MFM Summer Camp Wrap-Up

Andrew W. Lo, MIT
The Financial Crisis

- Pension Funds
- Mutual Funds
- Sovereign Wealth Funds
- Foundation Endowment
- Hedge Funds

Rating Agencies

Commercial Banks
Investment Banks
Mortgage Companies
Fannie Mae
Freddie Mac

Politicians

Insurance & CDS Market

$\times\times\times$

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How Could This Have Happened To Us??

Who Benefited From This Trend?:

- Commercial banks
- Credit rating agencies (S&P, Moody’s, Fitch)
- Economists
- Government sponsored enterprises
- Homeowners
- Insurance companies (multiline, monoline)
- Investment banks and other issuers of MBSs, CDOs, and CDSs
- Investors (hedge funds, pension funds, mutual funds, others)
- Mortgage lenders, brokers, servicers, trustees
- Politicians
- Regulators (CFTC, Fed, FDIC, FHFA, OCC, OTS, SEC, etc.)

“A Rising Tide Lifts All Boats”
Macroeconomic Modeling and Financial Stability

Lessons from the Crisis

by Andrew W. Lo, Professor, MIT

Since the Financial Crisis of 2007–2008, macroeconomic modeling has come under fire for the spectacular failure of macroprudential policies to anticipate the impact of crisis on the real economy. Guided by highly sophisticated mathematical models known as dynamic stochastic general equilibrium (DSGE) models, central bankers and regulators had no idea that the financial-market tremors that began as early as 2005 would exact such an enormous toll on real output and employment just a few years later.

Part of the reason was, of course, the fact that the DSGE models used by central bankers did not contain a financial sector. From a macroeconomists perspective, financial markets are a sideshow, always operating flawlessly and without constraints to facilitate production, real investment, and economic growth. With the benefit of hindsight, we now understand that financial constraints can become extraordinarily important when market-distribution strikes. Apparently, financial stability cannot be taken for granted.

The reaction against DSGE models has been swift, with the most severe critics arising from inside the economics profession. In his testimony before the U.S. House of Representatives Committee on Science and Technology, MIT economist Nobel Laureate Robert Solow leveled the following critique against this literature:

— N. Kocherlakota (2009)
Many Narratives Have Emerged

Regulators, Politicians, Homeowners, Economists

CDOs, CDSs, Rating Agencies, Insurers

Commercial vs. Investment Banks

Subprime Mortgages

Population Growth

Globalization

Technology

Prolonged Bull Market

Fear

Greed

- N rays
- Polywater
- Urbanization
- etc.
Many Narratives Have Emerged

Academics
- Acharya, Richardson, van Nieuwerburgh, and White, 2011, *Guaranteed to Fail*
- Akerlof and Shiller, 2009, *Animal Spirits*
- French et al., 2010, *The Squam Lake Report*
- Garnaut and Llewellyn-Smith, 2009, *The Great Crash of 2008*
- Gorton, 2010, *Slapped by the Invisible Hand*
- Johnson and Kwak, 2010, *13 Bankers*
- Rajan, 2010, *Fault Lines*
- Reinhart and Rogoff, 2009, *This Time Is Different*
- Roubini and Mihm, 2010, *Crisis Economics*
- Stiglitz, 2010, *Freefall*

Journalists
- Cohan, 2009, *House of Cards*
- Farrell, 2010, *Crash of the Titans*
- Lewis, 2010, *The Big Short*
- Lowenstein, 2010, *The End of Wall Street*
- McLean and Nocera, 2010, *All the Devils Are Here*
- Morgenson and Rosner, 2011, *Reckless Endangerment*
- Paulson, 2010, *On the Brink*
- Sorkin, 2009, *Too Big to Fail*
- Tett, 2009, *Fool’s Gold*
- Zuckerman, 2009, *The Greatest Trade Ever*
Many Narratives Have Emerged

Popular Narratives of the Crisis

- Crisis started with a “run on repo”
- Bankers didn’t have enough “skin in the game”
- Predatory lending created the subprime crisis
- No one saw the crisis coming
- Devotion to market efficiency caused the crisis
- Wall street bonuses were too high
- Changes in regulation allowed huge increases in leverage
Unanswered Questions

- To what extent did regulatory forbearance contribute to the crisis?
- Would better/different bank accounting practices have changed the extent of the crisis?
- Would better monetary models have allowed central banks to avoid the crisis?
- What role did culture play?
- Can we develop early warning signals for financial crises?
What Can Be Done?

