

Monetary and Fiscal Policy Design at the Zero Lower Bound: Evidence from the lab

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Goals within MACFINROBODS

- WP1: **Behaviour under uncertainty, heterogeneous agents and herding**
- WP2: **Expectations formation and belief heterogeneity**

- **Tasks and Objectives:**
run **laboratory experiments** with human subjects to test **micro** behavioral assumptions and aggregate **macro** behavior



Outline

- 1 Motivation
- 2 Model
- 3 Experimental design
- 4 Experimental results
- 5 Conclusions

1 Motivation

2 Model

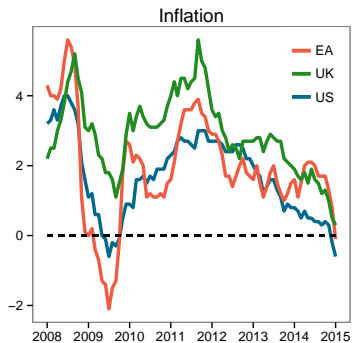
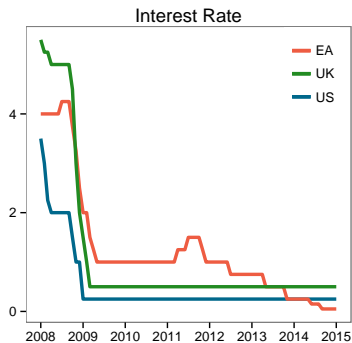
3 Experimental design

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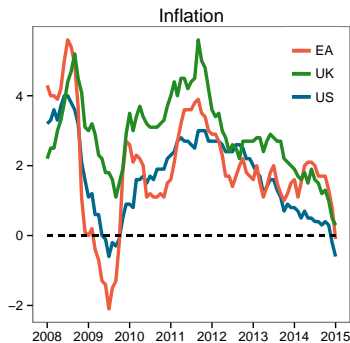
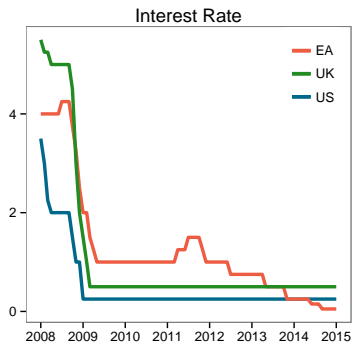
Empirical evidence

Liquidity trap in the Euro Area, US and UK



Empirical evidence

Liquidity trap in the Euro Area, US and UK



→ Fiscal stimulus at the ZLB?

Expectations and fiscal stimulus at the ZLB: theoretical contributions

- Under **rational expectations/perfect foresight** (Woodford 1999, Benhabib et al. 2001a,b):
 - ▶ ZLB gives rise to a second, deflationary steady state, with the possibility of self-fulfilling decelerating inflation paths.
 - ▶ A liquidity trap is a low but stable inflation state.
 - ▶ Automatic fiscal stimulus rules out liquidity traps.

Expectations and fiscal stimulus at the ZLB: theoretical contributions

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 - ▶ ZLB gives rise to a second, deflationary steady state, with the possibility of self-fulfilling decelerating inflation paths.
 - ▶ A liquidity trap is a low but stable inflation state.
 - ▶ Automatic fiscal stimulus rules out liquidity traps.
- Under **adaptive learning** (McCallum 2002, **Evans et al. 2008**, Benhabib et al. (2012)):
 - ▶ The targeted steady state is **not globally stable**.
 - ▶ Deflationary spiral is self-reinforcing.
 - ▶ A **preventive cut** in interest rates is not enough, a **fiscal switching rule** restores global stability of the targeted state.

Main objectives of this experimental paper

- 1 Characterizing liquidity traps using **experimental evidence**:
 - ▶ Do liquidity traps arise in a **learning-to-forecast experiment** when expectations are formed by human subjects?
 - ▶ Is a liquidity trap a low inflation steady state or deflationary spiral?

- 2 Assessing the empirical relevance of policy recommendations in a learning-to-forecast experiment:
 - ▶ Is monetary policy enough to **avoid/escape** liquidity traps? (with a preventive cut in interest rate)
 - ▶ Can a **fiscal switching rule** prevent a liquidity trap?
 - ▶ What are the **dynamics** along the convergence path towards the targeted steady state?

