Classical Economics

- Say's Law
  - Supply creates its own demand
  - Saving is irrational
  - Products are paid for with products, so money has only a momentary function

- Bastiat's Fallacy
  - Destruction and repair is not a net benefit
  - Opportunity costs of repair have economic consequences

Keynesian Revolution

- Business cycle literature vs. Growth literature

- Refutes Say's Law
  - supply creates its own demand

- Stable relationships: Keynes (1936)
  - Consumption function of total income $C = c(Y)$
    - Fiscal multiplier
  - Phillips curve $\pi = f(u)$
    between inflation and unemployment

- Unstable money demand + Liquidity trap
  - Monetary policy ineffective - focus on fiscal policy

Monetarism

- Stable relationship: money demand
  - Quantity theory of money $vM = PY$
  - Quantity of money M is exogenous

- Consumption is a function of *permanent* income
  - Fiscal intervention only provides temporary income

- Economic instability was caused by inept monetary policy – Friedman & Schwartz (1963)

Neo-Keynesianism

- Hicks' (static) IS/LM model, Alvin Hansen

- Synthesis of neoclassical and Keynesian ideas
  - Samuelson, Tobin, Modigliani

- Short vs. Long Run
  - Market failures only in the short run, as current prices are essentially predetermined
  - Price and wage rigidities

- Large scale equation by equation behavioral models

- Financial sector is a veil – no financial frictions

Post-Keynesianism

- Neo-Keynesianism (IS/LM model) is a misinterpretation of Keynes' ideas

- Heterogeneous group
  - Financial frictions, speculation
    - Minsky
  - Irrational expectations, animal spirits
  - Disequilibrium analysis
    - Mark-up pricing, Eichner
    - …

Rational Expectations

- Rational Expectations
  - Sargent & Wallace show that systematic monetary policy aimed at stabilizing economy is doomed to fail
  - Phillips curve was empirically rejected

- Micro-foundations are key for policy analysis
  - Lucas critique
  - Structural instead of reduced-form relations

- Fully dynamic models (of business cycles)
  - Time inconsistency problem

Real Business Cycle Theory

- Real shocks to technology cause economic fluctuations
  - Supply side focus – TFP shock only
  - Quantitative macro
  - Shocks induce substitution of consumption and leisure

- Model selection: calibration exercises

- Instantaneous price adjustment – no financial frictions
  - Monetary policy plays a secondary role

New Keynesian Theory

- DSGE models imposing rational expectations
  - Large number of shocks

- Sticky prices
  - Transaction costs and market power
  - Resource allocation and expectations in the absence of market clearing
  - Many regimes, but the Keynesian regime of excess supply in goods and labor market is most common

- Model selection
  - VAR - impulse response of linearized DSGE models

Macroeconometrics

- Tindenbergen's book included first multiple equation time series model
  - Keynes questioned whether this could test a theory

- Haavelmo highlighted importance of a probabilistic approach
  - Precise numerical predictions
  - Internal consistency

- Models must characterize the nature of their errors
  - This allows for model testing

Keynesian vs. Monetarist

- Large-scale models with hundreds of variables
  - Unbounded likelihood functions

- Friedman, Schwartz focus on few variables
  - Correlation between money growth, prices and real activity
  - Money growth "leads" changes in income

Model Selection

- These Keynesian and monetarist models did not address Haavelmo's concerns
  - Not able to test model fit

- Further, did not incorporate government behavior into the model
  - Policy taken as exogenous
  - Cannot predict results of policy changes

What's Exogenous?

