RESEARCH INSIGHT

Global Sovereign Bonds Are Connected. But Is That a Warning?

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Executive summary



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Global sovereign bonds are closely connected, but network measures did not improve the tested four-week downside forecasts.

Key findings

- Sovereign connectedness closely tracks a common bond factor.
- Estimated country roles change across VAR models.
- Network measures worsened downside forecasts.

Key metrics

Sovereign markets	7
Common-factor correlation	0.965
OOS forecasts (6 / 7 markets)	442 / 111
Six country Brier	0.2526 → 0.2799
Seven country Brier	0.2404 → 0.2685

Why it matters

Connectedness reveals shared market risk without necessarily improving forecasts. Measuring risk is not the same as predicting it.

Sovereign bond dependence changes through time

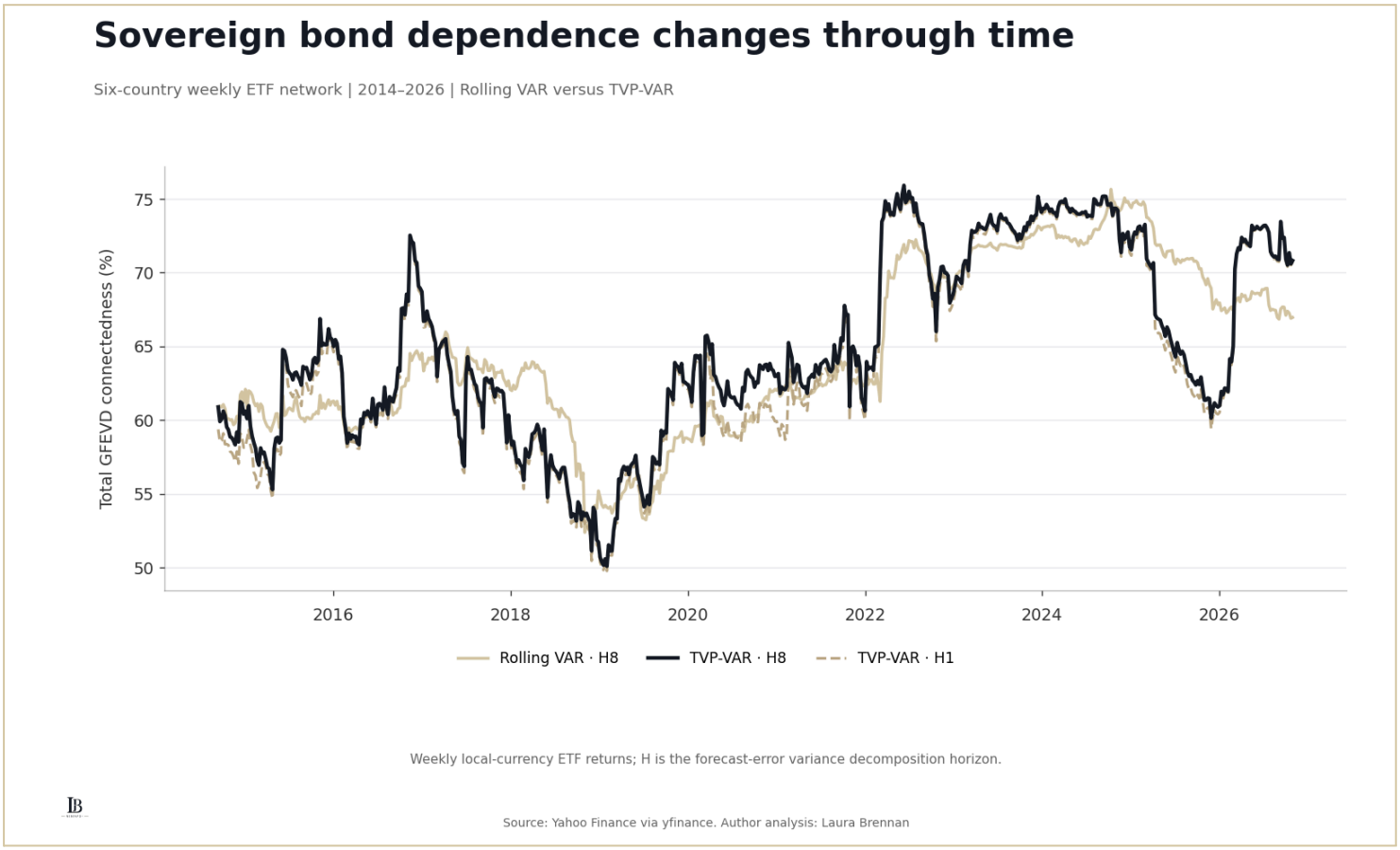


Figure 1. Dynamic total GFEVD connectedness across six sovereign bond markets, 2014–2026, using rolling VAR and TVP-VAR specifications.

Sovereign bond connectedness is not constant. Across six markets, estimated dependence declines during 2018–2019, rises sharply in 2022 and remains elevated through much of 2025 before falling and subsequently rebounding in 2026. The TVP-VAR responds differently to changing conditions than the rolling VAR, while its one- and eight-week connectedness estimates remain closely aligned. These movements describe changing market dependence, not necessarily causal transmission or advance warning of future losses.