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An expectation-feedback model: (c, π, R, g)

Evans et al. (2008)

- Aggregate demand (IS curve):

$$c_t = c \left(\begin{array}{ccc} c_{t+1}^e & \pi_{t+1}^e & R_t \\ + & + & - \end{array} \right)$$

- Aggregate supply/NKPC:

$$\pi_t = \pi \left(\begin{array}{ccc} c_t & \pi_{t+1}^e & g_t \\ + & + & + \end{array} \right)$$

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- Fiscal policy** instrument : $g_t = \bar{g}$
- Monetary policy** rule with preventive cut interest rate:

$$\begin{cases} R \left(\begin{array}{cc} \pi_{t+1}^e / \pi^T & c_{t+1}^e / c^* \\ + & + \end{array} \right) & \text{if } \pi_t \geq \tilde{\pi} \\ \tilde{R} = \text{ZLB} & \text{if } \pi_t < \tilde{\pi} \end{cases}$$

Zero-lower bound and multiple steady states

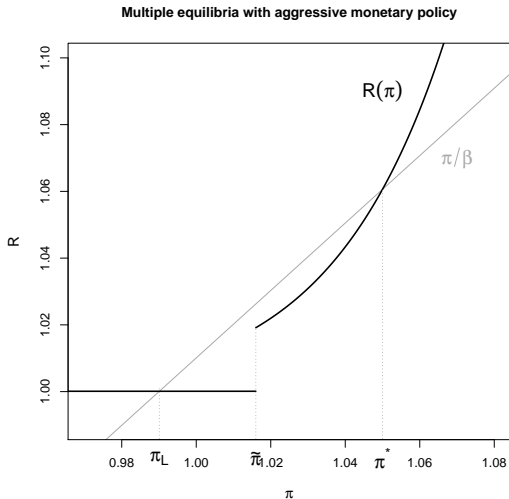


Figure : Aggressive monetary policy rule (preventive cut to ZLB) and multiple steady states

Policy Rules in Experiment

M Monetary policy only

- ▶ **Aggressive monetary policy: preventive cut** at the ZLB if inflation falls below $\tilde{\pi} \equiv 1.6\%$.
- ▶ Fiscal policy always remains fixed ($g = \bar{g}$).

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F Fiscal Policy (together with monetary policy):

- ▶ **Aggressive monetary policy:** preventive cut at the ZLB if inflation falls below $\tilde{\pi} \equiv 1.6\%$.
- ▶ **"Fiscal switching rule":** inflationary-threshold fiscal policy. If inflation falls below $\tilde{\pi}$ despite the ZLB, g is increased so that inflation meets the threshold $\tilde{\pi}$.

Global dynamics under adaptive learning

Evans et al. (2008) : without fiscal policy

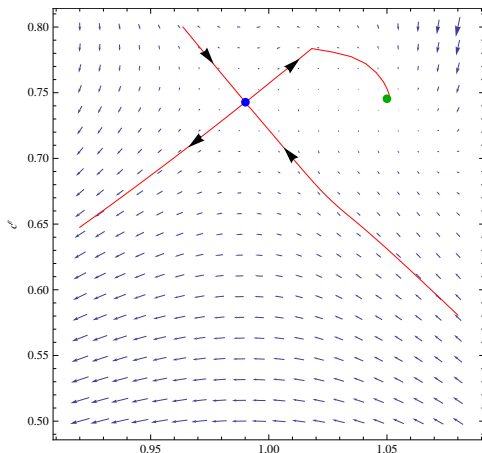


Figure : Phase plot of the economy π^e under adaptive learning

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Learning to forecast experiment

General context and information

- **Two forecasts:** net output and inflation.
- Interpretation: private forecasters and representative firm-household.
- **Pay-off** as a function of forecast errors; randomized between inflation and output.
- **Qualitative information:** positive/negative relationships between variables, time series, specific information on policies.
- A 2×2 treatment design:
 - ▶ Monetary Policy with or without Fiscal Policy
 - ▶ Expectations Pessimistic (P) or subject to negative Expectational Shocks (S)
- 7 experimental economies in each (28 in total).

Policy treatments

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Expectations treatments

- P Initial **severe** pessimism:
[−8, 8]% (5%) and [50, 80] (74).

Expectations treatments

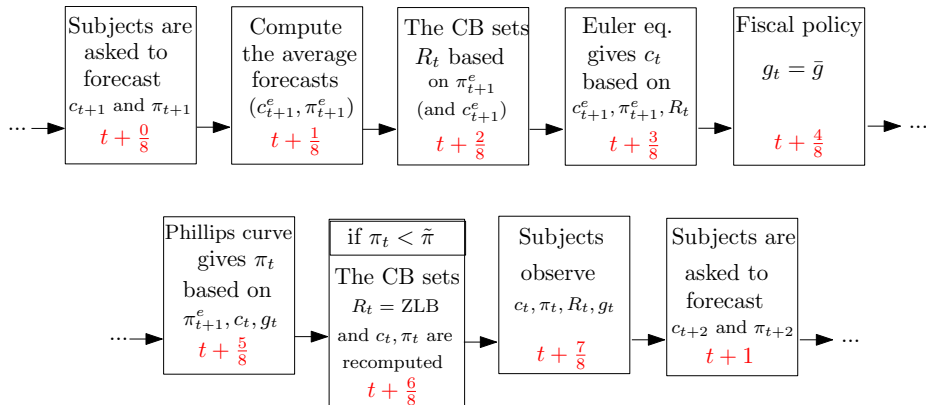
- P** Initial **severe** pessimism:
[−8, 8]% (5%) and [50, 80] (74).
- S** Initial **mild** pessimism + **news shocks**:
[−5, 8]% (5%) and [60, 80] (74).



