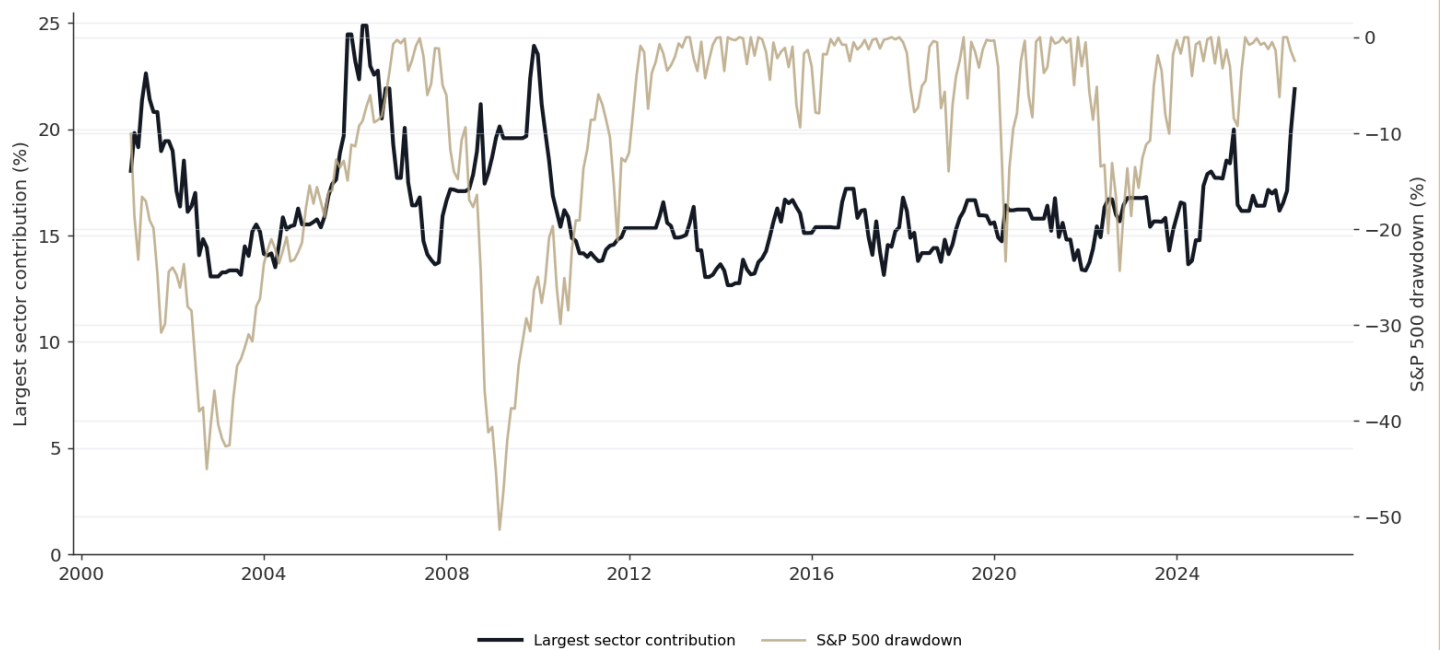
Figure 3. Sector volatility versus contribution to system Expected Shortfall.

Higher volatility does not necessarily imply a larger contribution to shared market losses. While Technology combines elevated volatility with high downside importance, Energy exhibits relatively high volatility but a much smaller contribution to Expected Shortfall. Downside leadership therefore depends on more than standalone risk and reflects how sectors contribute to losses within the broader system.

Downside leadership becomes more concentrated during market stress

When Downside Leadership Becomes Concentrated

The largest sector contribution compared with the depth of the wider market drawdown



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Source: Yahoo Finance via yfinance. Author analysis — Laura Brennan

Figure 4. Largest sector contribution compared with S&P 500 drawdowns.

Deeper market drawdowns tend to coincide with a larger contribution from the leading sector. The relationship is modest, but it suggests that downside leadership can become more concentrated as market conditions deteriorate rather than rising evenly across all sectors.

Deeper drawdowns can coincide with fewer effective contributors

How Broadly Is Downside Risk Distributed?

