Fiscal Policy in an Expectations Driven Liquidity Trap

Karel Mertens[1] and Morten O. Ravn[2,3]
Cornell University[1], University College London[2], and the CEPR[3]

September 3, 2010

Introduction

Much of the world economy has witnessed a sharp recession during 2008-2010:

- Relative large output losses and very low inflation

Introduction

Much of the world economy has witnessed a sharp recession during 2008-2010:

- Relative large output losses and very low inflation
- Short term interest rates at or close to their lower floor - i.e. a *liquidity trap*

Introduction

Much of the world economy has witnessed a sharp recession during 2008-2010:

- Relative large output losses and very low inflation
- Short term interest rates at or close to their lower floor - i.e. a *liquidity trap*

  Policy responses have included

Introduction

Much of the world economy has witnessed a sharp recession during 2008-2010:

- Relative large output losses and very low inflation
- Short term interest rates at or close to their lower floor - i.e. a *liquidity trap*

  Policy responses have included
- Unorthodox monetary policy interventions

Introduction

Much of the world economy has witnessed a sharp recession during 2008-2010:

- Relative large output losses and very low inflation
- Short term interest rates at or close to their lower floor - i.e. a *liquidity trap*

  Policy responses have included
- Unorthodox monetary policy interventions
- Expansionary fiscal policies - the focus of this paper

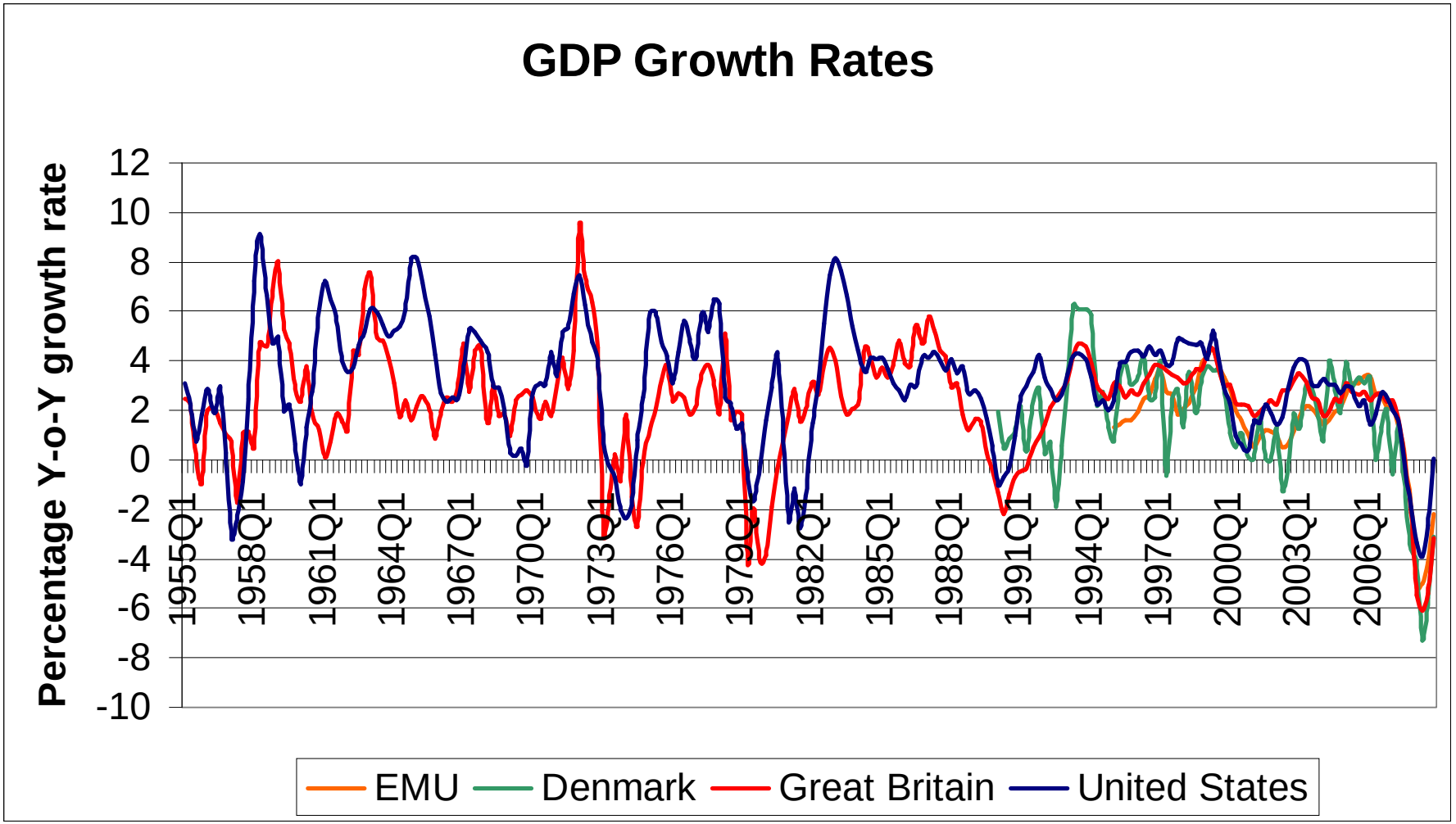
Introduction

Much of the world economy has witnessed a sharp recession during 2008-2010:

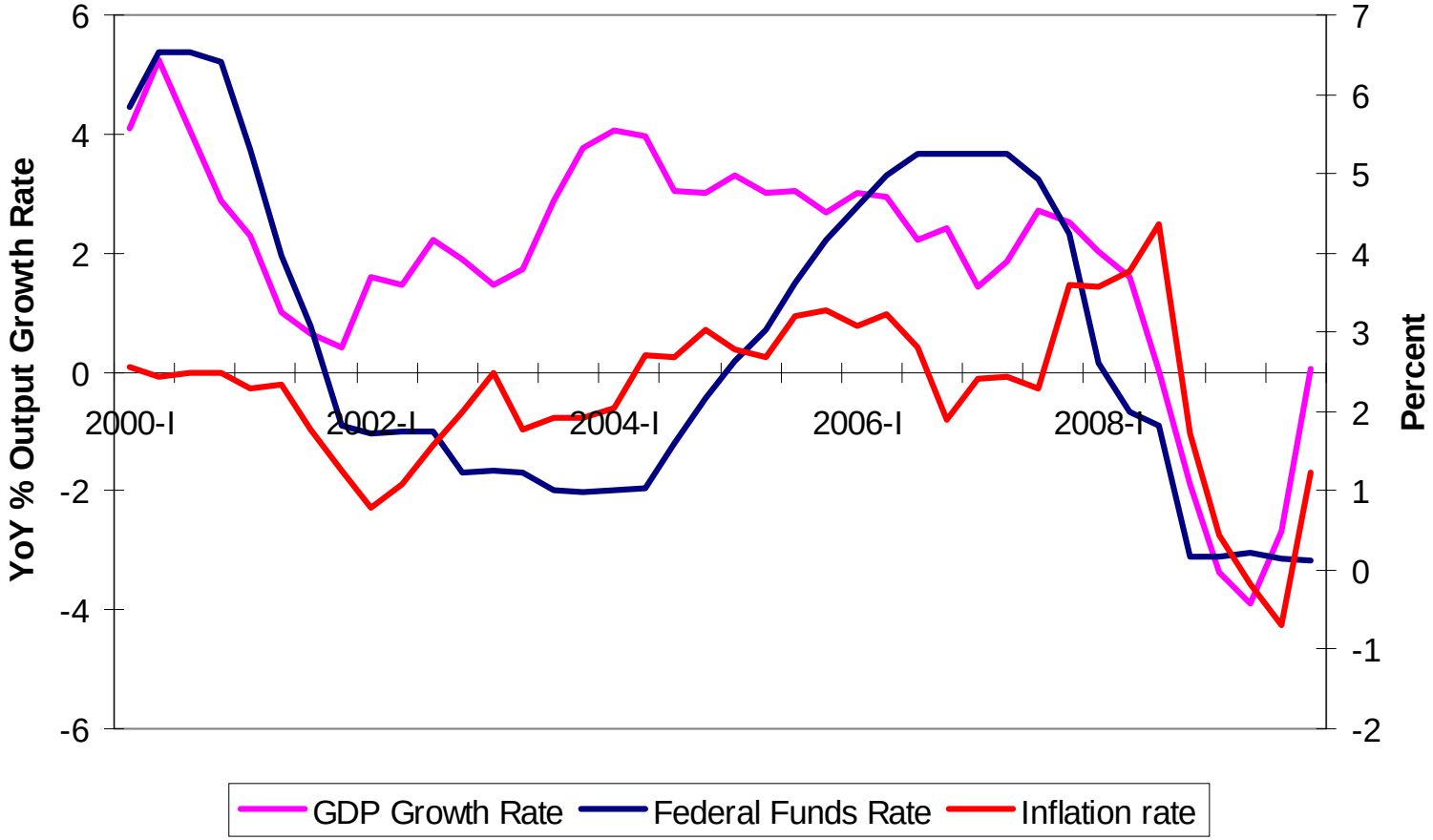
- Relative large output losses and very low inflation
- Short term interest rates at or close to their lower floor - i.e. a *liquidity trap*

  Policy responses have included
- Unorthodox monetary policy interventions
- Expansionary fiscal policies - the focus of this paper
- Is there good reason to expect these to have been especially effective given the nature of the recession?

Introduction



Introduction



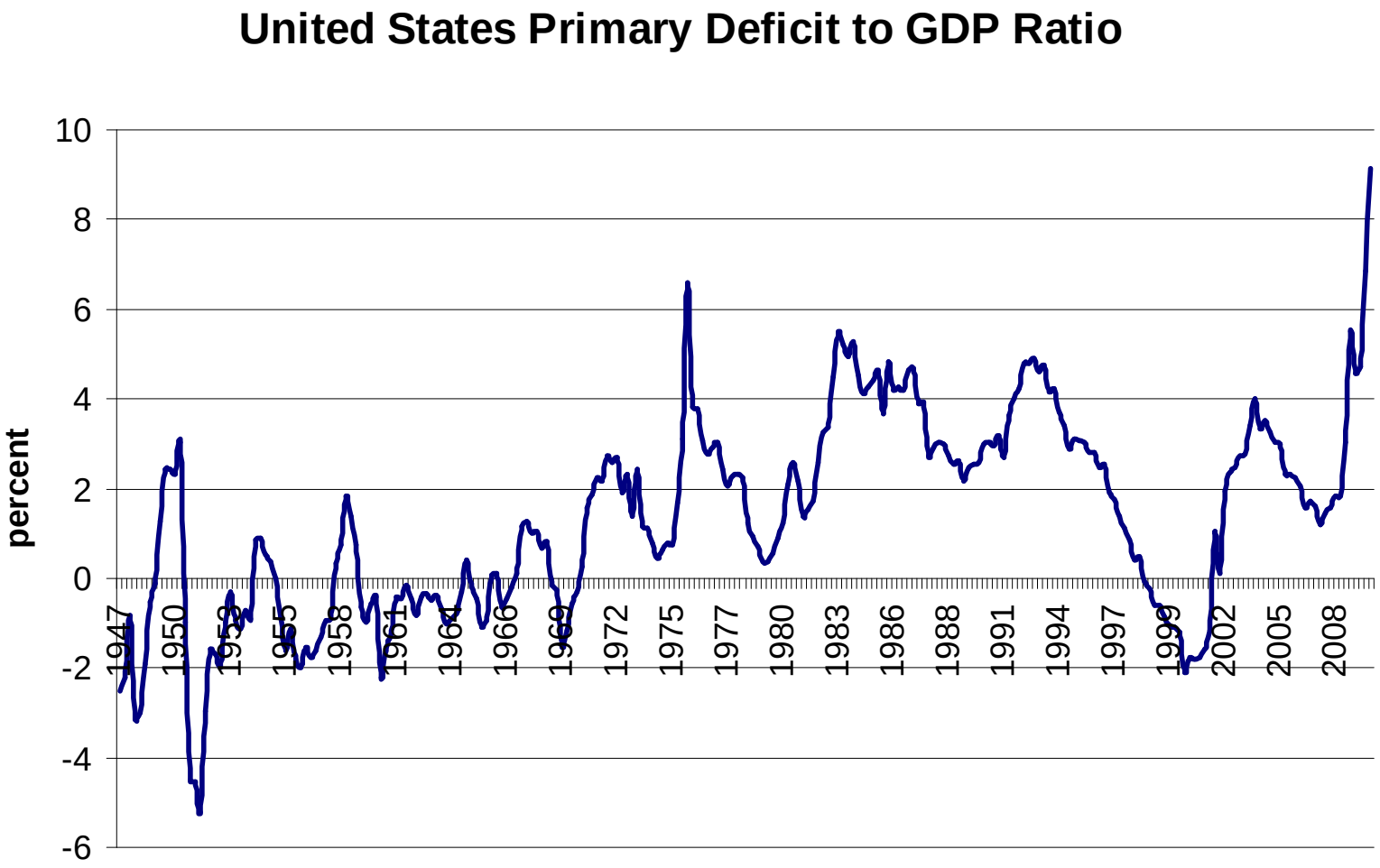
Fiscal Policies

Fiscal spending has been one of the favorite policy responses to the financial crisis

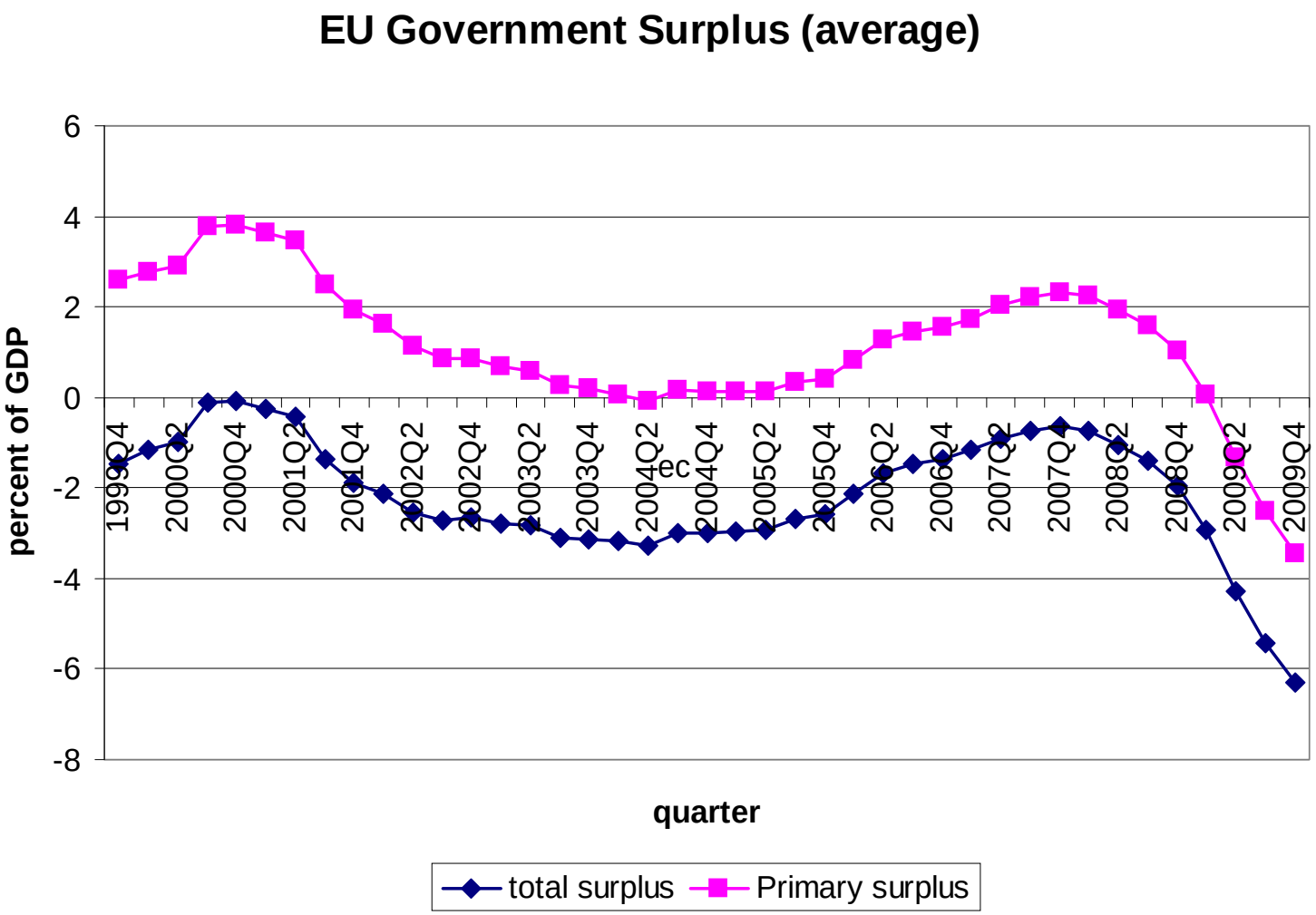
- **Obama**: The American Recovery and Investment Plan: $775 billion planned increase in government purchases of goods and services, government infrastructure investment, investment incentives and a "middle class" tax cut (5 percent of one year's GDP)
- **Obama**: Second stimulus package may be coming
- **Brown**: GBP38 billion increase in government spending during 2009-2011 relative to 2008 according to the April 2009 Budget (around 3 percent of one year's GDP)
- **Merkel**: A stimulus of around 3.3 percent of GDP during 2009-2010

