Does Systemic Risk in the Financial Sector Predict Future Economic Downturns?

Linda Allen, Turan Bali, Yi Tang

Presentation by Professor Linda Allen

William F. Aldinger Chair in Banking & Finance

Baruch College Zicklin School of Business

The crisis has focused attention on systemic risk measurement

- Micro-level measures focus on the interrelationships across individual financial institutions.
  - For example: MES (Acharya et al. (2010), Co-Var (Adrian and Brunnermeier (2009))
- Macro-level measures focus on whether interbank externalities are substantial enough to threaten real macroeconomic conditions
- We need **both** approaches to accomplish systemic risk regulation
  - Individual bank (micro-level) systemic risks may be low, but collectively, the systemic risk of economic downturn is high, or vice versa.
  - The macro-level measure can be used to calibrate the micro-level systemic risk premium (tax) or limits.

A new macro-level measure of systemic risk, *CATFIN*

- Banks play a special role in the economy.
- During crises, banks curtail lending and hoard liquidity – contagious spread across financial markets.
- Increased bank risk taking increases economic uncertainty and reduces real investment activity.
- Macroeconomic conditions are impacted.
- Can we design a macro-level early warning system for systemic risk that will trigger micro-level interventions?
- *CATFIN* is an out-of-sample measure of the financial sector's catastrophic (tail) risk.
  - *CATFIN* is robust to methodology (VaR or ES approaches) and parametric (GPD and SGED) v. non-parametric estimation.

Preview of Results (1)

- *CATFIN* forecasts macroeconomic downturns into the future:
  - For US (1,025 bank returns): 6 months
  - Asia (1183 banks from 27 countries): 8 months
  - Europe (607 banks from 25 countries): 6 months

Preview of Results (2)

- The risk of macroeconomic downturns increases when the *aggregate* level of risk taking in the banking sector is high.
  - *CATFIN* is predictive of economic and financial uncertainty, aggregate bank lending, many macro variables (GDP, industrial prod., micro-systemic risk measures such as MES, DD, CTR).
- *CATFIN* is a measure of the *collective* catastrophic (tail) risk of the banking system that forecasts economic downturns almost a year later.
  - The collective risk of non-financial firms and "fake" banks have no predictive power. Banks are "special."
  - The collective risk of even small banks has predictive power so this is not just "Too Big To Fail."
  - Results are robust to inclusion of leverage, size, past returns and bank interconnectedness, other systemic risk measures.

The *CATFIN* measure of aggregate systemic risk for the financial sector.

- Value at Risk (VaR) Approaches
  - Generalized Pareto Distribution (GPD)
  - Skewed Generalized Error Distribution (SGED)
  - Non-parametric
  - Average (Principal Component Analysis)
- Expected Shortfall (ES) Approaches
  - Generalized Pareto Distribution (GPD)
  - Skewed Generalized Error Distribution (SGED)
  - Non-parametric
  - Average (Principal Component Analysis)

Predicting future economic downturns

- The Chicago Fed National Activity Index (CFNAI) is used to measure the aggregate U.S. economy
  - A weighted average of 85 existing monthly indicators of national economic activity, constructed to have zero mean and unity standard deviation
  - Positive (negative) index reading corresponds to growth above (below) trend
- CFNAI in month $t + n$ is regressed on *CATFIN* in month t

$$CFNAI_{t+n} = \alpha + \gamma CATFIN_t + \varepsilon_{t+n}.$$

  - γ is significantly negative at the 5% level up to 13 months ahead
  - Increase in *CATFIN* by one standard deviation i.e. 1.6345 predicts decrease in CFNAI by 0.4 (-0.7 in three-month moving average CFNAI denotes economic contraction)
  - GPD, SGED and NP measures also have statistically significant negative coefficient up to 13 months ahead

