POE Exercises Merged

Principles of Economics (Technische Universität München)

Exercise 1: Specialization and Trade

Problem 1 (*Gains from Trade*)

Two pirates, Jack and Will, are stranded on a lonely Caribbean island. Each of them spends 40 hours per week fishing and distilling rum. In one hour, Jack can produce either 1 kg fish or $\frac{1}{4}$ kg rum, while Will can produce either $\frac{1}{5}$ kg fish or $\frac{1}{5}$ kg rum. Each pirate wants to consume exactly 5 kg rum per week and as much fish as possible.

(a) Determine, who has comparative and absolute advantages in the production of fish and rum, respectively.

(b) Draw the individual transformation curves as well as the joint transformation curve of the two pirates in a diagram with fish on the horizontal and rum on the vertical axis.

(c) Determine how each pirate's consumption of fish changes compared to autarky if the two pirates agree to trade 1 kg rum for 3 kg fish.

Jack and Will are joined by Liz, another stranded pirate, who spends 30 hours per week fishing and distilling rum. In one hour, Liz can produce either $\frac{1}{5}$ kg fish or $\frac{1}{2}$ kg rum. Just like the other two pirates, Liz wants to consume exactly 5 kg rum per week and as much fish as possible.

(d) Draw the joint transformation curve of the three pirates in a diagram with fish on the horizontal and rum on the vertical axis.

(e) Determine how each pirate's consumption of fish changes compared to autarky if the three pirates agree to trade 1 kg rum for $\frac{4}{5}$ kg fish.

Problems 2-6 (*Gains from Trade*)

Carl and Gottlieb are engineers. Each of them spends 300 days per year manufacturing motor vehicles. Every vehicle consists of a car body and an engine. Carl's car bodies are compatible with Gottlieb's engines and vice versa. To manufacture a car body, Carl needs 16 days while Gottlieb needs 10 days. To manufacture an engine, Carl needs 4 days while Gottlieb needs 5 days.

Problem 2

Who has an absolute advantage, and who has a comparative advantage?

(A) Carl has both, an absolute and a comparative advantage in the production of car bodies.

(B) Gottlieb has both, an absolute and a comparative advantage in the production of car bodies.

(C) Carl has an absolute advantage in the production of car bodies and a comparative advantage in the production of engines.

(D) Gottlieb has an absolute advantage in the production of car bodies and a comparative advantage in the production of engines.

Problem 3

How many vehicles can each engineer maximally manufacture per year under autarky?

(A) Carl 20 and Gottlieb 15 vehicles

(B) Carl 18.75 and Gottlieb 30 vehicles

(C) Carl 15 and Gottlieb 20 vehicles

(D) Carl 30 and Gottlieb 18.75 vehicles

Problem 4

How many vehicles can both engineers together maximally manufacture per year if they cooperate?

(A) 36 vehicles

(B) 39 vehicles

(C) 49 vehicles

(D) 56 vehicles

Problem 5

Carl and Gottlieb can realize mutual gains from specialization and trade if they agree on terms of trade

(A) between $\frac{1}{4}$ and $\frac{1}{2}$ car bodies per engine.

(B) between 1 and 2 engines per car body.

(C) between $\frac{5}{8}$ and $\frac{4}{5}$ engines per car body.

(D) between 2 and 4 car bodies per engine.

Problem 6

Which of the following combinations is *not* located on the joint transformation curve of Carl and Gottlieb?

(A) 0 car bodies and 135 engines

(B) 10 car bodies and 115 engines

(C) 30 car bodies and 75 engines

(D) 39 car bodies and 50 engines

Exercise 2: Consumption and Demand

Problem 1 (*Budget Restriction*)

Consider an individual who allocates $Z = 24$ hours on labor L and free time F. Per hour of labor, the individual earns the wage rate $w = 25$. He spends his entire earned income wL on a particular consumption good, the quantity of which is denoted by q and whose price is given by $p = 1$.

(a) Specify the individual's budget restriction with respect to his potential income wZ, and draw his budget line in a diagram with the quantity of free time F on the horizontal axis and the quantity of the consumption good q on the vertical axis.