The hope was (or is?) that aggressive hikes in spending will help stimulating the economy substantially during the current recession

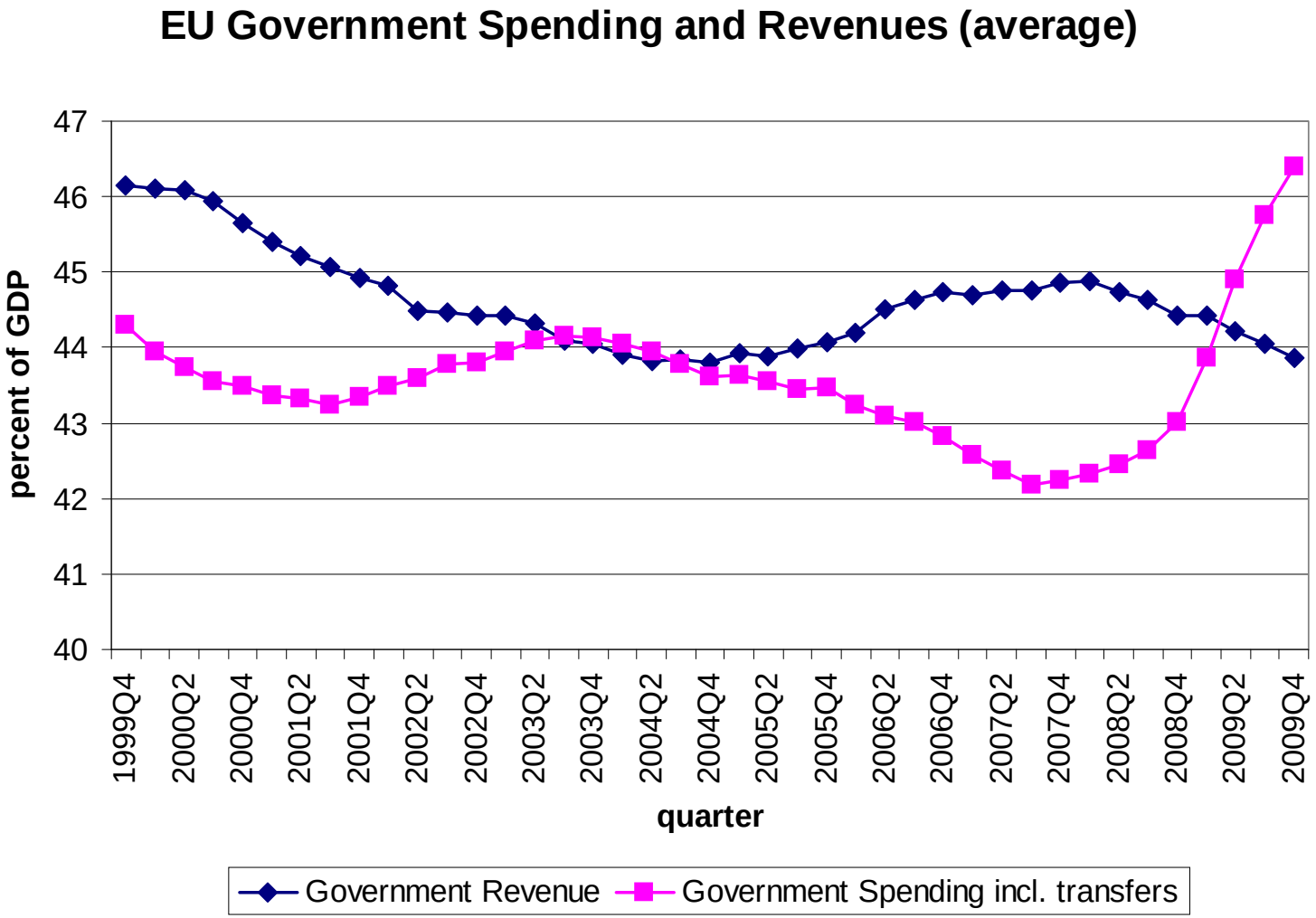
US Fiscal Policy



Fiscal Policies in the EU



Fiscal Policies in the EU



Introduction

Given the special circumstances of the recession it might seem natural to argue that all policy options should be employed

- What else than expansionary fiscal policy could have been done?

Introduction

Given the special circumstances of the recession it might seem natural to argue that all policy options should be employed

- What else than expansionary fiscal policy could have been done?
- But a number of questions remain unaddressed

Introduction

Given the special circumstances of the recession it might seem natural to argue that all policy options should be employed

- What else than expansionary fiscal policy could have been done?
- But a number of questions remain unaddressed

1. Which shock(s) drove the economy into the recession in the first place?

Introduction

Given the special circumstances of the recession it might seem natural to argue that all policy options should be employed

- What else than expansionary fiscal policy could have been done?
- But a number of questions remain unaddressed

1. Which shock(s) drove the economy into the recession in the first place?
2. Are fiscal interventions particularly effective in a liquidity trap?

Introduction

Given the special circumstances of the recession it might seem natural to argue that all policy options should be employed

- What else than expansionary fiscal policy could have been done?
- But a number of questions remain unaddressed

1. Which shock(s) drove the economy into the recession in the first place?
2. Are fiscal interventions particularly effective in a liquidity trap?
3. Should we implement demand or supply oriented interventions?

Should we expect fiscal multipliers to be large?

1. **Normal times** (positive short-term interest rates):
   - Multipliers most likely *moderate* and smaller than one in the data and in theory (Hall, 2009, Woodford, 2010) due to crowding-out unless allowance for non-standard features (Ravn, Schmitt-Grohe and Uribe, 2006, 2007, Monacelli and Perotti, 2009)
2. **In a liquidity trap** (constant short term interest rates):
   - Multipliers may be *very large* (Eggertsson, 2009, Christiano, Eichenbaum and Rebelo, 2009, Woodford, 2010)
   - Romer and Bernstein argue in favor of a multiplier around 1.75 with large positive effects on employment
3. **Which instrument**?
   - *Demand management* rather than supply-side policies (Eggertsson, 2009, Woodford, 2010)

Fiscal Policies in a Liquidity Trap

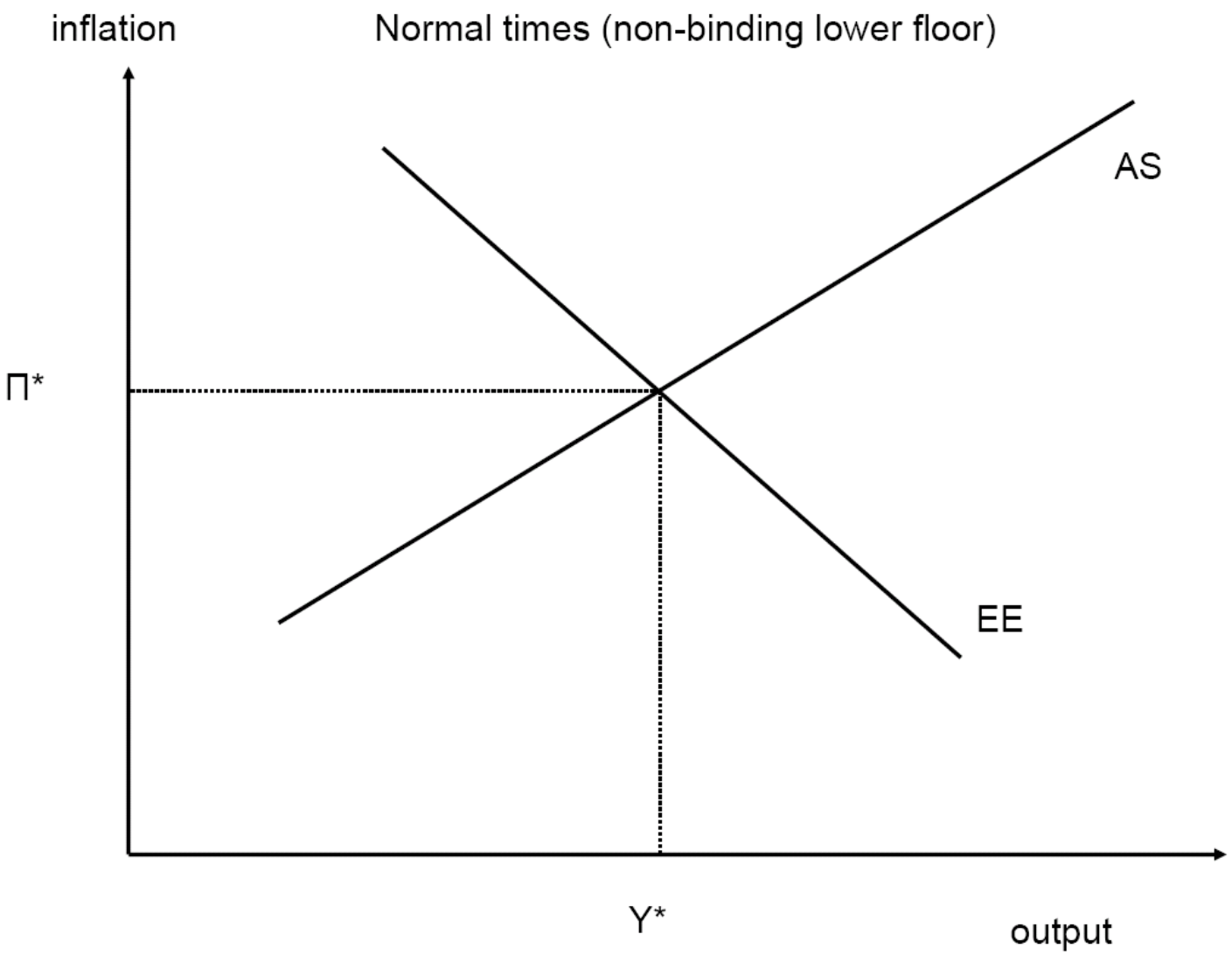
Eggertsson, 2009, Christiano, Eichenbaum and Rebelo, 2009, Woodford, 2010:

- New Keynesian sticky price models
- Monetary policy described by an interest rate rule
- Large shock leads the economy to a liquidity trap where the short-term interest rate is at its lower floor
  - Christiano, Eichenbaum and Rebelo: Huge temporary positive productivity shock or a very large decrease in the rate of time discount
  - Woodford: Very large temporary increase in spread (Eggertsson: Equivalent to large decrease in the rate of time discount)

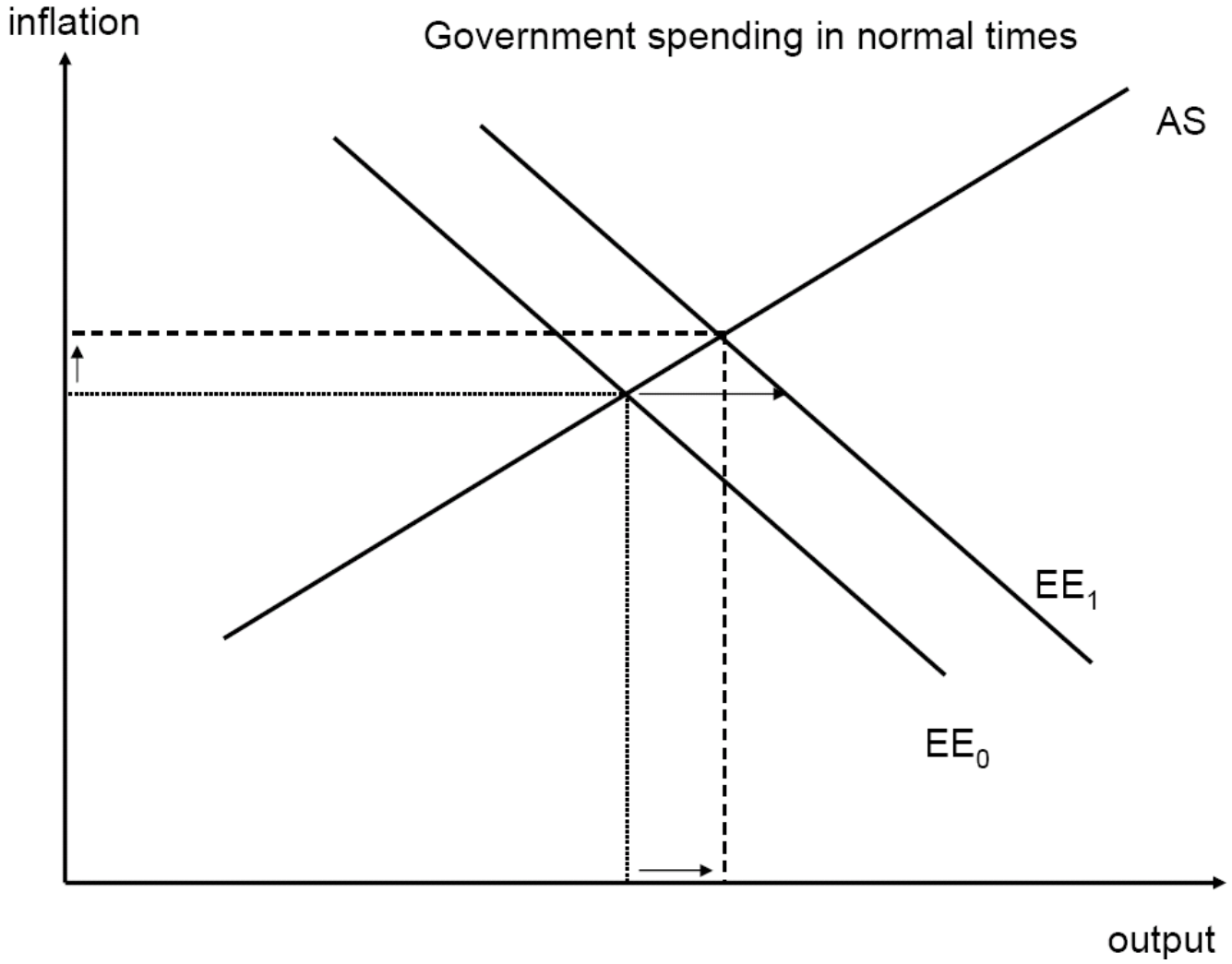
Table 1

	Labor Tax Multiplier	Government Spending Multiplier
Positive interest rate	0.19	0.3
Zero interest rate	-1.65	2.45