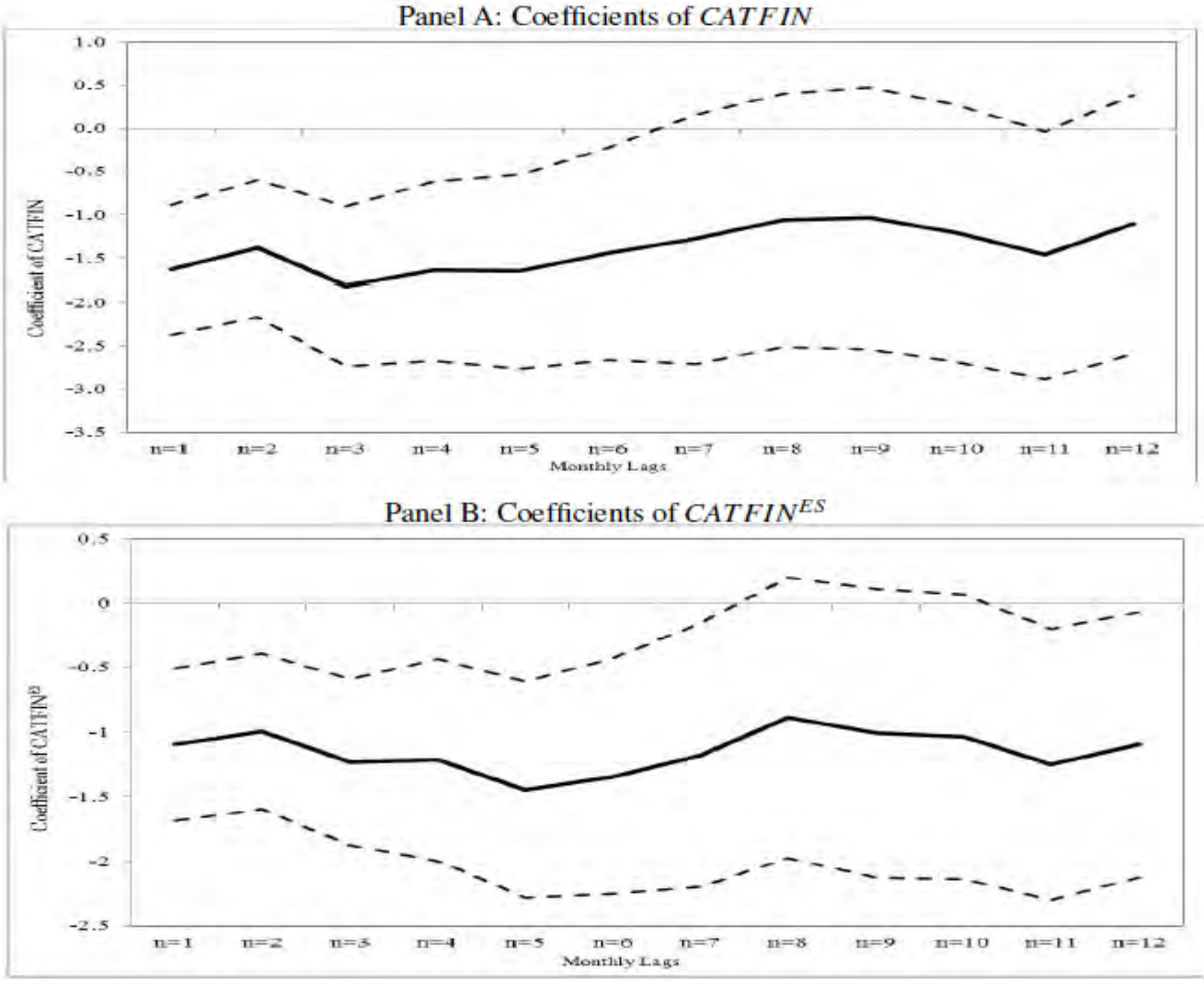


Figure 2. Predictive ability of *CATFIN* for the Chicago Fed National Activity Index (CFNAI). This figure depicts the coefficients of *CATFIN* (the upper panel) and $CATFIN^{ES}$ (the lower panel) from the predictive regressions: $CFNAI_{t+n} = \alpha + \gamma CATFIN_t / CATFIN_t^{ES} + \beta X_t + \sum_{i=1}^{12} \lambda_i CFNAI_{t-i+1} + \varepsilon_{t+n}$, where $CATFIN_t$ and $CATFIN_t^{ES}$ are, respectively, computed as the average of the 1% *VaR* measures and the average of the 1% expected shortfall (ES) measures, estimated from the GPD, the SGED, and the non parametric methods; X_t denotes a vector of control variables; the default spread (*DEF*)

