OFFICE OF FINANCIAL RESEARCH

The OFR Financial Stress Index (FSI)

Financial Research Advisory Committee Meeting
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Summary

The OFR Financial Stress Index (FSI) is a daily, market-based snapshot of stress in global financial markets. The index can be decomposed into contributions along various asset classes and markets.

Relative to other FSIs, the OFR FSI is distinguished by its global scope, daily frequency, dynamic weighting scheme, transparent and methodical construction, and decomposition into stress categories and economy types.

Statistical analysis shows that higher values of the OFR FSI are associated with increased likelihood of being in stress and higher values of the OFR FSI predict decreases in overall economic activity.

The OFR FSI complements other monitoring products intended to fulfill OFR's financial stability monitoring mandate.

The OFR FSI conveys information about realizations of shocks and their effects on stress.

The OFR Financial Stability Monitor concerns vulnerabilities that can exacerbate stress when market events occur.

Why an FSI?

- **Financial stress refers to breakdowns in the normal functioning of markets.**

- **Financial stress**
  - can precede reductions in economic activity; accurately measuring financial stress is important to policymakers
  - is unobserved, so it must be estimated

- **An FSI measures some combination of common symptoms of financial stress:**
  - uncertainty about the fundamental value of assets or the behavior of investors, which can lead to increased volatility
  - increased information asymmetries, which can lead to problems of adverse selection or moral hazard and affect asset valuations and liquidity
  - decreased willingness to hold risky or illiquid assets because of changes in preferences or sudden decreases in risk appetite

- **FSIs complement other systemic risk indicators, such as conditional value-at-risk and systemic expected shortfall**

Why an OFR FSI? Methodological Features

- **Variable Selection**
  - Survey of the literature to obtain candidate variables
  - Variables must have at least daily frequency and reflect financial stress in a timely manner
  - Sufficient history (back to at least 2001)
  - Balance across asset classes, markets, and economy types
  - Subject to a quantitative test for redundant information

- **Variable Aggregation: Dynamic PCA**
  - Use previous 500 trading days of data to estimate the first loading vector from a constrained principal components analysis (PCA)
  - Standardize today's data to entire previous history
  - The OFR FSI is the scalar projection of today's standardized data onto the first loading vector

Why an OFR FSI? Methodological Features

- The OFR FSI's value depends on the size of market shocks and the recent relationships among variables, which interact to produce a set of marginal contributions of each variable to financial stress

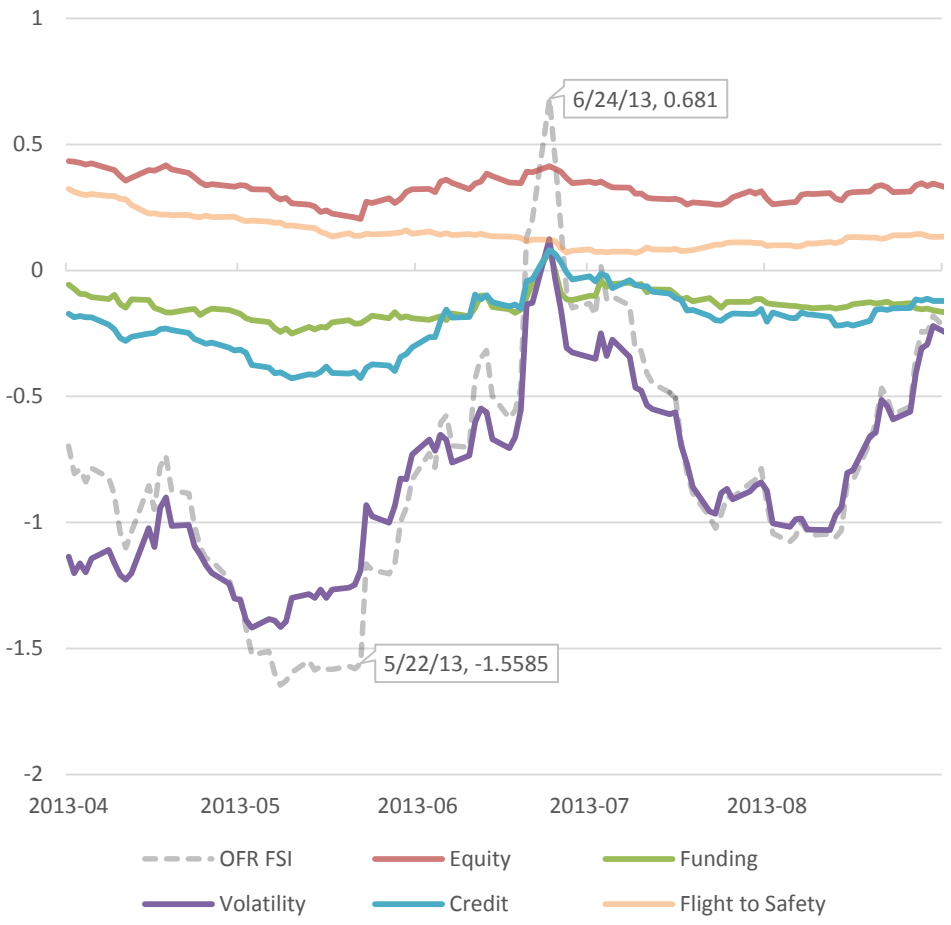
- The OFR FSI is positive when positive contributions to financial stress exceed negative contributions. The index is near zero when market variables are near their long-run average or when their degree of co-movement is atypical of stress events

