

# Business Cycles

- Mock Exam -

Student ID: \_\_\_\_\_

- Fill in your matriculation number into the form at the top of each page.
- You have 60 minutes to finish the exam. This exam consists of 4 questions with a total of 60 points. You have to answer all questions.
- Please keep your answers **short** but informative and in **readable** handwriting.
- If not defined otherwise, variables have the same meaning as in class. Please make sure that your answers are clearly legible and without any ambiguity. Your answers have to be tractable. If you use diagrams, make sure to label them and **explain** them sufficiently.

Question:	1	2	3	4	Total
Points:	12	15	8	25	60
Score:					

## Fundamental Economic Principles

1. Discuss the following two questions, providing short and concise answers.

- a) Explain *intertemporal substitution* and its relevance for monetary policy transmission. How is it impaired at the ZLB and how may fiscal policy be able to compensate for that? [6 points]

- b) Explain “money neutrality” and explain why the Real Business Cycle Model can be considered a useful benchmark in the medium run. [6 points]

## Micro foundations

2. Consider the following two periods consumption-savings problem with government. The consumer maximizes

$$\max_{C_t, C_{t+1}, S_t, S_{t+1}} \ln C_t + \beta \ln C_{t+1} \quad (1)$$

subject to the budget constraints

$$C_t + S_t = Y_t - T_t \quad (2)$$

$$C_{t+1} + S_{t+1} = Y_{t+1} - T_{t+1} + (1 + r)S_t. \quad (3)$$

- a) Derive the Euler equation and explain its economic intuition. [7 points]

- b) Use the Euler equation and intertemporal budget constraint to derive an expression for the consumption function. [3 points]

c) The government faces two within period budget constraints:

$$G_t + S_t^G = T_t \quad (4)$$

$$G_{t+1} = T_{t+1} + (1 + r_t)S_t^G \quad (5)$$

Suppose that the representative household knows that the government's intertemporal budget constraint must hold. Combine this information with the household's consumption function you derived above. Which insight could you draw from this? Explain the main message of Ricardian equivalence in this context. [5 points]

3. Consider the following two period investment problem. Suppose a representative firm that maximizes its firm value  $V_t$  by choosing current and future labor,  $N_t$  and  $N_{t+1}$ , and current and future investment,  $I_t$  and  $I_{t+1}$ , subject to the capital accumulation equation in both  $t$  and  $t + 1$ . Further, suppose that the production function is Cobb-Douglas in every period, i.e.  $Y_t = A_t F(K_t, N_t)$ .

$$\max_{N_t, N_{t+1}, I_t, I_{t+1}} V_t = Y_t - w_t N_t + \frac{1}{1 + r_t} [Y_{t+1} - w_{t+1} N_{t+1} - I_{t+1} - (1 + r_t) B_t^I] \quad (6)$$