Fewer effective contributors mean shared losses are becoming concentrated in fewer sectors



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Source: Yahoo Finance via yfinance. Author analysis — Laura Brennan

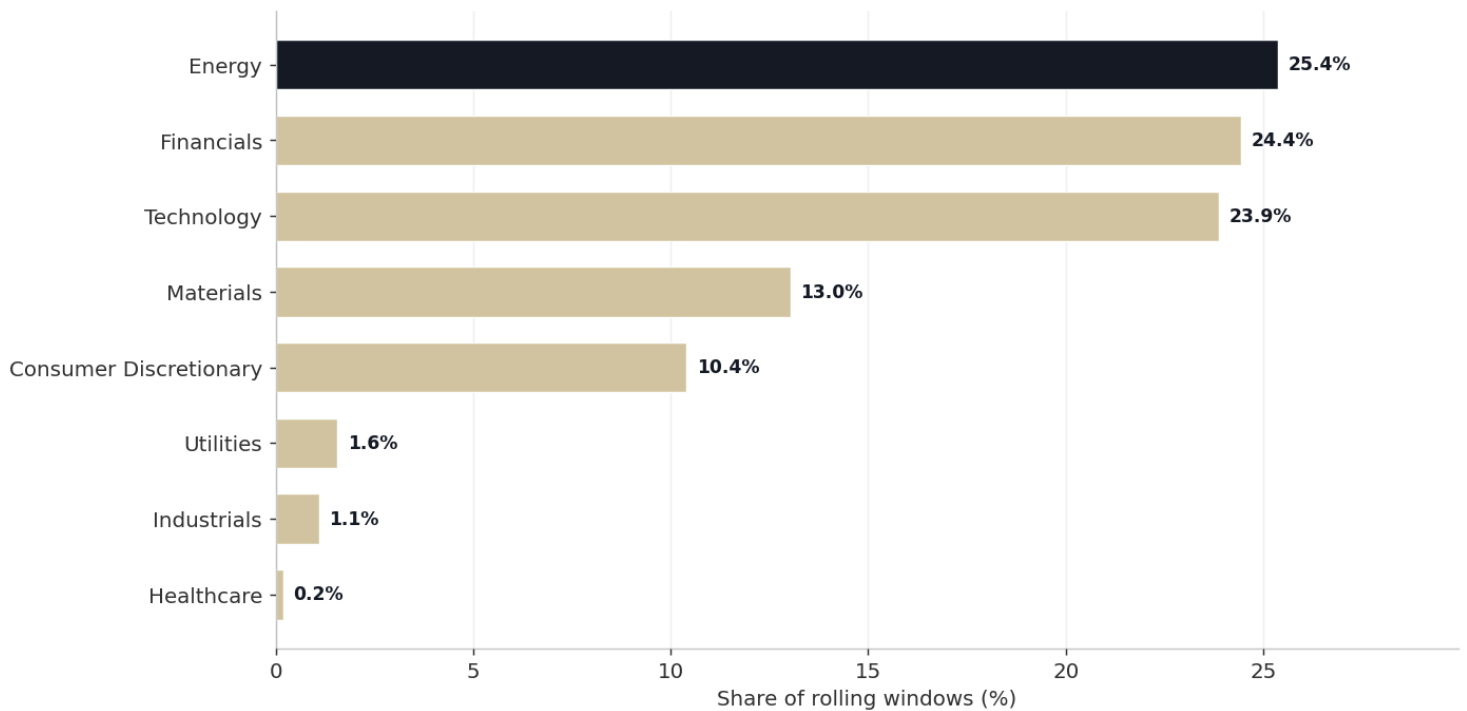
Figure 5. Effective number of sectors contributing to downside risk.

The effective number of sector contributors tends to decline during some deeper market drawdowns, although the unconditional relationship is weak. This suggests that market stress can coincide with narrower downside participation, but concentration is not determined by drawdown depth alone.

Downside importance is not fixed

Downside importance is not fixed

Energy, Financials and Technology have each led downside contribution across different regimes



Source: Yahoo Finance via yfinance. Author analysis — Laura Brennan

Figure 6. Share of rolling windows in which each sector was the largest contributor to downside risk.

Technology is currently the largest contributor to downside risk, but it is not the most frequent historical leader. Energy led in 25.4% of rolling windows, followed closely by Financials at 24.4% and Technology at 23.9%. Leadership therefore changes across market regimes rather than remaining permanently concentrated in one sector.

Methodology

Data

Sample period

2001–2026

Universe

Nine U.S. equity sectors represented by SPDR ETFs.

