

Financial Market Stress: Measuring Spillover Effects Across Countries

James MacDonald
Advised by Julieta Yung, Ph.D.

What is Financial Stress?

Financial stress does not have a single, clear definition, but has commonly agreed upon ways in which it manifests itself in market data.

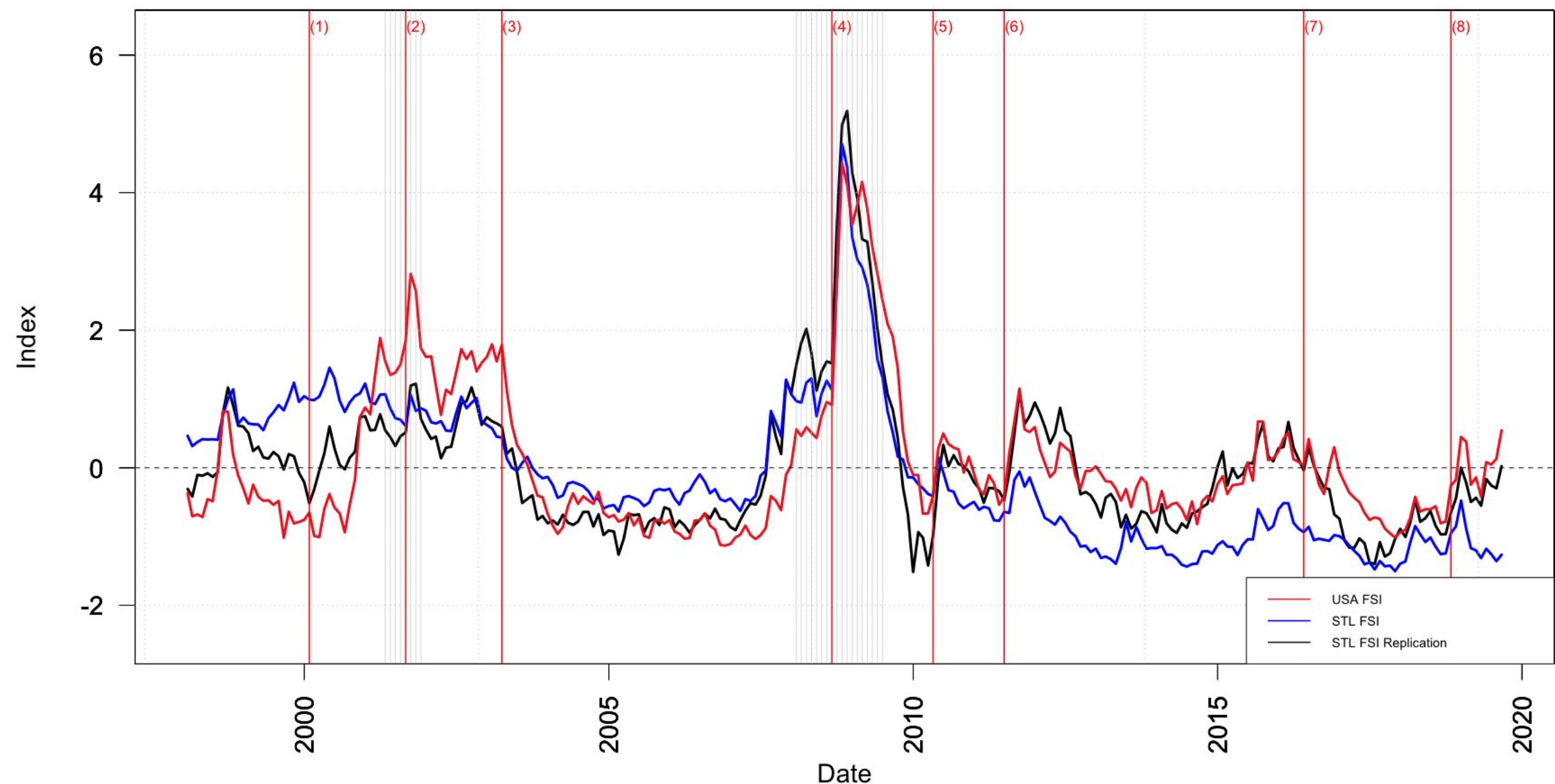
How to Measure Financial Stress?

