Monetary and Fiscal Policies: Stabilization Policy

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NK models also have novel implications about the interactions of fiscal and monetary policies in the stabilization context, as we will see, but the conduct of policy in reality has not embraced these implications. Mishkin (2010) also discusses the ways in which the financial crisis posed challenges to the pre-crisis consensus about stabilization policy.
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The conduct, as well as the rhetoric, of US fiscal policy during the crisis drew sharp criticisms from a number of academic researchers, as Leeper (2010) illustrates. Leeper acknowledges that the lack of consensus reflects, in part, the inconclusive state of academic research on fiscal multipliers. But he mainly blames the disconnect between politicized discourse and scientific principles, and takes as a case in point the Obama Administration’s claims about the size of US multipliers.
Figure 1: Output multipliers for a permanent increase in government spending or a permanent decrease in taxes, as reported in Romer and Bernstein (2009).

simultaneously, then economic activity will improve.

To be sure, fiscal multipliers depend on the state of the economy and can change over time. But can they change sign in a little over a year? Does any model exist to show that 18 months ago it made sense for the United Kingdom to expand fiscal policy, while now it makes sense to implement the recently announced 25 percent nearly across-the-board budget cuts? As Alesina and Ardagna (1998) make clear, an intricate set of conditions needs to be in place for consolidations to be expansionary—“the tightening must be sizeable and occur after a period of stress when the budget is quickly deteriorating and public debt is building up…. To be long lasting, it must include cuts in public employment, transfers and government wages. To be politically possible, such a policy must be supported by trade unions.” Those authors also point out that several issues are “not settled,” but are critical to determining which fiscal consolidations will contract the economy and which will expand it.

Fiscal flip-flops are being justified in the name of credibility. Countries feel the need
Fiscal Multipliers

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  - And the output multiplier is well below unity, as Leeper (2010) illustrates.
financed by lower lump-sum transfers. When higher spending brings forth lower future spending, the multiplier turns negative in about two years and remains negative even 10 years out. The sharpest difference occurs when capital and labor tax rates rise to finance spending, with the multiplier turning negative in six quarters and remaining strongly negative.\textsuperscript{17}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{output_multipliers.png}
\caption{Output multipliers estimated in a neo-classical growth model using post-war U.S. data, as reported in Leeper et al. (2010). Various counterfactual exercises.}
\end{figure}

The thought experiment underlying figure 3 is controlled in the sense that the only difference across the multiplier paths is the policy rules in place, which determine the sources of future fiscal adjustments and the model agents’ expectations of future policies. Evidently, those expectations are of central importance to determining the dynamic impacts of govern-

\textsuperscript{17}Multipliers are present-value multipliers, computed for horizon $k$ as

$$
\text{Present-Value Multiplier}(k) = \frac{E_t \sum_{j=0}^{k} \left( \prod_{i=0}^{j} R_{t+i}^{-1} \right) \Delta Y_{t+j}}{E_t \sum_{j=0}^{k} \left( \prod_{i=0}^{j} R_{t+i}^{-1} \right) \Delta G_{t+j}}
$$

where $Y$ and $G$ are real GDP and real government consumption and $R$ is the model-derived discount rate. Often the $k$-period multiplier is calculated as $\Delta Y_k/\Delta G_0$, where $\Delta G_0$ is the initial change in spending. This textbook-style multiplier, however, is inadequate when changes in government spending generate dynamics in both spending and output.
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  - In NK models (with price rigidity), the conduct of monetary policy affects the size of fiscal multipliers.
  - But the output multiplier for government purchases typically remains below unity in NK models, under standard interest-rate rules (like a Taylor rule) and under optimal monetary policy.
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The optimality condition is

\[ u'(Y - G) = w'(Y) \]

where \( w(Y) = \nu[f^{-1}(Y)] \)
RBC Model

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- The planner responds to an increase in government purchases partly by increasing hours worked and partly by curbing private consumption.

- Departures from the benchmark (say, due to tax distortions) seem small on the margin.
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Basic NK Model

• The presence of price rigidity in NK models de-couples the consumption and employment decisions.

\[ \beta (1 + r) = 1 \]

The representative household's Euler equation implies that (in a perfect-foresight equilibrium) consumption is constant and the market-clearing condition implies

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the representative household’s Euler equation implies that (in a perfect-foresight equilibrium) consumption is constant.
- And the market-clearing condition implies \( dY / dG = 1 \)
Multipliers in NK Models

- So, under a benchmark monetary policy that keeps the real interest rate constant, the market-clearing condition

\[ Y_t = C + G_t \]

implies that the fiscal multiplier in the NK model is equal to one.

- Compared to this benchmark, a monetary policy that raises the real interest rate (in response to a fiscal expansion) leads to a fiscal multiplier below one.

- A monetary policy following a Taylor-type rule has this property in standard NK models, because a fiscal expansion is inflationary.

- Optimal monetary policy in the NK model also has this property, because it keeps the price level constant (as we will see) in response to a fiscal expansion.