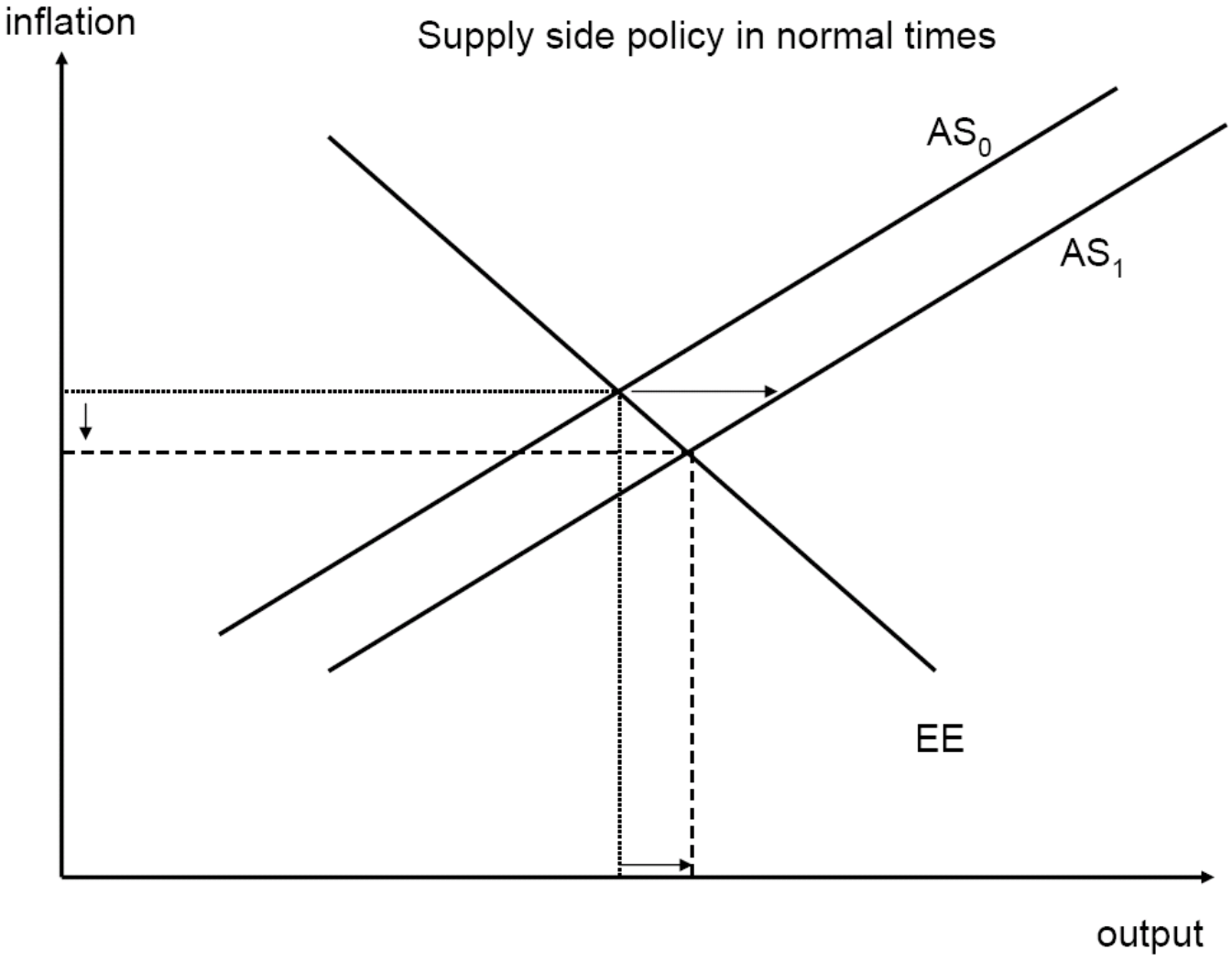
The Canonical New Keynesian Model



Fiscal Policies in Normal Times



Fiscal Policies in Normal Times



A Liquidity Trap

In normal times, an increase in inflation increases the real interest rate through the policy rule

- If a sufficiently large deflationary shock occurs, lower floor on policy rule may become binding

A Liquidity Trap

In normal times, an increase in inflation increases the real interest rate through the policy rule

- If a sufficiently large deflationary shock occurs, lower floor on policy rule may become binding
- Suppose that there is a large increase in desired savings

A Liquidity Trap

In normal times, an increase in inflation increases the real interest rate through the policy rule

- If a sufficiently large deflationary shock occurs, lower floor on policy rule may become binding
- Suppose that there is a large increase in desired savings

$\Rightarrow$ falling demand and deflationary pressures which may lead policy rate to its lower floor

A Liquidity Trap

In normal times, an increase in inflation increases the real interest rate through the policy rule

- If a sufficiently large deflationary shock occurs, lower floor on policy rule may become binding
- Suppose that there is a large increase in desired savings

$\Rightarrow$ falling demand and deflationary pressures which may lead policy rate to its lower floor

- Two things happen:

A Liquidity Trap

In normal times, an increase in inflation increases the real interest rate through the policy rule

- If a sufficiently large deflationary shock occurs, lower floor on policy rule may become binding
- Suppose that there is a large increase in desired savings

$\Rightarrow$ falling demand and deflationary pressures which may lead policy rate to its lower floor

- Two things happen:

1. Large output loss required to equilibrate savings and investment

A Liquidity Trap

In normal times, an increase in inflation increases the real interest rate through the policy rule

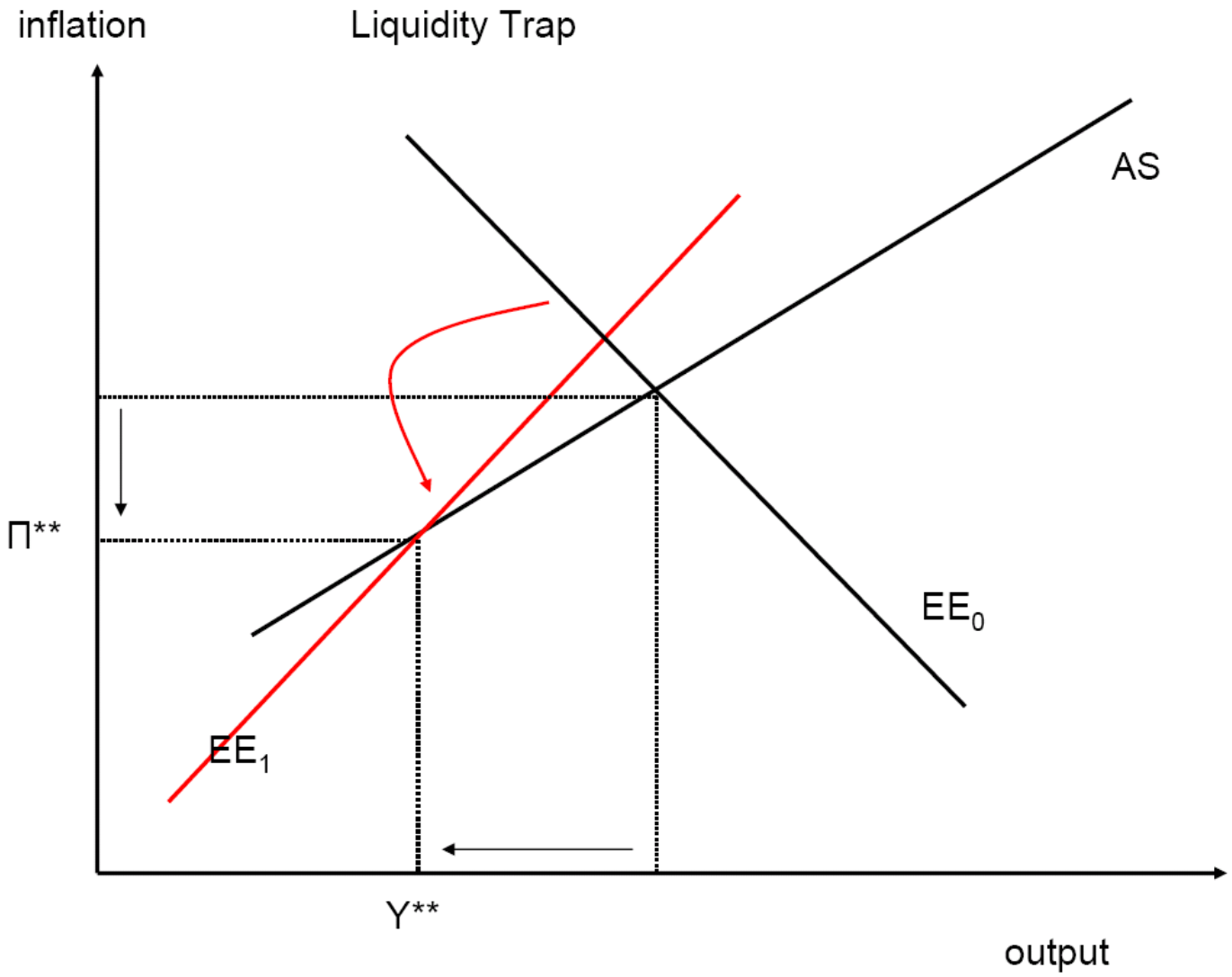
- If a sufficiently large deflationary shock occurs, lower floor on policy rule may become binding
- Suppose that there is a large increase in desired savings

$\Rightarrow$ falling demand and deflationary pressures which may lead policy rate to its lower floor

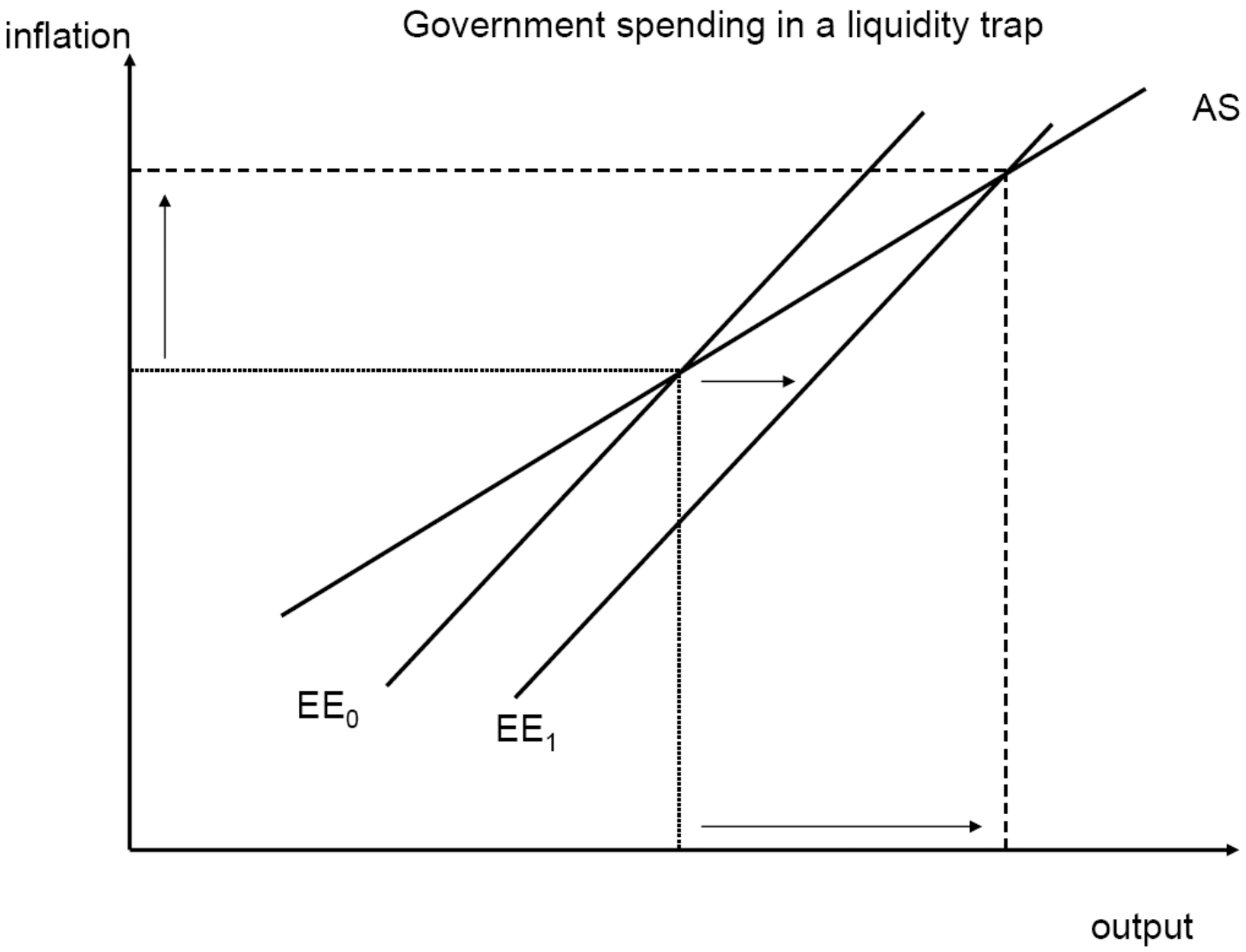
- Two things happen:

1. Large output loss required to equilibrate savings and investment
2. Current demand must depend positively on inflation because of lack of policy response to inflation

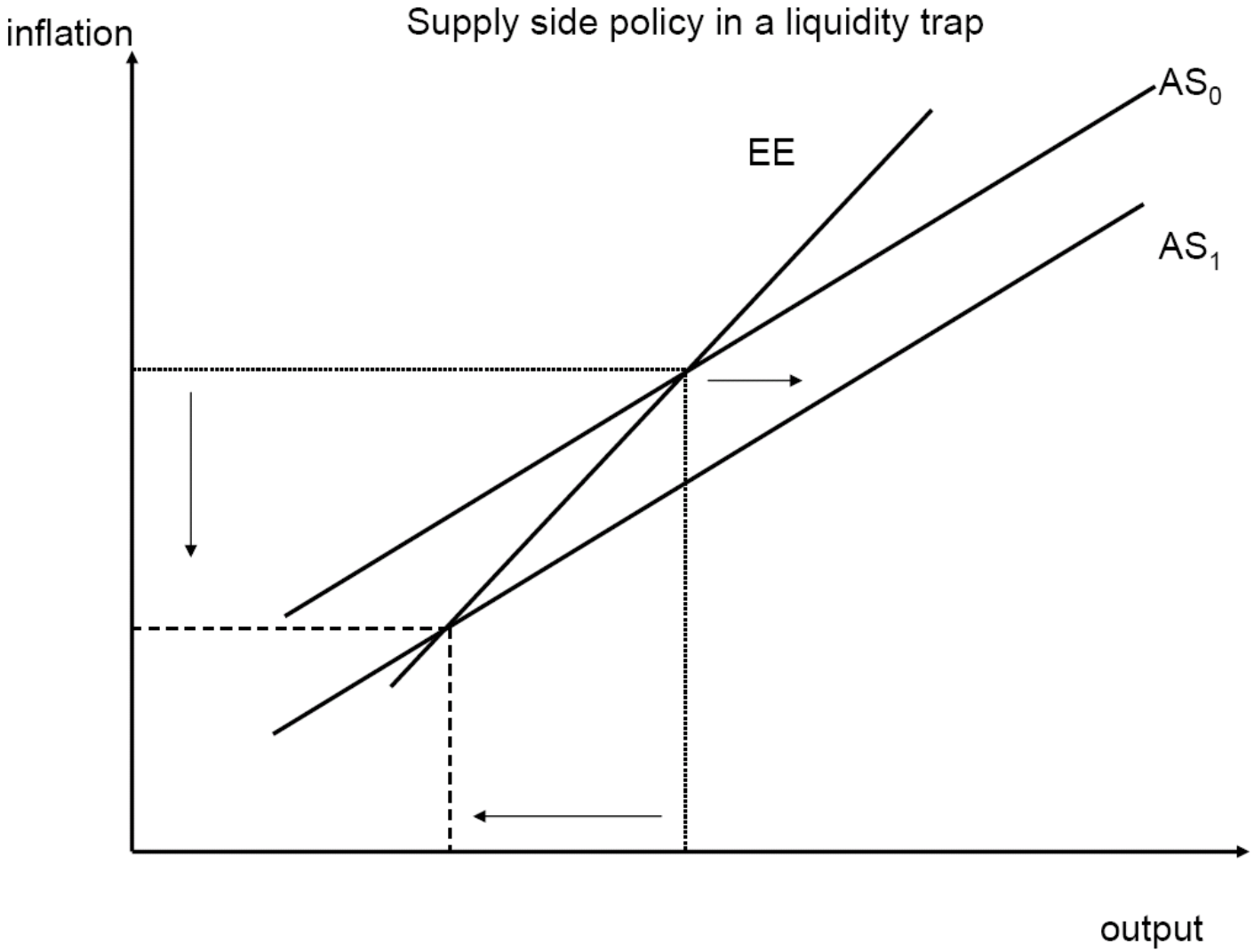
A Liquidity Trap



Fiscal Policy in a Liquidity Trap



Fiscal Policy in a Liquidity Trap



Our Argument

Key difference to above mentioned papers: **The shock**:

- A loss of confidence drives the economy into a deep recession with the lower bound binding - *an expectations driven liquidity trap.*

Our Argument

Key difference to above mentioned papers: **The shock**:

- A loss of confidence drives the economy into a deep recession with the lower bound binding - *an expectations driven liquidity trap.*
- In our opinion, there's no strong evidence in favor of a huge technology shock or a decrease in the rate time discount nor any strong evidence

Our Argument

Key difference to above mentioned papers: **The shock**:

- A loss of confidence drives the economy into a deep recession with the lower bound binding - *an expectations driven liquidity trap.*
- In our opinion, there's no strong evidence in favor of a huge technology shock or a decrease in the rate time discount nor any strong evidence
- **We demonstrate**:

Our Argument

Key difference to above mentioned papers: **The shock**:

- A loss of confidence drives the economy into a deep recession with the lower bound binding - *an expectations driven liquidity trap.*
- In our opinion, there's no strong evidence in favor of a huge technology shock or a decrease in the rate time discount nor any strong evidence
- **We demonstrate**:

1. Expectations driven liquidity trap associated with large drops in output and welfare

Our Argument

Key difference to above mentioned papers: **The shock**:

- A loss of confidence drives the economy into a deep recession with the lower bound binding - *an expectations driven liquidity trap.*
- In our opinion, there's no strong evidence in favor of a huge technology shock or a decrease in the rate time discount nor any strong evidence
- **We demonstrate**:

1. Expectations driven liquidity trap associated with large drops in output and welfare
2. Demand management become less effective than in normal times

Our Argument

Key difference to above mentioned papers: **The shock**:

- A loss of confidence drives the economy into a deep recession with the lower bound binding - *an expectations driven liquidity trap.*
- In our opinion, there's no strong evidence in favor of a huge technology shock or a decrease in the rate time discount nor any strong evidence
- **We demonstrate**:

1. Expectations driven liquidity trap associated with large drops in output and welfare
2. Demand management become less effective than in normal times
3. Supply side policies become more effective

Our Argument

Key difference to above mentioned papers: **The shock**:

- A loss of confidence drives the economy into a deep recession with the lower bound binding - *an expectations driven liquidity trap.*
- In our opinion, there's no strong evidence in favor of a huge technology shock or a decrease in the rate time discount nor any strong evidence
- **We demonstrate**:

1. Expectations driven liquidity trap associated with large drops in output and welfare
2. Demand management become less effective than in normal times
3. Supply side policies become more effective
4. Higher inflation targets are a really bad idea

The Model: Building Blocks

We look at a standard New Keynesian model:

- **Agents**: Households, intermediate goods producers, final goods producers, a government

The Model: Building Blocks

We look at a standard New Keynesian model:

- **Agents**: Households, intermediate goods producers, final goods producers, a government
- **Intermediate goods producers**: Monopolistically competitive, staggered prices a' la Calvo

The Model: Building Blocks

We look at a standard New Keynesian model:

- **Agents**: Households, intermediate goods producers, final goods producers, a government
- **Intermediate goods producers**: Monopolistically competitive, staggered prices a' la Calvo
- **Monetary policy**: Described by an interest rate rule. We do not allow for non-standard policies neither ex-ante nor ex-post.