Figure : News shocks at periods 8,9 and 10.

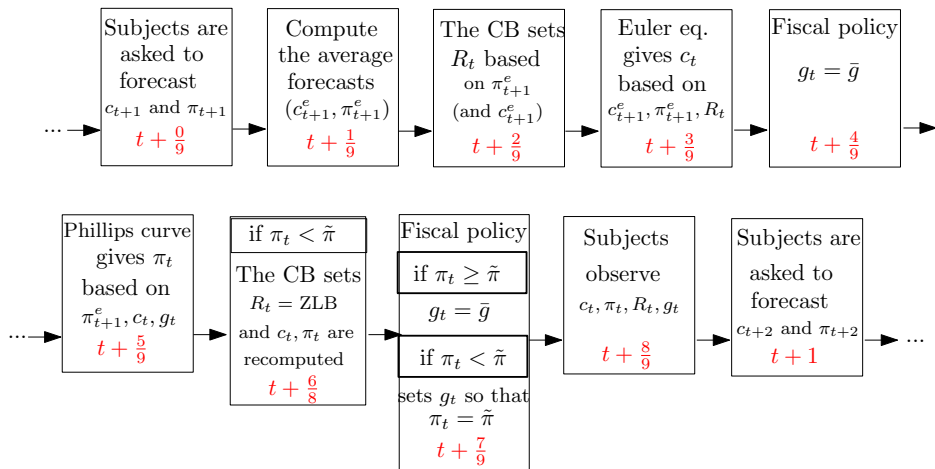
Learning to forecast experiment

Timing of events (under aggressive monetary policy)



Learning to forecast experiment

Timing of events (under policy mix)



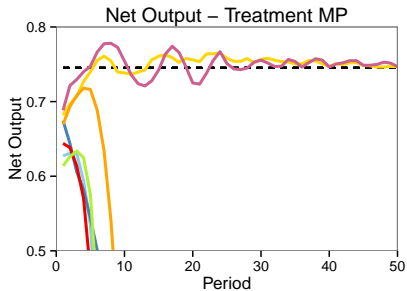
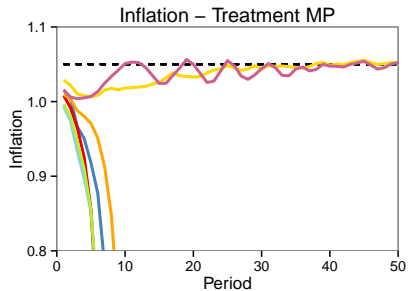
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Overview 2x2 Treatments: Policy versus Expectations

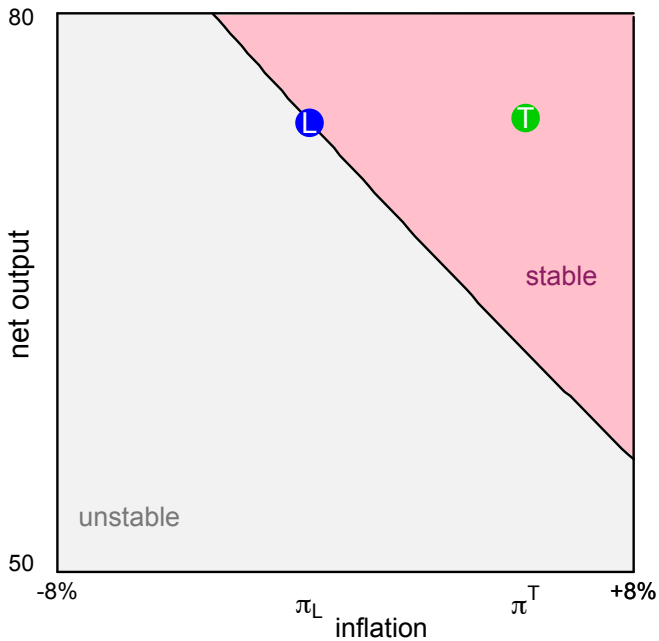
	Monetary policy only	additional Fiscal Policy
Severe Pessimism	<ul style="list-style-type: none">● 5 deflationary spirals (initial pessimism)● 2 convergences to steady state with ZLB	<ul style="list-style-type: none">● 1 convergence with standard policy● 6 convergences with policy mix:<ul style="list-style-type: none">▶ 2 oscillatory convergence paths,▶ 4 liquidity traps
Mild pessimism + news shock	<ul style="list-style-type: none">● 4 deflationary spirals after news● 3 convergences to steady state (1 with ZLB)	<ul style="list-style-type: none">● 1 convergences with standard policy● 6 convergences with policy mix:<ul style="list-style-type: none">▶ 3 oscillatory convergence paths,▶ 3 liquidity traps

