Discussion

Seth Pruitt[1]

[1] Federal Reserve
Board of Governors

Financial Stress Indexes (FSI)

1. Cleveland FSI (CFSI)
2. IMF FSI
3. CISS

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   - market variables
   - empirical CDF
   - credit weight
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    - simple averages?
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3. CISS
   - market variables
   - empirical CDF
   - correlation and impact weight

CFSI and CISS

$$Y_t = \sum_{j}^{J} w_{jt} F_j(x_{jt})$$

	CFSI	CISS
J	11	15
w_{jt}	Credit in mkt. segment from flow of funds	Impact from quantile regression $\times$ time-varying correlation
F_j	emp. CDF of indicator x	emp. CDF of indicator x, possibly recursively estimated

Robustness of idea is nice – Hollo, Kremer and Lo Duca point out the reclassification problem and this appears to help

These Papers

- Oet, Bianco, Gramlich, Ong (JBF forth)
  - Early-warning system predicting CFSI
  - financial variables
- Christensen and Li (2013)
  - Early-warning system predicting IMF FSI
  - macro variables
- Hollo, Kremer, Lo Duca (2012)
  - Construct CISS
  - financial variables

I start with the EWS

Oet, Bianco, Gramlich, Ong: SAFE EWS

- Key idea: imbalances
- Different models
  - identify stresses accumulating to act (long-lag model)
  - predict near-term (short-lag model)
- Brings to forefront idea of policy endogeneity
  - Can confound any prediction exercise
- A lot going on in paper
  - I may have gotten lost somewhere in the middle

Oet, Bianco, Gramlich, Ong: SAFE EWS

Short-lag model

$$Y_t = \sum_{k=1}^{7} \beta_{S,k} SL_{kt} + \left(1 - \sum_{k=1}^{7} \beta_{S,k}\right) SL_{8t}$$

Long-lag model

$$Y_t = \sum_{k=1}^{7} \beta_{L,k} LL_{kt} + \left(1 - \sum_{k=1}^{7} \beta_{L,k}\right) SL_{8t}$$

SL and LL from individual regressions selected using t-tests, Granger tests, collinearity statistics, and judgmental selection

A lot of work behind the scenes

Oet, Bianco, Gramlich, Ong: SAFE EWS

A concern I have – SL_j (or LL_j) contain intersecting subsets of variables

$$
\begin{aligned}
Y_t &= a_0 + a_1 X_{1t} & &\rightarrow \hat{Y}_{at} \\
Y_t &= b_0 + b_1 X_{1t} + b_2 X_{2t} & &\rightarrow \hat{Y}_{bt}
\end{aligned}
$$

Oet, Bianco, Gramlich, Ong: SAFE EWS

A concern I have – SL_j (or LL_j) contain intersecting subsets of variables

$$Y_t = a_0 + a_1 X_{1t} \qquad \rightarrow \hat{Y}_{at}$$

$$Y_t = b_0 + b_1 X_{1t} + b_2 X_{2t} \qquad \rightarrow \hat{Y}_{bt}$$

$$Y_t = w\hat{Y}_{at} + (1-w)\hat{Y}_{bt} \qquad \rightarrow Y_t - \hat{Y}_{bt} = w(\hat{Y}_{at} - \hat{Y}_{bt})$$

$$\downarrow$$

$$\hat{w} \approx 0 \qquad \rightarrow \text{encompassing like Todd Clark works on}$$

So probably these SL_j don't contain exactly the same variables, due to different lag choices?

Oet, Bianco, Gramlich, Ong: SAFE EWS

Equity imbalances: "increase in real equity should be positively related to systemic financial stress"

- A volatility paradox like Brunnermeier and Sannikov?
- If value ratio: past positive returns push up and therefore expected future returns lower

Liquidity imbalances: "asset liability mismatch will positively reflect greater systemic risk"

- greater roll-over risk – clear
- but also indicating greater ability to perform core financial intermediation?

Christiansen and Li: EWS

- Key idea: probability forecast
- Convert variables to indicator variables
- Brings to forefront idea of prediction
- Paper a work in progress
  - Some things to clarify

Christiansen and Li: EWS

Use the IMF FSI for nation j.

High-stress event H is

$$H_{jt} = \begin{cases} 1 & Y_{jt} > \mu_j + 1.5\sigma_j \\ 0 & \text{otherwise} \end{cases}$$

Imminent even G is

$$G_{jt} = \begin{cases} 1 & H_{j,t+j} \text{ for any } j = 1, 2, 3, 4 \\ 0 & \text{otherwise} \end{cases}$$

Predict whether today is G using market variables X_{kjt}

Christiansen and Li: EWS

Market variable X_t (subsume j, k) is converted to signals in three ways

$$O_t = \begin{cases} 1 & X_t \notin (-X_O^*, X_O^*) \\ 0 & \text{otherwise} \end{cases}$$ Ordinary signal

$$M_t = \begin{cases} 1 & X_t \notin (-X_M^*, X_M^*) \text{ and } X_t \in (-X_E, X_E) \\ 0 & \text{otherwise} \end{cases}$$ Mild signal

$$E_t = \begin{cases} 1 & X_t \notin (-X_E, X_E) \\ 0 & \text{otherwise} \end{cases}$$ Extreme signal