(b) How does the individual's budget line change if

(i) an income tax reduces the wage rate to $(1 - t)w = 20$?

(ii) a consumption tax raises the price of the consumption good to $(1 + \tau)p = 1.25$?

(iii) earned income below a threshold $wL < 200$ is subsidized with a social transfer $S = 200 - wL$?

Problem 2 (*Assumptions on Preferences*)

Consider an individual who derives utility from two goods, apples and oranges. Assume that she is indifferent between consumption bundle A (8 apples, 2 oranges) and consumption bundle B (2 apples, 8 oranges) and that she prefers consumption bundle B to consumption bundle C (6 apples, 6 oranges). Determine, whether the four assumptions on preferences (completeness, transitivity, monotonicity, and convexity) can hold together in this case.

Problem 3 (*Individual Demand*)

Consider an individual with a given income $y > 0$ and a utility function $U(q_1, q_2) = q_1^{\frac{1}{2}} + q_2^{\frac{1}{2}}$, where q_1 and q_2 denote the quantity consumed of good 1 and good 2, respectively. The goods prices are given by $p_1 > 0$ and $p_2 > 0$, respectively.

(a) Determine the individual demand for each good as a function of prices and income.

(b) Characterize each good with respect to the change of consumption resulting from income and price changes.

Problem 4 (*Substitution and Income Effects*)

Consider an individual with a given income $y = 600$ and a utility function $U(q_1, q_2) = (q_1 \cdot q_2)^{\frac{1}{2}}$, where q_1 and q_2 denote the quantity consumed of good 1 and good 2, respectively. Initially, the goods prices are given by $p_1 = 25$ and $p_2 = 25$, respectively.

(a) Determine the optimal consumption bundle and depict it in a diagram.

Consider a price increase of good 2 to $p_2' = 100$

(b) Decompose the total effect of the price increase mathematically as well as graphically into substitution and income effects.

(c) What income is necessary after the price increase, so that the individual can obtain the initial level of utility?

Problem 5 (*Optimal Consumption*)

Consider an individual with a given income $y = 100$ and a utility function $U(q_1, q_2) = q_1 + 2q_2$, where q_1 and q_2 denote the quantity consumed of good 1 and good 2, respectively. The goods prices are given by $p_1 = 4$ and $p_2 = 5$, respectively.

(A) If the marginal rate of substitution and the price ratio are never equal, no optimal consumption bundle can be determined.

(B) The individual spends her entire budget on good 2.

(C) The optimal consumption bundle contains twice as many units of good 2 as of good 1.

(D) The individual spends her entire budget on good 1.

Problems 6-10 (*Optimal Consumption*)

Consider an individual with a given income $y = 12$ and a utility function $U(q_1, q_2) = q_1^{\frac{1}{4}} q_2^{\frac{3}{4}}$, where q_1 and q_2 denote the quantity consumed of good 1 and good 2, respectively. The goods prices are given by $p_1 = 1$ and $p_2 > 0$, respectively.

Problem 6

If $p_2 = 1$, the individual's optimal consumption bundle is

(A) $q_1 = 2$ and $q_2 = 6$.

(B) $q_1 = 2$ and $q_2 = 9$.

(C) $q_1 = 3$ and $q_2 = 6$.

(D) $q_1 = 3$ and $q_2 = 9$.

Problem 7

If $p_2 = 3$, the individual's optimal consumption bundle causes expenses of

(A) 6 for good 1.

(B) 9 for good 1.

(C) 6 for good 2.

(D) 9 for good 2.

Problem 8

Regarding good 1, the substitution and income effects of an increase in the price of good 2 from $p_2 = 1$ to $p_2 = 3$ work

(A) in the same direction.

(B) in opposite directions, while the substitution effect prevails.

(C) in opposite directions, while both effects neutralize.

(D) in opposite directions, while the income effect prevails.

Problem 9

Regarding a price increase of good 2 from $p_2 = 1$ to $p_2 = 3$, the two goods can be characterized as follows:

(A) Good 1 is a normal good, and good 2 is an ordinary good.

(B) Good 1 is a normal good, and good 2 is a Giffen good.

