On the Merits of Conventional vs Unconventional Fiscal Policy

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The views expressed in this paper do not necessarily reflect those of Banque de France and Sveriges Riksbank.

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Main messages
Relative merits of conventional vs unconventional fiscal policy

- In the context of high debt levels and monetary constraints (ZLB), recent literature has promoted *unconventional fiscal policy* (UFP)
  - **One important proposal is a gradual increase of the sales tax.**
  - See Correia et al. (2013, AER) for a closed economy analysis and Fahri et al. (2014, ReStud) for open economy extension (fiscal devaluation).

- We compare such a policy with *conventional fiscal policy* (CFP) based on **hikes of government investment**
  - Data suggest historically low levels of public and private infrastructure investment in recent years in many EA countries (IMF issued support for increased public investment in Germany, May 14th).
Main findings
Conventional fiscal policy is more robust to adding realistic frictions

- **UFP is appealing in a stylized model with sticky prices and flexible wages.**
  - Both policies are expansionary, but UFP has the virtue of reducing public debt.

- **Advantage of UFP does not necessary hold up in a richer TANK model with sticky wages**
  - Contrary to conventional policy, UFP is not expansionary anymore unless labor (or capital) income taxes are adjusted aggressively.
Presentation outline

- Stylized Model
- Impulses to Gradual Sales Tax Hike
- Impulses to Higher Government Investment
- Analysis in a Fully-Fledged Model
- Tentative Conclusions
A standard log-linearized version of the New Keynesian DSGE model with a lower bound constraint on interest rates following Eggertsson and Woodford (2003)

- Separability between consumption and labor
- Production function with fixed private capital and with public capital subject to time-to-build
- Sticky prices, flexible nominal wages
- Government consumes/invests part of final domestic good
- Sales taxes exogenous
- Labor income tax rule stabilizes gov’t debt

Standard calibration intended to be relevant for US and EA
Setting of the two experiments: announced increase of sales taxes by 1pp of GDP, with aggressive or non agg. response of labor tax, within 10-quarter liquidity trap (achieved with taste shock $\nu_t$)
Key equation: the dynamic IS curve extended with sales tax $\tau_{C,t}$

\[
\frac{(C_t - C_{\nu t})^{-1/\sigma}}{1 + \tau_{C,t}} = \beta E_t \frac{1 + i_t}{1 + \pi_{t+1}} \frac{(C_{t+1} - C_{\nu t+1})^{-1/\sigma}}{1 + \tau_{C,t+1}}
\]

Key responses

- As inflation is sticky, slow response of real interest rate
- Because of expected increase of $\tau_{C,t}$, **big incentive to substitute current consumption to future consumption**
- Inflation stimulated by the increased output gap (Phillips curve)
- Extra receipts from tax hike and its expansionary effect imply fall of debt or of labor tax depending on fiscal rule
Impulse Responses to Gradual Sales Tax Hike

1 percent of baseline GDP hike in stylized model

Figure 2. Impulses to Sales Taxes in Normal Times and in a 10 Quarter Liquidity Trap

Non-aggressive Tax Rule

Output

Real Interest Rate (APR)

Labor Income Tax

Govt. Debt (share of trend GDP)

Inflation (APR)

Quarter

Agressive Tax Rule

Output

Real Interest Rate (APR)

Labor Income Tax

Govt. Debt (share of trend GDP)

Inflation (APR)

Quarter
Stylized Model

Setting of simulations of gov’t investment stimulus

Setting of the two experiments: increase of gov’t investment by 1pp of baseline GDP at the onset of a 10-quarter liquidity trap

![Graph showing Public Infrast. Investment (GDP share) over time](image-url)
Stylized Model
Key ingredients driving responses to gov’t investment stimulus

**Key equations: supply/demand role of gov’t investment** $G_{I,t}$

$$Y_t = Z_t \left[ K_P^\nu K_{G,t}^{1-\nu} \right]^\alpha N_t^{1-\alpha} = C_t + G_{C,t} + G_{I,t}$$

**Key responses**

- Fall of real interest rate because of rising demand and inflation expectations
- Potential real rate only start to rise in the phasing out period (with flex. price, crowding in of consumption at that time)
- Output gap boosted by this fall of the real interest rate gap
- Here, demand channel reinforced by impact of gov’t investment on permanent income (smaller role for impact on marginal costs)
Impulse Responses to Higher Government Investment

1 percent of baseline GDP hike in stylized model

Figure 3. Impulses to Public Invest. in Normal Times and in a 10 Quarter Liqu. Trap

Non-agressive Tax Rule

- Output

- Real Interest Rate (APR)