- Monetarist regressions
  - $y_t = \alpha_0 + \beta_0 M_t + \beta_1 M_{t-1} + \cdots + (+\gamma_1 M_{t+1} + \gamma_2 M_{t+2} + \cdots)$
  - Showed that money stock was exogenous to income, i.e. γ_k insignificant

- Money demand equations
  - $M_t = \beta_0 + \beta_1 y_t + \beta_2 i_t$
  - Mehra (1978) showed that income and interest rates were **also** explaining money causally

Vector Auto-Regression

- Only explanation was a multiple-equation model
  - Sims (1980) found that money was predicted by rates, which was predicted by past production
  - Hard to argue that money was "erratic"

- Structural VARs can predict effects of policy interventions
  - However, not widely used because SVARs only allow conditioning on future policy
  - Modern DSGE models allow for this type of conditioning

Calibration

- Finding a set of model parameters that will induce descriptive statistics that match the data
  - This is an "in-sample" match
  - Policy experiments are always "out-of-sample"

- Other problems
  - Weak identification, i.e. which parameters are taken as given and which ones are calibrated?
  - Parameters taken from different environments
  - Calibration vs. estimation vs. verification

Saltwater vs Freshwater

- Saltwater approach
  - Stylized tractable models (e.g. 3-period models with H, L states) to i*solate* and *illustrate* particular mechanism
  - Closed form solutions
  - Model cannot be brought to data
  - Frictions are allowed

- Freshwater approach
  - Large scale microfounded models (many effects are mixed)
  - Numerical simulations
  - Quantification through calibration

Present Challenges

- DSGE models are "ripe for improvement"
  - Forecast errors during recession were of a size that should practically never occur
  - Log-linearization around steady state
  - Micro foundation is typically weak

- Belief distortions

- Macroeconomics and financial frictions
  - Interaction between price and financial stability
  - Liquidity and systemic risk
  - Heterogeneity
  - Interaction between rates and macroprudential policy

Stability

- Output (gap)

- Price stability
  Monetary policy

- Financial stability
  Macroprudential policy

  - Short-term interest
  - Policy rule
    (terms structure)

inter-action

  - Reserve requirements
  - Capital/liquidity
    requirements
  - Collateral policy
    Margins/haircuts
  - Capital controls

Methodology: Macro vs. Finance

- *Verbal Reasoning (qualitative)*

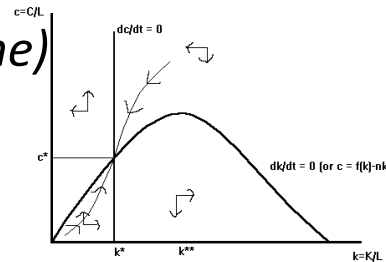Fisher, Keynes, …

Macro ← → **Finance**

timeline
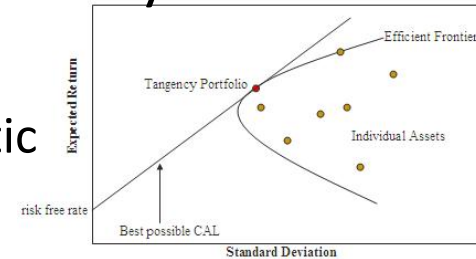
- Growth theory
  - *Dynamic (cts. time)*
  - *Deterministic*

- Portfolio theory
  - Static
  - Stochastic

- Introduce stochastic
  - *Discrete time*
    - Brock-Mirman, Stokey-Lucas
    - DSGE models

- Introduce dynamics
  - *Continuous time*
    - Options Black Scholes
    - Term structure   CIR
    - Agency theory   Sannikov

- ▪ Cts. time macro with financial frictions

Rates vs. Quantity Aggregates

- In favour of rates – Wicksell (1898), Woodford (2003)
  - New Keynesian Theory
    - interest rate has a first-order impact, while money supply plays a secondary role (after calibration)
  - Empirically
    - correlation between money supply, output, and inflation is weak
    - Goodhart's law
  - Communication policy
- In favour of quantity aggregates
  - Price stability (inflation) - Monetarists
  - Financial stability

Currency vs. Banking School

- Currency school – Ricardo
  - Species money (e.g. gold)
  - Mixed paper-gold currency should vary with outflow of gold (FX should determine value not BoE)
  - Quantity theory of money, fixed multiplier