- Machine Learning: Principal Component Analysis (PCA)
- Creation of Financial Stress Indexes (FSI)

What I Do:

- Replicate the St. Louis Financial Stress Index (STLFSI)
- Create my own index for 5 countries
- Investigate spillover effects between measured levels of stress

Comparing United States Financial Stress Indexes

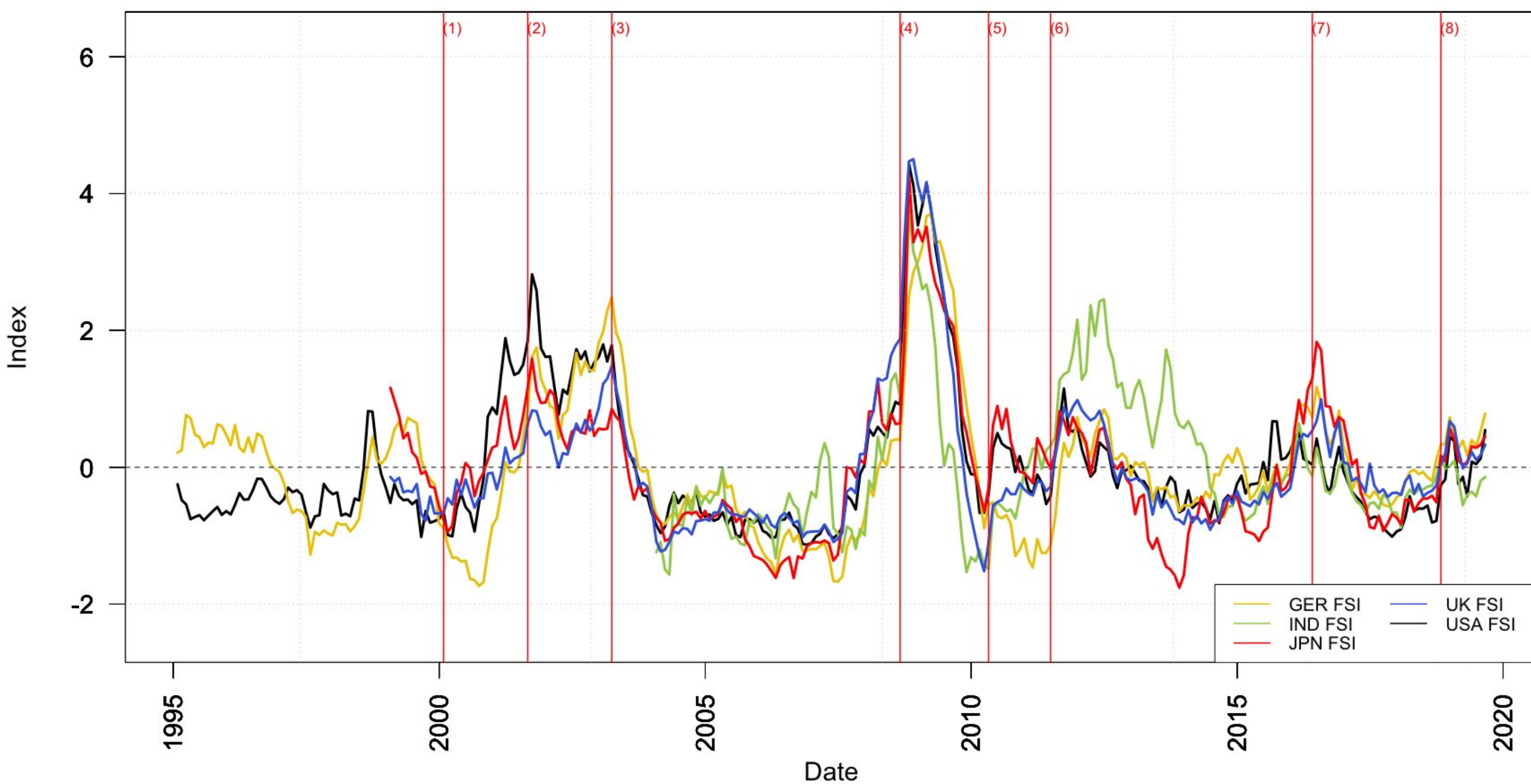


A Consistent International Approach

Financial Stress Index Variables Across Country Index Datasets

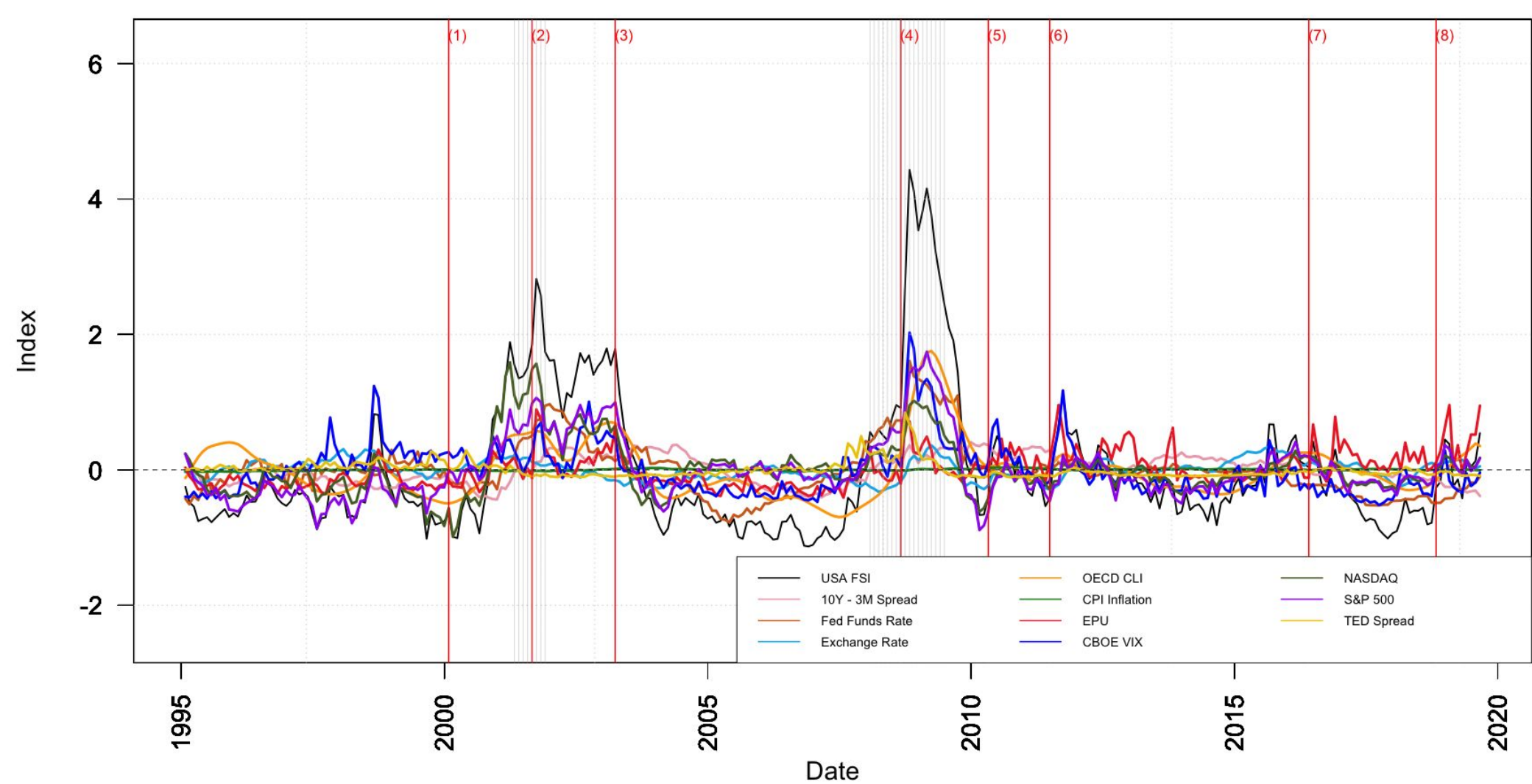
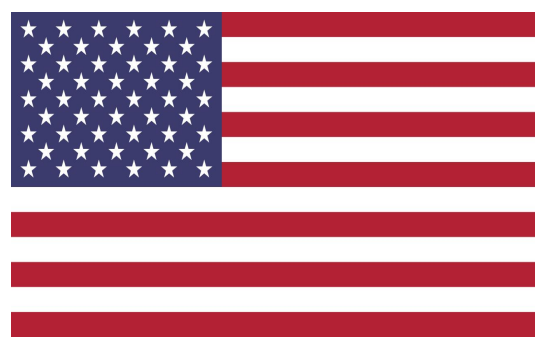
Data Type	United States USA FSI	Germany GER FSI	India IND FSI	Japan JPN FSI	United Kingdom UK FSI
Consumer Price Level Inflation Rate	✓	✓	✓	✓	✓
Economic Policy Uncertainty Index	✓	✓	✓	✓	✓
Fed Funds or Equivalent	✓	✓	✓	✓	✓
OECD Composite Leading Indicator	✓	✓	✓	✓	✓
Real Broad Effective Exchange Rate	✓	✓	✓	✓	✓
Stock Index One	NASDAQ	DAX	BSE Sensex	NIKKEI 225	FTSE 100
Stock Index Two	S&P 500	MDAX	NSE 50	TOPIX	FTSE All Share
Ten-Year Minus Three Month Treasury	✓	✓	✓	✓	✓
TED Spread or Equivalent	✓	✓	✓	✓	✓
CBOE Volatility Index (VIX) or Equivalent	✓	NA	NA	✓	NA

