LTIA is exactly true in

1. $N = \infty$ configuration models;
2. $N < \infty$ tree graph models;
3. $N < \infty$ deterministic models.
Typical Erdös-Renyi real-world skeleton graphs with $N = 100$.

- Buffer distributions were log normal with means $0.18 \times k$;
- Edge distributions were log normal with means $1$;
- A random subset of nodes “early adopt”.
- Analytic formulas (with LTIA) were compared with MC estimators;
ER Graph z: 3, N: 100, Wmean: 1.00, phistar: 0.40, Nrealiz: 100

adoption prob.

sorted node #
N=10 ER Graphs: mean cascade size vs $\phi$

Mean cascade size vs $\phi$ for different values of $z$.

- **Analytic** $z=1.5$
- **Monte Carlo** $z=1.5$
- **Analytic** $z=3.5$
- **Monte Carlo** $z=3.5$
- **Analytic** $z=5.5$
- **Monte Carlo** $z=5.5$
- **Analytic** $z=7.5$
- **Monte Carlo** $z=7.5$

Tom Hurd (McMaster)
N=100 ER Graphs: mean cascade size vs $\phi$

- Analytic $z=1.5$
- Monte Carlo $z=1.5$
- Analytic $z=3.5$
- Monte Carlo $z=3.5$
- Analytic $z=5.5$
- Monte Carlo $z=5.5$
- Analytic $z=7.5$
- Monte Carlo $z=7.5$

Tom Hurd (McMaster)  Banking Networks  37 / 44
N=1000 ER Graphs: mean cascade size vs $\phi$

Analytic $z=1.5$
Monte Carlo $z=1.5$

Analytic $z=3.5$
Monte Carlo $z=3.5$

Analytic $z=5.5$
Monte Carlo $z=5.5$

Analytic $z=7.5$
Monte Carlo $z=7.5$
We tested the interplay between upstream illiquidity cascade and downstream insolvency cascade.

\[ \lambda > 0 \] measures the strength of banks’ stress response.

We are now trying to work with EU network data.
Extended GHK: Stress and Default

ER. N: 20, Nrlz: 500, W_mean: 3.0, D_buf_mean: 8.0, S_buf_mean: 5.0

Probability of default and stress response vs. stress response \( \lambda \)
A Schematic Europe in 2012

Time Step: 016 Defaulted Banks: 011 Stressed Banks: 0138
We can understand how systemic stability is related to the structure of the network;

We might be able to learn a lot from “Deliberately Simplified Models”.

Open questions abound.
Some References

1. Andrew G Haldane’s 2009 talk “Rethinking the Financial Network”;
Some More References