Treatment MP: Monetary Policy and Pessimistic Expectations

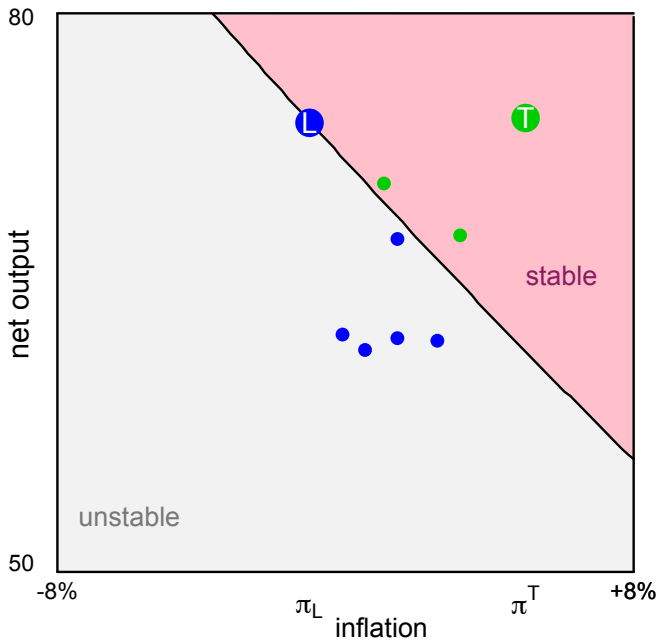
2 convergences and 5 deflationary spirals



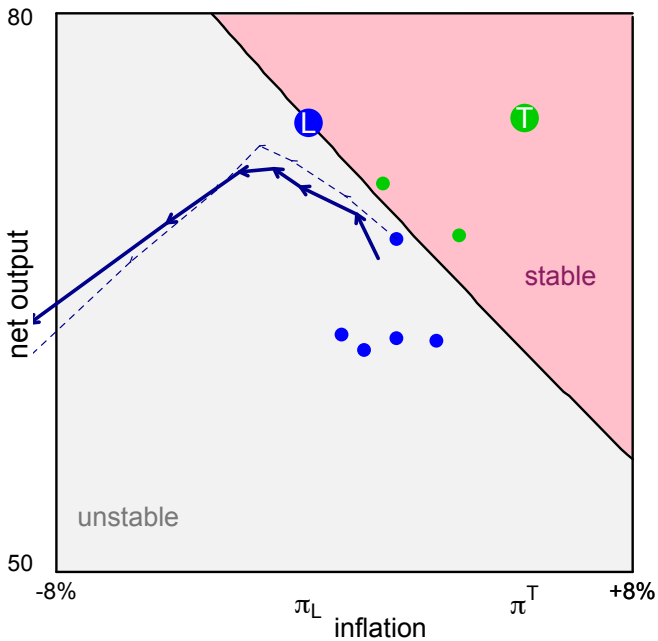
Phase plot of the experimental economy



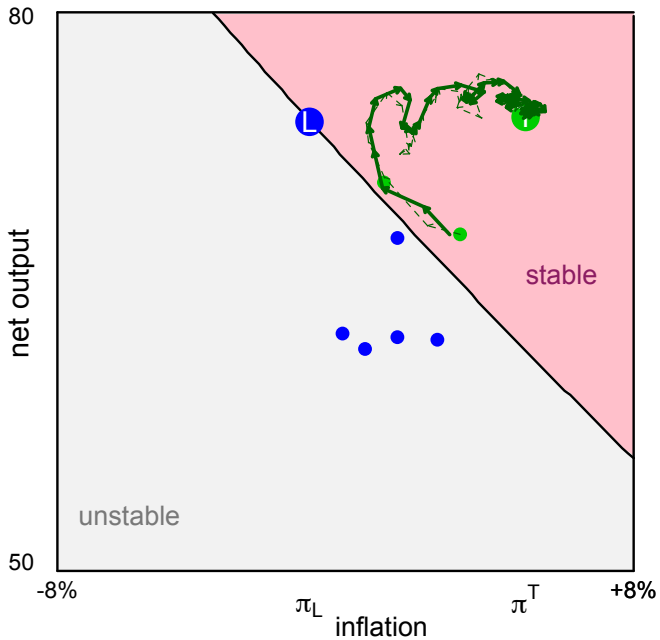
Initial expectations in Tr. MP/severe pessimism (b)



Fall in a liquidity trap in Tr. MP/severe pessimism (b)

