

# RETHINKING MACROECONOMICS: WHAT WENT WRONG AND HOW TO FIX IT

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# 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 uncompelling

- 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***
    - Stiglitz, *AER* 2010, *Journal of Globalization and Development*, 2010:
      - In life cycle model, capital market liberalization increases consumption volatility and may lower expected utility***
    - Stiglitz, *Oxford Review of Economic Policy* *Oxford Review of Economic Policy*, 2004

# *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
  - Greenwald & Stiglitz (2003), Allen-Gale (2000)
- 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
  - Haldane (2009), Haldane & May (2010), Battiston *et al* (2007, 2009), Gallegati *et al* (2006, 2009), Masi *et al* (2010)

# 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 decentralizability
  - 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)

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 through 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