National Financial Stress Indexes Together

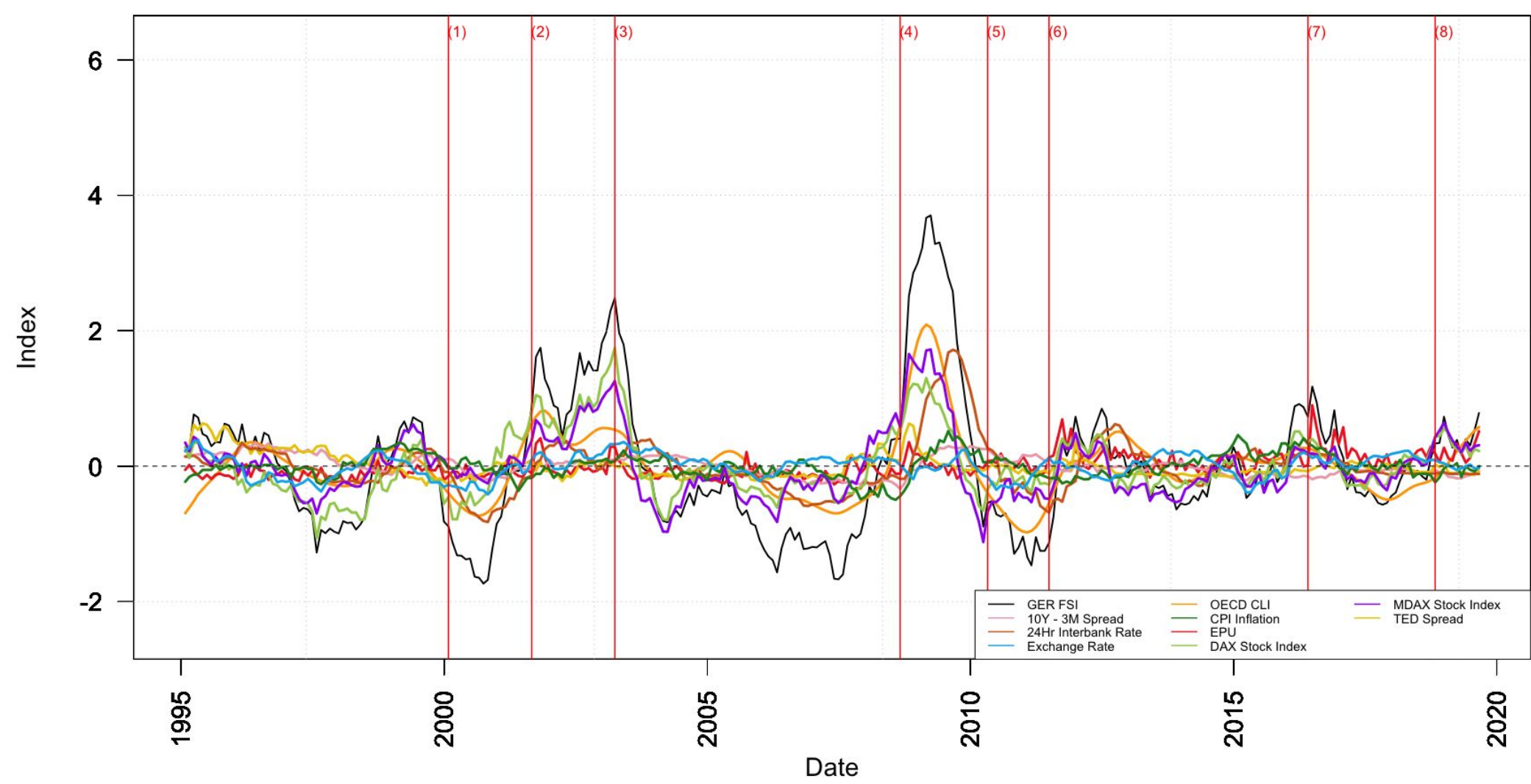


