Lifecycle Impacts of the Financial & Economic Crisis on Household Optimal Consumption, Portfolio Choice, and Labor Supply

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Financial/Economic Crisis

Unemployment Rate

Percentage of Americans in the workforce and without employment.

Data: Bureau of Labor Statistics

Real GDP

Year-on-Year Growth

Motivation & Research Questions

- Financial crisis (capital market): workers lost substantial portion of their retirement saving.
- Economic crisis (labor market): high unemployment and pay cuts; Social Security and private pension contributions down.

We ask:
- How might people react (optimally) to combination of financial & economic crisis?
- Diff’s by age group?
- Short vs long term consequences?
Literature & Contributions

• Recent LC-portfolio choice studies:
  ✓ Stock returns: i.i.d. normally distributed
  ✓ Labor income: Permanent & transitory shocks i.i.d.
  ✓ Relation: Correlation (Cocco et al. 2005 RFS) Cointegration (Benzoni et al. 2007 JF)

• Empirical models of regime changes:
  ✓ Finance Lit.: Time-varying investment opportunity set: bull/bear market → low/high volatility & high/low mean returns (Guidolin/Timmermann 2008 RFS)
  ✓ Macro Lit: Countercyclical dynamics of labor income risk (Storesletten et al. 2004 JPE)

• Our Contribution
  ✓ Extend LC-portfolio model using joint process for stock/labor market risk with business cycle (Ferri/Greenberg 1990 JEBO)
  ✓ Incorporate endogenous work effort, retirement, & annuitization.

Life Cycle Building Blocks

Utilty of consumption & leisure

\[ V_t = \left( \frac{C_t L_t^a}{1 - \rho} \right)^{-\rho} + \beta E_t (p_{t+1} V_{t+1}) \]

Labor market: Wage rate stochastic; econ. state dependent
Capital market: Deferred annuity, bond, econ. state dep. risky stock
Housing: Age dependent (det.) costs
Regulation: US SocSec-rules, tax rates
Household: US female; mid-income; RRA=5; α=1.3

Business Cycle

Numerical dynamic optimization; simulation of 100,000 life cycles

Consumption
Leisure/labor supply
Asset allocation, annuitization
Retirement
Model & Calibration

➢ Business Cycle: NBER classification

• Markov Chain

\[ M = \begin{bmatrix} p_{0,0} & p_{1,0} \\ p_{0,1} & p_{1,1} \end{bmatrix} = \begin{bmatrix} 0.68 & 0.32 \\ 0.32 & 0.68 \end{bmatrix} \]

• Regime change for macroeconomy.
Two states: \( s = \text{expansion or contraction} \)

• Annual US GNP growth rate from BEA for 1929-2008

Model & Calibration

Labor market:

➢ Data: PSID panel

\[
\text{Prob(unemployment)} = \begin{cases} p_b & \text{if expansion at date } t \\ p_c & \text{if contraction at date } t \end{cases}, \quad p_b < p_c
\]

\[
WR_t = \begin{cases} \frac{w(t,...)E_u_t}{x^\epsilon} & \text{if employed} \\ x^{\frac{\epsilon}{2}} & \text{if unemployed} \end{cases}, \quad x \in (0,100)
\]

➢ When working: wage rate * hours

\[
E_t = E_{t-1}n_{t-1}
\]

\((S = \text{expansion or contraction})\)

Permanent income shock \( n_{t,x} \sim \log \text{Niid } (0, \sigma_{n,t}^2) \)

\[
\sigma_{n,t} = \begin{cases} \sigma_{n,0} & \text{if expansion at date } t \\ \sigma_{n,1} & \text{if contraction at date } t \end{cases}, \quad \sigma_{N,0} < \sigma_{N,1}
\]

Transitory income shock \( u_t \sim \log \text{Niid } (0, \sigma_u^2) \)

Model & Calibration

- Labor market:
  - Social Security benefits depend on retirement age relative to NRA, & earnings:
    - If retire < NRA: benefit permanently reduced
    - If retire ≥ NRA: benefit permanently increased

- Annuities:
  - Deferred annuity: before NRA, payout at NRA;
  - Immediate annuity: after NRA;
  - Loading factor: 2.38%.

Model & Calibration

- Capital market:
  - Risk-free asset: Bonds 2% p.a.
  - Risky stocks:
    - Data: Annual real value-weighted market index portfolio returns on the NYSE, AMEX, and NASDAQ (retrieved from CRSP) from 1950 to 2008
    - Markov chain -> Business Cycle
      - state 1: \( y_i \sim N(\mu_1 = 6.84\%, \sigma_1 = 11.21\%) \)
      - state 2: \( y_i \sim N(\mu_2 = 2.12\%, \sigma_2 = 20.77\%) \)
    - Transition matrix:
      \[
      \begin{bmatrix}
      0.68 & 0.32 \\
      0.32 & 0.68
      \end{bmatrix}
      \]
How to Define a Crisis?

- **Macro: Financial/Economic**
  - 1st year: -30% downturn in the stock market
  - First 4 years contraction (business cycle)
  - Exogenous into the model (i.e. for all 100,000 simulated LC with optimal feedback controls)

- **Individual crisis:**
  - 2+ years unemployed in first 4 years;
  - Average yearly stock return < age 62 in 1st quintile;
  - Methodology: Select from 100,000 simulated LC-Profiles (with optimal feedback controls).

### Results: Work Hours & Retirement Age

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<th>Normal</th>
<th>Crisis</th>
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**Avg. Ret. Age**

- Age 20: 64.82
- Age 55: 65.80

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**Avg. Ret. Age**

- Age 20: 65.08
- Age 55: 66.04
Results: Consumption Loss Crisis vs Normal

- Substantial and persistent for both age groups
  - Young: Large SR consumption loss partly offset by more leisure; smaller LR loss.
  - Older: SR consumption loss smaller despite more work effort; LR consumption loss large

Results: Asset Allocation Crisis vs Normal

- Young: SR: 40% wealth drop (low wage & low hours); less equity; LR wealth recovers somewhat; more equity in second half of life
- Older: SR 20% wealth drop, less equity now, more later
Conclusions

- LC model to explore SR & LR impacts of financial/economic crisis on:
  - Optimal portfolio choice,
  - Consumption and saving,
  - Work hours and retirement.
  - Double-barreled crisis Regime change B-cycle model driving stochastic dynamics of stock & labor market risk.

- Results:
  - Young: Work - early but + later; retire later; consumption drop; hold less (more) equity early (late) in life.
  - Older group: Work + and retire later; consume less; hold - (+) equity early (late); buy less longevity risk insurance.

  → Corresponds to recent evidence on short-term effects.

Thank you!

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