Table 3: International CATFIN

European Union GDPt+n	CATFIN	Adj. R2	Asian countries CAT FIN	Adj. R2
n=1	-0.003***	96.68%	-0.002**	94.36%
	(-3.03)		(-2.11)	
n=2	-0.007***	85.96%	-0.006**	76.11%
	(-3.66)		(-2.08)	
n=3	-0.011***	66.1%	-0.010**	42.5%
	(-4.12)		(-2.06)	
n=4	-0.013***	51.12%	-0.012**	23.52%
	(-3.87)		(-1.99)	
n=5	-0.015***	39.6%	-0.013**	13.88%
	(-3.54)		(-2.01)	
n=6	-0.014***	29.58%		
	(-3.22)			
n=7	-0.013***	21.97%		
	(-2.67)			
n=8	-0.012**	17.1%		
	(-2.22)			

Predictive ability of *CATFIN* and *CATnonFIN* for the CFNAI

- No predictive power for non-financial sectors

	Dependent variable: $CFNAI_{t+1}$			Dependent variable: $CFNAI_{t+3}$		
Industry	$CATFIN_t$	$CATnonFIN_t$	Adj. R^2	$CATFIN_t$	$CATnonFIN_t$	Adj. R^2
All non-financial firms	-0.2205***	-0.0389	16.22%	-0.2458***	-0.0421	19.97%
	(-3.46)	(-0.72)		(-3.77)	(-0.82)	
Consumer goods & services	-0.2292***	-0.0255	16.07%	-0.2596***	-0.0215	19.75%
	(-3.92)	(-0.46)		(-4.04)	(-0.40)	
Manufacturing, energy & utilities	-0.1929***	-0.0768	16.78%	-0.2320***	-0.0596	20.16%
	(-3.43)	(-1.57)		(-3.66)	(-1.12)	
Hitech, bus. equipment, telephone & TV	-0.2415***	-0.0082	15.98%	-0.2463***	-0.0455	20.02%
	(-3.86)	(-0.16)		(-4.12)	(-1.02)	
Healthcare, medical equipment, & drugs	-0.2186***	-0.0562	16.35%	-0.2447***	-0.0595	20.11%
	(-3.97)	(-0.87)		(-4.07)	(-0.97)	
All other non-financial firms	-0.2432***	-0.0053	15.98%	-0.2704***	-0.0064	19.68%
	(-3.62)	(-0.10)		(-4.00)	(-0.13)	

Developing a warning system

- The CFNAI has designated three-month moving average CFNAI equal to -0.7 as contraction. Median CATFIN during these months is 0.7680 over 1973-2009 period
- Define $CATFIN^{+}$ ($CATFIN^{-}$) $= CATFIN$ if CFNAI $\leq (>) -0.7$, and zero otherwise
- CFNAI in month $t+n$ is regressed on $CATFIN^{+}$ and $CATFIN^{-}$ in month t