- Banking school – John Law, Adam Smith
  - Real bills doctrine, i.e. issuing money for real bills is not inflationary
  - Banks are concerned that depositors withdraw gold
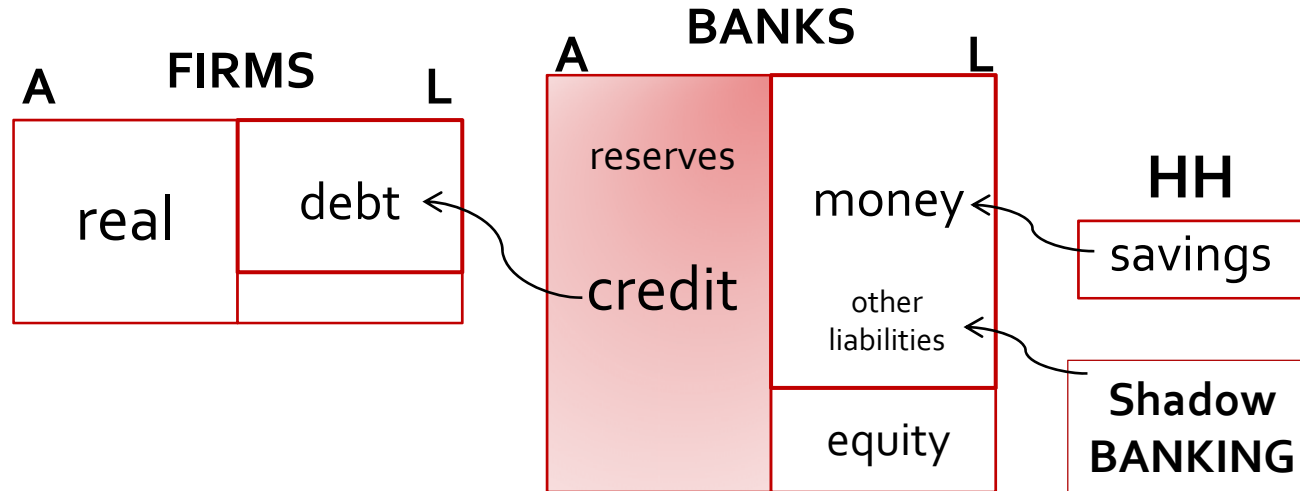 - 'Need of trade' acted as a natural regulator

