Outline

• The failures of the existing paradigm
  – And the policy frameworks based on them

• Explaining the failures: key assumptions, key omissions
  – Some methodological remarks

• Key unanswered questions

• Five hypotheses

• New frameworks/models
General Consensus:

• Standard economic models did not predict the crisis
  – And *prediction* is the test of any science
• Worse: Most of the standard models (including those used by policymakers) argued that bubbles *couldn’t* exist, because markets are efficient and stable
  – Many of the standard models *assumed* there could be no unemployment (labor markets clear)
  – If there was unemployment, it was because of wage rigidities
    • Implying countries with more flexible labor markets would have lower unemployment
Six Flaws in Policy Framework

Policymaking frameworks based on that model (or conventional wisdom) were equally flawed

- Maintaining price stability is necessary and almost sufficient for growth and stability
  - It is not the role of the Fed to ensure stability of asset prices
- Markets, by themselves, are efficient, self-correcting
  - Can therefore rely on self-regulation
- In particular, there cannot be bubbles
  - Just a little froth in the housing market
Conventional Policy Wisdom

• Even if there might be a bubble, couldn’t be sure, until after it breaks
• And in any case, the interest rate is a blunt instrument
  – Using it to break bubble will distort economy and have other adverse side effects
• Less expensive to clean up a problem after bubble breaks

IMPLICATION: DO NOTHING
Expected benefit small, expected cost large
EACH OF THESE PROPOSITIONS IS FLAWED
1. Inflation targeting

Distortions from relative commodity prices being out of equilibrium as a result of inflation are second order relative to losses from financial sector distortions

- Both before the crisis, even more, after the bubble broke
- Ensuring low inflation does not suffice to ensure high and stable growth
- More generally, no general theorem that optimal response to a perturbation leading to more inflation is to raise interest rate
  - Depends on source of disturbance
- *Inflation targeting risks shifting attention away from first-order concerns*
2. “Markets are neither efficient nor self-correcting”

- General theorem: whenever information is imperfect or risk markets incomplete (that is, always) markets are not constrained Pareto efficient (Greenwald-Stiglitz)
  - Pervasive externalities
  - Pervasive agency problems
    - Manifest in financial sector (e.g. in their incentive structure)
  - Greenspan should not have been surprised at risks—they had incentive to undertake excessive risk
    - Both at the individual level (agency problems)
    - And organizational (too big to fail)
    - Problems of too big to fail banks had grown markedly worse in previous decade as a result of repeal of Glass-Steagall
  - Systemic consequences (which market participants will not take into account) are the reason we have regulation
    - Especially significant when government provides (implicit or explicit) insurance
3. “There cannot be bubbles..”

- Bubbles have marked capitalism since the beginning
- Bubbles are even consistent with models of rational expectations (Allen, Morris, and Postlewaite 1993) and rational arbitrage (Abreu and Brunnermeier 2003).
- Collateral-based credit systems are especially prone to bubbles
4. “Can’t be sure...”

- All policy is made in the context of uncertainty
- As housing prices continued to increase—even though real incomes of most Americans were declining—it was increasingly likely that there was a bubble
5. “We had no instruments...”

- We had instruments
- Congress had given them additional authority in 1994
- If needed more authority, could/should have gone to Congress to ask for it
- Could have used regulations (loan-to-value ratios) to dampen bubble
  - Had been briefly mentioned during tech bubble
- Ideological commitment not to “intervene in the market”
- But setting interest rates *is* an intervention in the market
  - General consensus on the need for such intervention
  - “Ramsey theorem”: single intervention in general not optimal
  - Tinbergen: with multiple objectives need multiple instruments
    - Even with single objective, with risk preferable to use multiple instruments
    - They had multiple instruments
6. “Less expensive to clean up the mess...”

• Few would agree with that today
• Loss before the bubble broke in hundreds of billions
• Loss after the bubble in trillions
What went wrong? Why did the models fail?