(C) Good 1 is an inferior good, and good 2 is an ordinary good.

(D) Good 1 is an inferior good, and good 2 is a Giffen good.

Problem 10

If $p_2 = 3$, the indifference curve through the consumption bundle $q_1 = 3$ and $q_2 = 3$

(A) runs completely beyond the budget line.

(B) is tangent to the budget line.

(C) intersects the budget line once.

(D) intersects the budget line twice.

Exercise 3: Production and Supply

Problem 1 (*Production Function*)

Consider a firm with a production function $q = F(L, K) = L^a K^b$ with $a \in (0, 1)$ and $b \in (0, 1)$, where q denotes output and L and K denote the input of labor and capital, respectively. Assume that $L > 0$ and $K > 0$.

(a) Show that the production function exhibits positive and decreasing marginal products in both inputs.

(b) Determine the conditions under which the production function exhibits increasing, constant, and decreasing returns to scale.

(c) Show that the production function has strictly convex isoquants.

Problem 2 (*Cost Minimization*)

Consider a firm with a production function $q = F(L, K) = L^{\frac{1}{2}} K^{\frac{1}{2}}$, where q denotes output and L and K denote the input of labor and capital, respectively. Initially, the wage rate for labor is given by $w = 2.5$, and the rental rate for capital is given by $r = 2.5$. The firm produces an output of $q = 100$.

(a) Determine the cost minimizing input bundle and depict it in a diagram.

Assume now that a minimum wage law raises the wage rate for labor to $w' = 10$, while the rental rate for capital remains at $r = 2.5$.

(b) Calculate and depict the effect of the increase in wage rate

(i) on input costs if the same input bundle is employed as in (a),

(ii) on the cost minimizing input bundle.

Problems 3-5 (*Cost Minimization*)

Consider a firm with a production function $q = F(L, K) = L^{\frac{1}{4}} K^{\frac{1}{4}}$, where q denotes output and L and K denote the input of labor and capital, respectively.

Problem 3

Provided that $L > 0$ and $K > 0$, a multiplication of both inputs by 4 implies a multiplication of output by

(A) 1.

(B) 2.

(C) 4.

(D) 16.

Problem 4

If the wage rate for labor is given by $w = 16$, and the rental rate for capital is given by $r = 4$, variable costs are

(A) $c(q) = \frac{1}{16}q$.

(B) $c(q) = \frac{1}{4}q$.

(C) $c(q) = 4q^2$.

(D) $c(q) = 16q^2$.

Problem 5

If the wage rate for labor is given by $w = 18$ and the rental rate for capital is given by $r = \frac{1}{2}$, variable costs are

(A) $c(q) = \frac{1}{9}q$.

(B) $c(q) = \frac{1}{6}q$.

(C) $c(q) = 6q^2$.

(D) $c(q) = 9q^2$.

Problems 6-8 (*Profit Maximization*)

Consider a profit maximizing and price taking firm. Let q denote the firm's output, and let $p \geq 0$ denote the market price per unit of output. In the short run, the firm's total costs are

$$C(q) = 200 + 2q^2, \quad q \geq 0.$$

In the long run, the firm's total costs are

$$C(q) = \begin{cases} 200 + 2q^2, & q > 0 \\ 0, & q = 0. \end{cases}$$

Problem 6

For $q = 20$, marginal costs

(A) equal average total costs.

(B) are higher than average total costs.

(C) equal average variable costs.

(D) are lower than average variable costs.

Problem 7

If $p = 20$, the firm's supply

(A) is 0 in the short run as well as in the long run.

(B) is 5 in the short run and 0 in the long run.

(C) is 10 in the short run and 0 in the long run.

(D) is 20 in the short run as well as in the long run.

Problem 8

Which is the threshold price, above which the firm's supply is $q > 0$ in the long run?

