Comment on Drautzburg and Uhlig, Fiscal Stimulus and Distortionary Taxation

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Some basic analytics of fiscal policy, monetary policy, the neutral real interest rate, and output determination in the simplest New Keynesian model

- Cf. Christiano-Eichenbaum-Rebelo 09, Erceg-Lindé 09, Eggertsson 09, Drautzberg-Uhlig 10, Woodford 10
- Necessary to get intuition behind Drautzberg-Uhlig

A few specific comments about Drautzberg-Uhlig
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Fiscal policy and the neutral interest rate

- Simplest New Keynesian model:

\[ r_t \equiv i_t - \pi_{t+1|t} \]
\[ c_t = c_{t+1|t} - \sigma(r_t - \rho_t) \]
\[ \alpha \equiv C/Y \]
\[ y_t = \alpha c_t + (1 - \alpha)g_t \]
\[ c_t = \frac{1}{\alpha} y_t - \frac{1 - \alpha}{\alpha} g_t \]

- Aggregate demand:

\[ \frac{1}{\alpha} y_t - \frac{1 - \alpha}{\alpha} g_t = \frac{1}{\alpha} y_{t+1|t} - \frac{1 - \alpha}{\alpha} g_{t+1|t} - \sigma(r_t - \rho_t) \]

- Potential (flexprice) output and neutral (real) interest rate:

\[ \frac{1}{\alpha} \bar{y}_t - \frac{1 - \alpha}{\alpha} g_t \equiv \frac{1}{\alpha} \bar{y}_{t+1|t} - \frac{1 - \alpha}{\alpha} g_{t+1|t} - \sigma(\bar{r}_t - \rho_t) \]
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Fiscal policy and the neutral interest rate

- Neutral (real) interest rate:

\[ \tilde{r}_t \equiv \rho_t + \frac{1}{\sigma \alpha} E_t \Delta \tilde{y}_{t+1} - \frac{1 - \alpha}{\sigma \alpha} E_t \Delta g_{t+1} \]

- Potential output depends on fiscal expenditure

\[ u'(\tilde{Y}_t - G_t) = \frac{\phi'(\tilde{H}_t)}{\tilde{W}_t / \tilde{P}_t} = \frac{\phi'(\tilde{H}_t)}{f'(\tilde{H}_t)} = \frac{\phi'(f^{-1}(\tilde{Y}_t))}{f'(f^{-1}(\tilde{Y}_t))} \equiv \tilde{\phi'}(\tilde{Y}_t) \]

\[ \frac{d\tilde{Y}_t}{dG_t} = \frac{\tilde{\phi}''}{\tilde{\phi}'' - u''} \equiv m < 1 \]

\[ \frac{e\tilde{Y}_t}{eG_t} = \frac{\tilde{y}_t}{\tilde{g}_t} = \frac{d\tilde{Y}_t}{dG_t} \frac{G}{\tilde{Y}} = m(1 - \alpha) \equiv \gamma < 1 \]

- Neutral (real) interest rate:

\[ \tilde{r}_t = \rho_t + \frac{1 - \alpha}{\sigma \alpha} (m - 1) E_t \Delta g_{t+1} \]
Fiscal policy and the neutral interest rate

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- Potential output depends on fiscal expenditure:

\[ u'(\bar{Y}_t - G_t) = \frac{v'(\bar{H}_t)}{\bar{W}_t / \bar{P}_t} = \frac{v'(\bar{H}_t)}{f'(\bar{H}_t)} = \frac{v'(f^{-1}(\bar{Y}_t))}{f'(f^{-1}(\bar{Y}_t))} \equiv \bar{v}'(\bar{Y}_t) \]

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\[ \bar{r}_t = \rho_t + \frac{1 - \alpha}{\sigma\alpha} (m - 1) E_t \Delta g_{t+1} \]

\[ E_t \Delta g_{t+1} \downarrow \implies \bar{r}_t \uparrow \]

Output gap:

\[ y_t - \bar{y}_t = (y_{t+1|t} - \bar{y}_{t+1|t}) - \sigma\alpha (r_t - \bar{r}_t) \]

\[ = y_{t+T|t} - \bar{y}_{t+T|t} - \sigma\alpha \sum_{\tau=0}^{T-1} (r_{t+\tau|t} - \bar{r}_{t+\tau|t}) \approx 0 \]

Output:

\[ y_t \approx \bar{y}_t - \sigma\alpha \sum_{\tau=0}^{T-1} (r_{t+\tau|t} - \bar{r}_{t+\tau|t}) = \gamma g_t - \sigma\alpha \sum_{\tau=0}^{T-1} (r_{t+\tau|t} - \bar{r}_{t+\tau|t}) \]

Monetary policy stance:

\[ r_t - \bar{r}_t, \quad \sum_{\tau=0}^{T-1} (r_{t+\tau|t} - \bar{r}_{t+\tau|t}) \]
Fiscal policy and the neutral interest rate

