On the Limits to Monetary Policy

March 2012

Narayana Kocherlakota

Federal Reserve Bank of Minneapolis
Monetary Policy in the United States

- The Federal Open Market Committee (FOMC) formulates monetary policy.

- It seeks to fulfill a dual mandate from Congress.
  - promote price stability
  - promote maximum employment

- The FOMC views the two objectives as generally complementary.
Dual Mandate Performance Since 2007

- The Great Recession began in the fourth quarter of 2007.

- Over the intervening four years, average inflation is close to the Fed’s target of 2%.

- But employment is much lower now than four years ago.
• The Fed is clearly doing well on the price stability mandate.

• Why does its performance appear to be so much worse on the other?

• I suggest an answer to this question in the context of a model.
Disclaimer and Acknowledgements

- I am not speaking for others in the Federal Reserve System.

- Thanks to David Fettig, Terry Fitzgerald, Jenni Schoppers, Robert Shimer, and Kei-Mu Yi for helpful comments.
Demand Shocks Since 2007

- Starting point for analysis: two distinct kinds of demand shocks.


- Usual models/analyses emphasize one force or the other - I include both.
Falls in Employment

- Labor demand shock generates a fall in employment.

- This fall in employment is magnified if the real wage adjusts slowly to the shock.

- The product demand shock generates an additional fall in employment.
Main Model Implications

In this model:

1. Monetary policy **can** offset the jobs impact of a *product* demand shock.

2. Monetary policy **cannot** offset the jobs impact of a *labor* demand shock and any associated slow real wage adjustment.

3. Non-monetary policy **can** offset the jobs impact of a *labor* demand shock - but only with the support of monetary policy.
Dual Mandate Implications of the Model

• The dual mandate is: promote price stability and maximum employment.

• The model implies that, acting alone, the Fed cannot offset the impact of adverse labor demand shocks.

• Hence: adverse labor demand shocks reduce the maximum employment achievable by the Fed.
Connections

• Long line of disequilibrium models that nest "classical" and "Keynesian" unemployment.
  – See, for example, Malinvaud (1977), Coen and Hickman (1988).

• These concepts have rough analogs in my model.
  – "Classical" unemployment = employment shortfall due to slow real wage adjustment.
  – "Keynesian" unemployment = employment shortfall due to high real interest rates.
More Recent Connections

- Recent academic work studies how increased uncertainty about financial conditions reduces labor demand.
  - See Quadrini and Perri (2011), among others.


- Hall (2011) - models labor market impact of high real interest rates.
  - Like Hall, I use a disequilibrium model (not New Keynesian or search).
Outline

1. Labor Demand Shock
2. Product Demand Shock
3. Limits to Monetary Policy
4. Other Policy Responses
5. Conclusions
6. Appendix: Model Math
Before I Get Started ....

• "Real" wages are actual wages, divided by the price index.
  – Real wage growth is wage growth, adjusted for inflation.

• "Real" interest rate is the actual interest rate net of inflation.
  – I assume that the Fed controls current and future real interest rates.

• (Minor) assumption: no income effects on labor supply.
1. LABOR DEMAND SHOCK
Fall in Labor Demand

• For a given real wage:

• Firms want to hire fewer workers/hours in 2012 than in 2007.

• Why?
Multiple Sources of Fall in Labor Demand

- Harder to start up new firms (because households have less net worth).
  - Young firms are important source of employment growth.

- High firm profits suggest that product market competition has declined.
  - Recession eliminated many firms.
  - Less startup activity means less competition from potential entrants.
Uncertainties

• Firms now see adverse financial shocks as being more likely than they did in 2007.
  – They learned in 2008 that such shocks can trigger large layoffs.
  – This possibility makes them less willing to hire new workers.

• Firms remain concerned about possible increases in taxes and regulations.
Adverse Labor Demand Shock

The diagram illustrates the impact of an adverse labor demand shock. The supply of labor, $L^s$, and the demand for labor, $L^d$, are shown on the graph. The shock results in a decrease in demand, indicated by $L_{12}^d$, compared to $L_{07}^d$. The wage rate, $W$, is represented on the vertical axis, with $W_{07}$ indicating the wage level before the shock.

The intersection of the supply and demand curves before the shock is at $L_{07}$, indicating the equilibrium level of employment. After the shock, the demand curve shifts to the left, and the new equilibrium is found at a lower level of employment, $L_{07}$, and a lower wage rate, $W_{07}$. This demonstrates the negative effect of the shock on labor market dynamics.
Slow Real Wage Adjustment

- Real wages should fall to clear markets.