A seven-country view of global sovereign dependence

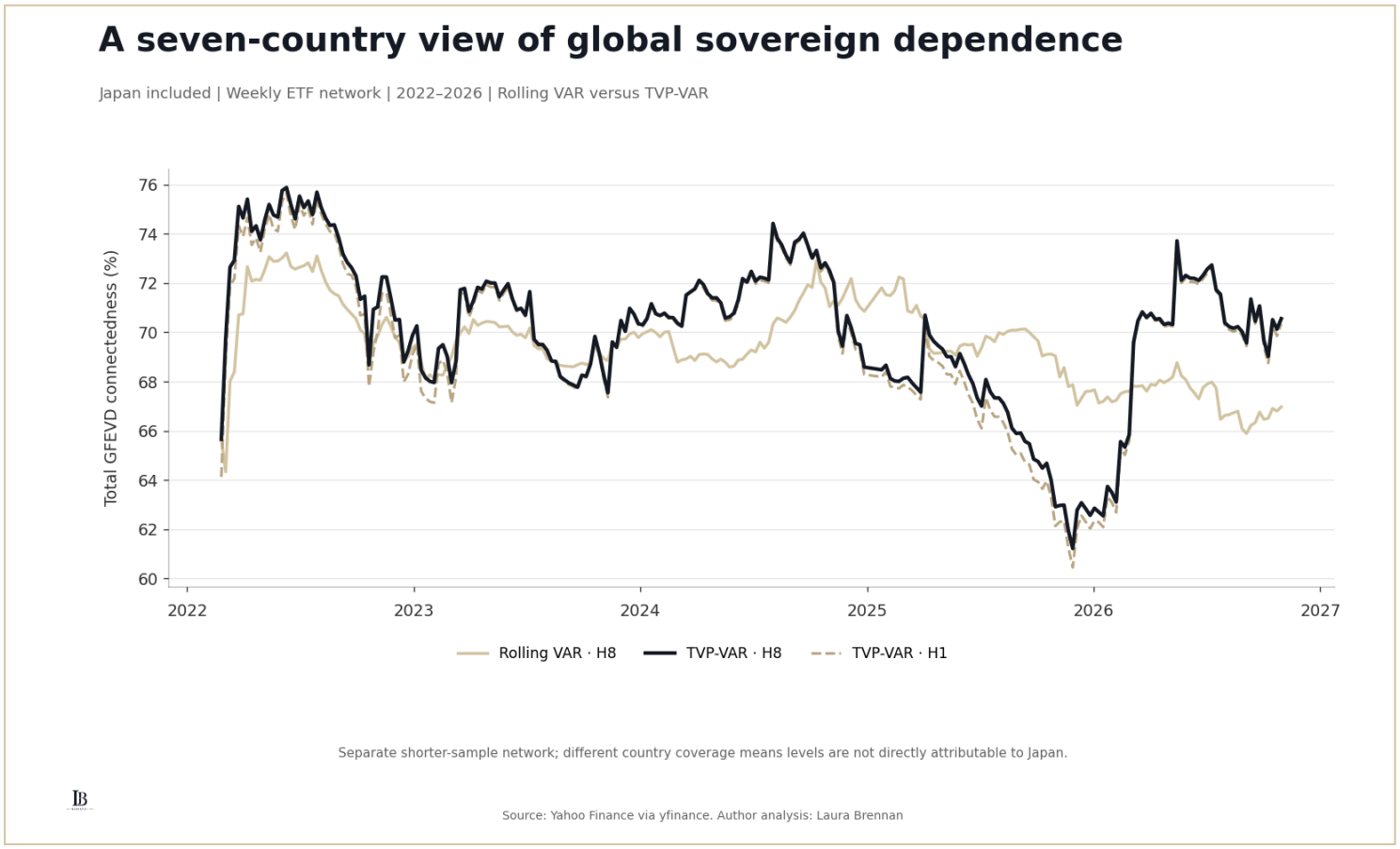


Figure 2. Dynamic total GFEVD connectedness across seven sovereign bond markets, 2022–2026, including Japan, using rolling VAR and TVP-VAR specifications.

The seven-country analysis extends the network to Japan while using a shorter historical sample. Connectedness is elevated in 2022, fluctuates through 2023–2024, then declines during 2025 before recovering sharply in 2026. The TVP-VAR captures these changes more rapidly than the rolling VAR, particularly during the decline and subsequent rebound. However, differences between the six- and seven-country estimates reflect both sample coverage and network composition. They cannot be attributed to Japan alone, nor do they establish causal transmission between sovereign markets.