• All models represent simplification
• Key issue: what were the critical omissions of the standard models? What were the most misleading assumptions of the models?
  • Answer depends partly on the questions being asked
• Wide variety of models employed, so any brief discussion has to entail some “caricature”
• Dynamic, stochastic, general equilibrium models focused on three key elements
  – Macro-dynamics crucial
  – Uncertainty is central
  – And partial equilibrium models are likely to be misleading
Key Problem

• Not with “dynamic stochastic general equilibrium” analysis but specific assumptions
  – Need to simplify somewhere
  – Problem is that Standard Models made wrong simplifications
    • In representative agent models, there is no scope for information asymmetries (except with acute schizophrenia)
    • In representative agent models, there is no scope for redistributive effects
    • In representative agent models, there is no scope for a financial sector
      – Who is lending to whom? And what does bankruptcy mean?
Arguments for simplifications un compelling

• Need to reconcile macro- with micro-economics, derive aggregate relations from micro-foundations
  – But standard micro-theory puts few restrictions on aggregate demand functions (Mantel, Sonnenschein)
    • Restrictions result from assuming representative agent
  – Hard to reconcile macro-behavior with reasonable specifications (e.g. labor supply, risk aversion)
  – Important to derive macro-behavior from “right” micro-foundations
    • Consistent with actual behavior
    • Taking into account information asymmetries, imperfections
• Going forward: explore implications of different simplifications
Recent Progress

• Recent DSGE models have gone beyond representative agent models and incorporated capital market imperfections
  – Question remains: Have they incorporated key sources of heterogeneity and capital market imperfections
    • Life cycle central to behavior—models with infinitely lived individuals have no life cycle
    • Factor distribution key to income/wealth distribution
• Equity and credit constraints both play a key role
• As do differences between bank and shadow banking system
• Some notable successes (Korinek, Jeane-Korinek)
Asking the Right Questions

• Test of a good macro-model is not whether it predicts a little better in “normal” times, but whether it anticipates abnormal times and describes what happens then
  – Black holes “normally” don’t occur
  – Standard economic methodology would therefore discard physics models in which they play a central role
  – Recession is a pathology through which we can come to understand better the functioning of a normal economy
Major puzzle: Fast declines, slow recoveries

1. In the absence of war, state variables (capital stocks) change slowly. Why then can the state of the economy change so quickly?
   – Importance of expectations
     • But that just pushes the question back further: why should expectations change so dramatically, without any big news?
       – Especially with rational individuals forming Bayesian expectations
       – Puzzle of October, 1987—How could a quarter of the PDV of the capital stock disappear overnight?
   – Discrete government policy changes
     • Removing implicit government guarantee (a discrete action)
     • Dramatic increases in interest rates (East Asia)
     • But these discrete policy changes usually are a result of sudden changes in state of economy
       – Though intended to dampen the effects, they sometimes have opposite effect of amplification
Large Changes in State of Economy from Small Changes in State Variables

• Consequence of important non-linearities in economic structure
  – Familiar from old non-linear business cycle models (Goodwin)

• Individuals facing credit constraints
  – Leading to end of bubble
  – Though with individual heterogeneity, even then there can/should be some smoothing
Fast Declines

– Whatever cause, changes in expectations can give rise to large changes in (asset) prices
– And whatever cause, effects of large changes in prices can be amplified by economic structure (with follow on effects that are prolonged)
– Understanding amplification should be one of key objectives of research
Amplification

- **Financial accelerator** (derived from capital market imperfections related to information asymmetries) (Greenwald-Stiglitz, 1993, Bernanke-Gertler, 1995)
  - “Trend reinforcement” effects in stochastic models (Battiston *et al* 2010)
- **New uncertainties:**
  - Large changes in prices lead to large increases in uncertainties about net worth of different market participants’ ability to fulfill contracts
  - Changes in risk perceptions (not just means) matter
    - Crisis showed that prevailing beliefs might not be correct
    - And dramatically increased uncertainties
Amplifications Imply Fast Declines

• New Information imperfections
  • Any large change in prices can give rise to information asymmetries/imperfections with *real* consequences
  • Indeed, even a small change in prices can have first order effects on welfare (and behavior)
    – Unlike standard model, where market equilibrium is PO (envelope theorem)

• Redistributions
  – With large price changes, large gambles there can be fast redistributions (balance sheet effects) with large *real* consequences
  – Especially if there are large differences among individuals/firms
  – With some facing constraints, others not
Control