Money View

- Financial sector's primary role is to create money
  - Connection between money growth an inflation
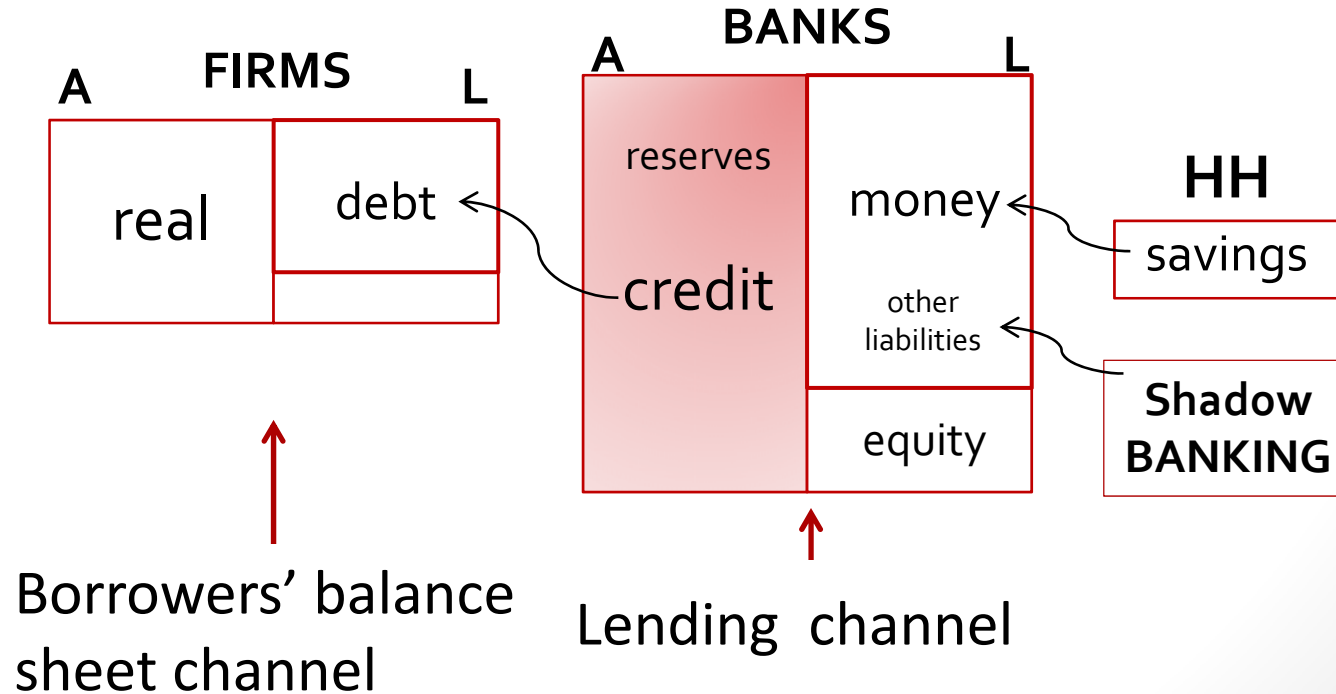 - Outside and inside money are perfect substitutes
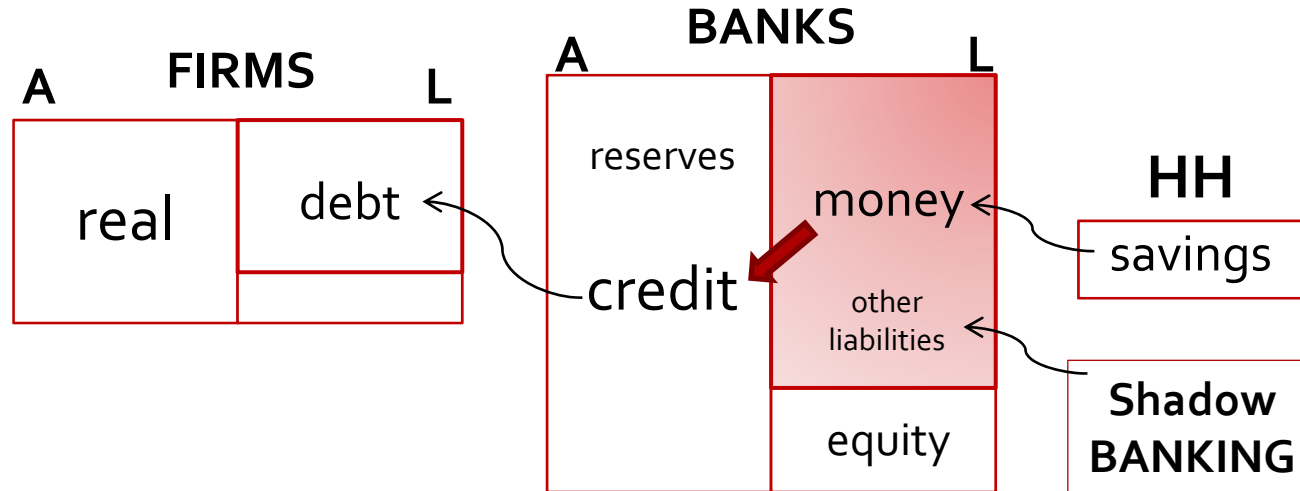
Credit View

- Credit view focuses on stimulating
  - Printing money will not lead to credit unless banks lend

Credit View: Frictions

- Balance Sheet Channel   Lenders' friction
- Lending Channel   Borrowers' friction

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