- Fiscal policy and the neutral interest rate:

\[ \bar{r}_t = \rho_t + \frac{1 - \alpha}{\sigma \alpha} (m - 1) E_t \Delta g_{t+1} \]

\[ E_t \Delta g_{t+1} \downarrow \Rightarrow \bar{r}_t \uparrow \]

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Fiscal policy and the neutral interest rate

- Fiscal policy and the neutral interest rate:
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  \bar{r}_t = \rho_t + \frac{1 - \alpha}{\sigma \alpha} (m - 1) E_t \Delta g_{t+1}
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Fiscal policy and the neutral interest rate

- Nominal (market) rate $i_t$, policy rate $i^p_t$, spread $\delta_t$: $i_t = i^p_t + \delta_t$
- Real (market) rate $r_t$: $r_t \equiv i_t - \pi_{t+1|t} = i^p_t + \delta_t - \pi_{t+1|t}$
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\sum_{\tau=0}^{T-1} (r_{t+\tau|t} - \bar{r}_{t+\tau|t}) = \sum_{\tau=0}^{T-1} i^p_{t+\tau|t} + \sum_{\tau=0}^{T-1} \delta_{t+\tau|t} - (p_{t+T|t} - p_t) - \sum_{\tau=0}^{T-1} \bar{r}_{t+\tau|t}
\]

- Increase output gap: $\sum_{\tau=0}^{T-1} (r_{t+\tau|t} - \bar{r}_{t+\tau|t}) \downarrow$
  - Extend period of low policy rate (monetary policy, ZLB!):
    $\sum_{\tau=0}^{T-1} i^p_{t+\tau|t} \downarrow$
  - Keep spreads down (credit policy, credit easing):
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- Monetary policy stance:

$$\sum_{\tau=0}^{T-1} (r_{t+\tau|t} - \bar{r}_{t+\tau|t}) = \sum_{\tau=0}^{T-1} i_{t+\tau|t}^p + \sum_{\tau=0}^{T-1} \delta_{t+\tau|t} - (p_{t+T|t} - p_t) - \sum_{\tau=0}^{T-1} \bar{r}_{t+\tau|t}$$

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  - Use fiscal policy to increase neutral rate: $\sum_{\tau=0}^{T-1} \bar{r}_{t+\tau|t} \uparrow$
Use fiscal policy to increase neutral rate

- Shift up neutral-rate path:

\[
\sum_{\tau=0}^{T-1} \bar{r}_{t+\tau|t} \uparrow
\]

\[
\bar{r}_t \equiv \rho_t + \frac{1 - \alpha}{\sigma \alpha} (m - 1) E_t \Delta g_{t+1} \uparrow
\]

\[
\sum_{\tau=0}^{T-1} \bar{r}_{t+\tau|t} = \sum_{\tau=0}^{T-1} \rho_{t+\tau|t} + \frac{1 - \alpha}{\sigma \alpha} (m - 1) (g_{t+T|t} - g_t) \uparrow
\]

- Reduce long-run government expenditure growth:

\[
g_{t+T|t} - g_t \downarrow
\]

- Increase current expenditure, lower future expenditure:

\[
g_t \uparrow, g_{t+T|t} \downarrow
\]
Use fiscal policy to increase neutral rate

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\sum_{\tau=0}^{T-1} \bar{r}_{t+\tau|t} \uparrow
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\]

\[
\sum_{\tau=0}^{T-1} \bar{r}_{t+\tau|t} = \sum_{\tau=0}^{T-1} \rho_{t+\tau|t} + \frac{1 - \alpha}{\sigma\alpha} (m - 1) (g_{t+T|t} - g_t) \uparrow
\]

- Reduce long-run government expenditure growth:

\[g_{t+T|t} - g_t \downarrow\]

- Increase current expenditure, lower future expenditure:

\[g_t \uparrow, \ g_{t+T|t} \downarrow\]
Distortionary taxation and potential output

- Potential output decreasing in distortionary taxes:

\[
\tilde{y}_t(g_t) \rightarrow \tilde{y}_t(g_t, \tau_t)
\]

\[
\tau_t \uparrow \Rightarrow \tilde{y}_t \downarrow
\]

- Direct effect on output at given output gap:

\[
y_t = \tilde{y}_t(g_t, \tau_t) + \ldots
\]

- Effect on neutral rate through \(\tilde{y}_{t+T|t} - \tilde{y}_t\):

\[
\sum_{\tau=0}^{T-1} \tilde{r}_{t+\tau|t} = \sum_{\tau=0}^{T-1} \rho_{t+\tau|t} + \frac{1}{\sigma\alpha} [\tilde{y}_{t+T|t}(g_{t+\tau|t}, \tau_{t+\tau|t}) - \tilde{y}_t(g_t, \tau_t)]
\]

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