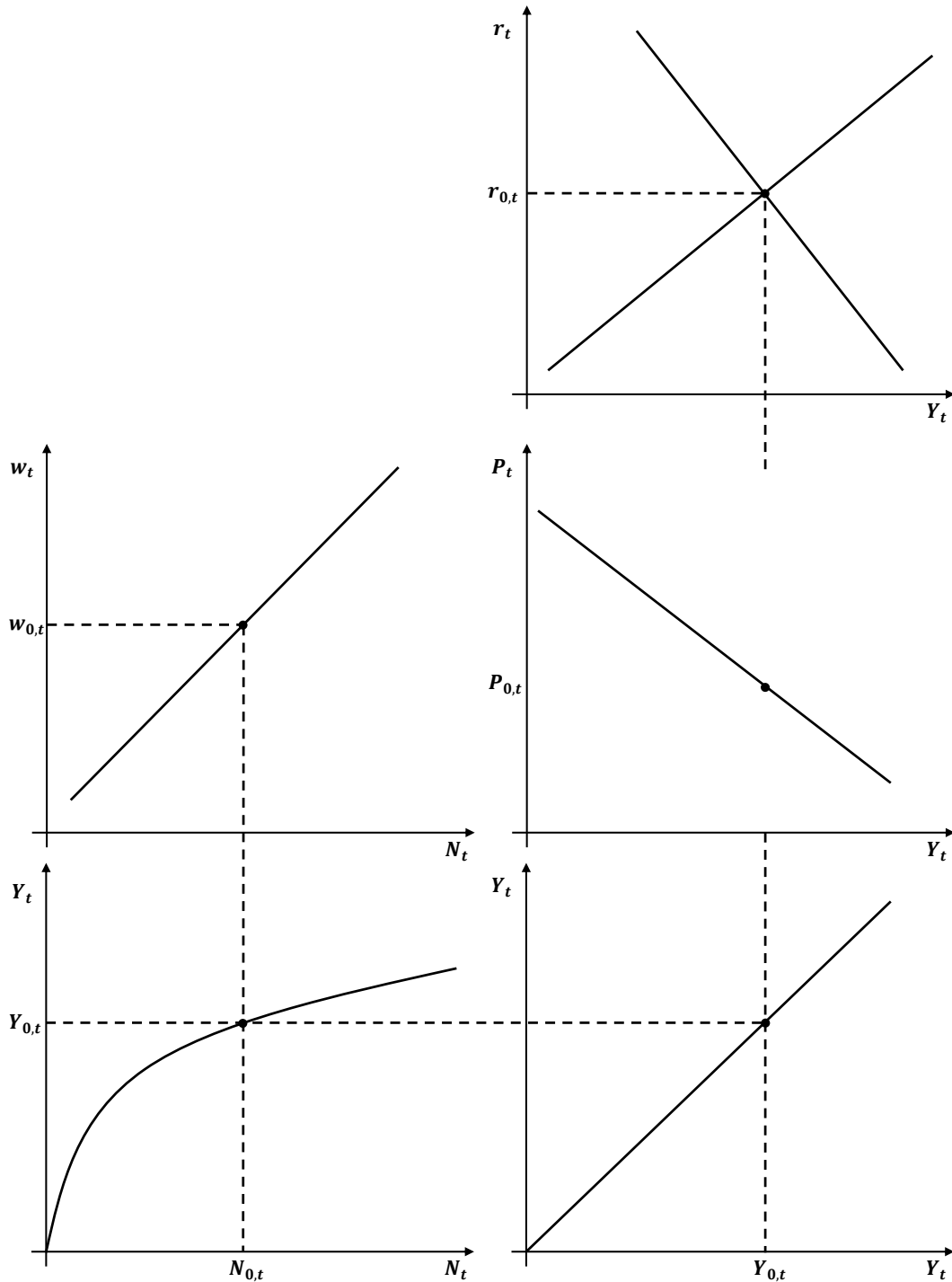
$$\begin{aligned} \text{s.t. } K_{t+1} &= I_t + (1 - \delta)K_t \\ K_{t+2} &= I_{t+1} + (1 - \delta)K_{t+1} \\ I_t &= B_t^I \end{aligned}$$

Derive the first order optimality conditions for the optimal choices of  $\underline{K_{t+1}}$  and explain its economic intuition. [8 points]

## The short to the medium run

4. Suppose an **increase in  $A_t$** .

- a) Graphically analyze the medium-run effects of an increase in  $A_t$  using the Neo-classical model framework in the IS-LM-AS-AD representation. Please fill-in the remaining graphs and label all of the graphs.