1. Recognize that we have a new problem: systemic risk
2. Propose systemic risk measures (Bisias et al. 2012)
3. Adopt a systems and adaptive approach to regulation
4. Develop new technologies that address human nature
5. Train more people in macrofinance (especially Ph.D.s)

Academia Has A Critical Role To Play

- The scientific method (“establishing the phenomenon”)
- Tenure is a privilege but also a responsibility
- Focus on problems rather than disciplines
Predicting Social Security numbers from public data

Alessandro Acquisti¹ and Ralph Gross

Carnegie Mellon University, Pittsburgh, PA 15213

Communicated by Stephen E. Fienberg, Carnegie Mellon University, Pittsburgh, PA, May 5, 2009 (received for review January 18, 2009)

Information about an individual’s place and date of birth can be exploited to predict his or her Social Security number (SSN). Using only publicly available information, we observed a correlation between individuals’ SSNs and their birth data and found that for younger cohorts the correlation allows statistical inference of private SSNs. The inferences are made possible by the public availability of the Social Security Administration’s Death Master File and the widespread accessibility of personal information from multiple sources, such as data brokers or profiles on social networking sites. Our results highlight the unexpected privacy consequences of the complex interactions among multiple data sources in modern information economies and quantify privacy risks associated with information revelation in public forums.

identity theft | online social networks | privacy | statistical reidentification

number (SN). The SSA openly provides information about the process through which ANs, GNs, and SNs are issued (1). ANs are currently assigned based on the zipcode of the mailing address provided in the SSN application form [RM00201.030] (1). Low-population states and certain U.S. possessions are allocated 1 AN each, whereas other states are allocated sets of ANs (for instance, an individual applying from a zipcode within New York state may be assigned any of 85 possible first 3 SSN digits). Within each SSA area, GNs are assigned in a precise but nonconsecutive order between 01 and 99 [RM00201.030] (1). Both the sets of ANs assigned to different states and the sequence of GNs are publicly available (see www.socialsecurity.gov/employer/statweb.htm and www.ssa.gov/history/ssn/geocard.html). Finally, within each GN, SNs are assigned “consecutively from 0001 through 9999” (13) (see also [RM00201.030], ref. 1.)
Privacy vs. Transparency

Is There A Compromise??
Secure Multi-Party Computation

\[
Y_1 = S_1 + X_1 \\
Y_2 = Y_1 + S_2 + X_2 \\
\ldots \\
Y_n = Y_{n-1} + S_n + X_n
\]

\[
Z_1 = Y_n - X_1 \\
Z_2 = Z_1 - X_2 \\
\ldots \\
Z_{n-1} = Z_{n-2} - X_{n-1} \\
\frac{1}{n} \sum_{i=1}^{n} S_i = \frac{1}{n} Z_n
\]

Andrew
Lars
Amy

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Secure Multi-Party Computation

Transparency and Privacy Can Both Be Achieved

- Abbe, Khandani, and Lo (2012, 2016)
- Individual data is kept private, e.g., RSA
- Encryption algorithms are “collusion-robust”
- Aggregate risk statistics can be computed using encrypted data
  - Means, variances, correlations, percentiles, Herfindahl indexes, VaR, CoVaR, MES, etc.
- Privacy is preserved, no need for raw data!

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Real Estate Loans Outstanding

- Aggregate
- Bank of America
- JPMorgan
- Wells Fargo
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Example: Aron Lee Ralston, 4/26/03

- Hiking on 4/26/03 in Blue John Canyon, Utah
- Trapped for 127 hours
- Finally escaped by amputating his own right forearm
- How??
- A different narrative!
Example: Aron Lee Ralston, 4/26/03

A blond three-year-old boy in a red polo shirt comes running across a sunlit hardwood floor in what I somehow know is my future home. By the same intuitive perception, I know the boy is my own. I bend to scoop him into my left arm, using my handless right arm to balance him, and we laugh together as I swing him up to my shoulder... Then, with a shock, the vision blinks out. I’m back in the canyon, echoes of his joyful sounds resonating in my mind, creating a subconscious reassurance that somehow I will survive this entrapment. Despite having already come to accept that I will die where I stand before help arrives, now I believe I will live.

That belief, that boy, changes everything for me.

- In 2003, Ralston was not engaged, married, and had no children
- Ralston married in August 2009; son Leo born in 2010
Parting Observations

- Change the world
- Save the world
- Focus on problems, not disciplines or courses
- Manage your emotions and expectations
- Jekyll-and-Hyde approach to research
- Follow your passion

You Now Have Permission!
Thank You!