The Model: Building Blocks

We look at a standard New Keynesian model:

- **Agents**: Households, intermediate goods producers, final goods producers, a government
- **Intermediate goods producers**: Monopolistically competitive, staggered prices a' la Calvo
- **Monetary policy**: Described by an interest rate rule. We do not allow for non-standard policies neither ex-ante nor ex-post.
- **Zero lower bound**: Equilibrium short-term interest rates must be non-negative in order to prevent an arbitrage.

The Model: Building Blocks

We look at a standard New Keynesian model:

- **Agents**: Households, intermediate goods producers, final goods producers, a government
- **Intermediate goods producers**: Monopolistically competitive, staggered prices a' la Calvo
- **Monetary policy**: Described by an interest rate rule. We do not allow for non-standard policies neither ex-ante nor ex-post.
- **Zero lower bound**: Equilibrium short-term interest rates must be non-negative in order to prevent an arbitrage.
- **Fiscal policy**: Government has choice of fiscal instruments (spending, labor income taxes, sales taxes). Must observe government budget constraint (Ricardian policies). We do look also at threats of being irresponsible.

The Model: Households

Preferences

$$V_0 = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[U\left(c_t, l_t\right) + V\left(m_t\right) \right]$$

Budget constraints

$$\begin{aligned} \left(1+\tau_{c,t}\right) P_t c_t + M_t + \frac{B_t}{1+i_t} &\leq \left(1-\tau_{n,t}\right) W_t \left(1-l_t\right) \\ &\quad + B_{t-1} + M_{t-1} + T_t + \Pi_t \\ M_{-1} &\geq 0 \quad , \quad B_{-1} \geq 0 \text{ given} \end{aligned}$$

Bounded budget sets:

$$i_t \geq 0$$

Final Goods Producers

Technology

$$y_t = \left(\int_0^1 y_{it}^{1-1/\eta} di \right)^{1/(1-1/\eta)}$$

implying demand functions

$$y_{it} = \left(\frac{P_{it}}{P_t} \right)^{-\eta} y_t$$

where P_{it} is the date t price of intermediate good of variety i. P_t is the price of the final good defined as

$$P_t = \left(\int_0^1 P_{it}^{1-\eta} di \right)^{1/(1-\eta)}$$

Intermediate Goods Producers

Intermediate goods producers:

- Owned by households

Intermediate Goods Producers

Intermediate goods producers:

- Owned by households
- Produce a differentiated good with labor

Intermediate Goods Producers

Intermediate goods producers:

- Owned by households
- Produce a differentiated good with labor
- Each producer sells its product to final goods producers at price P_{it}

Intermediate Goods Producers

Intermediate goods producers:

- Owned by households
- Produce a differentiated good with labor
- Each producer sells its product to final goods producers at price P_{it}
- Face nominal rigidities: Each period they receive the opportunity to reoptimize prices with probability $(1 - \xi) \in (0, 1]$. The arrival of this event is Poisson

Intermediate Goods Producers

Intermediate goods producers:

- Owned by households
- Produce a differentiated good with labor
- Each producer sells its product to final goods producers at price P_{it}
- Face nominal rigidities: Each period they receive the opportunity to reoptimize prices with probability $(1-\xi) \in (0,1]$. The arrival of this event is Poisson
- Government pays intermediate goods producers a labor cost subsidy in order to neutralize the steady-state distortion that derives from market power

Intermediate Goods Producers

Technology

$$y_{it} = n_{it}$$

Profit maximization

$$\max \mathbb{E}_t \sum_{s=t}^{\infty} \xi^{s-t} Q_{t,s} \left(P_{it}^* - (1-\tau_r) W_s\right) \left(\frac{P_{it}^*}{P_s}\right)^{-\eta} y_s$$

$$: \quad Q_{t,s} = \beta^{s-t} \left(U_c(c_s, l_s) / U_c(c_t, l_t)\right) \left(P_t / P_s\right)$$

Assuming $\tau_r = 1/\eta$, **optimality requires**

$$\mathbb{E}_t \sum_{s=t}^{\infty} \xi^{s-t} Q_{t,s} \left[\left(P_{it}^* - W_s\right) y_{is}\right] = 0$$

Government Policies and Constraints

Monetary policy

$$1 + i_t = \phi\left(\frac{\pi_t}{\tilde{\pi}}\right)$$

- $\tilde{\pi} \geq 1$ is the inflation target
- $\phi(1) = \beta^{-1}\tilde{\pi}$, $\phi(\cdot) \geq 1$ for all π_t ,
- $\phi'(\cdot)$ is sufficiently large when $i_t > 0$

Fiscal policy

$$\begin{aligned} \frac{B_t}{1+i_t} &= B_{t-1} - M_t + M_{t-1} + D_t \\ D_t &= P_t g_t + T_t + \frac{1}{\eta} W_t n_t - \left(\tau_{c,t} P_t c_t + \tau_{n,t} W_t (1 - l_t)\right) \end{aligned}$$

Fiscal policies are Ricardian

Price Dispersion

- In equilibrium, aggregation implies that:

$$y_t = \frac{1}{v_t} n_t = c_t + g_t$$
$$v_t = \int_0^1 \left(\frac{P_{it}}{P_t} \right)^{-\eta} di \geq 1$$

- v_t is a price dispersion term: An **inefficiency wedge** that arises due to sticky prices

Equilibrium

- Putting all together, the equilibrium allocation and relevant prices are the solutions to the following set of stochastic difference equations:

$$
\begin{aligned}
1 &= \beta\phi\left(\frac{\pi_t}{\tilde{\pi}}\right)\mathbb{E}_t\left[\frac{\frac{\omega_{t+1}}{(1+\tau_{c,t+1})\pi_{t+1}}}{\frac{\omega_t}{(1+\tau_{c,t})}}\frac{U_c\left(y_{t+1}-g_{t+1},1-v_{t+1}y_{t+1}\right)}{U_c\left(y_t-g_t,1-v_t y_t\right)}\right] \\
p_t^*\pi_t &= \frac{\mathbb{E}_t\sum_{s=t}^{\infty}(\beta\xi)^{s-t}\,\omega_s\frac{U_l(y_s-g_s,1-v_s y_s)}{1-\tau_{n,s}}\left(\prod_{j=0}^{s-t}\pi_{t+j}\right)^{\eta}y_s}{\mathbb{E}_t\sum_{s=t}^{\infty}(\beta\xi)^{s-t}\,\omega_s\frac{U_c(y_s-g_s,1-v_s y_s)}{1+\tau_{c,s}}\left(\prod_{j=0}^{s-t}\pi_{t+j}\right)^{\eta-1}y_s} \\
v_t &= \xi\pi_t^{\eta}v_{t-1}+(1-\xi)\,p_t^{*-\eta} \\
1 &= \xi\pi_t^{\eta-1}+(1-\xi)\,p_t^{*1-\eta}
\end{aligned}
$$

- for a given initial condition v_{-1} and (Ricardian) fiscal policies and law of motion for the preference shock ω_t

Markovian Equilibria and Computation

- We focus on Markov equilibria that can be generated from

$$\begin{aligned} u_t &= f\left(s_t\right) \\ s_{t+1} &= h\left(s_t\right) + \varepsilon_t, \ s_0 \text{ given} \end{aligned}$$

  s_t vector of state variables, u_t inflation/output vector, random innovation ε_t
- Equilibrium allocations and prices are then computed by using a polynomial approximation and time iteration

Multiple Equilibria

- **Sargent and Wallace, 1975**: Interest rate rules can lead to multiple equilibria
- **Local indeterminacy and Taylor rules**: Local determinacy of the intended equilibrium usually obtained by imposing the Taylor principle on the policy rule
- **Global indeterminacy**: With a lower bound on the interest rate, Taylor type rules leads to global indeterminacy (Benhabib, Schmitt-Grohe and Uribe, 2001 AER & JET, 2002, JPE)
- The global indeterminacy opens the door for **sunspots** (Shell, 1977, Cass and Shell, 1983) and this will be our focus

The Intended and the Unintended Steady-States

The intended steady-state: Inflation is on target and output is efficient:

$$\begin{aligned} \pi^I &= \widetilde{\pi}, \text{ and } \phi(1) = 1/\beta \\ y^I &= n^I = y^E \\ v^I &= 1 \\ U_l\left(y^E, 1 - y^E\right) &= U_c\left(y^E, 1 - y^E\right) \end{aligned}$$

The unintended steady-state: Interest rate at lower bound and inefficiently low output:

$$\begin{aligned} \pi^U &= \beta \text{ and } \phi(1/\beta) = 1 \\ y^U &< y^E \\ v^U &> 1 \text{ and } p^* < 1 \\ U_l\left(y^U, 1 - y^U v^U\right) &> U_c\left(y^U, 1 - y^U v^U\right) \end{aligned}$$

- Price dispersion gives rise to inefficiently low output

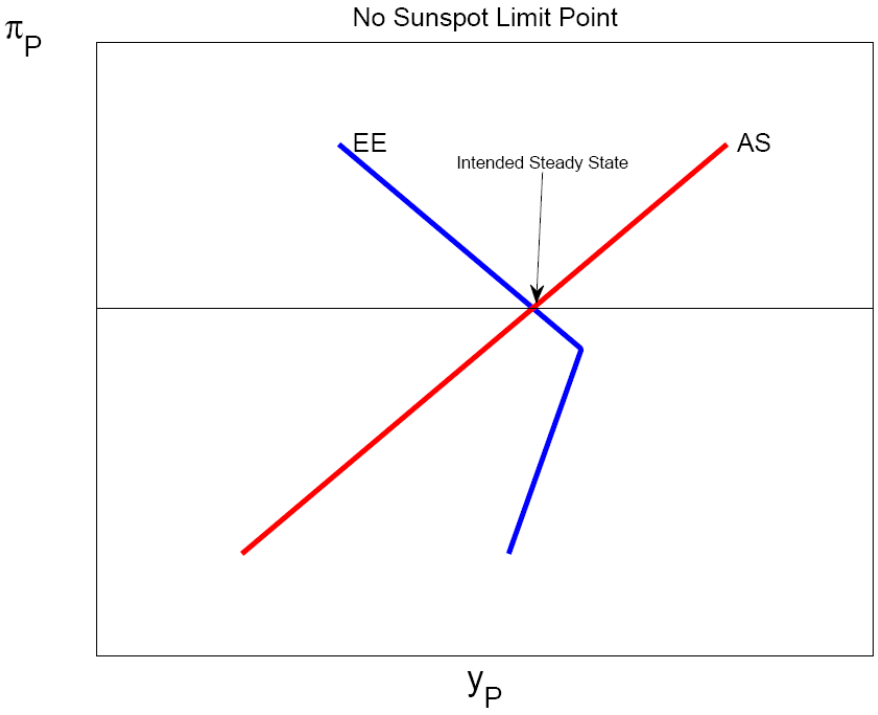
Stochastic Sunspot Equilibria

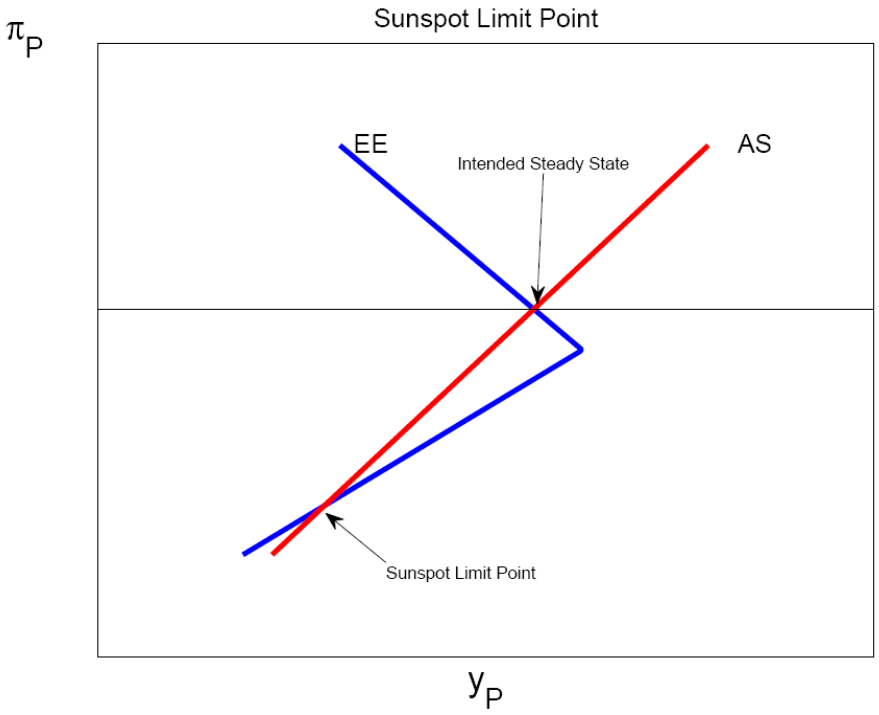
- We look at **temporary liquidity traps** modelled as sunspot equilibria: Sunspot variable, ψ_t follows discrete Markov chain $\psi_t \in [\psi_1, ..., \psi_n]$ with transition matrix R.