A common bond factor closely tracks connectedness

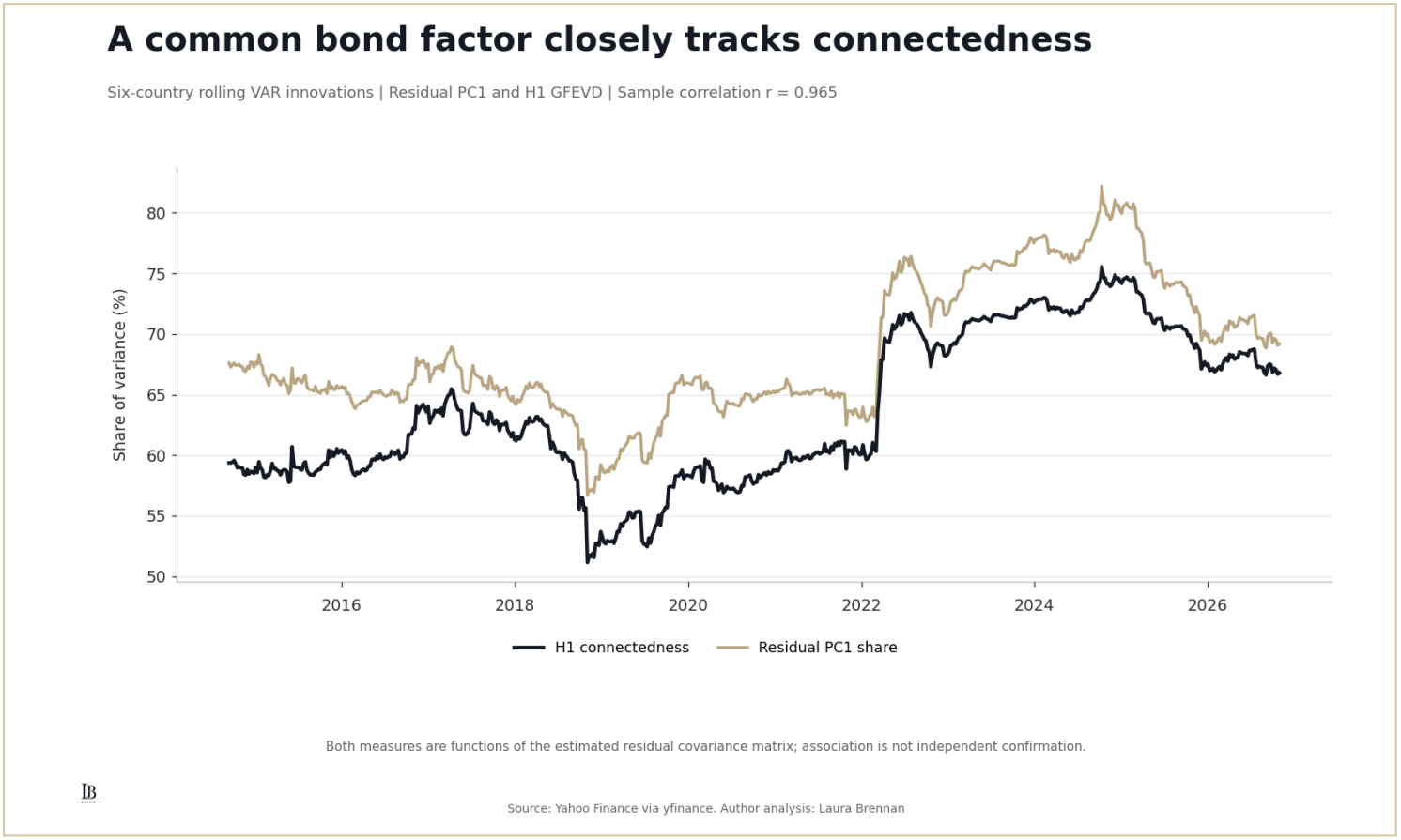


Figure 3. Residual PC1 variance share and one-step GFEVD connectedness across six sovereign bond markets, 2014–2026.

The two measures move closely together, with a correlation of 0.965. Both decline during 2018–2019, rise sharply in 2022 and subsequently moderate. This strong relationship reflects their shared dependence on the estimated residual covariance matrix. One-step connectedness primarily captures contemporaneous market dependence rather than lagged shock propagation. The results therefore suggest that much of the measured connectedness reflects common sovereign bond-market movements, not independently identified contagion. High connectedness alone does not establish whether future losses can be predicted.