- Labor Income Tax

- Govt. Debt (share of trend GDP)

- Effective Capital Stock

Agressive Tax Rule

- Output

- Real Interest Rate (APR)

- Labor Income Tax

- Govt. Debt (share of trend GDP)

- Effective Capital Stock

DSGE model of Erceg and Lindé (2013), building on CEE/SW

- Endogenous private capital
- Nominal and real rigidities CEE (2005), SW (2003, 2007):
  - Staggered price and wage contracts, dynamic indexation
  - External habit persistence in consumption
  - CEE type of investment adjustment costs

- “Hand-to-mouth” households following EGG (2006)
- Other aspects as in stylized model, but more realistic modelling of tax bases and positive steady state debt
Impulse Responses to Both Shocks
1 percent of baseline GDP hike in fully-fledge model

Sales tax hike: not anymore expansionary, unless aggressive tax rule

![Figure 4. Impulses to Sales Taxes in Normal Times and in a 10 Quarter Liquidity Trap in the Full Model](image)

Non-agressive Tax Rule
Output

Agressive Tax Rule
Output

Gov’t investment stimulus: expansionary effects, as in the stylized case

![Figure 7. Impulses to Public Invest. in Normal Times and in a 10 Quarter Liqu. Trap in the Full Model](image)

Non-agressive Tax Rule
Output

Agressive Tax Rule
Output
Impulse Responses to Gradual Sales Tax Hike
What drives the difference w.r.t. the stylized model?

Sticky Price Model

Output

Inflation (APR)

Potential

Sticky Price - Sticky Wage Model

Output

Inflation (APR)

Normal Times

Liquidity Trap

Full Model

Output

Inflation (APR)
Robustness checks

- Discounting of Euler equation: does not matter so much
- Expansionary effect of CFP robust to the productive degree of gov’t spending and to time-to-build delay
- UFP more expansionary with an aggressive tax rule based on capital income tax
- GHH preferences: expansionary effect of UFP disappears even in stylized model (with non aggressive tax rule)
- Durables: could be in favor of UFP (work in progress)
Tentative Conclusions

- For an economy facing a deep recession and prolonged liquidity trap, there is a **strong argument for temporarily increasing government spending on infrastructure spending**.
  - Such a policy would boost demand in the near-term which is useful, and potential output in the longer term when the economy is recovering.
  - Given the slack of the Euro area, for its members with fiscal space this is still thus a strong case for fiscal stimulus.
  - But for a country like the United States, which now experiences more normalized business cycle conditions, the macroeconomic argument for stimulus via infrastructure spending is much weaker.

- **Benign effects of unconventional fiscal policy less certain**, and dependent on “grand tax bargains.”
  - The sales tax part of “Abenomics” not necessarily stimulative.
  - Important lessons for ongoing empirical work (e.g. by D’Acunto et al., 2016).
Stylized Model
Log-linearized representation

- IS curve \((x_t \equiv y_t - y_{t}^{pot})\)

\[ x_t = x_{t+1|t} - \hat{\sigma}(i_t - \pi_{t+1|t} - r_{t}^{pot}) \]

- Pricing schedule (NKPC)

\[ \pi_t = \beta \pi_{t+1|t} + \kappa_{mc} \left( \phi_{mc} x_t + \frac{1}{1 - \tau_N} \left( \tau_{N,t} - \tau_{N,t}^{pot} \right) \right) \]

- Potential output \(y_{t}^{pot}\)

\[ y_{t}^{pot} = \frac{1}{\phi_{mc} \hat{\sigma}} \left[ g_y g_t + (1 - g_y) \nu_c \nu_t - \frac{\hat{\sigma}}{1 - \tau_N} \tau_{N,t}^{pot} - \frac{\hat{\sigma}}{1 + \tau_C} \tau_{C,t} \right] \]

- Potential real interest rate \(r_{t}^{pot}\)

\[ r_{t}^{pot} = \frac{1}{\hat{\sigma}} E_t \Delta y_{t+1}^{pot} - \frac{g_y}{\hat{\sigma}} E_t \Delta g_{t+1} - \frac{1 - g_y}{\hat{\sigma}} \nu E_t \Delta \nu_{t+1} + \frac{1}{1 + \tau_C} E_t \Delta \tau_{C,t+1} \]
Monetary policy rule

\[ i_t = \max \{ -i, (1 - \gamma_i) (\gamma_{\pi} \pi_t + \gamma_x x_t) + \gamma_i i_{t-1} \} \]

ZLB binding when log-linearized interest rate reach \(-i\)