- Woodford (2011) also shows how this leads to Eggertsson's (2009) result that the fiscal multiplier is larger than one in a liquidity trap with the nominal interest rate stuck at zero, the inflationary pressures of the fiscal expansion serve to lower the expected real interest rate.
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  - they also consider the ARRA (the Obama Administration’s stimulus package) and question the validity of the premises behind the policy
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- in a currency union where monetary policy cannot close the output gaps of all member countries simultaneously
- in environments (with financial frictions?) that make monetary policy less potent than the NK model suggests
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Qualitative Implications

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- In the first period, some firms have set their prices before observing the state of the economy (e.g., productivity, the nominal interest rate, tax rates):
  - so some firms cannot change their prices in response to aggregate shocks, while others can.
Benigno (2012) develops a 2-period model that highlights the main policy implications of NK models (albeit, not the quantitative aspects that central-bank models address)

All prices are flexible in the model’s second period

so, output is at the natural (full-employment) level in the second period, and we can think of the second-period as the long-run equilibrium

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and an increase in aggregate demand increases output as well as the price level
Consumers

- Consumers maximize

\[ u(C) - v(L) + \beta [u(C) - v(L)] \]

subject to the present-value budget constraint

\[(1 + \tau_c)PC + \frac{(1 + \tau_c)P\overline{C}}{1 + i} \leq (1 - \tau_l)WL + \frac{(1 - \tau_l)W\overline{L}}{1 + i} + T\]

where \(\tau_c\) and \(\tau_l\) are the tax rates on consumption and labor income, and \(T\) is income from sources other than labor (e.g., firm profits or government transfers)
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where \( \tau_c \) and \( \tau_l \) are the tax rates on consumption and labor income, and \( T \) is income from sources other than labor (e.g., firm profits or government transfers).

The optimality conditions for \( C \) and \( L \) imply

\[ v'(L) = \left( \frac{1 - \tau_l}{1 + \tau_c} \right) \left( \frac{W}{P} \right) [u'(C)] \]
Note that taxes on consumption and labor income distort the "labor-leisure margin" symmetrically.
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The consumption tax will distort the intertemporal consumption decision if $\tau_c \neq \overline{\tau}_c$. 
Tax Distortions

- Note that taxes on consumption and labor income distort the "labor-leisure margin" symmetrically.
- The consumption tax will distort the intertemporal consumption decision if $\tau_c \neq \bar{\tau}_c$.
- The optimality conditions for $C$ and $\bar{C}$ imply

$$\frac{u'(C)}{\beta u'(\bar{C})} = \frac{(1 + i)(1 + \tau_c)P}{(1 + \bar{\tau}_c)\bar{P}} = \left(\frac{1 + \tau_c}{1 + \bar{\tau}_c}\right)(1 + r)$$
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- The aggregate demand block of the model is derived (as usual in NK models) from this Euler equation
The log-linear version of the Euler equation,

\[ c \equiv \overline{c} - \tilde{\sigma} [i - (\overline{p} - p) - (\overline{\tau_c} - \tau_c) - \log(\beta)], \]

with \( \tilde{\sigma} > 0 \), shows how the real interest rate and consumption taxes affect intertemporal consumption decisions.
Aggregate Demand

- The log-linear version of the Euler equation,

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with \( \tilde{\sigma} > 0 \), shows how the real interest rate and consumption taxes affect intertemporal consumption decisions.

- In this simple model, output is either consumed or purchased by the government; the aggregate demand relation (the "dynamic IS equation") is

\[ y \approx \bar{y} + (g - \bar{g}) - \sigma[i - (\bar{p} - p) - (\bar{\tau}_c - \tau_c) - \log(\beta)], \]

implying an inverse relation between \( y \) and \( p \).
Figure 3: AD is a negative relationship between prices and output. As current prices increase, the real interest rate rises and consumers save more. Current consumption falls along with production.
The model reflects standard views about the effects of policy: a fiscal expansion and/or monetary expansion would shift AD to the right, given

\[ y = y + (g - \bar{g}) - \sigma[i - (\bar{p} - p) - (\tau_c - \tau_c) - \log(\beta)] \]
Figure 4: The AD curve shifts upward when the short-run nominal interest rate falls \((i \downarrow)\), short-run consumption taxes fall \((\tau_c \downarrow)\), short-run public spending increases \((g \uparrow)\), long-run prices increase \((\bar{p} \uparrow)\), or the future natural level of consumption rises \((\bar{c}_n \uparrow)\), due to an increase in long-run productivity \((\bar{a} \uparrow)\), a reduction in long-run public spending \((\bar{g} \downarrow)\), a fall in long-run monopoly power \((\bar{\mu}_\theta \downarrow)\), a fall in long-run payroll and income taxes \((\bar{\tau}_y \downarrow, \bar{\tau}_w \downarrow, \bar{\tau}_l \downarrow)\), or an increase in long-run consumption taxes \((\bar{\tau}_c \uparrow)\).
Shifts of Aggregate Demand