The strongest sovereign-bond links span multiple markets

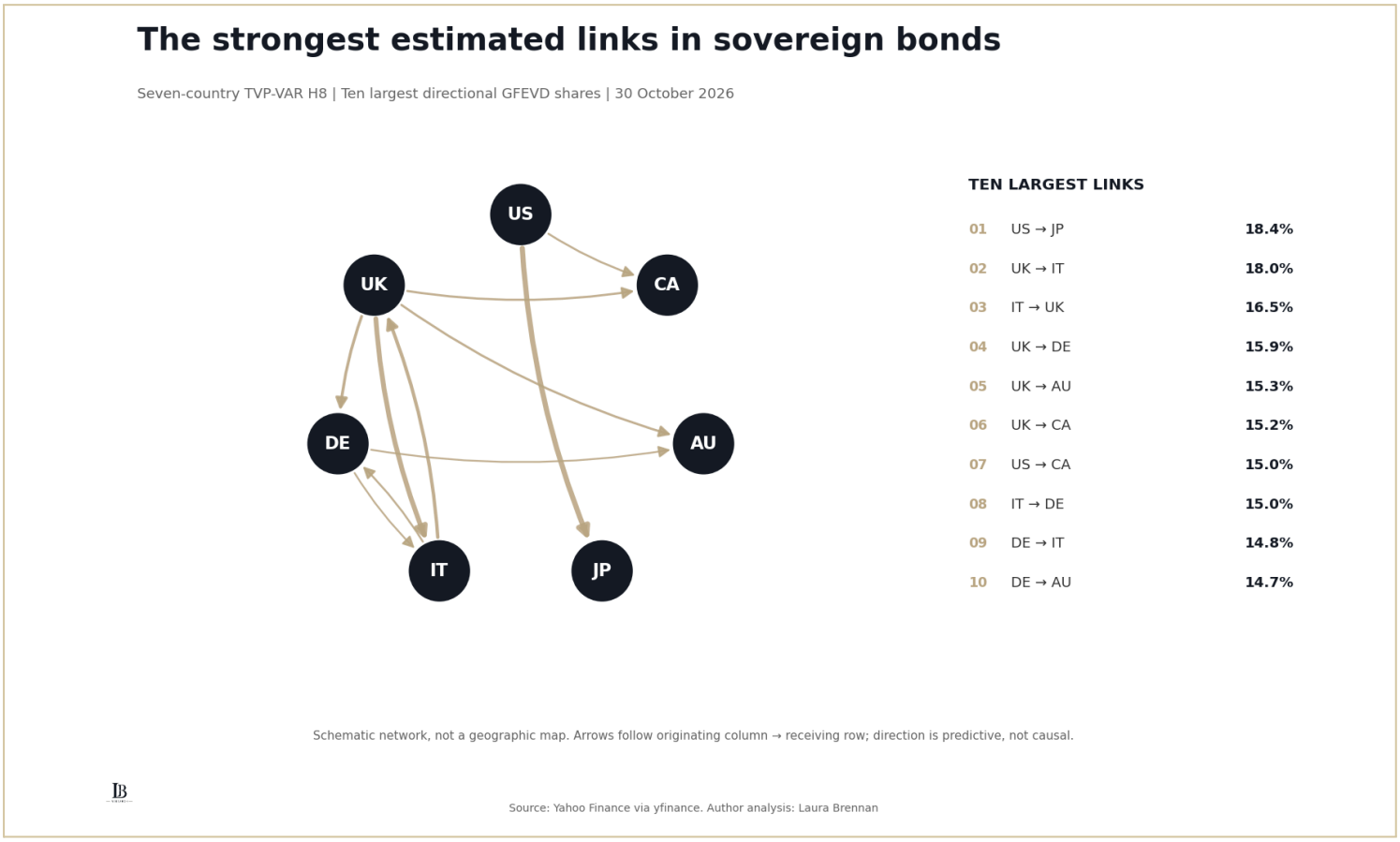


Figure 4. Ten largest estimated directional GFEVD links in the seven-country sovereign-bond network, using the TVP-VAR H8 specification as of 30 October 2026.

The strongest estimated directional links span several sovereign bond markets, with US → JP (18.4%), UK → IT (18.0%) and IT → UK (16.5%) among the largest. The UK appears repeatedly among these relationships, suggesting a prominent position in the displayed network. However, these arrows summarise directional forecast-error variance shares within the model, not causal spillovers or guaranteed transmission channels. The figure is therefore best read as a snapshot of the strongest estimated sovereign-bond relationships at this date.