Composite indicators constructed (subsume j)

$$I_{1t} = \sum_{k=1}^{n} O_{kt}$$

$$I_{2t} = \sum_{k=1}^{n} M_{kt} + E_{kt}$$

$$I_{3t} = \sum_{k=1}^{n} O_{kt} \frac{1}{\omega_k}$$ ω_j noise-to-signal ratio

Then convert to probability based on historical relationship

Christiansen and Li: EWS

Define noise-to-signal ratio

$$\omega = \frac{\text{CallWrong}}{\text{CallWrong} + \text{QuietCorrect}} \times \frac{\text{CallCorrect}}{\text{CallCorrect} + \text{QuietWrong}}.$$

Perfect signal $\rightarrow \omega = 0 \rightarrow \frac{1}{\omega} = \infty$: maybe not well-behaved

Instead, consider $y = x + e$ for independent x, e and x what you want to know. Try signal-to-noise ratio

$$\frac{Var(x)}{Var(x) + Var(e)} \in [0, 1]$$

So here

$$\frac{1}{\omega} = \frac{\text{CallCorrect} + \text{QuietCorrect}}{\text{CallCorrect} + \text{CallWrong} + \text{QuietCorrect} + \text{QuietWrong}}$$

Any difference?

Christiansen and Li: EWS

One criterion is $QPS = \frac{1}{T}\sum_t^T 2(\hat{I}_t - G_t)^2 \in [0, 2]$

Suppose $T = 100$

Event 6.25%/time separated by many periods $\rightarrow G_t = 1$ 25%/time

$P_t = 0 \rightarrow QPS = 0.5 \quad P_t = 1 \rightarrow QPS = 1.5 \quad P_t = 0.25 \rightarrow QPS = 0.38$

Event 1.25%/time separated by many periods $\rightarrow G_t = 1$ 5%/time

$P_t = 0 \rightarrow QPS = 0.1 \quad P_t = 1 \rightarrow QPS = 1.8 \quad P_t = 0.25 \rightarrow QPS = 0.095$

Point of comparison would help

Not about the glam-rock band from New York City

Hollo, Kremer and Lo Duca: CISS

- Key idea: correlation between indicators
- Brings to forefront idea of *widespread* or *contagious* financial conditions

Hollo, Kremer and Lo Duca: CISS

Overall index Y_t constructed from 5 subcomponents S_{it} which comprised of 3 inputs Z_{ijt}

- Z_{ijt} from empirical CDF of underlying variable X_{ijt}
  - Z is broad index of financial market segment
- $S_{it} = Z_{i1t} + Z_{i2t} + Z_{i3t}$
  - portfolio implication – Zs perfectly correlated

$$Y_t = \begin{bmatrix} w_{1t}S_{1t} & \cdots & w_{5t}S_{5t} \\ \vdots & \ddots & \vdots \\ w_{1t}S_{1t} & \cdots & w_{5t}S_{5t} \end{bmatrix} C_t \begin{bmatrix} w_{1t}S_{1t} & \cdots & w_{5t}S_{5t} \\ \vdots & \ddots & \vdots \\ w_{1t}S_{1t} & \cdots & w_{5t}S_{5t} \end{bmatrix}'$$

Hollo, Kremer and Lo Duca: CISS

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w_{it} is "real-impact" weight coming from lower-tail quantile regression of IP on Z_i

- Economic content being brought in
- Surprised these w are so similar
- In Giglio, Kelly, Pruitt, Qiao we find some stress indicators much more informative of median/tails of future economic activity

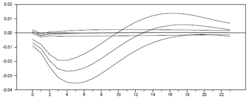
C_t is time-varying correlation matrix from exponentially-weighted moving-average

- Emphasizes *correlation* as key marker of stressful episodes

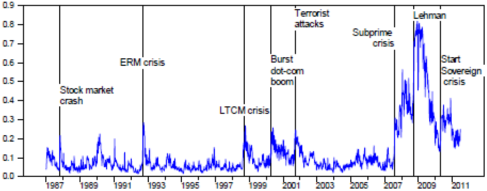
Hollo, Kremer and Lo Duca: CISS

Use Threshold VAR to analyze effect on IP during high- and low-stress times

- Idea that stress only matters sometimes
- Threshold value only breached in 2007 – all from recent episode



black solid line: IRF of high-regime; grey solid line: IRF of low-regime. IRFs with one std. dev. analytical error bands



- About nonlinear model/solutions like Krishnamurthy and He (2013) or Brunnermeier and Sannikov (2012)

Wrapping up

Systemic-risk / financial-stress / financial-stability / financial-fragility

- Oet, Bianco, Gramlich, Ong

  Systemic risk is a condition in which the observed movements of financial market components reach certain thresholds and persist

- Hollo, Kremer and Lo Duca

  Systemic risk can be defined as the risk that instability becomes so widespread within the financial system that it impairs its functioning to the point where economic growth and welfare suffer materially (de Bandt and Hartmann 2000).

  .

- Christiansen and Li – prediction is important

Elusive, and these are important efforts at narrowing in on the important mechanisms