- Who exercises control matters (unlike standard neoclassical model)
- Can be discrete changes in behavior
- With bankruptcy and redistributions, there can be quick changes in control
2. Slow Recovery

- There were large losses associated with misallocation of capital before the bubble broke. It is easy to construct models of bubbles. But most of the losses occur *after* the bubble breaks, in the persistent gap between actual and potential output.
  - Standard theory predicts a relatively quick recovery, as the economy adjusts to new “reality”
    - New equilibrium associated with new state variables (treating expectations as a state variable)
  - And sometimes that is the case (V-shaped recovery)
  - But sometimes the recovery is very slow
    - Persistence of effects of shocks
    - (partially explained by information/credit market imperfections (Greenwald-Stiglitz))—rebuilding balance sheets takes time
Fight over Who Bears Losses

- After bubble breaks, claims on assets exceed value of assets
- Someone has to bear losses; fight is over who bears losses

**Fight over who bears losses—and resulting ambiguity in long term ownership—contributes to slow recovery**

Standard result in theory of bargaining with asymmetric information

- Three ways of resolving
  - Inflation
  - Bankruptcy/asset restructuring
  - Muddling through (non-transparent accounting avoiding bank recapitalization, slow foreclosure)
  - America has chosen third course
New Frameworks

Frameworks focusing on

1. Risk
2. Information imperfections
3. Structural transformation
4. Stability
and Four Hypotheses

- Hypothesis A: *There have been large (and often adverse) changes in the economy’s risk properties, in spite of supposed improvements in markets*.

- Hypothesis B: *Moving from “banks” to “markets” predictably led to deterioration in quality of information*.

- Hypothesis C: *Structural transformations may be associated with extended periods of underutilization of resources*.

- Hypothesis D: *Especially with information imperfections, market adjustments to a perturbation from equilibrium may be (locally) destabilizing*.
Underlying Theorem

• Markets are not in general (constrained) Pareto efficient
  – Once asymmetries in information/imperfections of risk markets are taken into account

• Nor are they stable
  – In response to small perturbations
  – And even less so in response to large disturbances associated with structural transformation
New Frameworks and Hypotheses

1. Risk: A central question in macroeconomic analysis should be an analysis of the economy’s risk properties (its exposure to risk, how it amplifies or dampens shocks, etc).
   – Hypothesis A: *There have been large (and often adverse) changes in the economy’s risk properties, in spite of supposed improvements in markets*
     • Liberalization exposes countries to more risks
     • Automatic stabilizers, but also automatic destabilizers
       – Changes from defined benefit to defined contribution systems
       – Capital adequacy standards can act as automatic destabilizers
       – Floating rate mortgages
       – Change in exchange rate regime
   – Privately profitable “innovations” may have socially adverse effects
     • Corollary of Greenwald-Stiglitz Theorem
Insufficient attention to “architecture of risk”

• Theory was that diversification would lead to lower risk, more stable economy
  – Didn’t happen: where did theory go wrong?
  – Mathematics:
    • Made assumptions in which spreading risk necessarily increases expected utility
    • With non-convexities (e.g. associated with bankruptcy, R & D) it can lead to lower economic performance
  – Two sides reflected in standard debate
    • Before crisis—advantages of globalization
    • After crises—risks of contagion
    • Bank bail-out—separate out good loans from bad (“unmixing”)
  – Standard models only reflect former, not latter
    • Should reflect both
    • Optimal electric grids
    • Circuit breakers
New Research

- Recent research reflecting both
  
  *Full integration may never be desirable*
  

  *In life cycle model, capital market liberalization increases consumption volatility and may lower expected utility*

New Research

• Showing how economic structures, including interlinkages, interdependencies can affect systemic risk
  – Privately profitable interlinkages (contracts) are not, in general, constrained Pareto efficient
    • Another corollary of Greenwald-Stiglitz 1986
  – Interconnectivity can help absorb small shocks but exacerbate large shocks, can be beneficial in good times but detrimental in bad times
Further results: Design Matters