Financial Stress Indexes

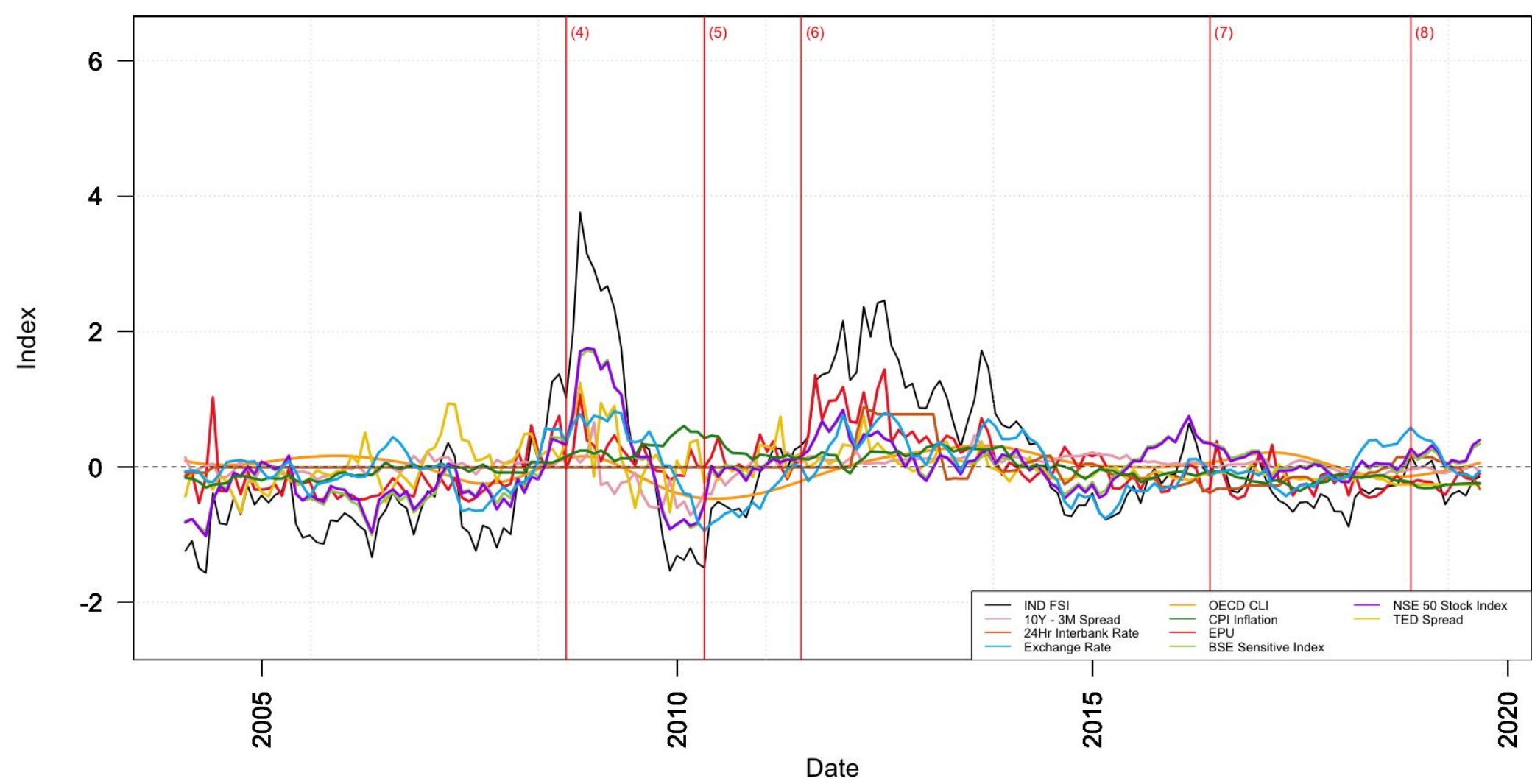
United States