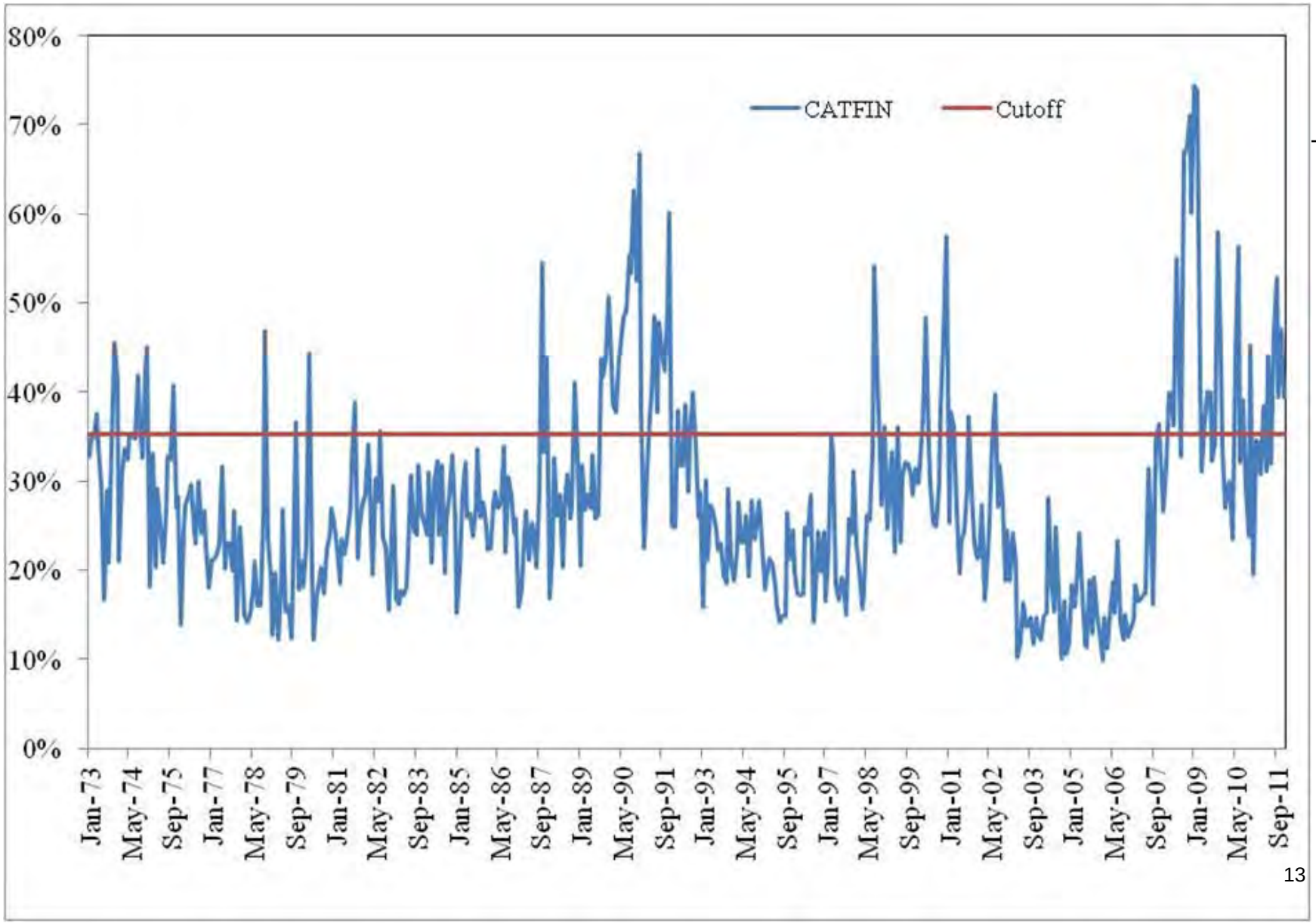
$$CFNAI_{t+n} = \alpha + \gamma^{+} CATFIN_{t}^{+} + \gamma^{-} CATFIN_{t}^{-} + \varepsilon_{t+n}$$

- $CATFIN^{+}$ has predictive power (excessive bank risk taking during contractions), whereas $CATFIN^{-}$ does not

Table 6: The Early Warning System

$CFNAI_{t+n}$	$CATFIN_t^+$	$CATFIN_t^-$	Adj. R^2
n=1	-1.273***	-1.580**	67.21%
	(-3.23)	(-2.35)	
n=2	-0.907**	-0.167	71.30%
	(-2.52)	(-0.30)	
n=3	-1.218**	-0.604	61.76%
	(-2.41)	(-0.97)	
n=4	-1.567***	-0.738	55.83%
	(-2.76)	(-1.07)	
n=5	-1.615**	-1.070*	48.65%
	(-2.41)	(-1.68)	
n=6	-2.048***	-1.114	47.83%
	(-2.93)	(-1.28)	
n=7	-1.707**	-0.995	41.44%
	(-2.04)	(-1.22)	
n=8	-2.326***	-1.455**	42.74%
	(-3.11)	(-1.99)	
n=9	-2.889***	-1.471*	48.47%
	(-3.63)	(-1.66)	
n=10	-2.730***	-1.937*	43.83%
	(-3.33)	(-1.97)	
n=11	-3.087***	-3.048***	47.49%
	(-4.07)	(-3.30)	
n=12	-2.244***	-1.394	46.92%
	(-3.00)	(-1.50)	

Jan. 1973- Dec. 2011



Why CATFIN works?

- CATFIN is correlated to:
  - Aggregate bank lending activity
  - Financial and economic uncertainty
  - Financial sector conditions (bank capital, CDS spreads, bank financial ratios)
  - Conditional Asset Pricing Model (ICAPM) in which systemic risk is a priced factor for financial firms only – CATFIN is correlated with business cycle fluctuations (Merton 1973) – independent of market risk

Conclusions

- Banks are still special.
- Monthly estimation of *CATFIN* can provide regulators with real-time estimates of the risk of macroeconomic downturns around six months into the future.
- *CATFIN* can be used by international bank regulators.
- *CATFIN* can be used in conjunction with a micro-level measure of systemic risk (e.g., MES, co-VAR, etc.) to calibrate systemic risk taxes and limits for large and small banks.