Country roles depend on the estimation method

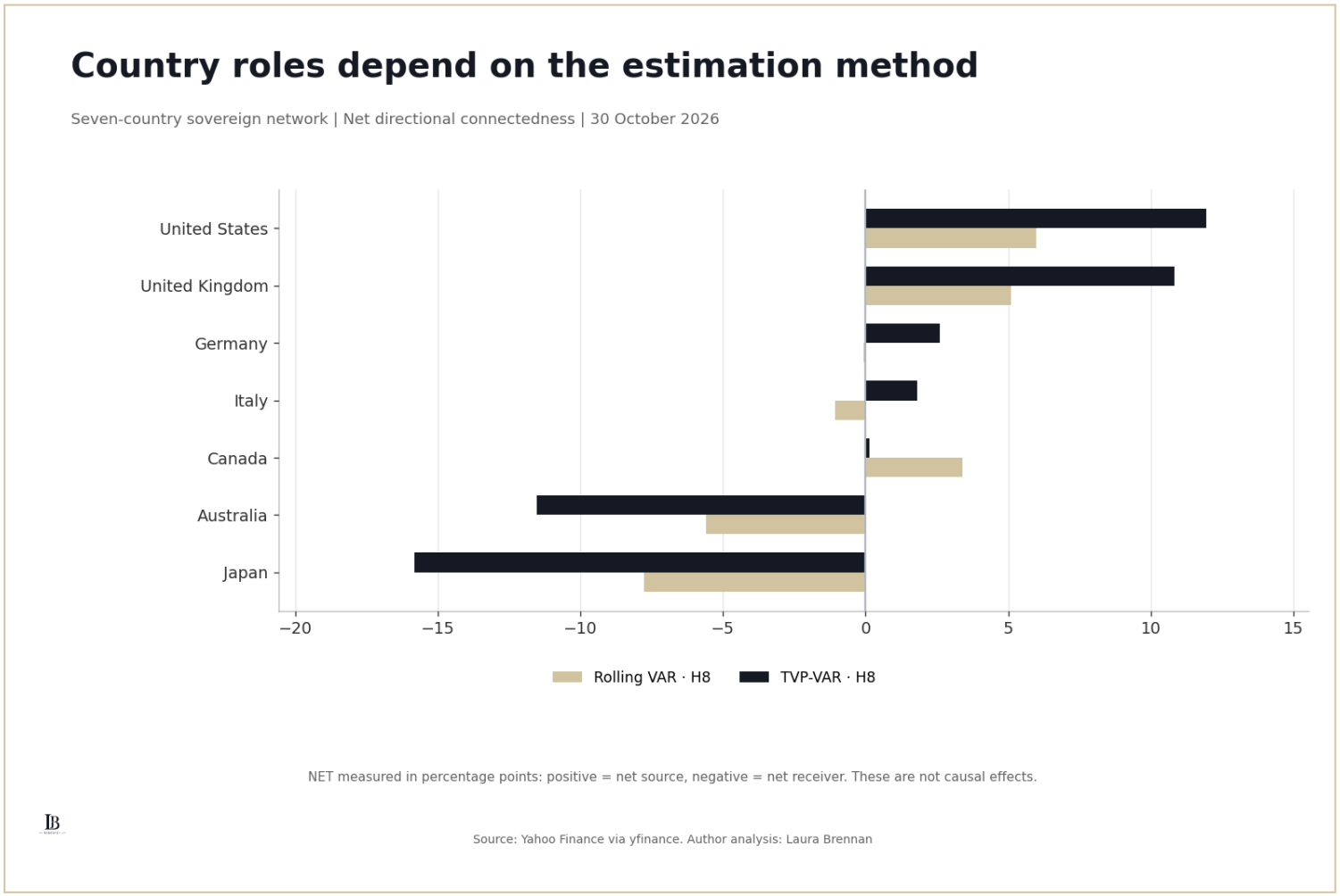


Figure 5. Estimated net directional GFEVD connectedness across seven sovereign bond markets, comparing rolling VAR and TVP-VAR H8 specifications as of 30 October 2026.

Estimated country roles differ substantially between the two models. Under TVP-VAR, the United States and United Kingdom emerge as stronger net transmitters, while Japan and Australia become more pronounced net receivers. Japan's net connectedness shifts from −7.8 to −15.8 percentage points, while the United States rises from +6.0 to +12.0. Canada moves from a positive net position towards zero. These differences demonstrate that directional connectedness is sensitive to the estimation framework. Countries identified as transmitters or receivers under one specification may occupy different positions under another. Such rankings describe model-based relationships, not causal influence or reliable forecasts of future market stress.