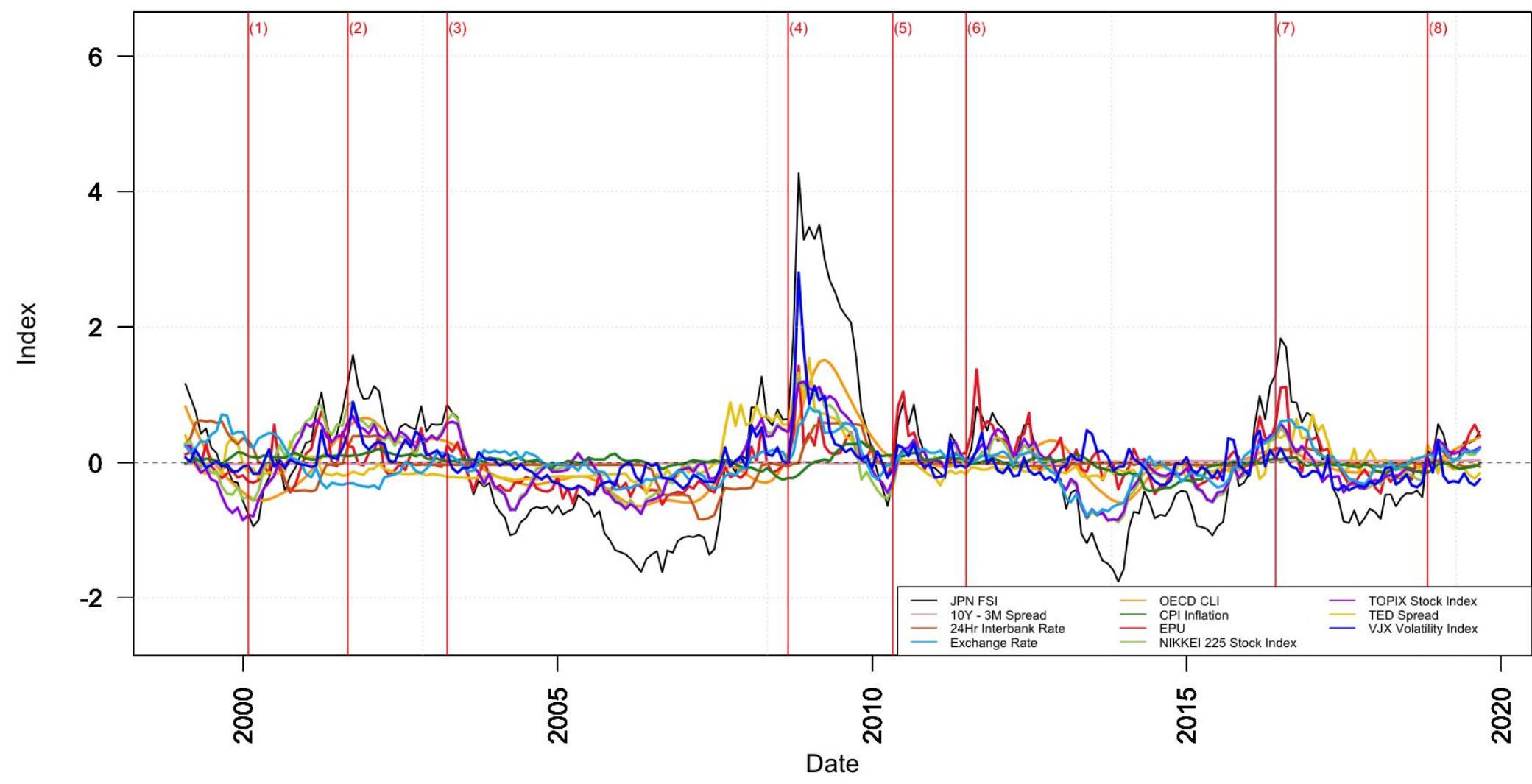
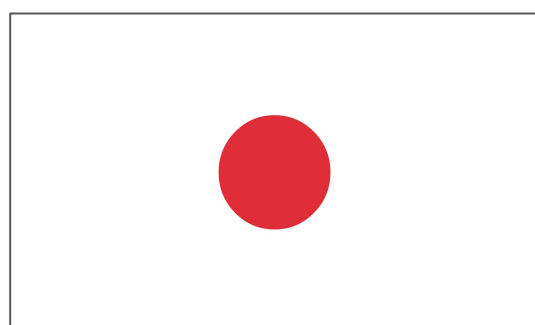
Germany