- But firms may face internal and external impediments to cutting real wages for new hires.

- This gives rise to even lower employment.
Slow Real Wage Adjustment

\[ W \]

\[ L^d \]

\[ L^{s} \]

\[ w_{\text{FLOOR}} \]

\[ L_{\text{FEDMAX}} \]

\[ L_{\text{FE}} \]
2. PRODUCT DEMAND SHOCK
• When real interest rate is high: people buy less and save more.

• When real interest rate is low: people buy more and save less.

• For a given real interest rate, people demand less consumption in 2012 than in 2007.

• Why?
Sources of Lower Product Demand

- Loss of wealth due to fall in housing values and equity wealth.

- Higher risk of job loss: households need to do more self-insurance.

- Tighter access to household credit.
Adverse Product Demand Shock

\[ r \]

\[ Y^d_{07} \]

\[ Y^d_{12} \]

\[ Y_{\text{FEDMAX}} \]

\[ Y_{\text{FE}} \]

\[ Y \]
Real Interest Rate, Output and Employment

- The Fed controls $r$.

- Its choice of $r$ determines the aggregate demand for goods.

- That in turn determines output, and thereby employment.
Relevance of the Real Interest Rate: Labor Market

The diagram illustrates the labor market with the demand curve $L^d$ and the supply curve $L^s$. The wage rate $W$ is depicted on the vertical axis, and the quantity of labor $L$ is on the horizontal axis. The wage floor $W_{FLOOR}$ is shown as a horizontal line at $W$. The labor market equilibrium is at $L_{FE}$, where the demand and supply curves intersect. The vertical distance between the wage rate and the wage floor, $W - W_{FLOOR}$, represents the real interest rate.
3. LIMITS TO MONETARY POLICY
Modeling Monetary Policy

- By lowering $r$, monetary policy can increase output.
Impact of Monetary Stimulus in the Product Market

\[
\begin{align*}
Y^d \quad &\quad Y_{FEDMAX} \quad &\quad Y_{FE} \\
\bar{r} \quad &\quad \bar{r'} \\
\end{align*}
\]
Impact of Monetary Stimulus in the Labor Market

\[ W \]

\[ \bar{W} \]

\[ W_{FLOOR} \]

\[ L \]

\[ L^s \]

\[ L^d \]

\[ L_{FEDMAX} \]

\[ L_{FE} \]
Key Model Result

- The Fed cannot remove impediments to real wage adjustment.

- This means that lowering $r$ cannot raise $Y$ above $Y_{FEDMAX}$.

- And: lowering $r$ cannot raise $L$ above $L_{FEDMAX}$.

- Fed’s "maximum employment" is $L_{FEDMAX}$ - which may be less than full employment $L_{FE}$. 
4. OTHER POLICY RESPONSES
Non-Monetary Policies

• Can non-monetary policies raise employment above $L_{FEDMAX}$?

• The model implies that:
  
  – Product demand stimulus policies cannot.

  – Labor demand stimulus policies can - but only with the help of monetary policy.
Product Demand Stimulus

• Suppose the government stimulates product demand.
  
  – examples: buying more goods itself or reducing sales taxes

• For a fixed $r$, such a policy can increase $Y$.

• But it cannot raise $Y$ above $Y_{FEDMAX}$ - or $L$ above $L_{FEDMAX}$. 
Impact of Product Demand Stimulus

The graph illustrates the impact of product demand stimulus on the economy. The demand curve shifts from $Y_d$ to $Y'_d$, indicating an increase in demand. The effect is depicted as a movement along the demand curve, from $Y$ to $Y'$, followed by a further shift to $Y_{FEDMAX}$ and then to $Y_{FE}$. The diagram shows the relationship between the interest rate ($r$) and the level of output ($Y$), highlighting the economic effects of stimulus measures.
Labor Demand Stimulus

- Policies that stimulate labor demand can raise $L_{FEDMAX}$.
  - Example: subsidies for hiring by firms.
Impact of Hiring Subsidies in the Labor Market

The graph illustrates the effect of hiring subsidies on the labor market. The demand for labor shifts from $L^d$ to $L'^d$, and the supply of labor shifts from $L^s$ to $L'^s$. The wage floor $W_{FLOOR}$ is shown, and the change in employment is indicated by the shift in labor supply and demand curves.
Needed: Help from Monetary Policy

- Consider any policy that raises the Fed’s maximum employment $L_{FEDMAX}$.