(A) $p = 10$

(B) $p = 20$

(C) $p = 30$

(D) $p = 40$

Exercise 4: Perfect Competition

Problem 1 (*Competitive Equilibrium*)

Consider a perfectly competitive market in the long run. Market demand is

$$Q^D(p) = a - p,$$

where $p \geq 0$ denotes market price, and $a > 0$. The market is served by $n \in \mathbb{N}$ identical profit-maximizing firms. Each firm has total costs of

$$C(q) = \begin{cases} c^f + q^2, & q > 0 \\ 0, & q = 0, \end{cases}$$

where $c^f > 0$ denotes quasi-fixed costs, and $q \geq 0$ denotes output of the respective firm.

(a) Determine the equilibrium number of firms as a function of a and c^f.

(b) Calculate the number of firms and profit per firm in equilibrium for

  (i) $a = 120$ and $c^f = 100$,

  (ii) $a = 120$ and $c^f = 64$,

  (iii) $a = 126$ and $c^f = 100$.

Assume now, a tax at the rate $t \geq 0$ per unit of output is levied on producers.

(c) Determine the equilibrium number of firms as a function of a, c^f, and t.

(d) Calculate the number of firms, profit per firm, tax revenue, and the welfare loss of taxation in equilibrium for $a = 126$, $c^f = 100$, and $t = 6$.

Problems 2-6: (*Competitive Equilibrium*)

Consider a perfectly competitive market in the long run. Market demand is

$$Q^D(p) = 125 - p,$$

where $p \geq 0$ denotes market price. The market is served by $n \in \mathbb{N}$ identical profit-maximizing firms. Each firm has total costs of

$$C(q) = \begin{cases} 25 + 20q + \frac{1}{4}q^2, & q > 0 \\ 0, & q = 0, \end{cases}$$

where $q \geq 0$ denotes output of the respective firm.

Problem 2

The equilibrium number of firms is

(A) 5.

(B) 10.

(C) 15.

(D) 20.

Problem 3

In equilibrium,

(A) consumer surplus is 7,500.

(B) consumer surplus is 5,000.

(C) producer surplus is 2,500.

(D) producer surplus is 0.

Problem 4

The introduction of a price ceiling at $p' = 20$ results in a welfare loss of

(A) 0.

(B) 250.

(C) 5,000.

(D) 5,250.

Problem 5

The introduction of a price floor at $p'' = 20$ results in a welfare loss of

(A) 0.

(B) 250.

(C) 5,000.

(D) 5,250.

Problem 6

If each firm receives a lump-sum subsidy of $S = 24$ whenever quasi-fixed costs arise, the equilibrium number of firms is

(A) 13.

(B) 26.

(C) 39.

(D) 52.

Exercise 5: Market Failure

Problem 1 (*Monopoly*)

A profit-maximizing catering firm applies for the exclusive right to sell sparkling wine in the *Bavarian State Opera*. The firm's variable costs are

$$c(Q) = 2Q,$$

where Q denotes the quantity, i.e. servings of sparkling wine. Market demand per opera season is

$$Q^D(p) = 10{,}000 - 1{,}000p.$$

(a) Determine the firm's reservation price for the exclusive right of sale during one opera season.

(b) How would the firm's reservation price change, if the city of Munich levied a tax on the seller of sparkling wine

  (i) at the rate $t = 2$ per unit sold?

  (ii) at the rate $t = 0.25$ on profit?

Problems 2-4 (*Monopoly*)

Consider a monopoly market in the long run. The profit-maximizing monopolist faces market demand

$$Q^D(p) = 75 - p,$$

where $p \geq 0$ denotes the market price. The monopolist's total costs are

$$C(Q) = \begin{cases} c^f + \frac{1}{4}Q^2, & Q > 0 \\ 0, & Q = 0, \end{cases}$$

where $c^f > 0$ denotes quasi-fixed costs, and Q denotes output.

Problem 2

Which is the threshold regarding quasi-fixed costs, below which the monopolist's output is $Q > 0$?

(A) $c^f = 0$

(B) $c^f = 375$

(C) $c^f = 1{,}125$

(D) $c^f = 1{,}875$

Problem 3

If quasi-fixed costs are $c^f = 625$, the equilibrium

(A) consumer surplus is $CS = 600$.

(B) producer surplus is $PS = 900$.

(C) total surplus is $TS = 1{,}500$.

(D) welfare loss is $WL = 300$.

