Fiscal Policy Can Reduce Unemployment: But There is a Better Alternative

Federal Reserve Bank of Atlanta
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The Goals of this Research

- To understand financial crises with a model of multiple steady state equilibria
- To understand the role of fiscal policy in restoring full employment
The Conclusions

- In response to a stock market crash of 20% unemployment is predicted to increase by 20%
- A balanced budget fiscal policy can restore full employment but labor income taxes would increase by 54% to 93%
- The multiplier is between 0.33 and 0.56
A Better Policy

- Direct intervention to support the value of the stock market
- Prevent both bubbles and crashes by stock market purchases financed with agency debt
Connection with New-Keynesian Theory

- New Keynesian economics assumes sticky prices. Deviations from the natural rate of unemployment are temporary.
- Old Keynesian economics assumes flexible prices. There is a continuum of steady state unemployment rates indexed by beliefs.
Connection with Search Theory

- Two kinds of multiplicity in search models
  - Finite multiplicities: Diamond 1982, 1984
  - Steady state Continuum: Howitt and McAfee 1987

- Continuum follows from bilateral monopoly
Comparing 2008 with the Great Depression

The Great Depression

The 2008 Financial Crisis
The War-Time Recovery Doesn’t Fit the Pattern

The Stock Market and Unemployment During WWII
Government Expenditure Was Important

Government Purchases and Unemployment During WWII
Structure of Talk

- I will explain the multiplicity in a representative agent version of the model.
- I will explain how the model is altered to allow for overlapping generations.
- I will present the results of a computational experiment.
Main Idea

- Two Ideas in Keynes
  - 1. Labor market is not a spot market
  - 2. Animal Spirits
- This paper builds these two ideas into a micro-founded general equilibrium model
The Market Failure

- Labor market is a search market without the Nash Bargain
- Costly Search and Recruiting
- Externality supports different allocations as equilibria
- Animal spirits select an equilibrium
A Model

- 1 Lucas tree – non reproducible
- 1 good produced by labor and capital
- No disutility of work – everyone wants a job
- Everyone fired and rehired every period
- No uncertainty
The Labor Market

- Finding a job uses resources
- Two technologies
- Production technology
- Matching technology
# Terminology

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Z$</td>
<td>Money value of GDP</td>
</tr>
<tr>
<td>$z$</td>
<td>Physical goods produced</td>
</tr>
<tr>
<td>$K$</td>
<td>Number of trees (Normalized to 1)</td>
</tr>
<tr>
<td>$H$</td>
<td>Time endowment of household (Normalized to 1)</td>
</tr>
</tbody>
</table>
Terminology

\[ C \]  Money value of consumption

\[ G \]  Money value of government purchases
## Terminology

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$w$</td>
<td>Money wage</td>
</tr>
<tr>
<td>$r$</td>
<td>Money rental rate</td>
</tr>
<tr>
<td>$p_k$</td>
<td>Relative price of a tree</td>
</tr>
<tr>
<td>$p$</td>
<td>Money price of a commodity</td>
</tr>
<tr>
<td>$Q_t^s$</td>
<td>Date $t$ value of a dollar delivered at date $s$</td>
</tr>
</tbody>
</table>
Terminology

\[ L \quad \text{Employment} \]
\[ X \quad \text{Production workers} \]
\[ V \quad \text{Recruiters} \]

\[ L = X + V \]
Technologies

Production technology

\[ z = K^{1-\alpha} X^\alpha \]

Match technology

\[ L = H^{1/2} V^{1/2} \]

\[ H \leq 1 \quad K \leq 1 \]
Planning Problem

\[ z = \left[ L \left(1 - L \right) \right]^\alpha \]
Decentralization

- Agents take wages and prices as given
- Households take hiring probability as given
- Firms take hiring effectiveness as given
- All markets clear
More Terminology

\( \tilde{q} \) Probability of a worker being hired

\( q \) One recruiter hires this many workers

\[ L = \tilde{q} H \]

\[ L = q V \]
Firm’s Problem

\[
\max \ p_t z_t - w_t L_t - r_t K_t
\]

\[
L_t = q_t V_t
\]

\[
L_t = X_t + V_t
\]

\[
z_t \leq K_t^\alpha X_t^{1-\alpha}
\]
Firm’s Problem

\[
\max p_t K_t^\alpha \left[ L_t \left( 1 - \frac{1}{q_t} \right) \right]^{1-\alpha} - w_t L_t - r_t K_t
\]

\[\alpha Z_t = r_t K_t\]

Firm acts like a firm in an auction market but takes \(q\) as given.

\[\left(1 - \alpha\right) Z_t = w_t L_t\]

\(q\) is an externality that represents market tightness. For any given \(q\) there is a zero profit equilibrium.
Normalization

\[ w_t = 1 \]

\[ Z_t = \frac{1}{1 - \alpha} L_t \]
## Comparison with the Classical Model

<table>
<thead>
<tr>
<th>Classical</th>
<th>Old Keynesian</th>
</tr>
</thead>
<tbody>
<tr>
<td>((1 - \alpha)Z = wL)</td>
<td>((1 - \alpha)Z = wL)</td>
</tr>
<tr>
<td>(L = 1)</td>
<td>(w = 1)</td>
</tr>
<tr>
<td>(w = \frac{(1 - \alpha)Z}{L})</td>
<td>(L = (1 - \alpha)Z)</td>
</tr>
</tbody>
</table>
Household’s Problem

\[
\max u = \sum_{t=0}^{\infty} \beta^t \log(c_t)
\]

\[
p_{k,t}K_{t+1} + p_t c_t \leq (p_{k,t} + r_t)K_t + w_t \tilde{q}_t
\]
Solution