• Poorly designed structures can increase risk of bankruptcy cascades
• Hub systems may be more vulnerable to systemic risk associated with certain types of shocks
  – Many financial systems have concentrated “nodes”
• Circuit breakers can affect systemic stability
• Real problem in contagion is not those countries suffering from crisis (dealing with that is akin to symptomatic relief) but the hubs in the advanced industrial country
Can be affected by policy frameworks

- **Bankruptcy** law (indentured servitude)
  - Lenders may take less care in giving loans
  - (Miller/Stiglitz, 1999, 2010)
- **More competitive banking** system lowers franchise value
  - May lead to excessive risk taking
    - (Hellman, Murdock, and Stiglitz, 2000)
- **Excessive reliance on capital adequacy standards** can lead to increased amplification (unless cyclically adjusted)
- **Capital market liberalization**
  - Flows into and out of country can increase risk of instability
- **Financial market liberalization**
  - May have played a role in spreading crisis
  - In many LDCs, liberalization has been associated with less lending to SMEs
2. Information imperfections and asymmetries are central

• Explain credit and equity rationing
  – Key to understanding “financial accelerator”
  – Key to understanding persistence (Greenwald-Stiglitz (1993)

• Why banks play central role in our economy
  – And why quick loss of bank capital (and bank bankruptcy) can have large and persistent effects

• Changes in the “quality of information” can have adverse effects on the performance of the economy
  – Including its ability to manage risk
Hypothesis B: Moving from “banks” to “markets” predictably led to deterioration in quality of information

- Inherent information problem in markets
  - The public good is a public good
  - Good information/management is a public good
  - Shadow banking system not a substitute for banking system
- Leading to deterioration in quality of lending
  - Inherent problems in rating agencies
- But also increased problems associated with renegotiation of contracts (Increasing litigation risk)
- “Improving markets” may lead to lower information content in markets
  - Extension of Grossman-Stiglitz
  - Problems posed by flash trading? (In zero-sum game, more information rents appropriated by those looking at behavior of those who gather and process information)
Again: Market equilibrium is not in general efficient

Derivatives market—an example
Large fraction of market over the counter, non-transparent
Huge exposures—in billions
Previous discussion emphasized risks posed by “interconnectivity”
Further problems posed by lack of transparency of over-the-counter market
Undermining ability to have market discipline
• Market couldn’t assess risks to which firm was exposed
• Impeded basic notions of decentralizibility
  – Needed to know risk position of counterparties, in an infinite web
Explaining lack of transparency:
• Ensuring that those who gathered information got information rents?
• Exploitation of market ignorance?
• Corruption (as in IPO scandals in US earlier in decade)?
3. Structural Transformation

- Great Depression was a period of structural transformation—move from agricultural to industry; Great Recession is another period of structural transformation (from manufacturing to service sector, induced by productivity increases and changes in comparative advantage brought on by globalization)
  - Rational-expectations models provide little insights in these situations
  - Periods of high uncertainty, information imperfections
Hypothesis C: *structural transformations may be associated with extended periods of underutilization of resources*

- With elasticity of demand less than unity, sector with high productivity has declining income
- There may be high capital costs (including individual-specific non-collateralizable investments) associated with transition—but with declining incomes, it may be impossible to finance transition privately
  - Capital market imperfections related to information asymmetries
- Declining incomes in “trapped” high-productivity sector has adverse effect on other sectors
4. Instability

Hypothesis D: *Especially with information imperfections, market adjustments to a perturbation from equilibrium may be (locally) destabilizing*

- Question not asked by standard theorem
- Partial equilibrium models suggest stability
- But Fisher/Greenwald/Stiglitz price-debt dynamics suggest otherwise
  - With unemployment, wage and price declines—or even increases that are less than expected—can lower employment and aggregate demand, and can have asset price effects which further
    - Lower aggregate demand and increase unemployment and
    - Lower aggregate supply and increase unemployment still further
This crisis

Combines elements of increased risk, reduced quality of information, a structural transformation, with two more ingredients:

• Growing inequality domestically, which would normally lead to lower savings rate
  – Except in a representative agent model
  – Obfuscated by growing indebtedness, bubble

• Growing global reserves
  – *Rapidly growing* global precautionary savings
  – Effects obfuscated by real estate bubble
Towards a New Macroeconomics