Problem 4

If quasi-fixed costs are $c^f = 0$, the introduction of a price ceiling at $p' = 40$

(A) causes an increase in consumer surplus.

(B) causes a decrease in consumer surplus.

(C) causes an increase in monopoly profit.

(D) neither affects consumer surplus nor monopoly profit.

Problem 5-8 (*External Effects*)

Consider a perfectly competitive market in the short run. Market demand is

$$Q^D(p) = 200 - 100p,$$

where $p \geq 0$ denotes market prize. The market is served by two identical profit-maximizing firms. Firm $i \in \{A, B\}$ has total costs of

$$C(q_i) = 15 + \frac{1}{100}q_i^2 + \frac{1}{5}q_j,$$

where $q_i \geq 0$ denotes output of firm $i \in \{A, B\}$, and $q_j \geq 0$ denotes output of firm $j \in \{A, B\}$, with $i \neq j$.

Problem 5

Individual profit maximization results in a market equilibrium where each firm's profit is

(A) 0.

(B) 15.

(C) 30.

(D) 45.

Problem 6

The welfare-maximizing total output is

(A) $Q_E = 30$.

(B) $Q_E = 60$.

(C) $Q_E = 90$.

(D) $Q_E = 120$.

Problem 7

The welfare loss in market equilibrium resulting from individual profit maximization is

(A) $WL = 0$.

(B) $WL = 1$.

(C) $WL = 19$.

(D) $WL = 20$.

Problem 8

Assume that a tax at the rate $t = \frac{1}{5}$ per unit of output is levied on producers. Individual profit maximization results in a market equilibrium where firms make zero profits if the tax on output is combined with a lump-sum subsidy for each firm amounting to

(A) $S = 3.75$.

(B) $S = 7.5$.

(C) $S = 11.25$.

(D) $S = 15$.

Problem 9-10 (*Public Goods*)

Consider a public good available to five identical individuals. The individuals can provide the public good at total costs of

$$C(Q) = 10Q + \frac{1}{4}Q^2,$$

where $Q \geq 0$ denotes the quantity. Each individual's marginal benefit from the public good is

$$MB(Q) = 4 - \frac{1}{10}Q.$$

Problem 9

The welfare maximizing quantity of the public good is

(A) $Q_E = 0$.

(B) $Q_E = 10$.

(C) $Q_E = 20$.

(D) $Q_E = 40$.

Problem 10

Individual provision of the public good implies a welfare loss of

(A) $WL = 0$.

(B) $WL = 25$.

(C) $WL = 50$.

(D) $WL = 100$.

Exercise 6: Macroeconomic Indicators

Problem 1 (*Gross Domestic Product*)

Consider an archipelago consisting of two islands (economies), *Robinson Island* and *Friday Island*. Robinson is the only inhabitant of the former, while Friday is the only inhabitant of the latter. Within one year, the following economic activity takes place within and between the two islands.

- Robinson catches 1,000 kg of fresh fish worth £1 per kg using a harpoon which he rents from Friday for £200 per year. Friday has crafted the harpoon in the previous year. Robinson eats 300 kg of the fresh fish himself and sells another 300 kg to Friday who then eats it. Robinson processes the remaining 400 kg of fresh fish into 200 kg of dried fish worth £2 per kg. He stores the dried fish in order to sell it to Friday in the next year.

- Friday collects 1,000 kg of coconuts worth £1 per kg from his palm plantation, which he has planted some years ago. The plantation has an imputed rental value of £500 per year. Friday eats 300 kg of the coconuts himself and sells another 300 kg to Robinson who then eats them. Friday plants another 200 kg of the coconuts in order to grow additional palm trees which shall carry coconuts in future years. Friday processes the remaining 200 kg of the coconuts into 20 liters of coconut oil worth £20 per liter. He does so by using an old oil mill which he rents from Robinson for £100 per year. Friday stores the coconut oil in order to sell it to Robinson in the next year.

Calculate the GDP of the respective year for both islands (economies) and decompose it according to the

(i) output method,

(ii) income method,

(iii) expenditure method.

Problems 2-4 (*Price Level*)

Consider a closed economy which produces only three goods; beef, pork, and potatoes. In each period, the entire output is consumed.