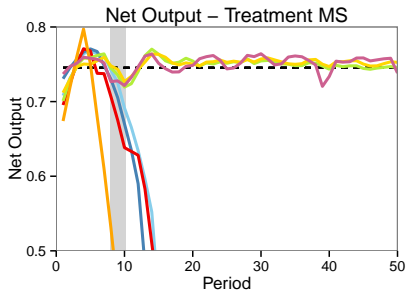
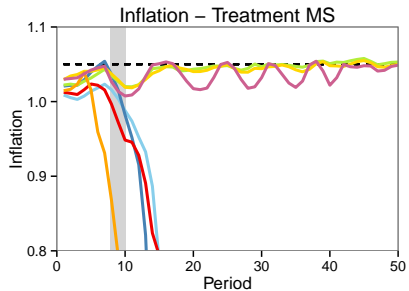


Convergence in Tr. MP/severe pessimism (b)

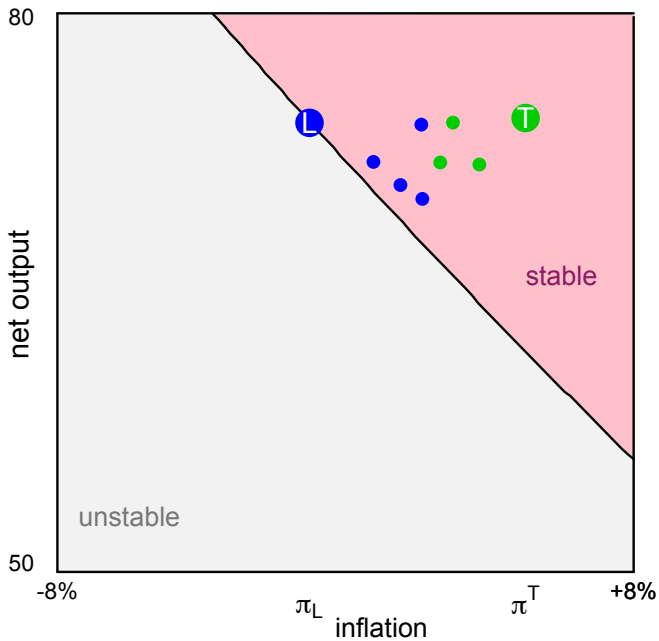


Treatment MS: Monetary Policy and Mild Pessimistic Expectations with News Shocks

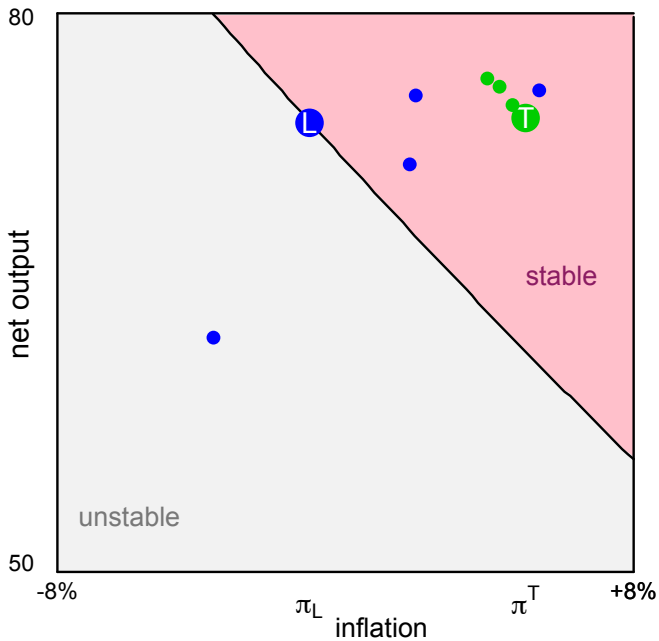
3 convergences and 4 deflationary spirals



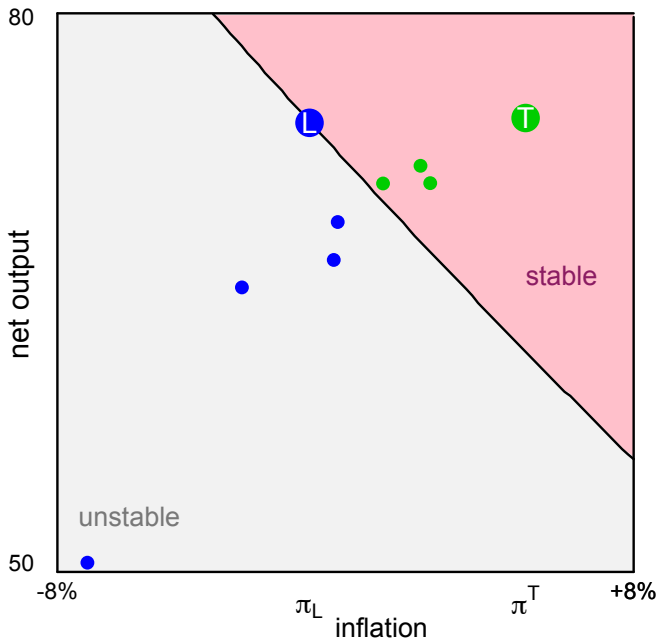
Initial expectations in Tr. MP/mild pessimism (a)



