WEALTH AND VOLATILITY

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Features of the Great Recession

1. Large fall in asset values
2. Sharp decline in consumer spending, especially durables
3. Sharp rise in unemployment, labor productivity strong
4. Slow recovery
Asset Prices

- House Price
- Stock Price
- Unemp. Rate (-ve, right axis)

Timeline: 2007-I to 2011-I
Theory

- Recession driven by self-fulfilling wave of pessimism (old idea, latest incarnations in Farmer 2010, Chamley 2011)
  1. Rise in expected unemployment $\rightarrow$ reduction in demand
  2. Firms reduce hiring $\rightarrow$ higher unemployment (Paradox of thrift)

- Sensitivity of aggregate demand to shocks depends on wealth, due to precautionary reasons (Guerrieri and Lorenzoni 2009)
  - Here level of wealth & cost of credit determine, through sensitivity of demand to expected unemployment, likelihood of self-fulfilling crises
  - High wealth or cheap credit $\rightarrow$ stable demand $\rightarrow$ no sunspot-driven fluctuations
  - Low wealth and costly credit $\rightarrow$ demand more sensitive to expectations $\rightarrow$ confidence-driven recessions possible
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Empirical Motivation

1. Macro evidence on the importance of sunspot shocks
   - when average wealth is high, aggregate volatility tends to be low

2. Micro evidence on the mechanism
   - the wealth-poor reduced consumption more than the rich in the Great Recession
Wealth & GDP Volatility: rolling window correlation

Note: Standard deviation of quarterly GDP growth are computed over 10 years rolling windows. Observations for net worth to GDP ratio are average over the same windows.
Wealth & GDP Volatility: instantaneous correlation

Net worth to GDP ratio

Volatility

Wealth

Correlation = -0.52

Note: Standard deviation of quarterly GDP growth are computed using GARCH(1,1).
Wealth & GDP Growth

Correlation = -0.23

Note: Average quarterly GDP growth are computed over 10 years rolling windows. Observations for net worth to GDP ratio are average over the same windows.
Few pictures

We start looking at a broad but comparable measure of consumption both in NIPA and CEX.

Note that the CEX fall much more than NIPA. Since the CEX does not include high wealth individuals this provides, very indirectly, some support for our story.

We then select all households who are in the sample for a full year and in each quarter we divide them in high (above the median) and low (below the median) wealth to income ratio. The cutoff value is around 1 in the initial part of the sample and around 0.7 toward the end of the sample.

The per capita total disposable income of the high wealth to income ratio is about 30,000, the low wealth to income ratio is about 20,000.

For these households we plot total wealth (levels), total disposable income growth (over the previous year) and total consumption growth (over the previous year). Note how the low wealth group fares better in terms of income growth, yet cuts its consumption more.

CEX versus NIPA Consumption

Growth in per capita total consumption expenditures (all households, excluding housing and health)
CEX Consumption Growth: Wealth Rich versus Poor

Consumption growth from CE, High and low w/y ratios
Each growth rate is computed on the same group of households
CEX Income Growth: Wealth Rich versus Poor

Total disposable income growth from CE, High and low w/y ratios

Each growth rate is computed on the same group of households
A Stylized Model

- Non-durable consumption $c$, produced by competitive firms using indivisible labor
- Durable housing $h$, in fixed supply with relative price $p$
- Each representative household contains continuum of potential workers
- Each representative firm produces with linear technology:

$$y = n$$

where $n$ is mass of workers employed
Timing

1. Household sends out workers with consumption order $c_t$, assets $p_t h_t$, reservation wage $w_t^*$

2. Firm randomly meets potential workers sequentially, decides whether to hire them

3. Firms pay wages $w_t = w_t^*$, workers pay for consumption - must borrow if unemployed and $c_t > p_t h_t - d$

4. Household regroups, net resources determine $h_{t+1}$.

Optimal firm strategy: hire worker iff aggregate order $c_t$ not yet filled and $w_t^* \leq 1$

Optimal household strategy: set $w_t^* = 1$
Household Problem

\[ \max_{\{c_t,h_{t+1}\}} \sum_{t=0}^{\infty} \beta^t (\log c_t + \phi h_t) \]

s.t.

\[ c_t + p_t(h_{t+1} - h_t) = (1 - u_t)w_t - \frac{\psi}{2} u_t \min\{ (p_t h_t - d - c_t), 0 \}^2 + T_t \]

\( \phi \): preference weight on housing
\( \psi \): cost of credit
\( d \): part of home value that cannot be used as collateral
\( u_t \): fraction of household workers unemployed
\( T_t \): lump-sum rebate of credit costs
Equilibrium Conditions

1. \[ w_t = w_t^* = 1 \]
2. \[ h_t = 1 \]
3. \[ T_t = \psi u_t \min \left\{ (p_t - d - c_t), 0 \right\}^2 \]
4. \[ c_t = n_t = 1 - u_t \]
5. \[ p_t \frac{1}{c_t} \times \frac{1}{(1 - \psi u_t \min \left\{ (p_t h_t - d - c_t), 0 \right\})} = \beta E_t \left[ \phi + \frac{p_{t+1}}{c_{t+1}} \right] \]
Key Frictions

- **Decentralized labor market**: unemployed cannot work for lower wage → demand can drive output