Two state example:ψ_t follows a Markov process with transition matrix R

$$\psi_t \in [\psi_O, \psi_P] \quad , \quad R = \begin{bmatrix} 1 & 0 \\ 1-q & q \end{bmatrix} \quad , \quad 0 < q < 1$$

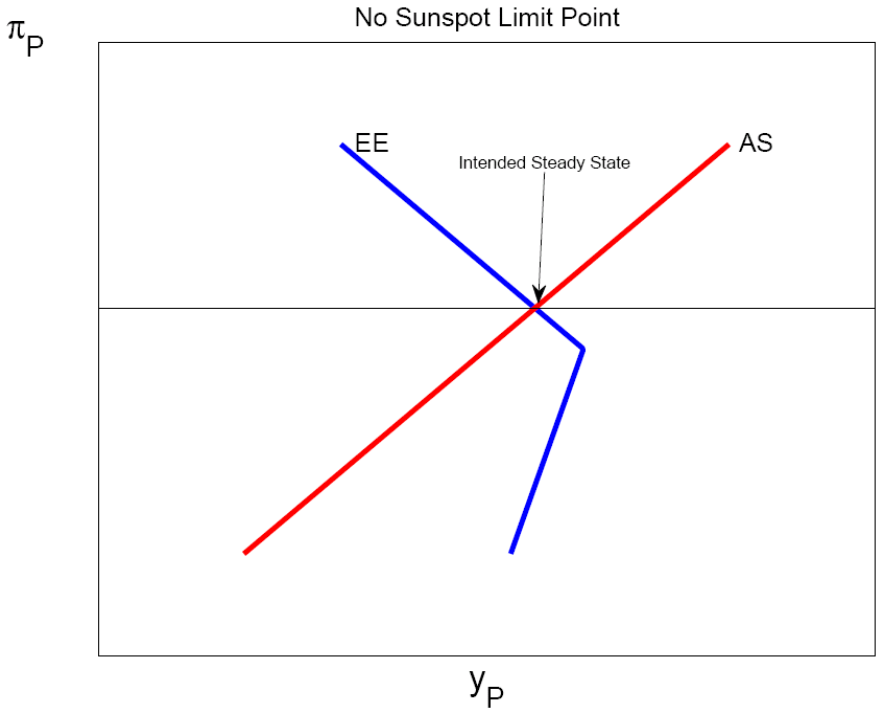
Existence of an Expectations Driven Liquidity Trap

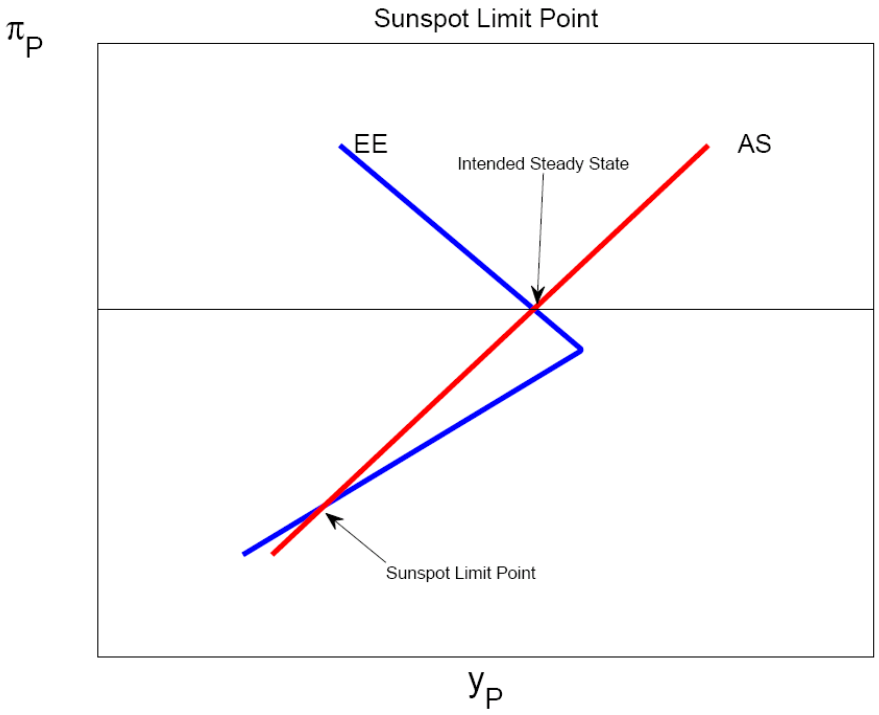




- **In the left picture**: Kink is moderate because of too low persistence of low confidence state - only the intended steady-state prevails

Existence of an Expectations Driven Liquidity Trap





- **In the left picture**: Kink is moderate because of too low persistence of low confidence state - only the intended steady-state prevails
- **In the right picture**: More persistent low confidence state - we can end up in unintended equilibria

Numerical Evaluation

- Functional forms:

$$
\begin{aligned}
U(c_t, l_t) &= \frac{c_t^{1-\sigma} - 1}{1-\sigma} - \frac{\theta}{1+\kappa}(1-l_t)^{1+\kappa}, \ \sigma, \theta, \kappa > 0 \\
\phi\left(\frac{\pi_t}{\tilde{\pi}}\right) &= \max\left(\frac{\pi_t^{\phi_\pi}}{\beta}, 1\right), \ \phi_\pi > 1
\end{aligned}
$$

Numerical Evaluation

- Functional forms:

$$
\begin{aligned}
U(c_t, l_t) &= \frac{c_t^{1-\sigma} - 1}{1-\sigma} - \frac{\theta}{1+\kappa}(1-l_t)^{1+\kappa}, \ \sigma, \theta, \kappa > 0 \\
\phi\left(\frac{\pi_t}{\tilde{\pi}}\right) &= \max\left(\frac{\pi_t^{\phi_\pi}}{\beta}, 1\right), \ \phi_\pi > 1
\end{aligned}
$$

- Calibration

Numerical Evaluation

- Functional forms:

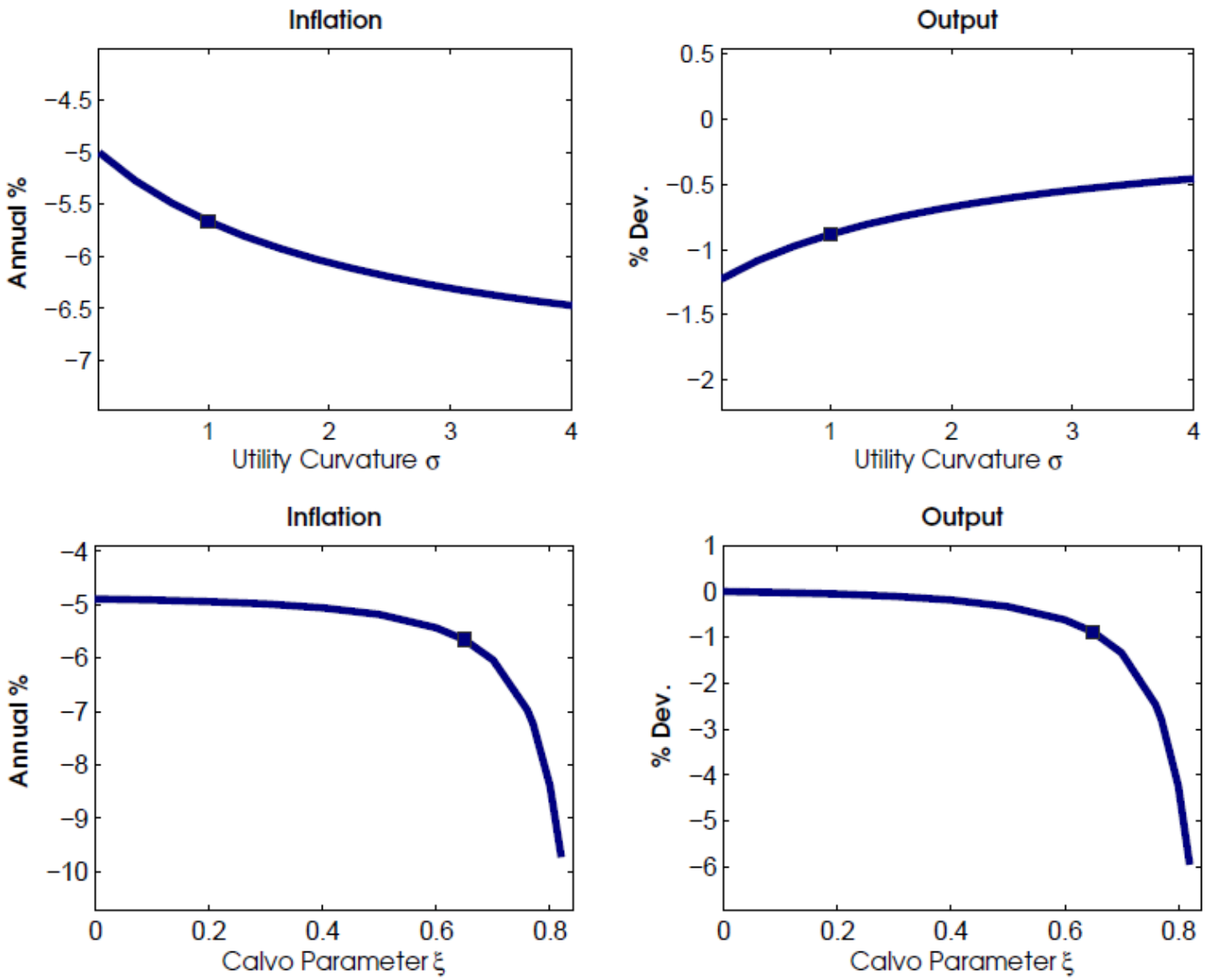
$$U(c_t, l_t) = \frac{c_t^{1-\sigma} - 1}{1-\sigma} - \frac{\theta}{1+\kappa}(1-l_t)^{1+\kappa}, \ \sigma, \theta, \kappa > 0$$

$$\phi\left(\frac{\pi_t}{\tilde{\pi}}\right) = \max\left(\frac{\pi_t^{\phi_\pi}}{\beta}, 1\right), \ \phi_\pi > 1$$

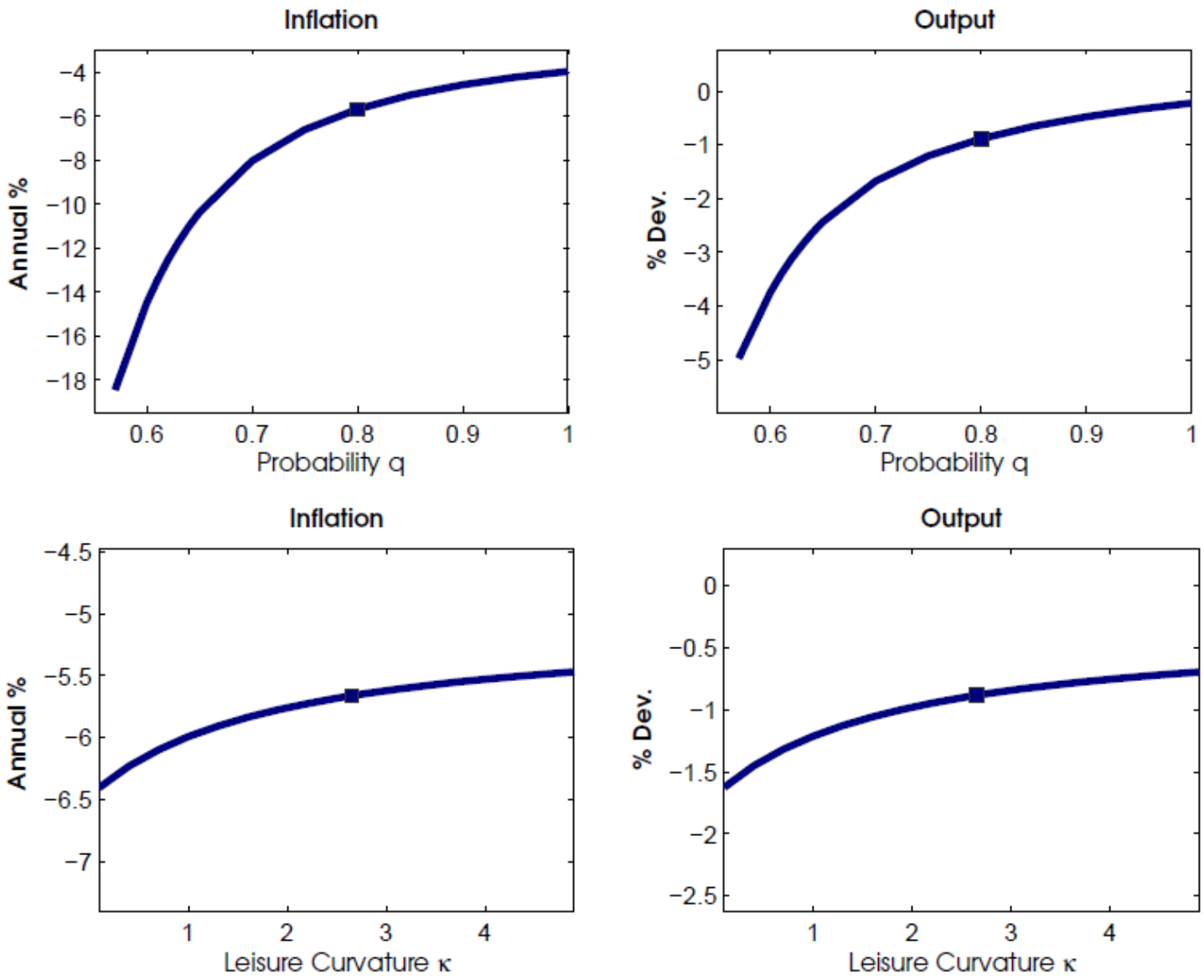
- Calibration

parameter	Mertens-Ravn	CER
β	0.99	0.99
Frisch Elasticity	2/3	1.4
σ	1	2
ξ	0.6	0.85
ϕ_π	1.5	1.5
q^ψ	0.8	-
q^ω	-	0.8