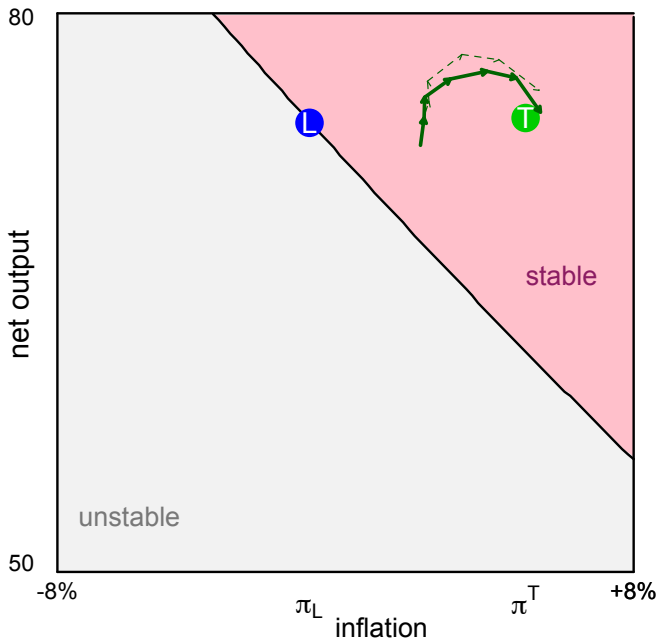
Expectations before the news in Tr. MP/mild pessimism (a)



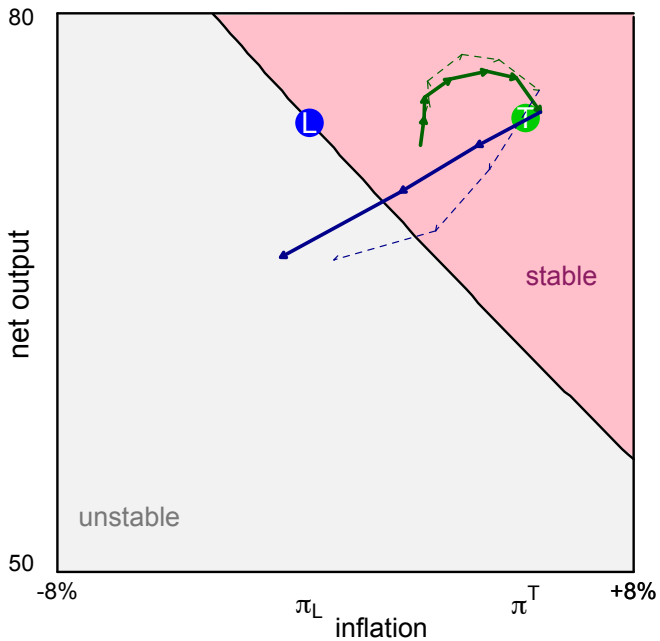
Expectations after the news in Tr. MP/mild pessimism (a)



Fall in a liquidity trap by expectational shock

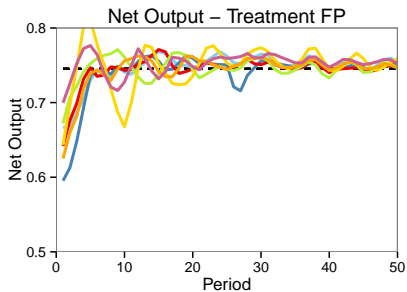
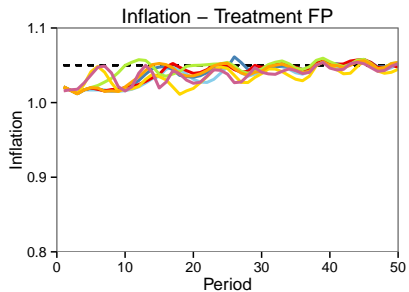


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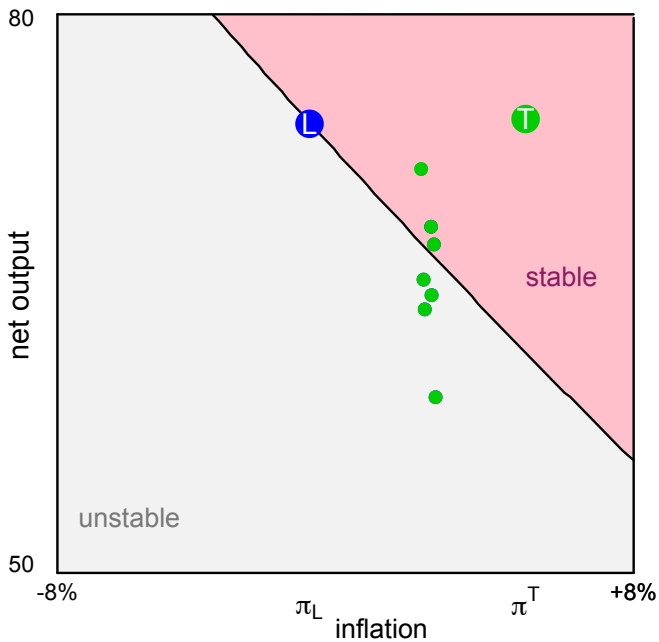


