Bubbles and Unemployment

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Disclaimer

- Usual disclaimer: I am not speaking for others in the Federal Reserve or on the Federal Open Market Committee.

- But I'll make an even stronger disclaimer: I'm exploring a new theoretical model ...

- And so the results do not necessarily reflect my thinking about policy.

Lots of Exciting Research on Great Recession

- But relatively little concerns the behavior of unemployment.

  – Nice exception: Farmer (2011)

- I will describe a (SIMPLE!) model that connects:

  – a bubble collapse

  – insufficiently accommodative monetary policy

  – elevated unemployment

Basic Modeling Approach

- Take a rational bubble model (in this case, OG).

- "Glue" a Diamond-Mortensen-Pissarides (DMP) model onto it.

- One key element: Ignore DMP job creation margin.

  – jobs are created as needed to satisfy demand

Basic Structure of Equilibria

- Continuum of bubbly equilibria

    - the size of the bubble varies across equilibria

    - zero real interest rate in all equilibria

- Continuum of non-bubbly equilibria

    - indexed by the real interest rate ≤ 0

    - no bubble in any of them

Result 1

- Take any bubbly equilibrium.

- There exists a non-bubbly equilibrium *with same labor market outcomes.*

  – it has a negative real interest rate

- Interpretation: Bubble collapses don't affect labor market if real interest rate falls enough.

Result 2

- Take any non-bubbly equilibrium with a negative real interest rate.

- The non-bubbly equilibrium with a zero real interest rate has:

  - higher unemployment

  - more slack in the labor market

- Interpretation: If monetary policy is not sufficiently accommodative after a bubble collapse, the economy will have high unemployment.

Similar Ideas to ...

- Hall (2011) and Krugman (1998)

    - ZLB disrupts adjustment of real interest rate

    - creates labor market disequilibrium

- Farmer (2011)

    - continuum of steady-state unemployment rates indexed by beliefs

Outline

1. Sketch of the DMP Model

2. Some Empirics

3. DMP - Meet OG

4. Structure of Equilibria

5. Results

6. Decline in Matching Efficiency

7. Conclusions

1. Sketch of the DMP Model

- Firms create jobs at exogenous cost k.

- Get matched with qualified worker with probability $f(\theta)$.

  - $\theta = v/u$ is endogenous

- (Nash) bargain over wages.

Exogenous Parameters

- A is worker output in job

- z is unemployed worker output

- β is worker bargaining power

- s is separation rate

- ϕ is matching efficiency

Endogenous Parameters

- u is unemployment rate

- v is vacancy rate

- $\theta \equiv v/u$ is market tightness

Steady-State in DMP Model

$$k = \frac{(1 - \beta)(A - z)}{\beta\theta} \quad \text{(approx. job creation)}$$

$$u = \frac{s}{s + \phi f(\theta)} \quad \text{(Beveridge curve)}$$

2. Some Empirics

- Job creation wedge has grown in past three years:

$$\frac{(1-\beta)(A-z)}{\beta\theta} - k$$

- θ has fallen by 65% from December 2007 to December 2010.

  – BLS data on unemployment and job openings

- The matching efficiency parameter has also fallen …

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$$\phi = \frac{s(1-u)}{uf(\theta)}$$

- ϕ has fallen between 32% and 44% over the past three years

  – as elasticity of f ranges between 0.5 and 0.3

3. DMP - Meet OG

- Consider a standard OG model, with 2-period lived households.

- Households have *apple* endowments (e^y, e^o).

- They have utility functions $U(c^y) + U(c^o + h)$ over *banana* consumption.

  - h is a small positive parameter

  - U has non-decreasing relative risk aversion

A Bubbly Asset

- Initial old each have one unit of intrinsically useless asset (land).

- Assume: $e^y > e^o + h$.

- This creates possibility of bubbly equilibria (usual OG).

DMP Part of the Model

- Distinct equal population of infinitely lived workers.

  - Matched workers/firms create A bananas.

  - Unmatched workers create z bananas, $z < A$.

- Worker and firm owners have linear utility over apples

- They can't participate in asset markets.

Two Novel Features of Model

- Firms create jobs as needed to satisfy banana demand.

  – no job creation condition in equilibrium.

- Central bank picks real interest rate.

4. Structure of Equilibria

- Define bubbly equilibria

- Define non-bubbly equilibria

- Apples (household endowment) are numeraire.

Bubbly Equilibria

- Given a land price P^L, $(c^y_{bub}, c^o_{bub}, P^B_{bub}, u_{bub}, \theta_{bub})$ is a bubbly equilibrium iff:

$$U'(c^y_{bub}) = U'(c^o_{bub} + h)$$

$$P^B_{bub} c^y_{bub} = e^y - P^L$$

$$P^B_{bub} c^o_{bub} = e^o + P_L$$

$$u_{bub}z + (1 - u_{bub})A = c^y_{bub} + c^o_{bub}$$

$$u_{bub} = \frac{s}{s + \phi f(\theta_{bub})}$$

Properties

- The bubbly equilibria are indexed by P^L; $r^* = 0$ in all equilibria

- Given a specification for P^L:

$$P^B_{bub} = \frac{e^y - e^o - 2P^L}{h}$$

$$[u_{bub}z + (1 - u_{bub})A] = \frac{(e^y + e^o)h}{(e^y - e^o - 2P^L)}$$

- Big bubbles imply low banana prices, high agg. demand, and low unemployment.

- They also imply small wedges in job creation first-order condition because

$$\frac{(A - z)(1 - \beta)}{\beta \theta_{bub}} - \frac{k}{P_{bub}}$$

is small.