\[ H_t = 1 \]

\[ h_t = \sum_{s=t}^{\infty} Q_s^t w_t L_t \]

\[ C_t = (1 - \beta) \left[ p_{k,t} K_t + h_t \right] \]
No Arbitrage Implies

\[ p_{k,t} = Q_{t}^{t+1} \left( p_{k,t+1} + \alpha C_{t+1} \right) \]

\[ Q_{t}^{t+1} = \frac{\beta C_{t}}{C_{t+1}} \]

\[ p_{k,t} = C_{t} \frac{\beta \alpha}{1 - \beta} \]
Proposition

There is a bound $b$ such that for every bounded sequence of asset prices there is an equilibrium where
Equilibrium (No Government)

\[ Z_t = C_t = \frac{1 - \beta}{\beta \alpha} p_{k,t} \quad z_t = c_t = \left[ L_t \left( 1 - \frac{1}{q_t} \right) \right]^{1 - \alpha} \]

\[ L_t = \frac{C_t}{1 - \alpha} \quad p_t = \frac{C_t}{c_t} \quad \tilde{q}_t = L_t \]

\[ U_t = 1 - L_t \quad q_t = \frac{1}{L_t} \quad V_t = L_t^2 \]
What Determines $Z$?

- $Z$ is aggregate demand
- Construct an infinite horizon model with a Blanchard-Weil population structure.
- Explore the role of fiscal policy.
Household’s Problem

\[ \text{max } u = \sum_{t=0}^{\infty} (\beta \pi)^t \log (c_t) \]

\[ p_{k,t} K_{t+1} + p_t c_t \leq \left( p_{k,t} + r_t \right) K_t \]

\[ + w_t \tilde{q}_t \left( 1 - \tau_t \right) \]
Definition

\[ \tilde{\beta} = \frac{1 - \pi (1 - \beta \pi)}{\pi} \]

\[ \tilde{\alpha} = \frac{(1 - \beta \pi)(1 - \pi)}{1 - \pi (1 - \beta \pi)} \]
The Model

\[ C_t = \frac{1}{\tilde{R}_t \beta} C_{t+1} + \tilde{\alpha} \left( Z_t + p_{k,t} + B_t - \tau_t \left( 1 - \alpha \right) Z_t \right) \]

\[ R_t = \frac{p_{k,t+1} + \alpha Z_{t+1}}{p_{k,t}} \]
The Model Continued

\[ Z_t = C_t + G_t \]

\[ L_t = (1 - \alpha) Z_t \]

\[ \tau_t = \frac{1}{(1 - \alpha) Z_t} \left( \frac{R_t B_t - B_{t+1}}{R_t} + G_t \right) \]
Steady State

\[ Z = H(R) \left( p_k + \frac{B}{R} \right) + G \]

Market Equilibrium

\[ R = 1 + \frac{\alpha Z}{p_k} \]

No Arbitrage

\[ \tau = \frac{1}{(1-\alpha)Z} \left( \frac{(R-1)B}{R} + G \right) \]
A Market Crash
Fiscal Policy

Diagram showing the relationship between R and Z with points A, B, and C marked on the graph.
<table>
<thead>
<tr>
<th>Disc. Factor</th>
<th>Life Expectancy</th>
<th>Stimulus % GDP</th>
<th>Tax incr. % Wage Inc</th>
<th>Cons Drop % GDP</th>
<th>Multiplier</th>
<th>Opt Int. Rate % per yr.</th>
<th>New Int. Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>β=0.97</td>
<td>67</td>
<td>67</td>
<td>100</td>
<td>-47</td>
<td>0.30</td>
<td>3.7</td>
<td>4.7</td>
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<tr>
<td>β=1</td>
<td>36</td>
<td>54</td>
<td>-16</td>
<td>0.56</td>
<td>0.09</td>
<td>1.1</td>
<td></td>
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<tr>
<td>β=0.97</td>
<td>50</td>
<td>61</td>
<td>93</td>
<td>-41</td>
<td>0.33</td>
<td>4.0</td>
<td>5.9</td>
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<tr>
<td>β=1</td>
<td>36</td>
<td>54</td>
<td>-16</td>
<td>0.56</td>
<td>1.2</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>β=0.97</td>
<td>20</td>
<td>47</td>
<td>72</td>
<td>-27</td>
<td>0.43</td>
<td>5.8</td>
<td>7.2</td>
</tr>
<tr>
<td>β=1</td>
<td>36</td>
<td>54</td>
<td>-16</td>
<td>0.56</td>
<td>3.0</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>β=0.97</td>
<td>12.5</td>
<td>43</td>
<td>65</td>
<td>-23</td>
<td>0.47</td>
<td>7.7</td>
<td>9.6</td>
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<tr>
<td>β=1</td>
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<td>53</td>
<td>-15</td>
<td>0.57</td>
<td>5.0</td>
<td>6.2</td>
<td></td>
</tr>
</tbody>
</table>

Effects of a Fiscal Stimulus
Welfare Cost

- Loss of confidence causes 20% drop in steady state consumption
- Restoring full employment reduces consumption by a further 41% of full employment GDP
- Welfare unambiguously falls
Welfare Cost if G yields Utility

- Assume Cobb Douglas Utility and C and G have equal weights
- Confidence drop of 20% reduces steady state consumption by 20%
- Restoring full employment with the wrong balance of G and C leads to a further 17% drop of utility in units of steady state consumption
Is there a Better Policy?

Stock market support

R

B

C

A

NA

ME

Z
Summary

- Unemployment depends on self-fulfilling beliefs
- The Great Depression and the 2008 Financial Crisis were caused by self-fulfilling drops in confidence
- Fiscal policy may not be the best solution