Treatment MP: Fiscal Policy and Pessimistic Expectations

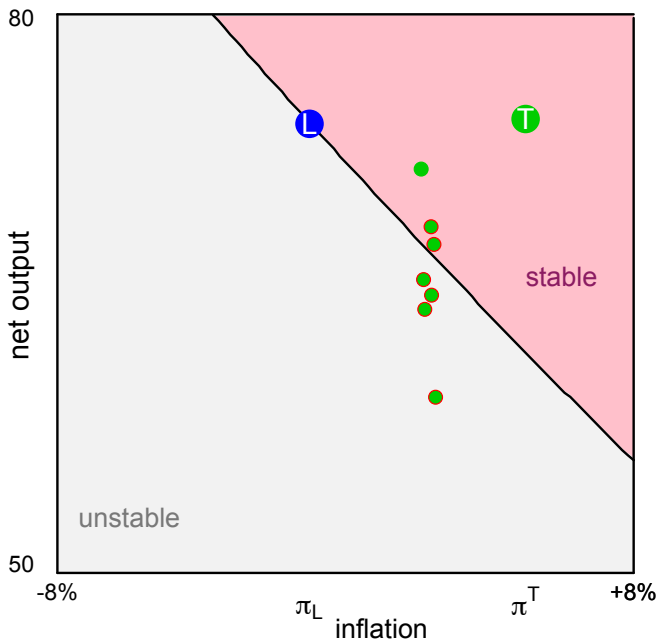
7 convergences, 6 with fiscal switching rule, no deflationary spirals



Effect of policy mix in Tr. MFP/severe pessimism (b)

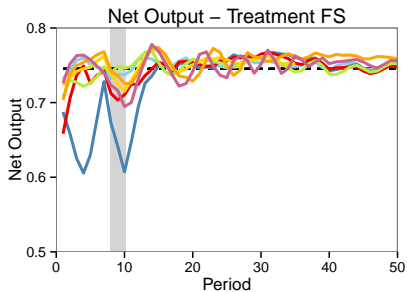
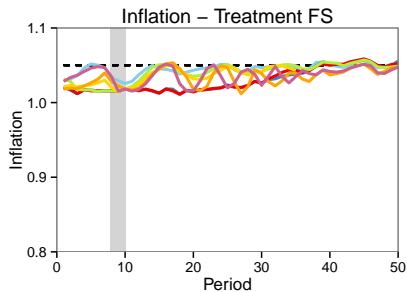


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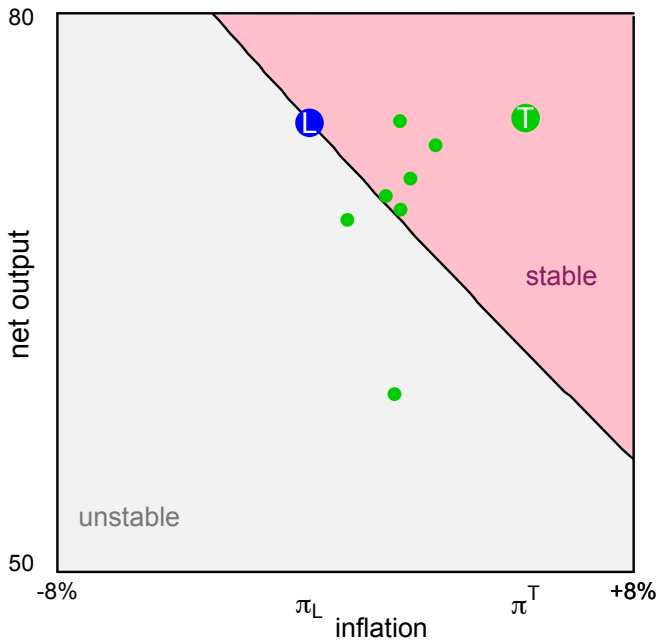