Liquidity Traps and Parameters

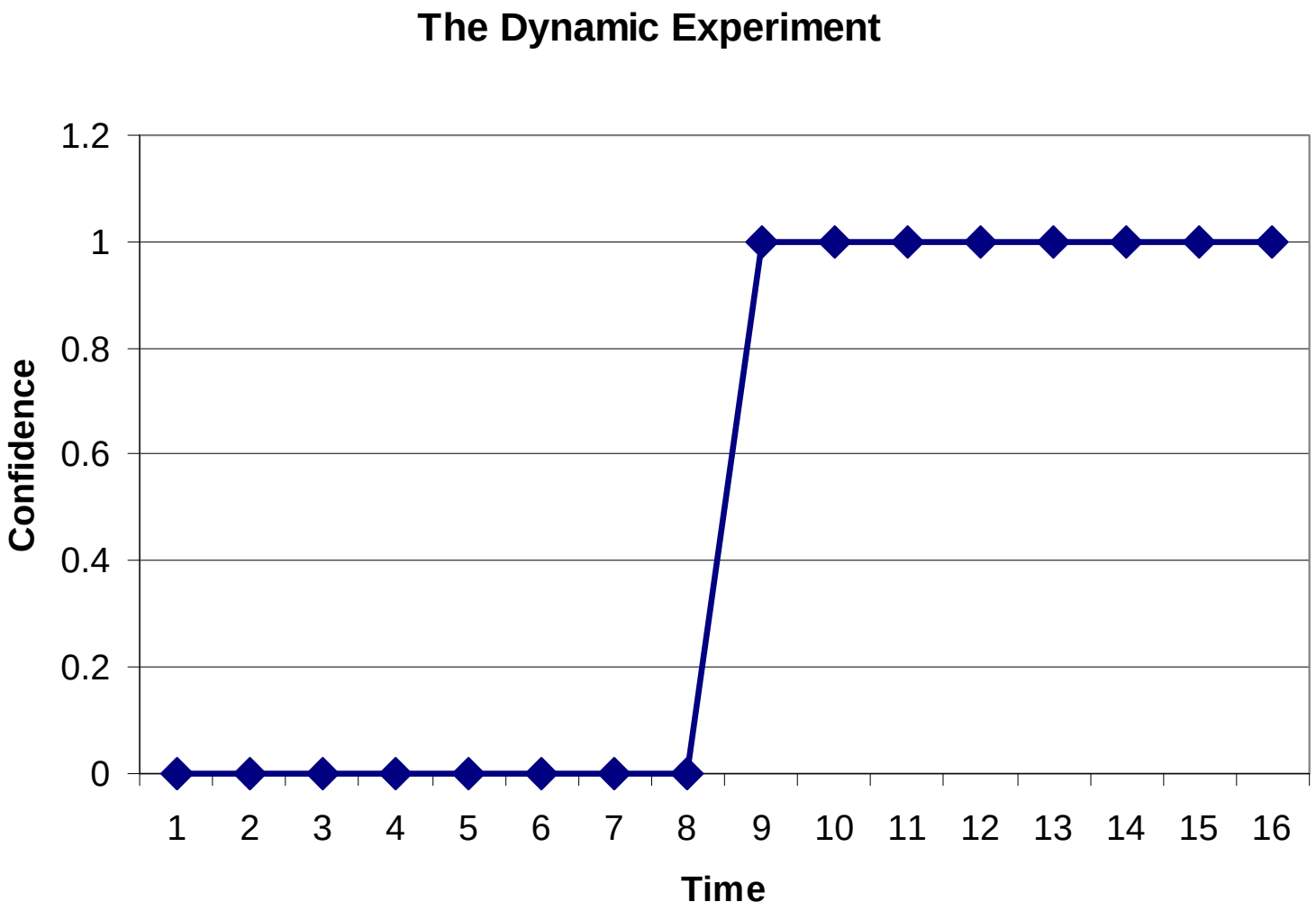


Liquidity Traps and Parameters

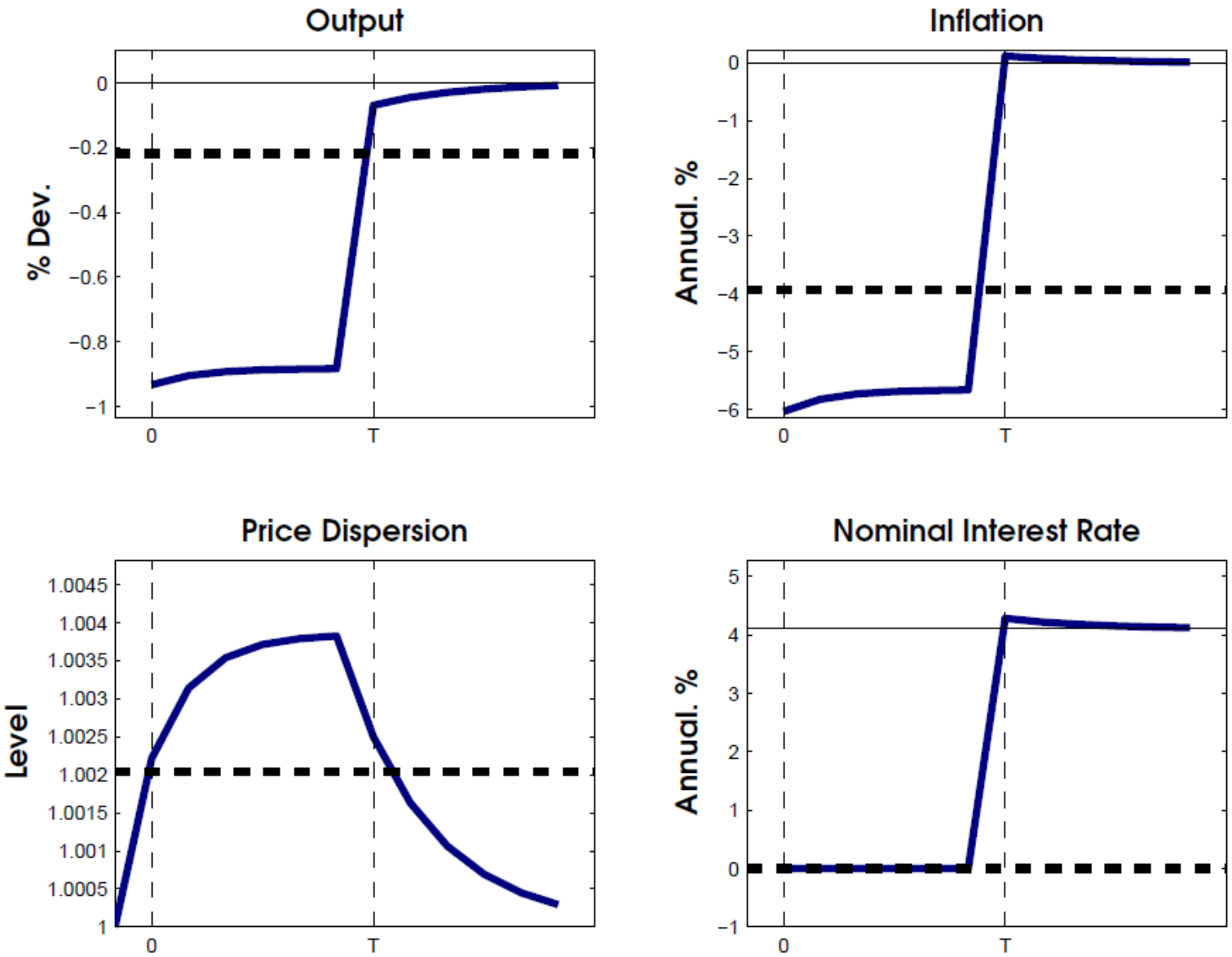


Dynamics of a Liquidity Trap

We assume that the economy starts in a low confidence state and then makes a permanent transition to the optimistic state in period T

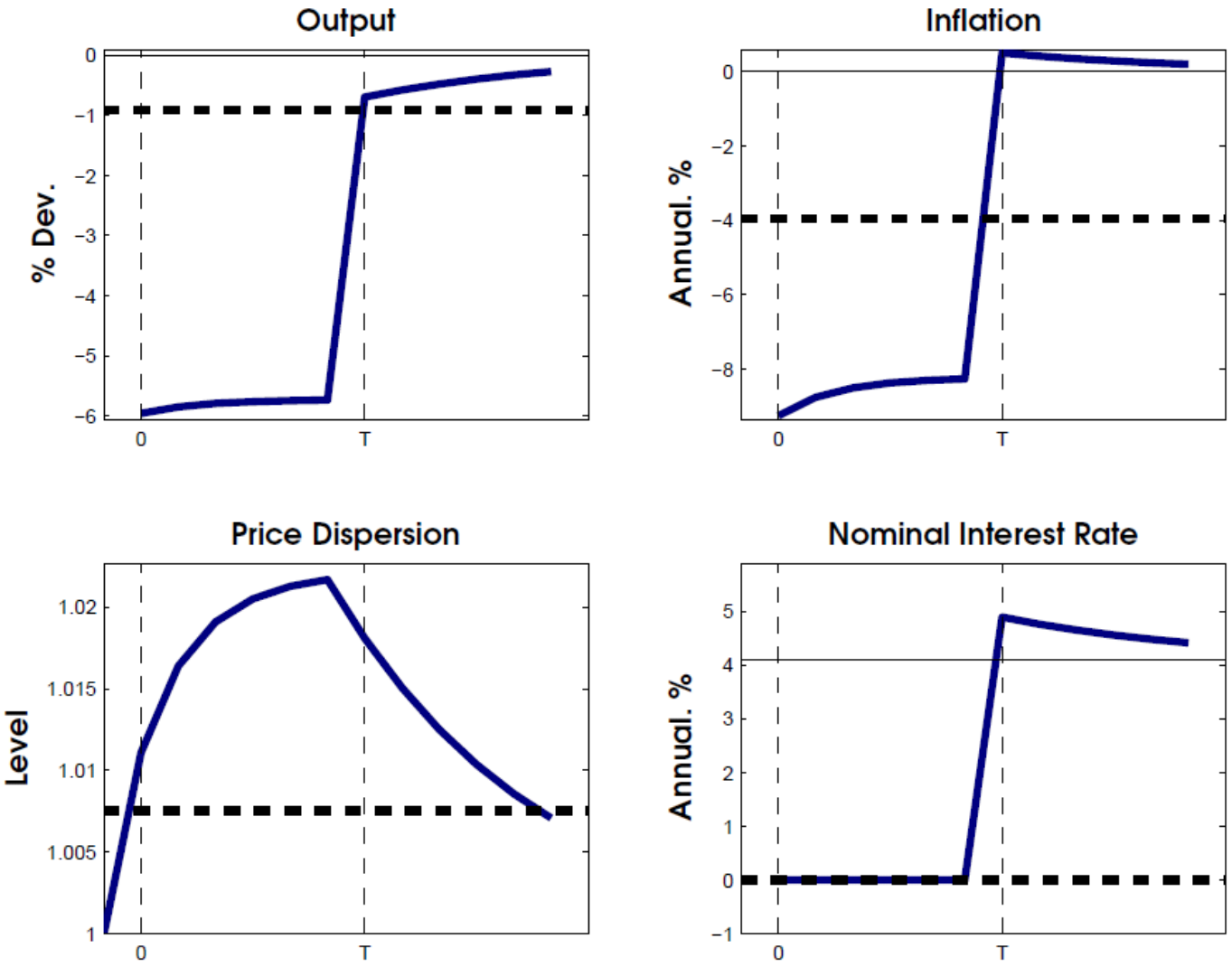


Dynamics of a Liquidity Trap



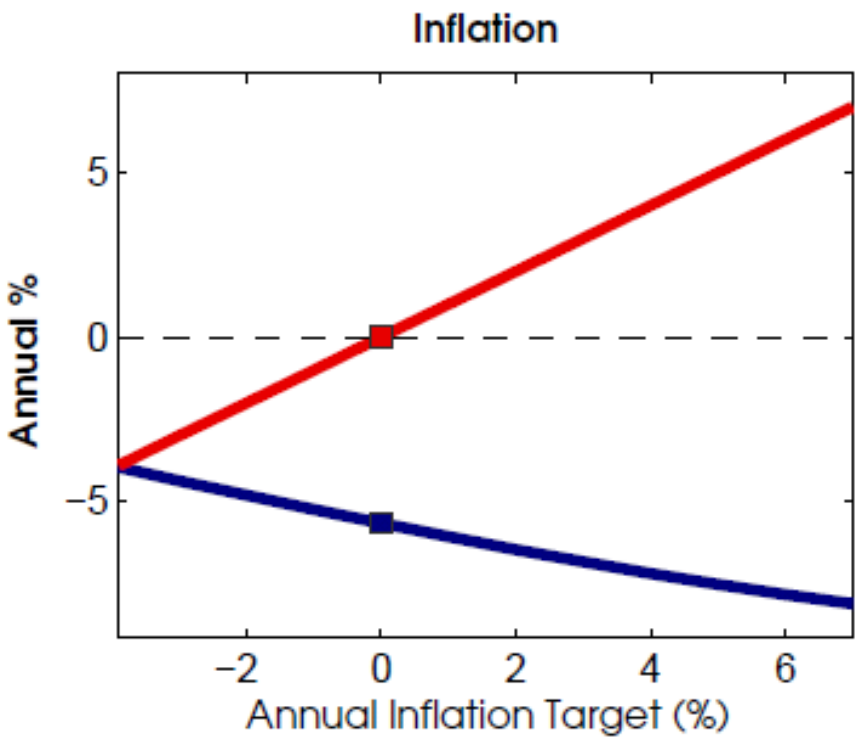
Dynamics of a Liquidity Trap:

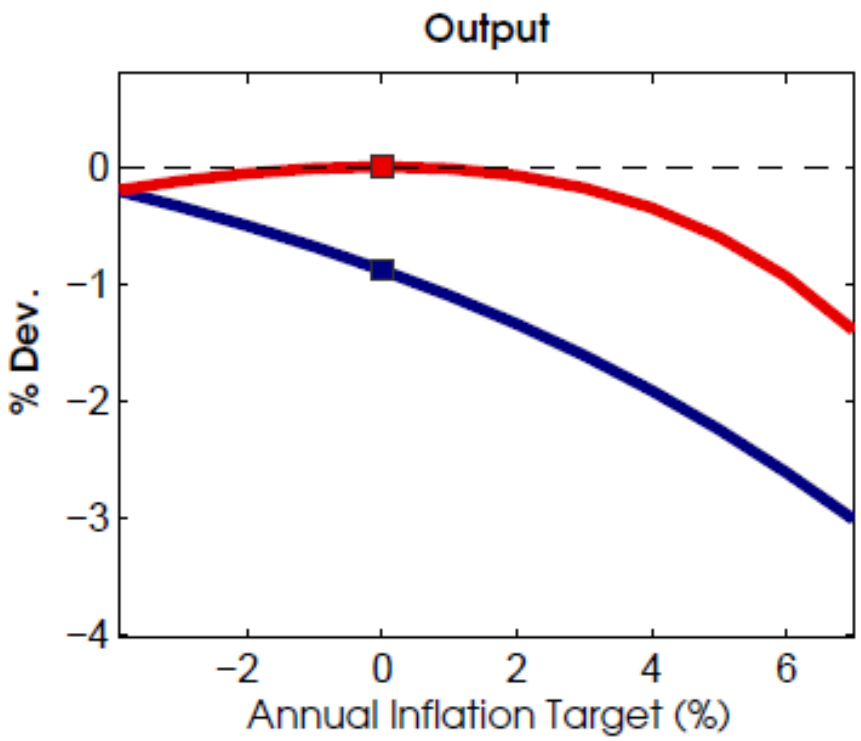
$\xi = 0.82, \ \sigma = 0.7$



Inflation Target

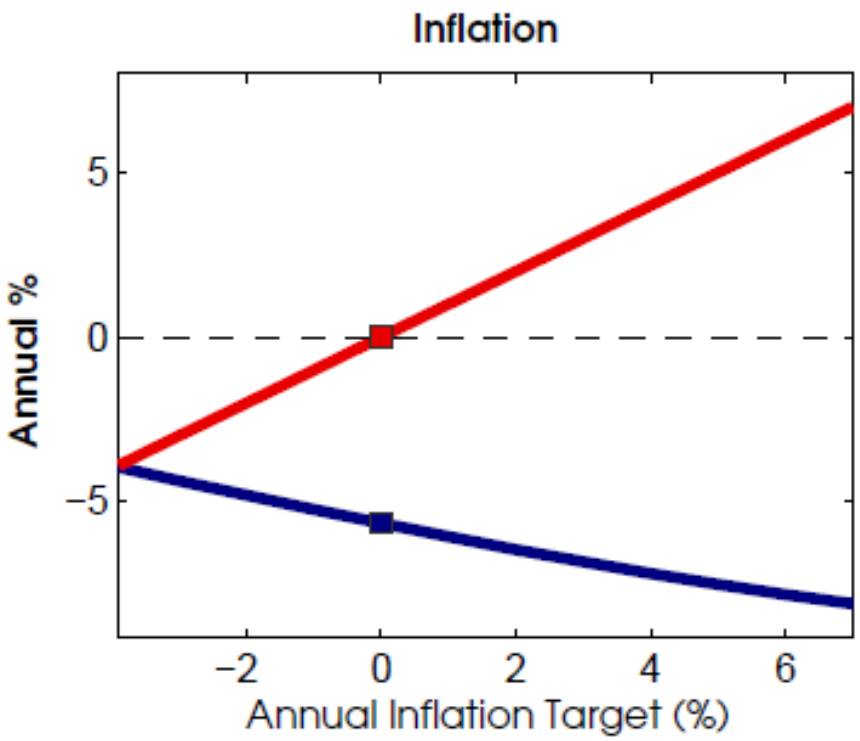
- Blanchard, Dell'Ariccia and Mauro have proposed to increase inflation targets to avoid such liquidity traps