• Should be clear that standard models were ill-equipped to address key issues discussed above
  – Assumptions ruled out or ignored many key issues
    • Many of risks represent redistributions
    • How these redistributions affect aggregate behavior is central

• New Macroeconomics needs to incorporate an analysis of Risk, Information, Institutions, Stability, set in a context of
  – Inequality
  – Globalization
  – Structural Transformation
• With greater sensitivity to assumptions (including mathematical assumptions) that effectively assume what was to be proved (e.g. with respect to benefits of risk diversification, effects of redistributions)
An Example: Monetary Economics with Banks

• Repository of institutional knowledge (information) that is not easily transferred
  – Internalization of information externalities provides better incentives in the acquisition of information
  – Cost: lack of *direct* diversification of risk
    • Though shareholder risk diversification can still occur
  – But risk diversification attenuates information incentives
• Banks still locus of most SME lending
  – Variability in SME central to understanding macroeconomic variability (employment, investment)
• Standard models didn’t model banking sector carefully (or at all)
  – Often summarized in a money demand equation
  – May work OK in normal times
  – But not now, or in other times of crisis (East Asia)
• Key channel through monetary policy affects the economy is availability of credit (Greenwald-Stiglitz, 2003, *Towards a New Paradigm in Monetary Economics*)
  – And the terms at which it is available (spread between T-bill rate and lending rate) is an *endogenous* variable, which can be affected by conventional policies and regulatory policies)
• Lack of model of banking meant monetary authorities had little to say about best way of restructuring banks
  – In fact—total confusion
  – Inability to restart lending now should not be a surprise
  – But, with interest rates near zero, it is not (standard) liquidity trap

• Implicit assumptions in much of discussion on how bank managers would treat government provided funds
An example

• Assume no change in control, bank managers maximize expected utility of profits to old owners (don’t care about returns to government)

\[
\text{Max } U(\pi)
\]

where \( \pi = \max \{(1 - \alpha)(Y - rB - r_g B_g), 0\} \)

where \( \alpha \) represents the dilution to government (through shares and/or warrants) and \( r_g \) is the coupon on the preferred shares and \( B_g \) is the capital injection though preferred shares)
Three states of nature (assuming can order by level of macroeconomic activity)

(a) $\theta \leq \theta_1$: bank goes bankrupt

(b) $\Theta_1 \leq \theta \leq \Theta_2$: old owners make no profit, but bank does not go bankrupt

(c) $\theta \geq \Theta_2$: bank makes profit for old owners, preferred shares are fully paid

Financing through preferred shares with/without warrants vs. equity affects size of each region and weight put on each
• If government charges actuarially fair interest rate on preferred shares, then \( r_g > r \), so (i) region in which old owners make no profit is actually increased; (ii) larger fraction of government compensation in form of warrants, larger region (a) and less weight placed on (a) versus (b) [less distorted decision making]

• Optimal:  full share ownership

• Worst (with respect to decision making):  injecting capital just through preferred shares
Concluding Remarks

• Models and policy frameworks (including many used by Central Banks) contributed to their failures before and after the crisis
  – And also provide less guidance on how to achieve growth with stability (access to finance)
• Fortunately, new models provide alternative frameworks
  – Many of central ingredients already available
  – Credit availability/banking behavior
  – Credit interlinkages
  – More broadly, sensitive to (i) agency problems; (ii) externalities; and (iii) broader set of market failures
  – Models based on rational behavior and rational expectations (even with information asymmetries) cannot fully explain what is observed
  – But there can be systematic patterns in irrationality, that can be studied and incorporated into our models
Concluding Remarks

• Less likely that a single model, a simple (but wrong) paradigm will dominate as it did in the past
  – Trade-offs in modeling
  – Greater realism in modeling banking/shadow banking, key distributional issues (life cycle), key financial market constraints may necessitate simplifying in other, less important directions

• Complexities arising from intertemporal maximization over an infinite horizon of far less importance than those associated with an accurate depiction of financial markets
New Policy Frameworks

• New policy frameworks need to be developed based on this new macroeconomic modeling
  – Focus not just on price stability but also in financial stability