Treatment MP: Fiscal Policy and Mild Pessimistic Expectations with News Shocks

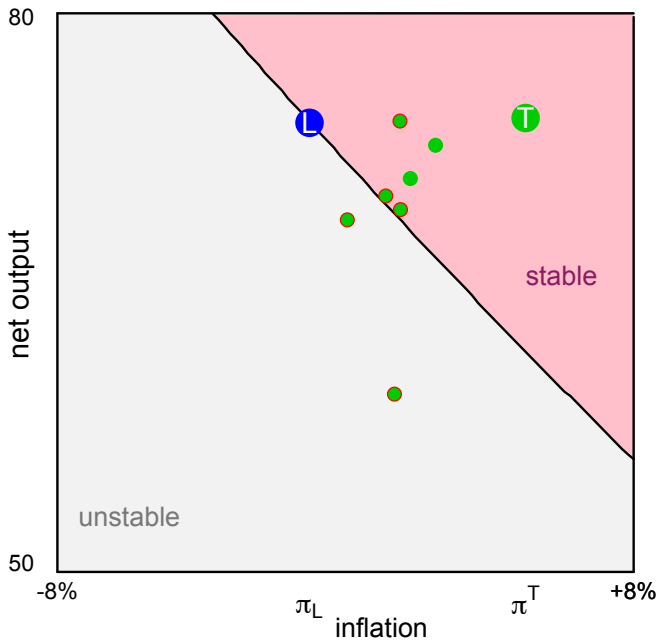
7 convergences, 6 with fiscal switching rule, no deflationary spirals



Effect of policy mix after the news in Tr. MFP/mild pessimism (a)



Effect of policy mix after the news in Tr. MFP/mild pessimism (a)

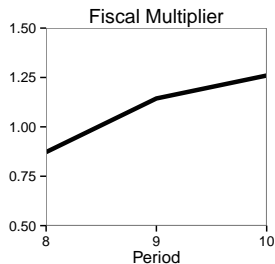
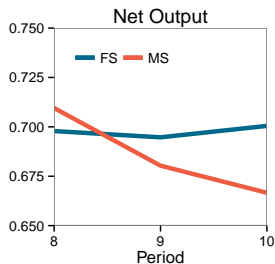
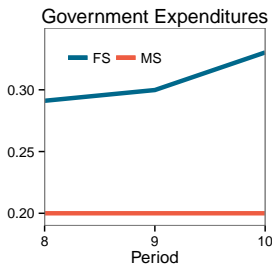


Estimates of the fiscal multiplier at ZLB in Lab

News Shocks in Periods 8-10

- Estimates based on counter-factual analysis (MS vs. FS):

fiscal multiplier
$$\mu_t = \frac{y_{t+1}^{F*} - y_{t+1}^{M*}}{g_t^{F*} - \bar{g}}$$

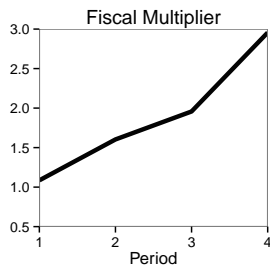
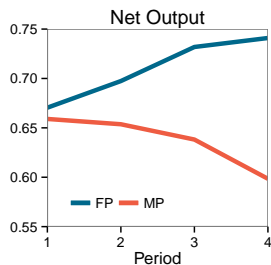
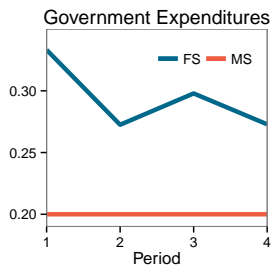


Estimates of the fiscal multiplier at ZLB in Lab

after initial Pessimistic Expectations periods 1-4

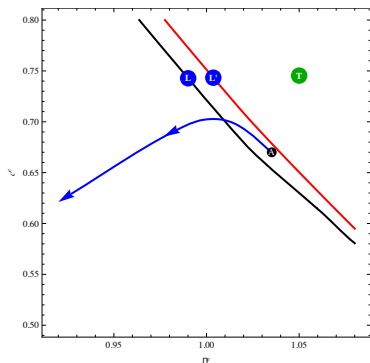
- Estimates based on counter-factual analysis (MS vs. FS):

fiscal multiplier
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Policy Debate: should FED raise target inflation rate to avoid liquidity traps?

- increasing target inflation, means increasing ZLB nominal rate \tilde{R} ;
- this leads to an **upward shift of the stable manifold** of the low inflation steady state L
- this may more easily lead to a **deflationary spiral**



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Sum-up

- 1 **Deflationary spirals** can arise as a result of pessimistic expectations even with an aggressive monetary policy using a preventive cut in the interest rate.
- 2 A **fiscal policy switching rule** prevents deflationary spirals.
- 3 The fiscal multiplier raises above one through the **expectations channel**.
- 4 Raising target inflation **makes liquidity traps more likely**.

Behavioural Macro Experiments

- 1 Expectations are the most important transmission channel of macro policies** → **Learning to Forecast Experiments**
empirical validation of policy recommendations that rely on specific expectation formation mechanisms
→ e.g. what to target? forward guidance, fiscal policy taking into account sovereign risk channel.
- 2 Learning to Optimize Experiments:** expectations are only one part of the story.
- 3 Large scale-experiments**

Thank you for your attention

