Monetary Economics

General Conclusion

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Objective, questions, and lessons of the course

- Main **objective** of the course: to provide an introduction to
  - the NK framework, from the basic NK model to an extended NK model,
  - its positive and normative implications in normal and crisis times.
- Main **questions** addressed by the course:
  - What are the effects of monetary policy?
  - How does monetary policy work?
  - What should be the objectives of monetary policy?
  - How should monetary policy be conducted?
  - What to think of existing monetary-policy strategies?
  - What to think of existing unconventional monetary-policy measures?
- Main **lesson** of the course: the importance of
  - the private agents' expectations,
  - the natural level of output and the natural rate of interest,

  in the transmission and the conduct of monetary policy.

Outline of the course

- **General introduction**
- **Part I: Conventional monetary policy**
  - *Chapter 1:* The basic NK model
  - *Chapter 2:* Optimal monetary policy
  - *Chapter 3:* Monetary-policy design
- **Part II: Unconventional monetary policy**
  - *Chapter 4:* Forward guidance
  - *Chapter 5:* Quantitative vs. credit easing
- **General conclusion**

Time inconsistencies in the basic NK model

Source of time-inconsistency	**Under discretion**	**Under commitment**
Steady-state inefficiency (*Chapter 2*)	$\mathbb{E}\{\pi_t\} > 0$ (inflation bias)	$\mathbb{E}\{\pi_t\} = 0$ (no inflation bias)
Cost-push shocks u_t (*Chapter 2*)	$\lvert\frac{\partial i_t}{\partial u_t}\rvert \gg 0$ and $\frac{\partial i_{t+k}}{\partial u_t} = 0$ (stabilization bias)	$\lvert\frac{\partial i_t}{\partial u_t}\rvert > 0$ and $\frac{\partial i_{t+k}}{\partial u_t} \neq 0$ (no stabilization bias)
Large negative shock to the natural rate of interest r_t^n, making the ZLB constraint binding (*Chapter 4*)	$\pi_t \ll 0$ and $\widetilde{y}_t \ll 0$ during the ZLB episode, $\pi_t = 0$ and $\widetilde{y}_t = 0$ after the ZLB episode	$\pi_t < 0$ and $\widetilde{y}_t < 0$ during the ZLB episode, $\pi_t > 0$ and $\widetilde{y}_t > 0$ after the ZLB episode

Two extensions

- For those interested, I have posted on my website the presentation slides of two extensions to the basic NK model (which are, of course, **not part of the exam syllabus**):
  - *Extension 1:* The sticky-wages extension,
  - *Extension 2:* The small-open-economy extension.

- Extension 1 is based on Erceg, Henderson, and Levin (2000), Galí (2015, C6), and Woodford (2003, C5).

- Extension 2 is based on Clarida, Galí, and Gertler (2001), Galí (2015, C8), Galí and Monacelli (2005), and Walsh (2010, C9).

Notations for model comparison

Notation	Model
B	**Basic** NK model (*Chapters 1-4*)
FF	Extension with (exogenous) **financial frictions** (*Chapter 5*)
SW	Extension with **sticky wages** (*Extension 1*)
SOE	Extension to **small open economy** (*Extension 2*)

In the next four slides, the blue color signals a difference between the extension considered (FF, SW or SOE) and the basic model (B).

Model comparison I: structural equations

Model	Structural equations	
B	$\widetilde{y}_t = \mathbb{E}_t\{\widetilde{y}_{t+1}\} - \frac{1}{\sigma}(i_t - \mathbb{E}_t\{\pi_{t+1}\} - r_t^n)$	(IS)
	$\pi_t = \beta\mathbb{E}_t\{\pi_{t+1}\} + \kappa\widetilde{y}_t$	(PC)
FF	$\widetilde{y}_t = \mathbb{E}_t\widetilde{y}_{t+1} - \frac{1}{\sigma}(i_t^{avg} - \mathbb{E}_t\pi_{t+1} - r_t^{n,ff})$	(IS)
	$\pi_t = \beta\mathbb{E}_t\pi_{t+1} + \kappa\widetilde{y}_t$	(PC)
SW	$\widetilde{y}_t = \mathbb{E}_t\{\widetilde{y}_{t+1}\} - \frac{1}{\sigma}(i_t - \mathbb{E}_t\{\pi_{t+1}^p\} - r_t^n)$	(IS)
	$\pi_t^p = \beta\mathbb{E}_t\{\pi_{t+1}^p\} + \kappa_p\widetilde{y}_t + \chi_p\widetilde{\omega}_t$	(PI)
	$\pi_t^w = \beta\mathbb{E}_t\{\pi_{t+1}^w\} + \kappa_w\widetilde{y}_t - \chi_w\widetilde{\omega}_t$	(WI)
	$\Delta\widetilde{\omega}_t = \pi_t^w - \pi_t^p - \Delta\omega_t^n$	(II)
SOE	$\widetilde{y}_t = \mathbb{E}_t\{\widetilde{y}_{t+1}\} - \frac{1}{\sigma_\alpha}(i_t - \mathbb{E}_t\{\pi_{H,t+1}\} - r_t^{n,soe})$	(IS)
	$\pi_{H,t} = \beta\mathbb{E}_t\{\pi_{H,t+1}\} + \kappa_\alpha\widetilde{y}_t$	(PC)

Model comparison II: interest-rate rules...