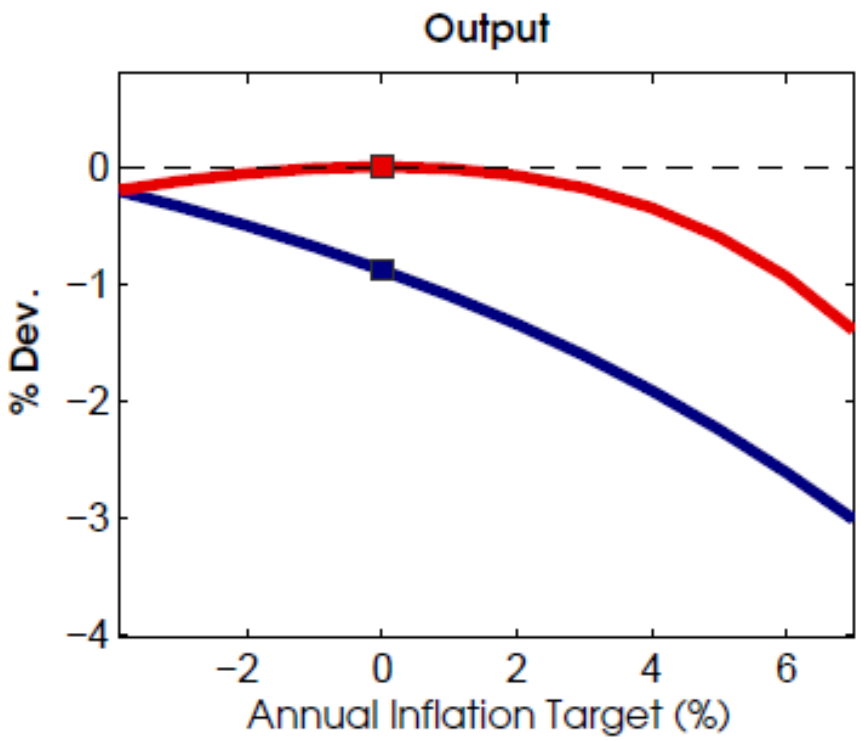




Inflation Target

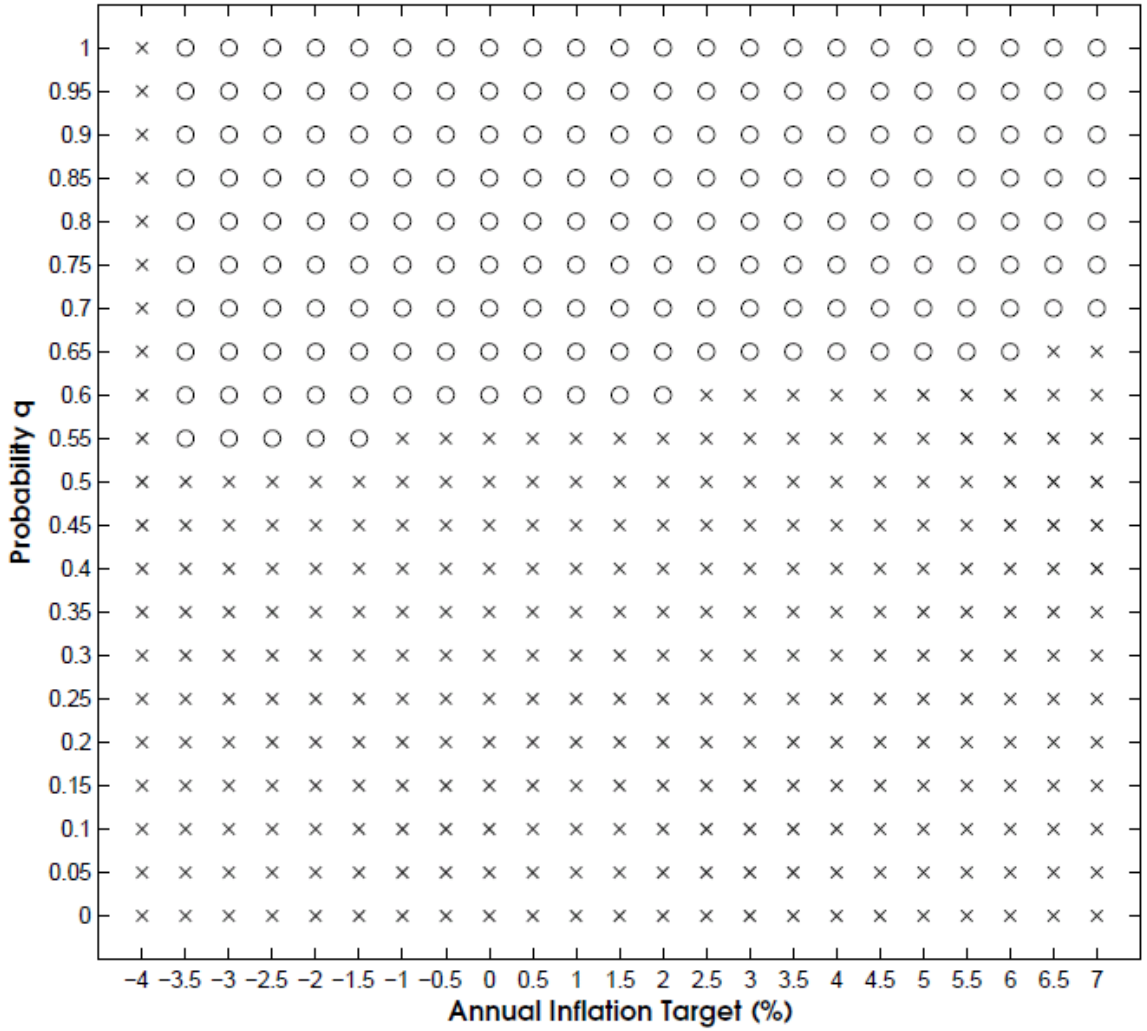
- Blanchard, Dell'Ariccia and Mauro have proposed to increase inflation targets to avoid such liquidity traps
- Would it work?





Inflation Target

- Very high targets required to rule out LT entirely



Policy

Ex-Ante: Prevention

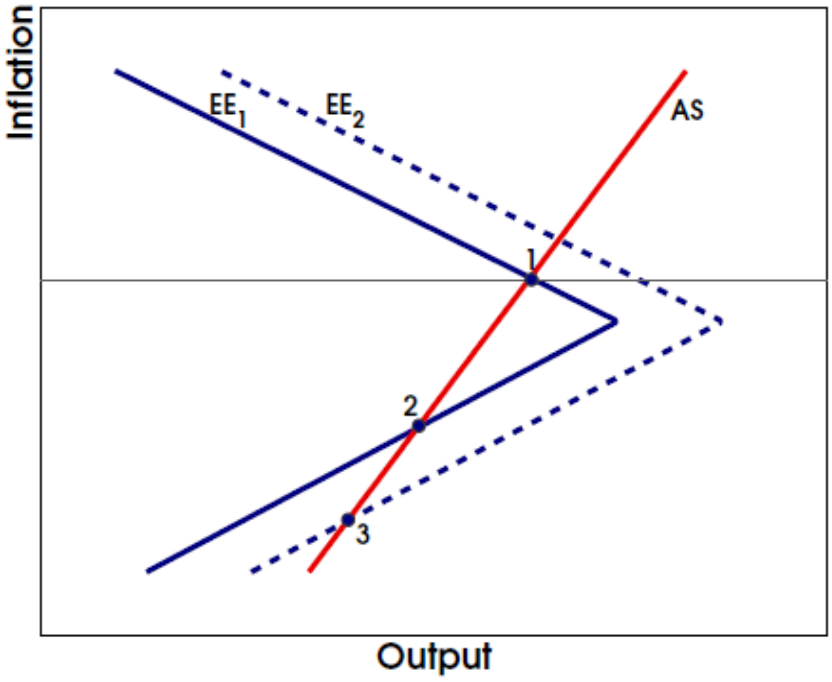
- Benhabib, Schmitt-Grohe and Uribe: Promise to be fiscally irresponsible in case agents coordinate on deflationary expectations - agents realize that transversality condition does not hold so this cannot be an equilibrium
- Benhabib, Schmitt-Grohe and Uribe: Switch to money growth target if agents coordinate on deflationary expectations
- Atkeson, Chari and Kehoe (QJE, 2010): Sophisticated equilibrium - stochastic switches to money growth rule
- BUT: We ARE in a LT

Ex-Post: **What to do in case a LT occurs**

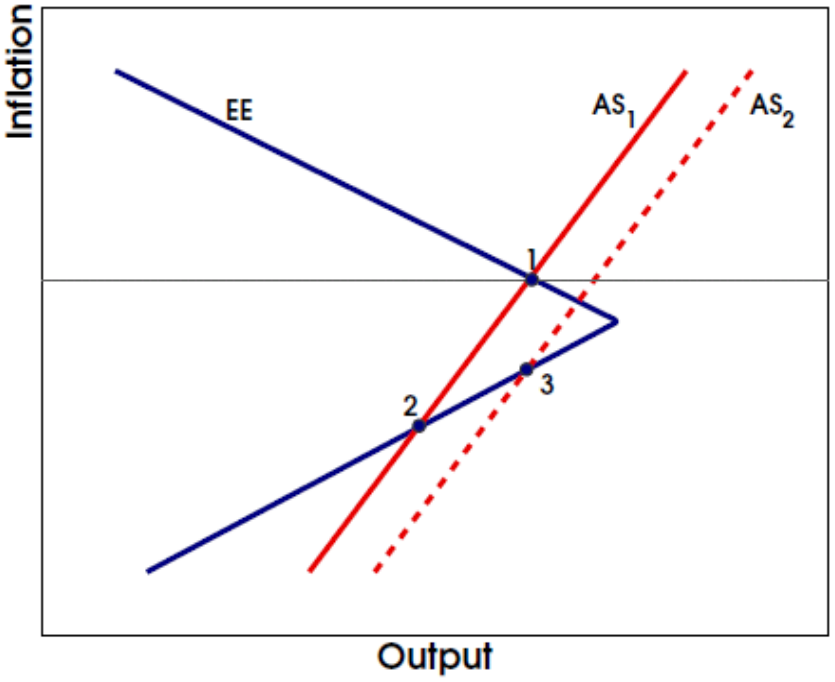
- Eggertsson and Woodford: Commit to a higher inflation target for an extended period (also after LT ends) - but serious credibility problems
- Eggertsson, 2009, Christiano, Eichenbaum and Rebelo, 2009, Woodford, 2010: Fiscal policy expansion

Fiscal Policy Graphically

Increasing government spending



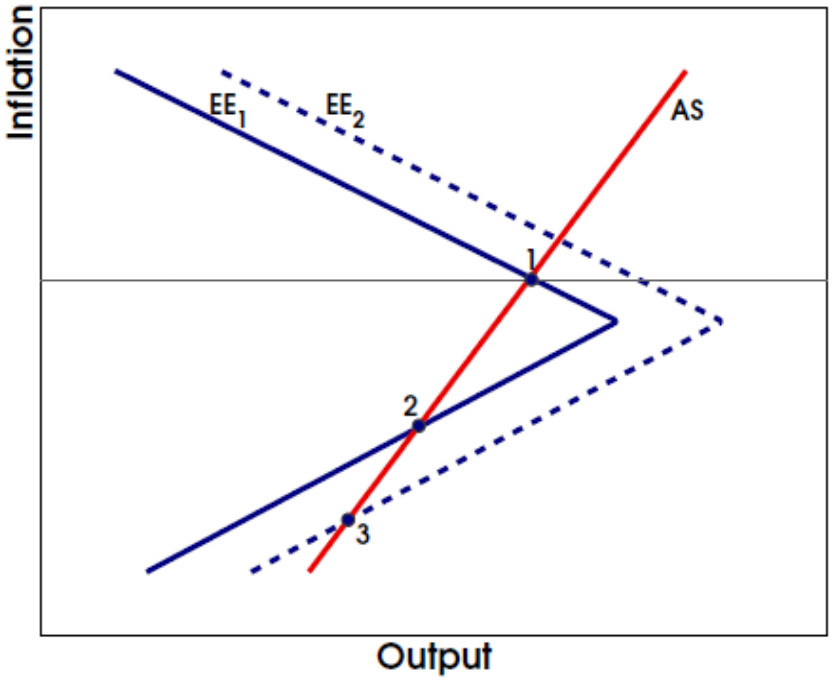
Cutting taxes



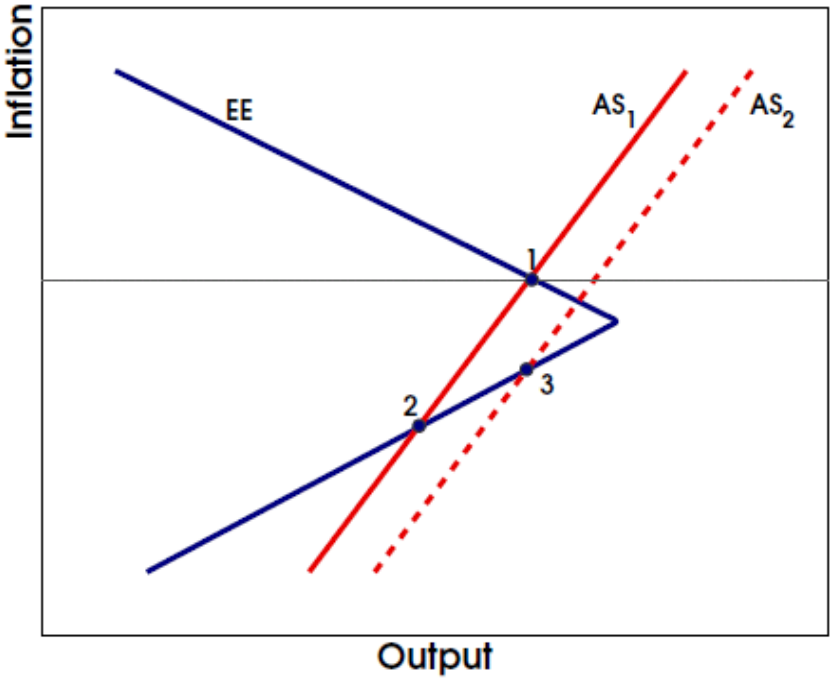
- **Government Spending**: Marginal increase from 20% of GDP

Fiscal Policy Graphically

Increasing government spending



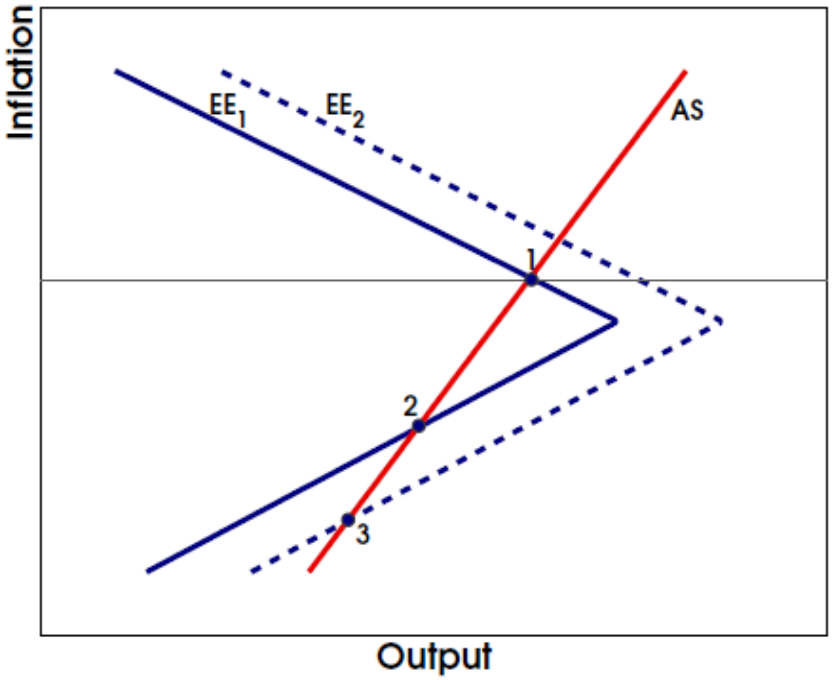
Cutting taxes



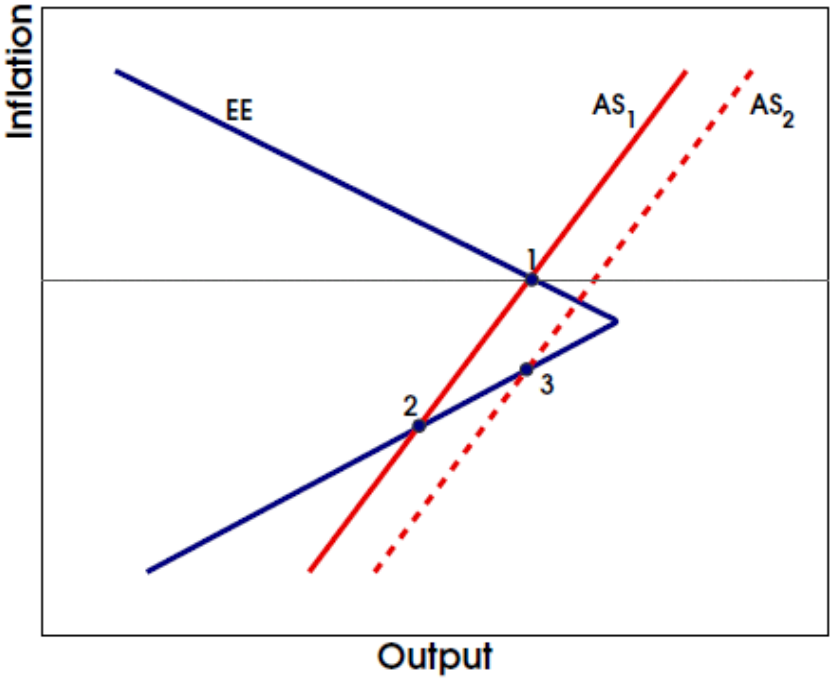
- **Government Spending**: Marginal increase from 20% of GDP
- **Consumption Tax**: Marginal decrease from 10%