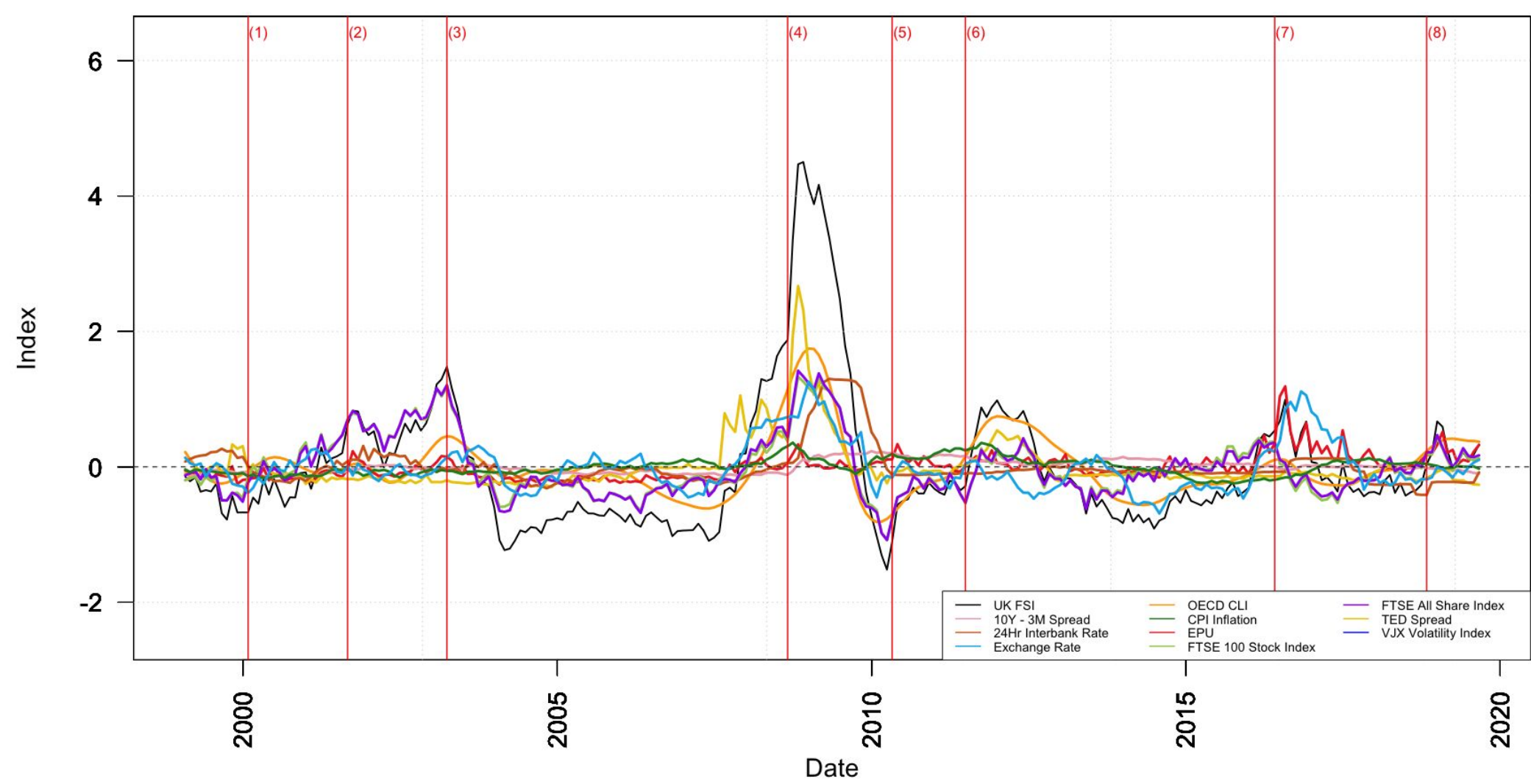
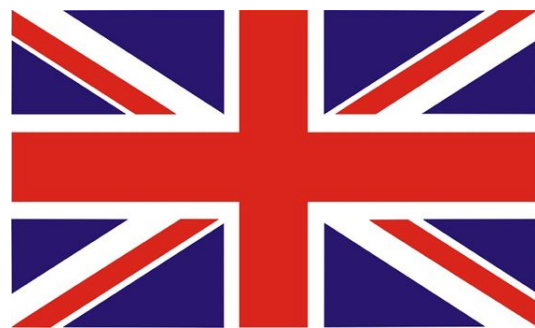
India



Japan



United Kingdom



How to Measure Spillover?

Diebold and Yilmaz (2009) Methodology

- VAR(2) on all FSI
- Forecast Error Variance Decomposition (FEVD) looking 3 months ahead
- Construct spillover table with FEVD averages for all possible data orders
- Produce a spillover index (SOI) with a 40 month rolling window.

FSI Spillover Table

	GER FSI	IND FSI	JPN FSI	UK FSI	USA FSI	From Others
GER FSI	47.46	5.56	9.82	21.40	15.78	52.56
IND FSI	7.37	64.35	5.54	14.41	8.33	35.65
JPN FSI	9.76	5.01	52.57	17.86	15.10	47.73
UK FSI	13.22	5.55	10.91	54.97	15.34	45.03
USA FSI	12.96	4.87	11.48	20.06	50.62	49.38
To Others	43.30	20.99	37.76	73.74	54.56	
Net	-9.25	-14.67	-9.97	28.71	5.18	SOI = 11.52

Spillover Over Time

SOI with a 40 month rolling window:



Conclusion

Financial stress measures have been increasing since 2017.

Conversely, spillover measures have been declining over that same period.

Thus, to gauge the health of the global financial system, both FSIs and SOI must be analyzed together to capture vulnerability of shocks to spread across markets.