Why an OFR FSI? Components

				Components on June 30, 2017 Marginal Contribution	Subtotal
Credit	In times of stress, credit spreads may widen due to increased default risk, dislocations in credit markets or valuation pressures therein, or increased information asymmetries.	BaML Corporate Master (IG) (OAS)	US	-0.120	
		BaML High Yield Corporate Master (HY) (OAS)	US	-0.175	
		BaML Euro Area Corp Bond Index (OAS)	AE	-0.242	
		BaML Euro Area High Yield Bond Index (OAS)	AE	0.018	
		BaML Japan Corporate (OAS)	AE	0.000	
		JPMorgan CEMBI Strip Spread	EM	-0.054	
		JPMorgan EMBI Global Strip Spread	EM	-0.127	-0.700
Equity Valuation	In times of stress, measures of equity valuation may fall during a flight to safety as investors are less willing to hold risky assets.	MSCI Emerging Markets Index (P/B Ratio)	EM	-0.041	
		MSCI Europe Index (P/B Ratio)	AE	0.079	
		NIKKEI 225 Index (P/B Ratio)	AE	-0.047	
		S&P 500 Index (P/B Ratio)	US	-0.087	-0.096
Funding	Required for institutions to fulfill their roles in maturity transformation and credit intermediation. In times of stress, funding markets can seize due to increased perceptions of counterparty risk and liquidity risk.	2-Year EUR/USD Cross-Currency Swap Spread	US, AE	-0.026	
		2-Year US Swap Spread	US	0.149	
		2-Year USD/JPY Cross-Currency Swap Spread	US, AE	0.052	
		3-Month EURIBOR - EONIA	AE	-0.151	
		3-Month Japanese LIBOR - OIS	AE	-0.001	
		3-Month LIBOR - OIS	US	-0.001	0.022
Flight to Safety	Safe assets have reliably stable and predictable cash flows. In times of stress, a decreased willingness to hold risky or illiquid assets can lead to investor migration into these assets.	4-Week US Treasury Bill (yield)	US	0.044	
		10-Year US Treasury Note (yield)	US	0.109	
		10-Year German Bond (yield)	AE	-0.096	
		US Term Spread (yield)	US	-0.010	
		US Dollar Index (DXY)	US	0.003	
		Gold/USD Real Spot Exchange Rate	US, AE, EM	-0.067	-0.017
Volatility	In times of stress, increased uncertainty about asset values or investor behavior can precipitate attendant increases in volatility.	CBOE S&P 500 Volatility Index (VIX)	US	-0.224	
		Dow Jones EURO STOXX 50 Volatility Index (V2X)	AE	-0.183	
		ICE Brent Crude Oil Future (realized volatility)	US, AE, EM	-0.005	
		Implied Volatility on 6-Month EUR/USD Options	US, AE	-0.242	
		Implied Volatility on 6-Month USD/JPY Options	US, AE	-0.005	
		JPMorgan Emerging Market Volatility Index	AE	-0.189	
		Merrill Lynch Euro Swaptions Volatility Estimate	AE	-0.235	
		Merrill Lynch US Swaptions Volatility Estimate	US	-0.236	
		NIKKEI Volatility Index	AE	-0.235	-1.554
				OFR FSI	-2.345

Why an OFR FSI? Components

Use in monitoring: 2013 Taper Tantrum



Why an OFR FSI? Empirical Characteristics

- In relation to other FSIs, the OFR FSI is distinguished by its global scope, daily frequency, dynamic weighting scheme, transparent and methodical construction, and decomposition into stress categories and economy types

- Using dates of significant government intervention in financial markets as a proxy for financial stress events, logistic regression analysis shows that higher values of the OFR FSI are associated with a greater likelihood of being in a stressful period

- Granger noncausality analysis indicates higher values of the OFR FSI help predict decreases in the Chicago Fed National Activity Index (but not vice versa), suggesting that high levels of stress can lead to reductions in economy activity

Conclusion

The OFR FSI is a daily, market-based snapshot of stress in global financial markets that

- Distills information from multiple stress categories and economy types, offering insight into the drivers of financial stress
- Helps the OFR monitor, compare, and understand financial stress events
- Offers improvements on other FSIs
  - Decomposition into stress categories and economy types
  - Dynamic PCA allows for changes in cross-asset relationships

Statistical analysis shows higher values of the OFR FSI are associated with a greater likelihood of being in a stressful period

Questions for Discussion

- Global market variables with a daily frequency were chosen for the OFR FSI. Would you make any changes to our set of variables? In particular, the current list does not include variables related specifically to real estate. Should it? If so, which ones available on a daily frequency are worth monitoring?

- The OFR FSI uses a dynamic principal components methodology where the covariance matrix is sampled over a rolling window. We chose this method instead of more advanced techniques because it can be decomposed and it is relatively accessible to our stakeholders. Should we consider other techniques?

- Because of the global nature of the modern financial system, the OFR FSI includes variables from global financial markets, using closing values for the variables in each respective markets. Are there any significant problems or issues because world markets operate on different time schedules and our variables are not observed at precisely the same time? If so, how can such problems be reduced or eliminated?