Base Period: 2018

	Output of beef (in kg)	Price of beef (per kg)	Output of pork (in kg)	Price of pork (per kg)	Output of potatoes (in kg)	Price of potatoes (per kg)
2018	5,000	30	15,000	16	80,000	2
2019	5,000	45	15,000	17.5	80,000	2.5
2020	300	120	20,000	20	83,000	2.5

Problem 2

In 2019, the

(A) GDP-Deflator is 0.75.

(B) GDP-Deflator is 1.25.

(C) CPI is 1.3.

(D) CPI is 2.0.

Problem 3

In 2020, the

(A) GDP-Deflator is 0.75.

(B) GDP-Deflator is 1.25.

(C) CPI is 1.3.

(D) CPI is 2.0.

Problem 4

Between 2019 and 2020, the inflation rate based on the

(A) GDP-Deflator is -0.02.

(B) GDP-Deflator is 0.04.

(C) CPI is 0.

(D) CPI is 0.06.

Problems 5-6 (*Unemployment*)

Consider an economy with an adult population of $N = 70$ million people, of which $U = 2.1$ million are unemployed.

Problem 5

If the labor force participation rate is $e = 0.5$, the number of employed people is

(A) $E = 32.9$ million.

(B) $E = 33.4$ million.

(C) $E = 33.9$ million.

(D) $E = 34.4$ million.

Problem 6

If the unemployment rate is $u = 0.05$, the labor force participation rate is

(A) $e = 0.4$.

(B) $e = 0.5$.

(C) $e = 0.6$.

(D) $e = 0.7$.

Exercise 7: Economic Growth

Problem 1 (*Golden-Rule Steady State*)

Consider a closed economy in the long run. Output Y is determined by the production possibilities according to

$$Y = F(L, K) = L^{\frac{1}{2}} K^{\frac{1}{2}},$$

where L denotes the labor force, and K denotes the capital stock. Output is used for consumption C and investment I. Investment equals savings sY, where $s \in [0, 1]$ denotes the saving rate. Savings are invested in the capital stock. In any period t, the labor force grows at the rate $n = -\frac{1}{20}$, while the capital stock depreciates at the rate $\delta = \frac{1}{10}$. Let lower-case letters denote quantities per worker.

(a) Calculate output per worker as a function of capital per worker.

(b) Calculate steady-state consumption per worker as a function of the saving rate.

(c) Calculate the golden-rule saving rate.

Problems 2-6 (*Golden-Rule Steady State*)

Consider a closed economy in the long run. Output Y is determined by the production possibilities according to

$$Y = F(L, K) = L^{\frac{1}{3}} K^{\frac{2}{3}},$$

where L denotes the labor force, and K denotes the capital stock. Output is used for consumption C and investment I. Investment equals savings sY, where $s \in [0, 1]$ denotes the saving rate. Savings are invested in the capital stock. In any period t, the labor force grows at the rate $n = \frac{1}{6}$, while the capital stock depreciates at the rate $\delta = \frac{1}{6}$. Let lower-case letters denote quantities per worker.

Problem 2

A steady-state output per worker of $y^* = 1$ requires a saving rate of

(A) $s = \frac{1}{12}$.

(B) $s = \frac{1}{6}$.

(C) $s = \frac{1}{3}$.

(D) $s = \frac{2}{3}$.

Problem 3

If the saving rate is $s = \frac{1}{3}$, and capital per worker is $k = 1$,

(A) then output per worker y decreases over time.

(B) then output Y increases over time at a constant rate.

(C) then capital per worker k increases over time.

(D) then the capital stock K decreases over time at a constant rate.

Problem 4

The golden-rule saving rate is

(A) $s_{gold} = \frac{1}{12}$.

(B) $s_{gold} = \frac{1}{6}$.

(C) $s_{gold} = \frac{1}{3}$.

(D) $s_{gold} = \frac{2}{3}$.

Problem 5

In the golden-rule steady state, consumption per worker is

(A) $c^*_{gold} = \frac{16}{3}$.

(B) $c^*_{gold} = \frac{8}{3}$.