Added network measures worsened downside forecasts

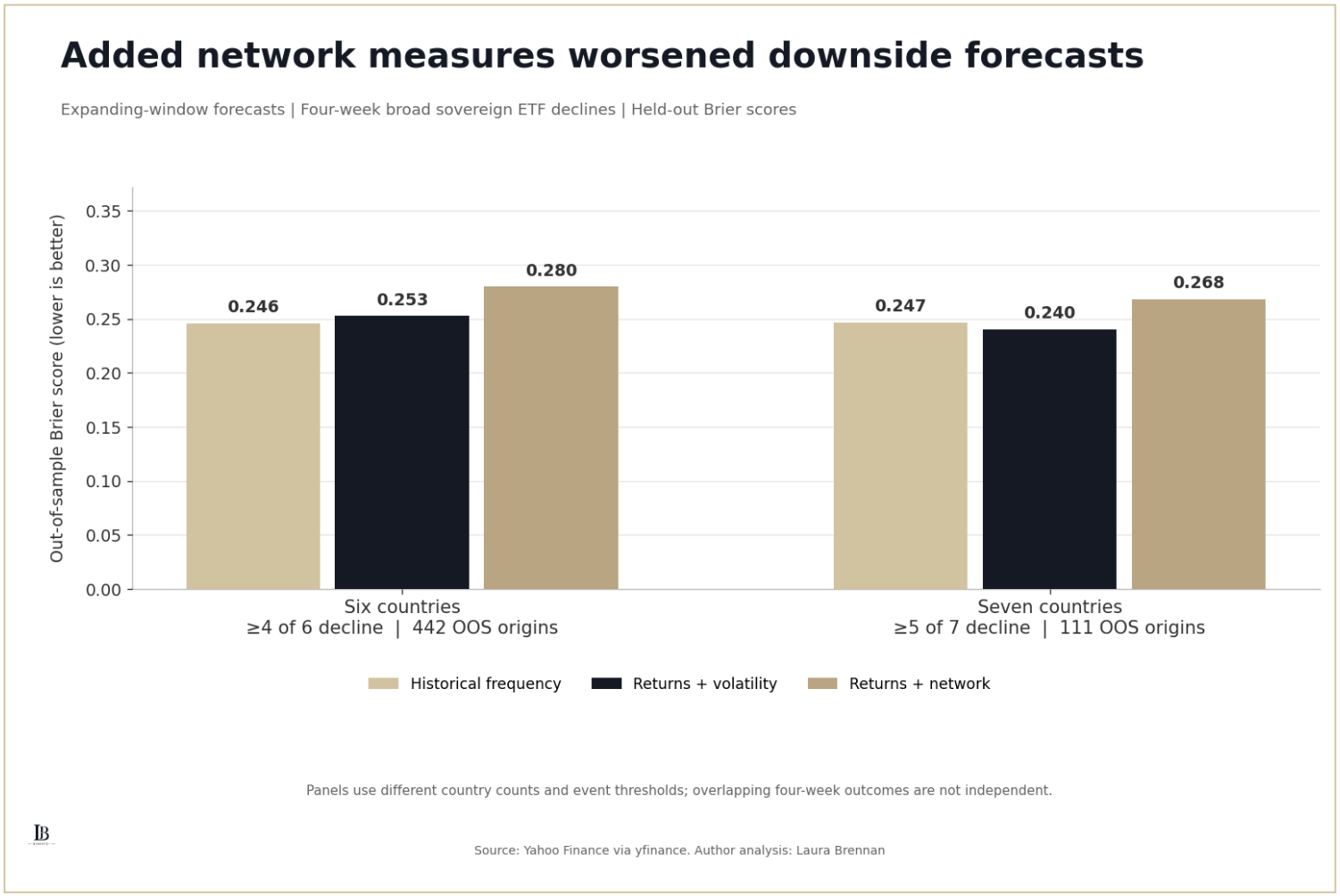


Figure 6. Out-of-sample Brier scores for four-week sovereign bond declines across six and seven markets, comparing historical frequency, returns and volatility, and rolling-VAR network models. Lower scores indicate better forecasts.

Adding network measures worsened four-week downside forecasts in both samples. Across 442 six-country forecasts, the Brier score increased from 0.2526 to 0.2799. The seven-country model showed similar deterioration, from 0.2404 to 0.2685 across 111 forecasts. In the longer sample, historical event frequency outperformed the more complex models. These tests evaluate rolling-VAR network predictors, not TVP-VAR forecasting performance. Despite substantial international connectedness, network information did not improve the tested forecasts. Measuring market dependence is not the same as predicting future losses.

Methodology

Data

Sample period

Six-country panel: September 2012 to October 2026, with 729 complete weekly observations.

Seven-country panel: March 2020 to October 2026, with 346 complete weekly observations.

Universe

Government bond ETFs covering the US, UK, Germany, Italy, Canada and Australia, with Japan included in the shorter panel.

Return construction

Weekly log returns from adjusted ETF prices in local quote currencies. Missing observations are not filled.

Primary downside outcome

At least four of six, or five of seven, markets decline over the following four weeks.

Data source

Yahoo Finance, accessed through yfinance, through 30 October 2026.

ETFs are sovereign bond proxies, not maturity-matched yields.

Dynamic connectedness estimation

Rolling VAR benchmark

A VAR(1) model is estimated using rolling 104-week windows, with 156-week windows used for sensitivity testing. Generalised forecast-error variance decompositions (GFEVD) measure dependence across sovereign markets.