- **Pre-committed consumption + costly credit**: unemployed must pay credit cost → when wealth is low demand is sensitive to expected unemployment

Note: wages not too high relative to full employment equilibrium.
Key Frictions

- **Decentralized labor market**: unemployed cannot work for lower wage $\rightarrow$ demand can drive output

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Potential for **expectations-driven multiplicity**:

1. Low wealth plus high expected unemployment
2. $\rightarrow$ high effective tax on current consumption
3. $\rightarrow$ low demand
4. $\rightarrow$ high unemployment

Note: wages not too high relative to full employment equilibrium.
Role of Wealth

- Level of wealth key to what can happen in model
- Introduce “marginal investor” with same preferences that faces no risk and is measure zero
- Assume no housing trade between the two types
- Marginal investor establishes a floor \( p \) for house prices:
  \[
  p_t \geq p = \frac{\beta}{1 - \beta} \phi
  \]
- Fundamental house value \( p \) depends on pref. weight \( \phi \)
Strong housing demand $\Rightarrow$ full employment

If

$$\phi \geq \bar{\phi} = (1 + d) \frac{1 - \beta}{\beta}$$

then the only steady state is $p = p_-$ and $u = 0$

Logic:

$$\phi \geq \bar{\phi} \Rightarrow p - d \geq c$$

Even when demand is high and agents lose their job they do not need to use credit. FOC are:

$$p = \frac{\beta(1 - u)}{1 - \beta} \phi \geq p = \frac{\beta}{1 - \beta} \phi \Rightarrow p = p_-, \quad u = 0$$

Asset price are high enough so that demand is high enough to guarantee full employment (Farmer 2010)
Weak housing demand $\Rightarrow$ positive unemployment

If $\phi < \bar{\phi}$ and $\psi \geq \bar{\psi} > 0$, then

1. There is (still) a steady state with $p = \underline{p}$ and $u = 0$

2. There are additional steady states with $p \geq \underline{p}$ and $u > 0$. In these steady states $c > p - d$

Intuition: $p \geq \underline{p}$ & $u > 0 \Rightarrow$ asset has liquidity value $\Rightarrow c > p - d$

Liquidity value must be large to support $p \geq \underline{p}$:

$$\psi \geq \bar{\psi} = \frac{(1 - \beta)^2}{(1 - \beta)(1 + d) - \beta \phi}$$
Example

Steady state demand $c_d$ and supply $c_s$ defined by FOC and resource constraint

\[
\frac{p}{c_d} \times \frac{1}{[1 - \psi u (p - d - c_d)]} = \beta \left[ \phi + p \frac{c_d}{c_d} \right]
\]

\[
c_s = 1 - u
\]

Example: $\psi = 1$ $\beta = 0.9$ $\phi = 0.05$ $d = 0.1$ $p = 0.6$:

1. $\psi > \bar{\psi} = 0.15$ (credit not cheap)
2. $\phi < \bar{\phi} = 0.12$ (housing demand weak)
3. $p > \underline{p} = 0.45$ (price above full employment fundamental)
Multiplicity 1: Two steady state $u$'s for a given $p$
Multiplicity 2: Multiple steady states $p$'s

Graph showing the behavior of $p$ and $p_{\text{bar}}$ with and without credit friction.
Multiplicity 3: Multiple paths to a steady state pair \((p, u)\)

- Suppose \(p_t = p > p \Rightarrow\) constraint always binding

- Difference equation defining equilibrium is

\[
\frac{p}{(1 - u_t)} \times \frac{1}{(1 - \psi u_t [p - d - (1 - u_t)])} = \beta \phi + \beta p E_t \left[ \frac{1}{1 - u_{t+1}} \right]
\]

- Assume no uncertainty / sunspots / expectational errors:

\[
\frac{1}{1 - u_{t+1}} = E_t \left[ \frac{1}{1 - u_{t+1}} \right]
\]

- Many solutions to difference equation corresponding to different initial unemployment rates
Unemployment Dynamics

\[ u(t+1) - u(t) \]

\( u(t) \)
Multiplicity 4: Sunspots generate fluctuations in $u_t$

- Low unemployment steady state is dynamically stable $\Rightarrow$ possibility of “sunspots”

- Define sunspot shock $v_{t+1}$

$$v_{t+1} = \frac{1}{1 - u_{t+1}} - E_t \left[ \frac{1}{1 - u_{t+1}} \right]$$

where $v_{t+1}$ is iid over time with mean zero and a support that ensures we stay in the stable region
Wealth and volatility

Unemployment ranges

High p

Low p

Unemployment
Using the model to capture The Great Recession

1. Fall in demand for housing (fall in $\phi$) reduces $p$ so that economy becomes fragile

2. Sunspot (Lehman Brothers?) triggers jump in unemployment

3. Slow recovery to low unemployment steady state
Graphically
Model Can Produce A Great Recession

Preference Shock at $t=-3$, Sunspot Shock at $t=0$
Conclusions

- Developed loss of confidence theory for Great Recession
- Decline in home values + costly credit left economy vulnerable to wave of pessimism
- Provided macro evidence of a link between level of wealth and aggregate volatility
- Provided micro evidence that low wealth households reduced consumption sharply
- Model stylized but suggests role for policy