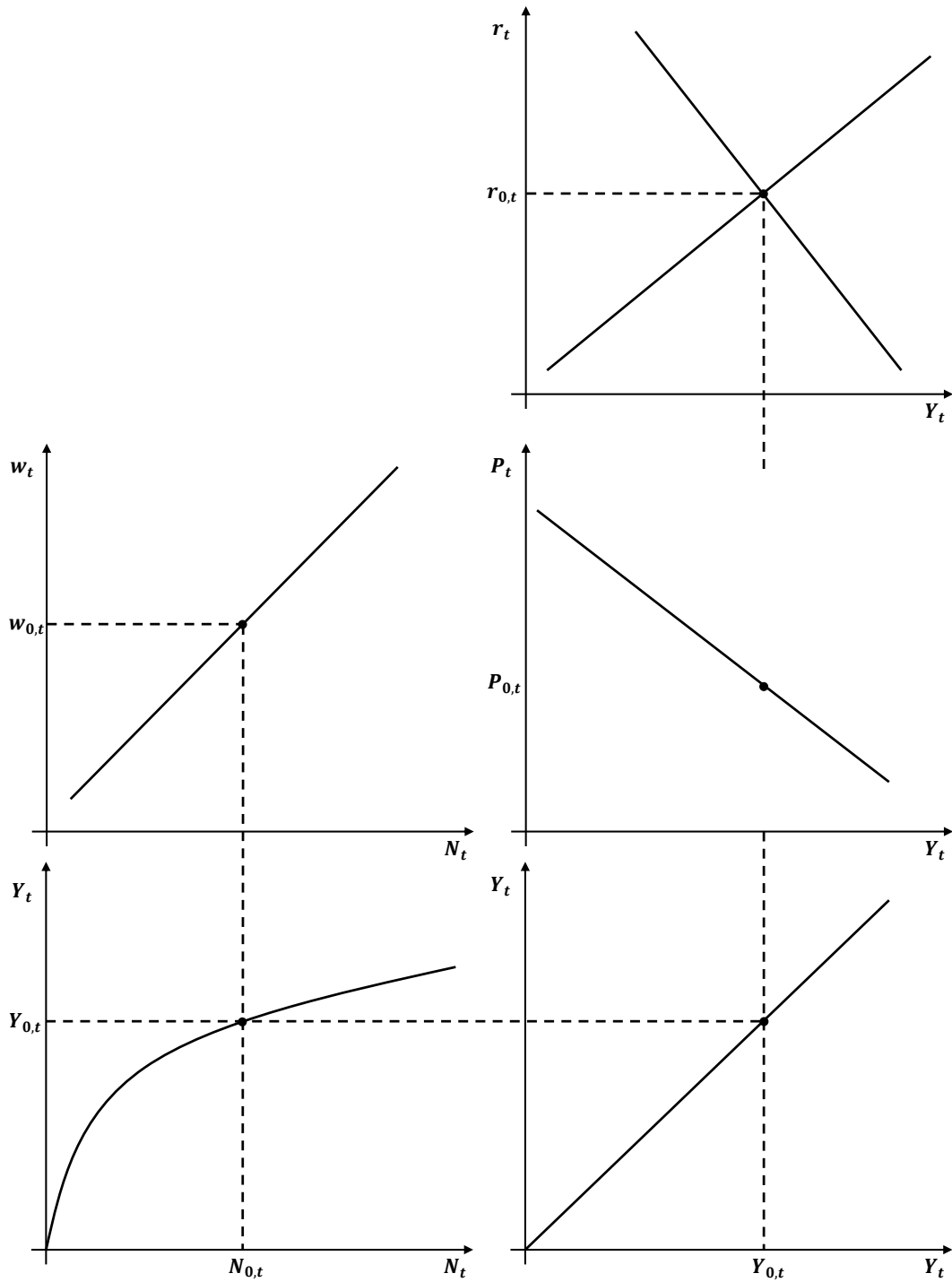


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In addition to the graphical analysis, explain the main mechanisms at work and briefly discuss how output, consumption, and investment change. [9 points]

- b) Graphically analyze the short-run effects of an increase in  $A_t$  using the sticky price model framework. Please fill-in the remaining graphs and label all of the graphs.





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In addition to the graphical analysis, explain the main mechanisms at work and briefly discuss how output, consumption, and investment change. [5 points]

- c) Explain the dynamic response to the  $A_t$  shock while going from the short run to the medium run. You can either explain it verbally or you may want to use the diagram of part b) to support your explanation. [5 points]

d) Describe the central prediction of the Phillips curve. Are the results of part a) to c) in line with this hypothesis? [3 points]

e) Aside from large stimulus on the fiscal side, what policy option does the monetary authority have to escape the zero lower bound? [3 points]