(C) $c^*_{gold} = \frac{4}{3}$.

(D) $c^*_{gold} = \frac{2}{3}$.

Problem 6

Any saving rate satisfying

(A) $s \in \left[0, \frac{1}{3}\right)$ implies a dynamically efficient steady state.

(B) $s \in \left(\frac{1}{3}, 1\right]$ implies a dynamically efficient steady state.

(C) $s \in \left[0, \frac{1}{3}\right)$ implies a dynamically inefficient steady state.

(D) $s \in \left(\frac{1}{3}, 1\right]$ implies a dynamically inefficient steady state.

Exercise 8: Economic Fluctuations

Problem 1: (*General Equilibrium*)

Consider a closed economy in the short run, where Y denotes output, and r denotes the interest rate. In the goods market, demand Z comprises private consumption $C(Y-T) = 200 + 0.75(Y-T)$ with taxes $T \geq 0$, planned investment $I(r) = 50 - 5r$, and government consumption $G \geq 0$. In the financial market, liquidity demand is $L(Y, r) = Y - 80r$, while money supply is $M \geq 0$.

(a) Calculate the interest rate r^* in general equilibrium as a function of taxes T, government consumption G, and money supply M.

(b) Assume that taxes are $T = 100$. Calculate the change in money supply M necessary to offset the effect of a marginal increase in government consumption G on the general-equilibrium interest rate r^*.

Problems 2-7: (*General Equilibrium*)

Consider a closed economy in the short run, where Y denotes output, and r denotes the interest rate. In the goods market, demand Z comprises private consumption $C(Y-T) = 100 + 0.8(Y-T)$ with taxes $T \geq 0$, planned investment $I(r) = 100 - 8r$, and government consumption $G \geq 0$. In the financial market, liquidity demand is $L(Y, r) = Y - 60r$, while money supply is $M \geq 0$.

Problem 2

In the goods market, the government-consumption multiplier is

(A) $\frac{\partial Y}{\partial G} = -1$.

(B) $\frac{\partial Y}{\partial G} = 2$.

(C) $\frac{\partial Y}{\partial G} = 5$.

(D) $\frac{\partial Y}{\partial G} = 8$.

Problem 3

In the goods market, the tax multiplier is

(A) $\frac{\partial Y}{\partial T} = -4$.

(B) $\frac{\partial Y}{\partial T} = -2$.

(C) $\frac{\partial Y}{\partial T} = 2$.

(D) $\frac{\partial Y}{\partial T} = 4$.

Problem 4

Assume that taxes are $T = 200$, government consumption is $G = 200$, and money supply is $M = 700$. Then, general-equilibrium output is

(A) $Y^* = 1{,}000$.

(B) $Y^* = 1{,}100$.

(C) $Y^* = 1{,}200$.

(D) $Y^* = 1{,}300$.

Problem 5

Assume that taxes are $T = 200$ and government consumption is $G = 300$. Then, general-equilibrium total savings are $S^* = 60$ if and only if money supply is

(A) $M = 1{,}000$.

(B) $M = 1{,}100$.

(C) $M = 1{,}200$.

(D) $M = 1{,}300$.

Problem 6

Ceteris paribus,

(A) an increase in taxes T combined with an increase in money supply M decreases general-equilibrium savings S^*.

(B) an increase in government consumption G combined with a decrease in money supply M increases general-equilibrium savings S^*.

(C) a decrease in taxes T combined with an increase in money supply M decreases general-equilibrium private consumption C^*.

(D) a decrease in government consumption G combined with a decrease in money supply M decreases general-equilibrium private consumption C^*.

Problem 7

Consider a diagram with output Y on the horizontal axis and the interest rate r on the vertical axis. Any combination (Y, r) located

(A) to the left of the IS-curve and below the LM-curve satisfies $I > S$ and $L > M$.

(B) on the IS-curve and above the LM-curve satisfies $I = S$ and $L > M$.

(C) to the right of the IS-curve and on the LM-curve satisfies $I > S$ and $L = M$.

(D) to the right of the IS-curve and above the LM-curve satisfies $I < S$ and $L > M$.