- XLB Materials
- XLE Energy
- XLF Financials
- XLI Industrials
- XLK Technology
- XLP Consumer Staples
- XLU Utilities
- XLV Healthcare
- XLY Consumer Discretionary

Market benchmark

S&P 500 Index

Data source

Yahoo Finance (via yfinance)

Data through 28 July 2026

Measures

Expected Shortfall

Downside risk is measured using empirical Expected Shortfall at the 95% confidence level. Tail observations are defined as the worst 5% of equally weighted system returns within each rolling estimation window.

Sector contribution

Component Expected Shortfall for each sector is calculated as its portfolio weight multiplied by its average loss conditional on the equally weighted system return falling within its worst 5% of observations. Component contributions are then normalised so that sector shares sum to 100%.

Largest contributor

For each rolling window, the sector with the highest contribution to aggregate downside risk is identified.

Effective contributors

The effective number of contributors is calculated using the inverse Herfindahl concentration index of sector Expected Shortfall (ES) contribution shares

$$N_{eff} = \frac{1}{\sum_{i=1}^n w_i^2}$$

where:

- N_{eff} is the effective number of sector contributors,
- w_i denotes sector i 's share of aggregate system Expected Shortfall.
- n is the number of sectors included in the analysis.

This measure estimates how broadly downside risk is distributed across sectors. Higher values indicate that downside risk is shared more evenly across multiple sectors, while lower values indicate that downside risk is increasingly concentrated within fewer dominant contributors.

Rolling estimation

Statistics are estimated using a 252-trading-day rolling window, recalculated daily. This captures changes in sector downside contribution through time rather than assuming fixed relationships.

System construction

The system return is constructed as an equally weighted average of the nine sector ETF returns. Each sector therefore receives a weight of 1/9.

Benchmark

Market drawdowns are calculated using the SPDR S&P 500 ETF Trust (SPY), based on auto-adjusted closing prices obtained from Yahoo Finance via [yfinance](#).

Returns and frequency

Daily logarithmic returns are calculated from auto-adjusted closing prices. Rolling measures are estimated daily, while selected figures are resampled to month-end observations for presentation.

Reproducibility

All analysis was performed using Python. Charts and summary statistics were generated directly from the underlying analysis pipeline without manual adjustment.

Research workflow

Step	Description
Data	Daily auto-adjusted closing prices
Returns	Daily logarithmic returns
System construction	Equally weighted across nine sectors
Risk measure	Empirical Expected Shortfall, 95% confidence level
Tail definition	Worst 5% of system-return observations
Rolling window	252 trading days, recalculated daily
Benchmark	SPY
Aggregation	Component ES shares normalised to 100%
Presentation frequency	Daily estimates; selected charts shown monthly
Output	Figures and summary statistics

Interpretation

Lower values indicate that downside contribution is concentrated among fewer sectors, while higher values indicate that contribution is distributed more broadly across the sector universe.

Research implications

The evidence presented in this report shows several characteristics of downside risk that are not immediately visible through traditional measures of market volatility.

Key observations

- Downside risk is unevenly distributed across sectors.
- Downside leadership rotates through time rather than remaining permanently concentrated in any single sector.
- Higher volatility alone does not determine **downside importance**.
- Periods of deeper market stress can coincide with more concentrated downside leadership.
- As concentration rises, the breadth of sector participation in downside risk narrows.
- Monitoring changes in downside leadership may provide additional insight into evolving market structure and vulnerability.

Together, these findings suggest that understanding how downside risk is distributed across markets may be as important as measuring the size of market declines themselves. Monitoring changes in concentration and leadership provides additional context for assessing evolving market conditions and the resilience of diversification.

References

Data

Yahoo Finance, accessed through [yfinance](#).

SPDR sector ETFs: XLB, XLE, XLF, XLI, XLK, XLP, XLU, XLV and XLY.

Market benchmark: SPDR S&P 500 ETF Trust (SPY).

Data through 28 July 2026.

Methodology

Acerbi, C. and Tasche, D. (2002). “On the coherence of expected shortfall.” *Journal of Banking & Finance*, 26(7), 1487–1503.

Software

Python, pandas, NumPy, matplotlib and yfinance.

Only retain the Acerbi and Tasche reference if you are comfortable citing the conceptual ES literature rather than claiming that your exact implementation follows every detail of that paper.

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