- This policy only raises employment itself if monetary policy also eases.
Impact of Hiring Subsidies in the Product Market

A graph showing the relationship between the interest rate (r) and the output (Y). The graph includes a demand curve (Y^d) and a supply curve (r), with points Y'_FEDMAX and Y_FEDMAX indicating changes in output due to hiring subsidies.
5. CONCLUSIONS
Motivating Question

- The FOMC views its two mandates as generally complementary.

- But over the past four years, the Fed has apparently done better on its price stability mandate than on its employment mandate.

- Why?
Model’s Answer to the Motivating Question

- The Fed’s accommodative policy has offset the impact of the product demand shock.

- Those actions have successfully kept inflation near target.

- But the Fed can’t offset the large adverse shock to labor demand and slow real wage adjustment.

- This limitation is what keeps employment low.
• In the language of the model, $\overline{L}$ is near $L_{FEDMAX}$ ...

• But $L_{FEDMAX}$ is well below $L_{FE}$
Important Policy Implication from the Model

- Some argue that raising employment requires *product demand stimulus*.
  - easier monetary policy or increased government purchases

- Others argue that raising employment requires *labor demand stimulus*.
  - cutting taxes or increasing subsidies to firms
• This model incorporates both labor demand and product demand shocks.

• Raising employment above $L_{FEDMAX}$ requires dual stimulus:
  
  – Labor demand stimulus (e.g. hiring subsidies) AND
  
  – Monetary easing
APPENDIX: MODEL MATH
Four Equilibrium Restrictions (in every date and state)

1. $\overline{Y}_t = F(\overline{L}_t)$

2. $\overline{w}_t = F'(\overline{L}_t)\eta_t$

3. $\overline{Y}_t = Y^d(\overline{\pi}_t; \xi_t)$

4. $\overline{w}_t \geq \max(w^FLOOR_t, v'(\overline{L}_t))$
Assumptions

\( v'(L_t) \) is indep. of \( C_t \) (no income effects on labor supply)

\( F' \) is strictly decreasing in \( L \)

\( Y^d \) is strictly decreasing in \( r \)
Understanding the Restrictions

Restriction 2: $\bar{w}_t = F'(L_t)\eta_t$

- Restriction 2 is implied by the following four assumptions:
  - Firms maximize profits.
  - Firms can freely adjust prices (unlike New Keynesian models).
  - Firms take wages as given.
  - Firms face revenue distortions $\eta_t$ (like taxes or market power).
Restriction 3: \( Y_t = Y^d(r_t; \xi_t) \)

- I assume that the Fed’s changes in the nominal interest rate have little impact on inflation expectations.

- In this way, the Fed is able to control the \textit{real} interest rate \( r_t \).
**Restriction 4:** \( \bar{w}_t \geq \max(\hat{w}_t^{FLOOR}, v'(\bar{L}_t)) \)

- Restriction 4 is implied by the following three assumptions:
  - Firms reject any worker’s offer to supply labor at a real wage below \( \bar{w}_t \).
  - Real wages cannot fall below \( \hat{w}_t^{FLOOR} \).
  - Firms cannot force workers to supply labor.
Changes Since 2007

- Fall in labor demand: modeled as fall in $\eta_t$.
  - This change is not due to technology, because $F$ is unchanged.

- Fall in product demand: modeled as fall in $\xi_t$. 
Definitions of Key Concepts

Def’n of full employment $L_t^{FE}$

$$\eta_t F'(L_t^{FE}) = v'(L_t^{FE})$$

Def’n of Fed’s maximum employment $L_t^{FEDMAX}$

$$\eta_t F'(L_t^{FEDMAX}) = \max (w_t^{FLOOR}, v'(L_t^{FEDMAX}))$$
Key Results

- \( L \leq L_{t}^{FEDMAX} \leq L_{t}^{FE} \).

- \( L_{t}^{FEDMAX} \) is independent of \((r_{t}, \xi_{t})\).

- That is, \( L_{t}^{FEDMAX} \) - not \( L_{t}^{FE} \) - is maximum employment for Fed (in any date and state).
Hiring Subsidies

• A hiring subsidy increases the value of $\eta_t$.

• Hence, a hiring subsidy raises $L_t^{FEDMAX}$ (and $L_t^{FE}$).

• But $F(L_t) = Y^d(r_t; \xi_t)$.

• Hence, a hiring subsidy does not raise $L_t$, unless $r_t$ is lower.