The taste shock \(\nu_t\) follows a AR(1) process

\[ \nu_t = (1 - \rho_{\nu}) \nu_{t-1} + \epsilon_{\nu, t} \]

Add negative shock \(\epsilon_{\nu, t}\) to make ZLB binding for 10 quarters in the baseline scenario.
Stylized Model
Fiscal Policy specification

- Gov’t debt $b_{G,t}$ as a share of trend output ($b_G = 0$) evolves as
  
  $$b_{G,t} = (1 + r)b_{G,t-1} + g_y g_t - c_y \left[ \tau_{C,t} + \frac{\tau_C}{c_y} (y_t - g_y g_t) \right]$$
  $$\quad - s_N \left[ \tau_{N,t} + \tau_N (y_t + \phi_{mc} x_t) \right] - \tau_t$$

  where $(y_t + \phi_{mc} x_t)$ equals real labor income, $\tau_t$ lump-sum tax, and $s_N$ is the steady state labor share.

- Fiscal policy rule based on the labor income tax
  
  $$\tau_{N,t} - \tau_N = \varphi_b b_{G,t-1} + \varphi_{bb} \tilde{\tau}_{N,t}$$

  where $\tilde{\tau}_{N,t}$ is the labor income tax which keeps gov’t debt $b_{G,t}$ fully stabilized. Non-agressive rule for a low value of $\varphi_b$ ($\varphi_{bb} = 0$) and complete stabilization rule for $\varphi_b = 0$ and $\varphi_{bb} = 1/s_N$

- Sales tax evolves according to a AR(2) process, written on error-correction form
  
  $$\Delta \tau_{C,t} = \rho_{\tau,1} \Delta \tau_{C,t-1} - \rho_{\tau,2} \tau_{C,t-1} + \epsilon_{C,t}$$
Parameterization
Calibration of key parameters

Standard calibration intended to be relevant for the US and the euro area

- $\kappa_{mc} = 0.011$, in line with empirical estimates for the U.S., e.g. GG (1999) and Altig et al. (2011)

- Assume standard simple rule for monetary policy unconstrained by ZLB ($\gamma_i = 0.7$, $\gamma_\pi = 2.5$, $\gamma_x = 0.25$)

- Other parameters assume standard values; Frisch elasticity = 0.4, Labor share = 0.7, Government spending share = 0.23, log utility of consumption

- In the steady state, sales tax $\tau_C = 0.10$ as a compromise between levels in US and EA.

- Simplifying assumption that gov’t debt $b_G = 0$ and $\tau_t = \tau = -0.06$, so that income tax $\tau_N = 0.33$ when satisfying the steady state gov’t budget constraint
Stylized Model

Sales tax hikes with and without discounting in Euler equation

Output responses to sales tax hike in baseline stylized model

Non-agressive Tax Rule

Output

<table>
<thead>
<tr>
<th>Percent</th>
<th>1</th>
<th>5</th>
<th>9</th>
<th>13</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Times</td>
<td>1.0</td>
<td>0.5</td>
<td>0.2</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Liquidity Trap</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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Aggressive Tax Rule

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Same in stylized model with discounted Euler equation

Non-agressive Tax Rule

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Extending the stylized model with public investment

Non-linear equations

- Instead of being fixed, total capital now affected by gov’t capital:

\[ Y_t = Z_t \left( K_{t}^{\text{tot}} \right)^{\alpha} N_t^{1-\alpha} \]

\[ K_t^{\text{tot}} = (K_P)^{\vartheta} (K_{G,t})^{1-\vartheta} \]

with \( \vartheta = .833 \) and \( \alpha = .3 \), output elasticity of gov’t capital stock equals .05 as in Leeper et al. (2010).

- Accumulation of gov’t capital stock with a depreciation rate \( \delta_G = .02 \)

\[ K_{G,t} = (1 - \delta_G) K_{G,t-1} + I_{G,t} \]

- Assumption of time-to-build, i.e. gov’t spending turns into effective investment with delays (in a range of 1 to 6 years)

\[ I_{G,t} = \frac{1}{6} \left( G_{I,t-4} + G_{I,t-8} + G_{I,t-12} + G_{I,t-16} + G_{I,t-20} + G_{I,t-24} \right) \]
Extending the stylized model with public investment
Log-linearized implications

- Key equations of the log-linearized model remain unaltered, except the equation for $y_{pot}^t$ which now becomes

$$y_{pot}^t = \frac{1}{\phi_{mc}} \left[ \frac{g_y}{\sigma} g_t + \frac{1}{\sigma} (1 - g_y) v_{ct} - \frac{1}{1 - \tau_N} \tau_{N,t} \right] - \frac{1}{1 + \tau_C} \tau_{C,t} + \frac{1 + \chi}{1 - \alpha} (z_t + \alpha (1 - \vartheta) k_{G,t})$$