...for which the **Taylor principle** applies

Model	Interest-rate rules	Restrictions on coefficients
B	$i_t = \rho i_{t-1} + \phi_\pi \pi_t + \phi_y y_t$	$\rho \geq 0,\ \phi_\pi \geq 0,\ \phi_y \geq 0$
	$i_t = \rho i_{t-1} + \phi_\pi \mathbb{E}_t\{\pi_{t+1}\} + \phi_y y_t$	$\rho \geq 0,\ \phi_\pi \geq 0,\ \phi_y \geq 0$
	$i_t = \phi_p p_t + \phi_y y_t$	$\phi_p > 0,\ \phi_y \geq 0$
FF	$i_t^{avg} = \rho i_{t-1}^{avg} + \phi_\pi \pi_t + \phi_y y_t$	$\rho \geq 0,\ \phi_\pi \geq 0,\ \phi_y \geq 0$
	$i_t^{avg} = \rho i_{t-1}^{avg} + \phi_\pi \mathbb{E}_t\{\pi_{t+1}\} + \phi_y y_t$	$\rho \geq 0,\ \phi_\pi \geq 0,\ \phi_y \geq 0$
	$i_t^{avg} = \phi_p p_t + \phi_y y_t$	$\phi_p > 0,\ \phi_y \geq 0$
SW	$i_t = \phi_p \pi_t^p + \phi_w \pi_t^w + \phi_y y_t$	$\phi_p \geq 0,\ \phi_w \geq 0,\ \phi_y \geq 0$
SOE	$i_t = \rho i_{t-1} + \phi_\pi \pi_{H,t} + \phi_y y_t$	$\rho \geq 0,\ \phi_\pi \geq 0,\ \phi_y \geq 0$
	$i_t = \rho i_{t-1} + \phi_\pi \mathbb{E}_t\{\pi_{H,t+1}\} + \phi_y y_t$	$\rho \geq 0,\ \phi_\pi \geq 0,\ \phi_y \geq 0$
	$i_t = \phi_p p_{H,t} + \phi_y y_t$	$\phi_p > 0,\ \phi_y \geq 0$

Model comparison III: welfare issues

Model	Distortions	Instantaneous welfare loss*
B	Monopolistic competition Sticky prices	$(\pi_t)^2 + \lambda(\widetilde{y}_t)^2$
FF	Monopolistic competition Sticky prices Financial frictions	$(\pi_t)^2 + \overline{\lambda}(\widetilde{y}_t)^2$
SW	Monopolistic competition Sticky prices Sticky wages	$(\pi_t^p)^2 + \frac{\lambda_w}{\lambda_p}(\pi_t^w)^2 + \frac{\lambda_y}{\lambda_p}(\widetilde{y}_t)^2$
SOE	Monopolistic competition Sticky prices Terms-of-trade externality	$(\pi_{H,t})^2 + \lambda(\widetilde{y}_t)^2$

* in the absence of steady-state distortion and cost-push shocks.

Model comparison IV: path under optimal mon. policy...

...in the absence of steady-state distortion and cost-push shocks

Model	Interest rate	Inflation rate(s)	Output gap	First best?
B	$i_t = r_t^n$	$\pi_t = 0$	$\widetilde{y}_t = 0$	yes
FF	$i_t = r_t^{n,ff}$	$\pi_t = 0$	$\widetilde{y}_t = 0$	yes
SW	$i_t \neq r_t^n$	$\pi_t^p \neq 0,\ \pi_t^w \neq 0$	$\widetilde{y}_t \neq 0$	no
SOE	$i_t = r_t^{n,soe}$	$\pi_{H,t} = 0,\ \pi_t \neq 0$	$\widetilde{y}_t = 0$	yes

Expectations I

- At the end of the course, with the course-presentation slides in hand, students are expected to be able to do the following things, in the context of the models studied in the course and similar models:

1. **write down** the optimization problems of private agents (households, firms, financial intermediaries), **derive** the corresponding first-order conditions, and **interpret** these conditions,
2. **log-linearize** the equilibrium conditions, **derive** the key equations (IS equation, Phillips curve...), and **interpret** these equations,
3. **write down** the optimization problem of the social planner, **solve** it, and **interpret** the solution,
4. **identify** the distortions, **derive** the condition for natural-allocation efficiency, and **interpret** the welfare-loss function,

Expectations II

5. **write down** the optimization problem for interest-rate policy away from the ZLB under discretion and under commitment, **solve** it, and **interpret** the solution,

6. **derive** the determinacy condition for a given interest-rate rule and **explain** how to estimate an interest-rate rule by GMM,

7. **explain** the problem of non-implementability of the optimal feasible path and the problem of multiplicity of determinate projections,

8. **write down** the optimization problem for forward-guidance policy at the ZLB under discretion and under commitment, and **interpret** the solution,

9. **explain** date-based and state-based forward-guidance policies, and **interpret** optimal quantitative-easing and credit-easing policies.

First-session exam

- The **exam** will be written and will last two hours.
- The examination paper will be in English, and you will have to answer in English.
- The exam will consist in an exercise and a commentary on a text (typically an excerpt from a central-banker speech).
- The paper version of the course's presentation slides (with or without manuscript annotations, on the slides or on separate sheets of paper), as well as bilingual dictionaries, will be allowed during the exam.
- The examination papers of the last three years, and the solutions to their exercises, are available on "Pamplemousse".

Course "Applied Macroeconomic Modelling"

- The second-semester course "**Applied Macroeconomic Modelling: Policies, the Business Cycle, and the Green Transition**" will extend the first-semester course "Monetary Economics".

- This course will notably
  - present a medium-scale dynamic stochastic general-equilibrium (DSGE) model, namely Smets and Wouters' model (2007),
  - address the resolution, estimation, and simulation of DSGE models.

- Smets and Wouters' (2007) model is an extension of the basic NK model with capital and the following frictions: sticky wages, price and wage indexation, habit formation, investment-adjustment cost, capacity-utilisation cost.