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- an anticipated fiscal contraction (decrease in \( \bar{g} \)) is expansionary (as households, anticipating their higher future consumption, raise current consumption)
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Benigno (2012) also discusses more subtle interactions that work through changes in the long-run price level and output
The aggregate supply side of the model leads to a familiar Phillips curve,

\[ p - p^e = \kappa(y - y_n) \]

relating the deviation of the price level from its expected (pre-set) level to the deviation of output from the natural level.
Figure 1: The AS equation is a positive relationship between prices and output. Higher output increases real wages and firms’ real marginal costs. The firms that can adjust their prices react by increasing them. AS crosses through the point \( (p^e, y_n) \).
The aggregate supply side of the model leads to a familiar Phillips curve,

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As a benchmark (for exposition), the graphs depicting equilibrium associate \( p = \bar{p} = p^e \) with \( y = y_n \).
the economy is at the natural level of output. It is also assumed that the natural and efficient levels of output initially coincide, $y_n = y_e$. The way the equilibrium changes in response to different shocks and how monetary policy should react to restore stability in prices and output gap, if possible, are then analyzed. Let us begin with the analysis of productivity shocks.

### 6.1 A temporary productivity shock

First, we analyze the case in which the economy undergoes a temporary productivity gain, meaning that productivity rises in the short run but does not vary in the long run. Starting from the equilibrium $E$, shown in Figure 6, the short-run natural level of output rises to $y'_n$ and $AS$ shifts downward, crossing $E''$, as discussed in the previous section. The $AD$ equation is not affected by movements in current productivity, and the new equilibrium is found at the intersection, $E'$, of the new $AS$ equation, $AS'$, with the old $AD$ equation.

The adjustment from equilibrium $E$ to $E'$ occurs as follows. A temporary increase

![Figure 5: The initial equilibrium is in $E$ where $AS$ and $AD$ intersect.](image-url)
The zero-bound constraint on the nominal interest rate puts a limit \( AD_0 \) in Figures 11 and 12 on how much interest-rate cuts can stimulate aggregate demand.
lower bound limit. As Figure 11 shows there is an $AD_0$ equation that corresponds to the lower bound and constrains any movement of $AD$ upward.

As in the Keynesian model, the liquidity trap is a state of depression. But the intertemporal side of the New Keynesian model offers an alternative interpretation of the origin of a slump *cum* liquidity trap. As noted by Krugman (1998), in a liquidity trap the equilibrium real rate is negative because of poor long-run growth prospects. Pessimistic views of future growth shifts $AD$ downward, as shown in Figure 12. This pessimism might be deep enough to leave very little scope for bringing the economy back up to the initial equilibrium, since $AD_0$ equation becomes binding. The best that can happen is to reach $AD_0$ by lowering the nominal interest rate to zero. But in the equilibrium $E'$, the real interest rate is too high, household consumption too low and the economy still in a slump with output far below potential.

Which kind of monetary and fiscal policy can bring the economy back up to potential?

Although conventional monetary policy is constrained, the model still provides for one more instrument: the determination of long-run prices. The critical insight of the New-Keynesian solution to the liquidity trap, discussed in Krugman (1998),
The zero-bound constraint on the nominal interest rate puts a limit ($AD_0$ in Figures 11 and 12) on how much interest-rate cuts can stimulate aggregate demand.

In a deep recession, $AD_0$ may become a binding constraint on "conventional" monetary stabilization.
is that policymakers still have a policy tool namely acting on expectations of future policy actions.\footnote{See Eggertsson and Woodford (2003) for a solution in a fully dynamic model.}

In a liquidity trap, agents save too much because the current real interest rate is too high. By increasing expected prices and creating inflationary expectations, monetary policy can actually lower the real rate of interest and shift both $AD$ and $AD_0$ up increasing consumption and production. This channel is the stronger, the greater households’ preferences for intertemporal consumption substitution. But how can a central bank succeed in this policy or in general in a policy of moving aggregate spending, when it is denied short-term nominal interest rate maneuvers?

One possibility is “quantitative easing”, a strategy of expanding the balance sheet of the central bank and injecting liquidity into the economy until there is a reversal in prices and in particular in the relative intertemporal price of consumption. Since
The zero-bound constraint on the nominal interest rate puts a limit ($AD_0$ in Figures 11 and 12) on how much interest-rate cuts can stimulate aggregate demand.

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A credible commitment to increase $\bar{p}$ could be used to lower the real interest rate and shift $AD_0$.

"Quantitative easing" can only work by raising expected inflation according to this model (there is no "credit easing" because there is no financial friction in the model).
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Other Applications

- Benigno’s setup reflects some implications of models with optimizing agents that policy-oriented discussions have not embraced.
  - The expansionary effects of raising future taxes on consumption and cutting future government purchases were noted by a number of academic economists during the financial crisis.

- Benigno also presents an AS-AD rendition of Eggertsson and Krugman’s (2012) model in which a deleveraging shock leads to Fisherian debt deflation and can cause a deep recession.