Non-Bubbly Equilibria

- Given an interest rate r^*, $(c_{nb}^y, c_{nb}^o, P_{nb}^B, u_{nb}, \theta_{nb})$ is a non-bubbly equilibrium iff:

$$U'(c_{nb}^y) = (1 + r^*)U'(c_{nb}^o + h)$$

$$P_{nb}^B c_{nb}^y = e^y$$

$$P_{nb}^B c_{nb}^o = e^o$$

$$u_{nb}z + (1 - u_{nb})A = c_{nb}^y + c_{nb}^o$$

$$u_{nb} = \frac{s}{s + \phi f(\theta_{nb})}$$

4. Results

Result 1

- Suppose $(c^{y*}, c^{o*}, P^{B*}, u^*, \theta^*)$ is a bubbly equilibrium given P^L.

- Then: There exists $(c^{y\prime}, c^{o\prime}, r^*)$ such that:

- $(c^{y\prime}, c^{o\prime}, P^{B*}, u^*, \theta^*)$ is a non-bubbly equilibrium given r^*.

- Pick $(c^{y\prime}, c^{o\prime}, r^*)$ so that:

$$c^{y\prime} = \frac{e^y}{e^y + e^o}(c^{y*} + c^{o*})$$

$$c^{o\prime} = \frac{e^o}{e^y + e^o}(c^{y*} + c^{o*})$$

$$(1 + r^*) = \frac{U'(c^{y\prime})}{U'(c^{o\prime} + h)}$$

- Simple intuition: Divide the aggregate bananas so that young don't save.

Interpretation

- Note: $r^* < 0$.

- Given appropriate monetary policy, a bubble collapse has no impact on labor market outcomes.

- Bubble collapse does mean that households are worse off (lower r^*).

Result 2

- Suppose $(c^{y\prime}, c^{o\prime}, P^{B*}, u^*, \theta^*)$ is a non-bubbly equilibrium given $r^* < 0$.

- Suppose $(c^{y\prime\prime}, c^{o\prime\prime}, P^{B\prime\prime}, u^{\prime\prime}, \theta^{\prime\prime})$ is a non-bubbly equilibrium given $r^\prime = 0$.

- Then:

$$u^{\prime\prime} > u^* \text{ and } \theta^{\prime\prime} < \theta^*$$

Mechanics

- Equilibrium banana price P_{nb}^B satisfies Euler equation:

$$U'(\frac{e^y}{P_{nb}^B}) = (1 + r^*)U'(\frac{e^o}{P_{nb}^B} + h)$$

- Comparative statics:

$$\frac{d(1/P_{nb}^B)}{dr} = \frac{P_{nb}^B(1 + r^*)}{-CRRA(e^y/P_{nb}^B) + CRRA(e^o/P_{nb}^B + h)(\frac{e^o/P_{nb}^B}{e^o/P_{nb}^B + h})}$$

$$< \quad 0$$

- Denominator is negative because U has non-decreasing RRA.

- As r^* rises, P_{nb}^B rises, and so u_{nb} rises.

Intuition

- Think of there being three goods - apples, bananas, and banana bonds.

- Young households demand banana bonds that pay off when they are old.

  - that drives up the price of banana bonds in terms of apples

- But - with the fixed real interest rate - the price of bananas has to go up.

- Conclusion: all households demand fewer bananas.

Interpretation

- Bubble collapse implies no effect on unemployment if r^* is lowered enough.

- BUT: ZLB + sticky inflation expectations imply lower bound on r^*.

- If r^* doesn't fall enough, then we get an increase in unemployment.

Increase in Labor Market Wedge

- As r^* rises, u rises, P_{nb}^B rises, and θ falls.

- Hence, the firm's job creation wedge:

$$\frac{(1-\beta)(A-z)}{\beta\theta_{nb}} - \frac{k}{P_{nb}^B}$$

rises.

- As noted: over past three years, wedge has increased by 65% in US data.

6. Decline in Matching Efficiency

- We have seen that US labor market matching efficiency has declined since 2007.

- What's the impact of such a decline in the model, assuming:

  - r^* is fixed

  - no bubbles

No Effect on Unemployment Rate

- Given r^*, $(c_{nb}^y, c_{nb}^o, P_{nb}^B)$ satisfy:

$$U'(c_{nb}^y) = (1 + r^*)U'(c_{nb}^o + h)$$

$$c_{nb}^y = \frac{e^y}{P_{nb}^B}$$

$$c_{nb}^o = \frac{e^o}{P_{nb}^B}$$

- Then, u_{nb} is pinned down by aggregate demand:

$$u_{nb}z + (1 - u_{nb})A = c_{nb}^y + c_{nb}^o$$

- Decline in ϕ has no effect on the unemployment rate.

Increased Job Openings Rate

- With fixed u_{nb}, fall in ϕ implies that θ_{nb} rises:

$$u_{nb} = \frac{s}{s + \phi f(\theta_{nb})}$$

- Hence, with fixed r^*, fall in ϕ results generates vertical upward shift in Beveridge curve.

- Intuition: need more job openings to replace separations.

7. Conclusions

- Kocherlakota (2011) considers a wide class of rational bubble models.

- That paper describes how a bubble collapse can generate a fall in labor supply.

  - Loss of wealth leads to increase in labor supply.

  - Fall in real interest rate leads to decrease in labor supply.

  - Aggregate effect is ambiguous but can be negative.

- In this paper: unemployment rate is wholly determined by demand.

  – labor supply is irrelevant

- Bubble collapse generates a fall in demand ...

- and unemployment rises if ZLB prevents accommodative monetary policy.

- It would be useful to extend results to a wider class of rational bubble models.