Time-varying estimation

A TVP-VAR(1) allows model coefficients and residual covariance to change over time. Kalman-filter estimation is initialised using 104 weeks of historical observations. Baseline forgetting factors are 0.99 for coefficients and 0.96 for covariance.

Connectedness measures

Five measures are examined:

- **Total connectedness** - overall cross-market dependence.
- **Directional TO** - contributions to other markets.
- **Directional FROM** - contributions received from other markets.
- **NET connectedness** - TO minus FROM.
- **Pairwise connectedness** - directional differences between market pairs.

Forecast horizons

GFEVD measures are calculated over one- and eight-week horizons. One-step connectedness reflects residual covariance; longer horizons additionally incorporate lagged dynamic**s.**

Interpretation

Directional connectedness describes forecast-error variance relationships, not independently identified causal transmission.

Forecast evaluation and robustness

Downside measure

A broad decline occurs when at least four of six, or five of seven, sovereign bond markets fall over the following four weeks.

Forecast models

Five specifications are compared:

- Historical event-frequency baseline
- Returns and realised volatility
- Returns, volatility and H1 connectedness
- Returns, volatility and H8 connectedness
- Returns, volatility and H8 network structure

Out-of-sample evaluation

Expanding-window testing produces 442 six-country and 111 seven-country forecasts. Only matured outcomes enter training. Performance is assessed using Brier scores, log loss and AUC.

Point-in-time controls

Models use identical evaluation dates within each panel. Missing returns are not filled, and future information is excluded.

Robustness testing

Paired 95% block-bootstrap intervals use 4-, 8- and 13-week blocks. Overlapping outcomes limit inference. Forecasts use rolling-VAR measures; TVP-VAR results are descriptive.

Research workflow

Step	Description
Data	Adjusted prices for seven sovereign bond ETFs
Weekly observations	Local-currency log returns; missing data retained
Sample construction	Six-country long panel and seven-country panel
Rolling VAR	VAR(1), 104-week windows; 156-week sensitivity
TVP-VAR	Kalman filtering with time-varying parameters
Variance decomposition	Generalised FEVD at H1 and H8
Connectedness	Total, directional, net and pairwise measures
Common factor	Residual PC1 compared with H1 connectedness
Network analysis	Directional links and country roles
Sensitivity	Alternative parameters and influential observations
Downside outcome	Broad four-week sovereign bond declines
Forecast models	Historical frequency, returns, volatility and network measures
Out-of-sample testing	442 six-country and 111 seven-country forecasts
Forecast accuracy	Brier score, log loss and AUC
Uncertainty	Paired bootstrap with 4-, 8- and 13-week blocks

Interpretation

Sovereign markets exhibit substantial shared dependence, but network measures did not improve the tested downside forecasts.

Research implications

The evidence shows that global sovereign bond markets exhibit substantial connectedness, but these relationships do not necessarily provide useful advance warning of future losses.

Key observations

- Sovereign bond connectedness changes substantially through time.
- The common bond factor closely tracks connectedness ($r = 0.965$).
- Much of aggregate connectedness reflects shared residual dependence.
- Estimated transmitter and receiver roles vary across VAR specifications.
- The strongest directional links involve a limited number of country pairs.
- Across 442 and 111 out-of-sample forecasts, adding network measures worsened forecasting accuracy.
- Bootstrap tests do not establish reliable incremental predictive gains.

Together, these findings distinguish financial interconnectedness from predictive usefulness. A network can identify shared market dependence and changing directional relationships without reliably anticipating subsequent declines.

For portfolio managers, connectedness provides information about market structure, but should not automatically be treated as an early-warning indicator. The relevant question is whether network measures improve forecasts beyond information already available. In these tests, that additional value was not demonstrated.

References

Data

Yahoo Finance, accessed through yfinance.

Government bond ETFs: IDTM.L, IGLT.L, IS0L.DE, IITB.MI, XGB.TO, IGB.AX and 2561.T.

Weekly market data through 30 October 2026.

Methodology

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Software

Python, pandas, NumPy, scikit-learn, statsmodels, NetworkX, matplotlib and yfinance.

VAR estimation, dynamic connectedness, forecasting and bootstrap analysis conducted in Python.

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