- Total government spending (in log-linearized terms) equals

$$g_t = g_C g_{Ct} + g_I g_{I,t}$$

where $g_{Ct}$ is government consumption, $g_C = G_C / G$ and $g_I = 1 - g_C$. As gov’t investment share of GDP equals 3 percent of GDP, against 23 percent for total gov’t spending, we set $g_I = 0.13$. 
Impulse Responses to Higher Government Investment
Robustness to alternative assumptions for non-aggressive rule

Figure 3. Alternative Simulations of Impulses to Public Invest.

Benchmark calibration

Output

Inflation (APR)

Public infrast. is not productive

Public infrast. is more productive

Public infrast. is sooner productive (1-2 years)

Public infrast. is later productive (5-10 years)

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Analysis in the Fully-Fledged Model
Parameterization

- We set the population share of the Keynesian households to optimizing households to 0.47, implies that the Keynesian households’ share of total consumption is about 0.3.

- Calibration of the parameters affecting the financial accelerator follow BGG (1999): the monitoring cost, $\mu$, expressed as a proportion of entrepreneurs’ total gross revenue, is 0.12. Default rate of entrepreneurs is 3 percent per year, and the variance of the idiosyncratic productivity to entrepreneurs is 0.28.

- The share of total government spending of GDP is set equal to 23 percent. The government debt to GDP ratio is 1. The steady state private capital income tax rate, $\tau_K$, is set to 0.25, while $\tau_C = 0.1$. Lump-sum transfers $-\tau$ equals 0.06. Given these choices, the government’s intertemporal budget constraint implies that $\tau_N$ equals 0.33 in steady state.

- Same paths for $\tau_C, t$ and $G_l, t$ as in stylized model.
Impulse Responses to Gradual Sales Tax Hike

1 percent of baseline GDP hike in fully-fledged model

Figure 4. Impulses to Sales Taxes in Normal Times and in a 10 Quarter Liquidity Trap in the Full Model

Non-agressive Tax Rule

Agressive Tax Rule

Output

Potential

Real Interest Rate (APR)

Labor Income Tax

Govt. Debt (share of trend GDP)

Inflation (APR)

Quarter

-0.5
0
0.5
1
1.5
Percent

0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Percent

Quarter
Impulse Responses to Gradual Sales Tax Hike
What drives the difference w.r.t. stylized model, focus on real wage

Figure 6. Simulations of Impulses to Sales Tax in Simplified and Full Models

Sticky Price Model

Output

Real Wage

Potential

Sticky Price - Sticky Wage Model

Output

Real Wage

Liquidity Trap

Normal Times

Sticky Price - Sticky Wage Model with Habit Consumption

Output

Real Wage

Full Model

Output

Real Wage

Impulse Responses to Gradual Sales Tax Hike
What if capital taxes are used aggressively to stabilize government debt?

Figure 6. Impulses to Sales Taxes with Aggr. Rule on Cap. Income Tax in the Full Model

- Output
- Potential
- Real Interest Rate (APR)
- Normal
- Liquidity Trap
- Total Consumption
- HtM Consumption
- Optimizing Households Consumption
- Capital Income Tax (P.P.)
- Government Debt (Trend Share)
- Private Investment
- Policy Rate (APR)
- Inflation (APR)
Impulse Responses to Higher Government Investment

1 percent of baseline GDP hike in fully-fledged model

Figure 7. Impulses to Public Invest. in Normal Times and in a 10 Quarter Liqu. Trap in the Full Model

- Non-aggressive Tax Rule
  - Output
  - Real Interest Rate (APR)
  - Labor Income Tax
  - Govt. Debt (share of trend GDP)
  - Inflation (APR)
  - Private Capital Stock

- Agressive Tax Rule
  - Output
  - Real Interest Rate (APR)
  - Labor Income Tax
  - Govt. Debt (share of trend GDP)
  - Inflation (APR)
  - Private Capital Stock
Impulse Responses to Higher Government Investment
Robustness to alternative assumptions for non-aggressive rule in fully-fledged model
Smaller Effect of UFP in a Stylized Model with GHH pref.
Output responses in models with GHH preferences and non-agg. tax rules

Stylized Model with GHH preferences, Non-agg. Tax Rule

Sales Tax Shock

Gov’t investment shock

Workhorse Model with GHH preferences, Non-agg. Tax Rule

Sales Tax Shock

Gov’t investment shock