Fiscal Policy Graphically

Increasing government spending

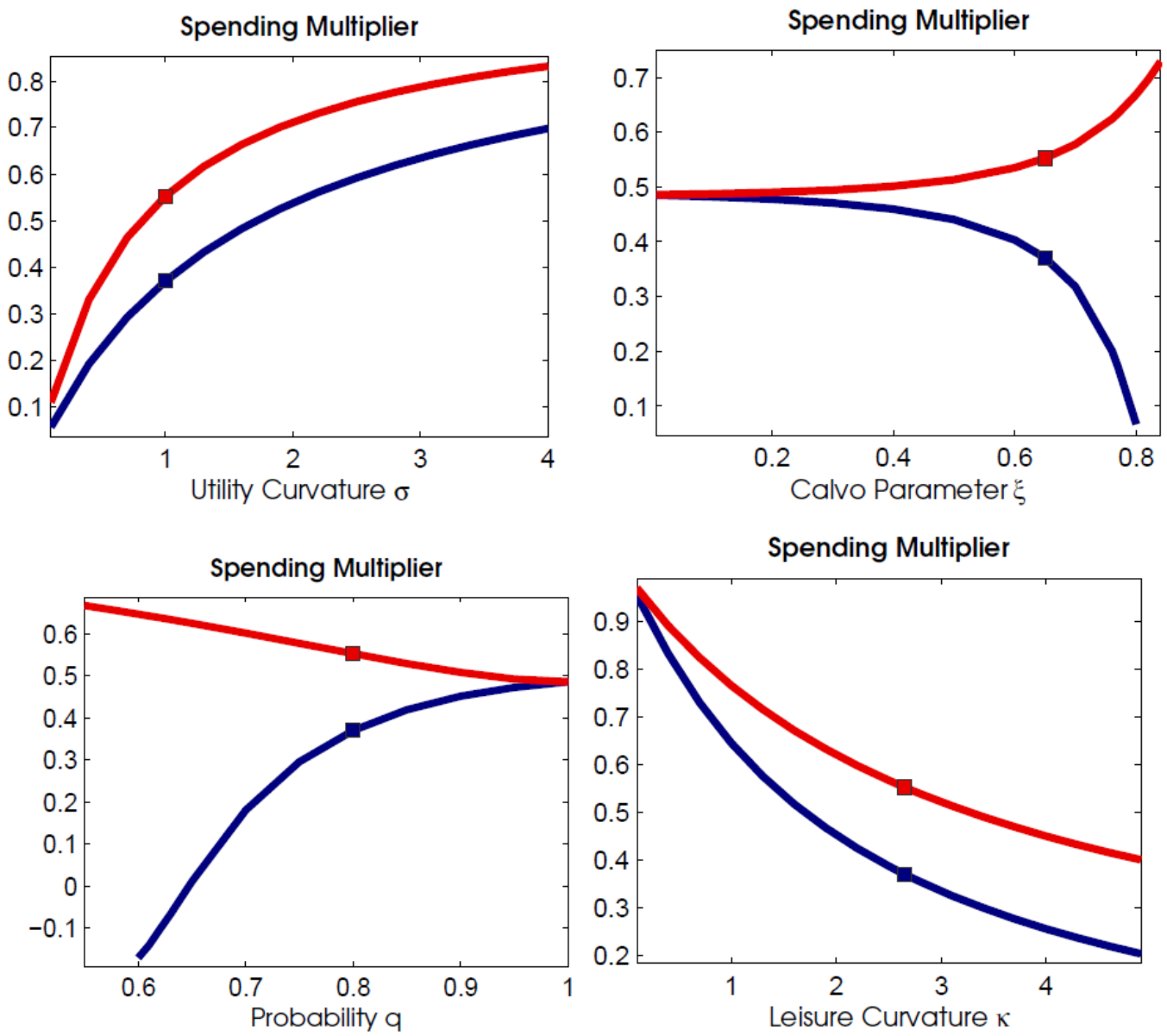


Cutting taxes

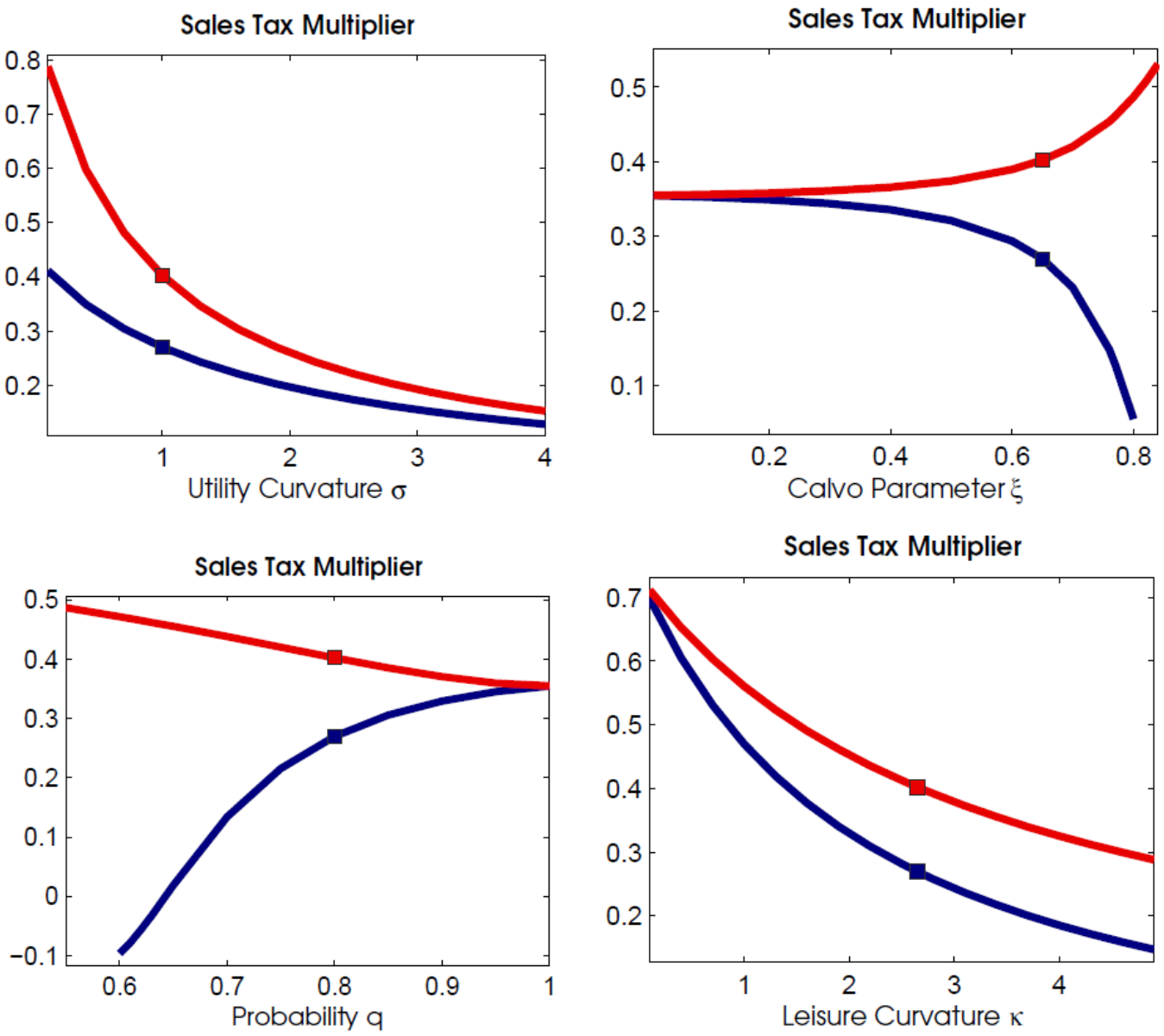


- **Government Spending**: Marginal increase from 20% of GDP
- **Consumption Tax**: Marginal decrease from 10%
- **Labor Income Tax Rate**: Marginal decrease from 20%

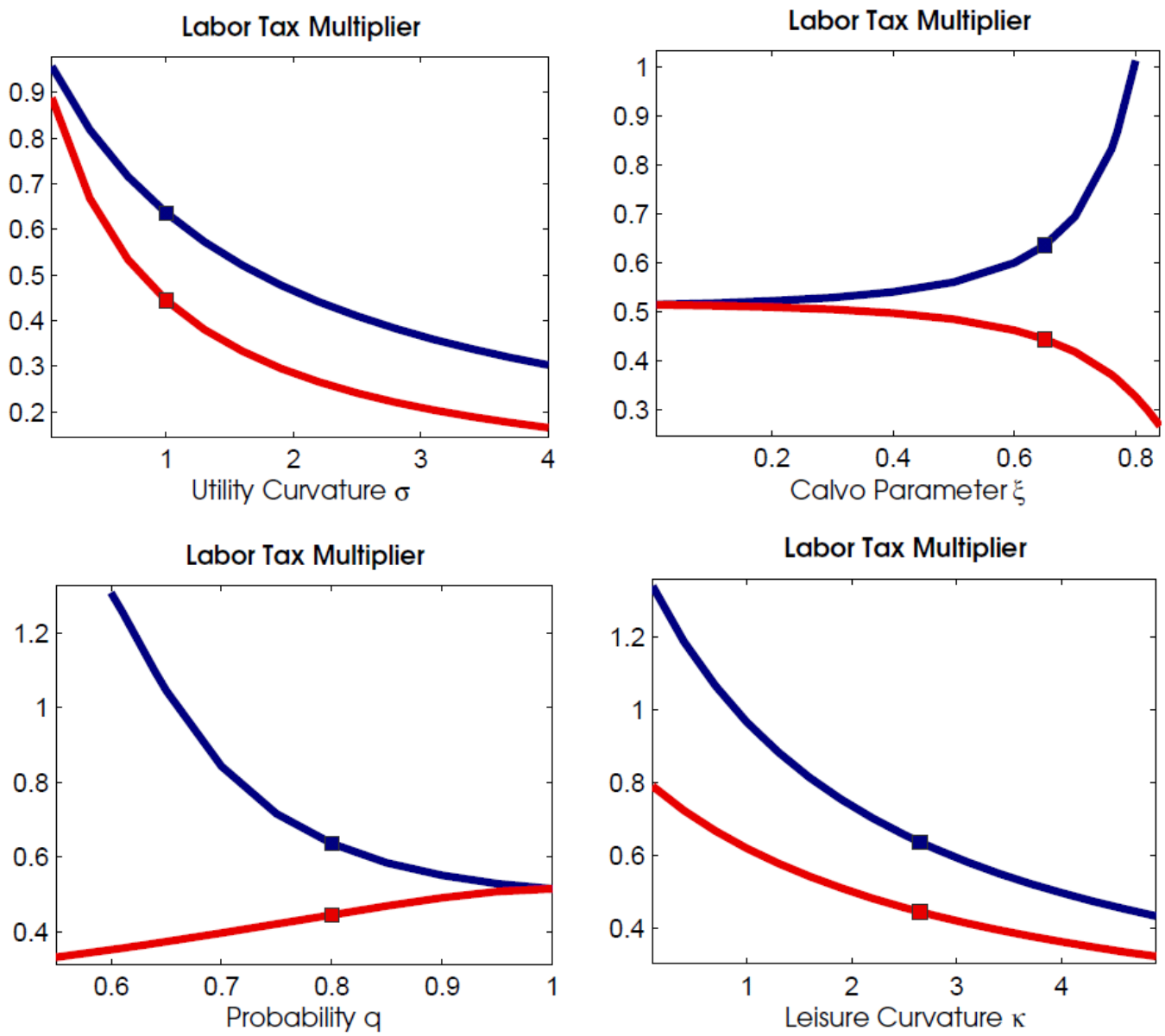
Spending Multipliers



Sales Tax Multipliers



Labor Income Tax Rate Multipliers



Conclusions

1. An expectations driven LT can be associated with large output and welfare losses

Conclusions

1. An expectations driven LT can be associated with large output and welfare losses
2. In contrast to fundamentals driven LT, increases in government spending lose potency in an expectations driven LT

Conclusions

1. An expectations driven LT can be associated with large output and welfare losses
2. In contrast to fundamentals driven LT, increases in government spending lose potency in an expectations driven LT
3. Supply side policies effective when expectations drive the economy into a LT (consistent with Akerlof and Shiller but for different reasons)

Conclusions

1. An expectations driven LT can be associated with large output and welfare losses
2. In contrast to fundamentals driven LT, increases in government spending lose potency in an expectations driven LT
3. Supply side policies effective when expectations drive the economy into a LT (consistent with Akerlof and Shiller but for different reasons)
4. Multipliers quite similar in LT and in normal times for standard parameter values

Conclusions

1. An expectations driven LT can be associated with large output and welfare losses
2. In contrast to fundamentals driven LT, increases in government spending lose potency in an expectations driven LT
3. Supply side policies effective when expectations drive the economy into a LT (consistent with Akerlof and Shiller but for different reasons)
4. Multipliers quite similar in LT and in normal times for standard parameter values
5. Increases in inflation target to prevent expectations driven LT could be very counterproductive

Conclusions

1. An expectations driven LT can be associated with large output and welfare losses
2. In contrast to fundamentals driven LT, increases in government spending lose potency in an expectations driven LT
3. Supply side policies effective when expectations drive the economy into a LT (consistent with Akerlof and Shiller but for different reasons)
4. Multipliers quite similar in LT and in normal times for standard parameter values
5. Increases in inflation target to prevent expectations driven LT could be very counterproductive
6. Policy recommendations consistent with Bils and Klenow (2008), Hall and Woodward (2008) and Feldstein (2009) but differ from Christiano et al (2009) and Woodford (2010)

Ruling Out Liquidity Traps Ex Ante

Can fiscal policy be applied to eliminate expectations driven liquidity traps ex-ante?

- **Benhabib, Schmitt-Grohe and Uribe** (2002, JPE): Commit to being irresponsible if agents coordinate on pessimism

Ruling Out Liquidity Traps Ex Ante

Can fiscal policy be applied to eliminate expectations driven liquidity traps ex-ante?

- **Benhabib, Schmitt-Grohe and Uribe** (2002, JPE): Commit to being irresponsible if agents coordinate on pessimism
- The appropriate transversality condition is:

$$\begin{aligned} \lim_{s\to\infty} \mathbb{E}_t \left[a_{t+s} \frac{\pi_t}{1+i_t} \cdots \frac{\pi_{t+s}}{1+i_{t+s}} \right] &= 0 \\ a_t &= \left(B_t + M_t \right) / P_t \end{aligned}$$

Ruling Out Liquidity Traps Ex Ante

Can fiscal policy be applied to eliminate expectations driven liquidity traps ex-ante?

- **Benhabib, Schmitt-Grohe and Uribe** (2002, JPE): Commit to being irresponsible if agents coordinate on pessimism
- The appropriate transversality condition is:

$$\begin{aligned} \lim_{s\to\infty} \mathbb{E}_t \left[a_{t+s} \frac{\pi_t}{1+i_t} \cdots \frac{\pi_{t+s}}{1+i_{t+s}} \right] &= 0 \\ a_t &= \left(B_t + M_t \right) / P_t \end{aligned}$$

- Outcomes that violate this condition cannot be equilibria

Ruling Out Liquidity Traps Ex Ante

Can fiscal policy be applied to eliminate expectations driven liquidity traps ex-ante?

- **Benhabib, Schmitt-Grohe and Uribe** (2002, JPE): Commit to being irresponsible if agents coordinate on pessimism
- The appropriate transversality condition is:

$$\begin{aligned} \lim_{s\to\infty} \mathbb{E}_t \left[a_{t+s} \frac{\pi_t}{1+i_t} \cdots \frac{\pi_{t+s}}{1+i_{t+s}} \right] &= 0 \\ a_t &= \left(B_t + M_t \right) / P_t \end{aligned}$$

- Outcomes that violate this condition cannot be equilibria
- They propose fiscal rules of the type:

$$\tilde{d}_t = \varkappa \left(\pi_t \right) a_{t-1} \quad (1)$$

$$x \left(\beta \right) > 1/\beta \quad (2)$$

$$x \left(\widetilde{\pi} \right) < 1/\beta \quad (3)$$

Ruling Out Liquidity Traps Ex Ante

In a sunspot, the equivalent rule for the LT will require that:

$$\varkappa(\pi_L) > \frac{1}{q\pi_L} > 1/\beta$$

- Thus, the government must threaten to be potentially extremely irresponsible in a LT

Ruling Out Liquidity Traps Ex Ante

In a sunspot, the equivalent rule for the LT will require that:

$$\varkappa(\pi_L) > \frac{1}{q\pi_L} > 1/\beta$$

- Thus, the government must threaten to be potentially extremely irresponsible in a LT
- **Problem:**

Ruling Out Liquidity Traps Ex Ante

In a sunspot, the equivalent rule for the LT will require that:

$$\varkappa(\pi_L) > \frac{1}{q\pi_L} > 1/\beta$$

- Thus, the government must threaten to be potentially extremely irresponsible in a LT
- **Problem:**
- If LT can occur for both fundamental and expectational reasons, then the rule has to be such that:

Ruling Out Liquidity Traps Ex Ante

In a sunspot, the equivalent rule for the LT will require that:

$$\varkappa(\pi_L) > \frac{1}{q\pi_L} > 1/\beta$$

- Thus, the government must threaten to be potentially extremely irresponsible in a LT
- **Problem:**
- If LT can occur for both fundamental and expectational reasons, then the rule has to be such that:
  - Transversality condition violated for expectational LT

Ruling Out Liquidity Traps Ex Ante

In a sunspot, the equivalent rule for the LT will require that:

$$\varkappa(\pi_L) > \frac{1}{q\pi_L} > 1/\beta$$

- Thus, the government must threaten to be potentially extremely irresponsible in a LT
- **Problem:**
- If LT can occur for both fundamental and expectational reasons, then the rule has to be such that:
  - Transversality condition violated for expectational LT
  - Transversality condition holds for fundamentals driven LT

Ruling Out Liquidity Traps Ex Ante

In a sunspot, the equivalent rule for the LT will require that:

$$\varkappa(\pi_L) > \frac{1}{q\pi_L} > 1/\beta$$

- Thus, the government must threaten to be potentially extremely irresponsible in a LT
- **Problem:**
- If LT can occur for both fundamental and expectational reasons, then the rule has to be such that:
  - Transversality condition violated for expectational LT
  - Transversality condition holds for fundamentals driven LT
- This might not always be possible