Направление: «Экономика»

Профили

«Прикладная экономика»

«Экономика: исследовательская программа»

Время выполнения задания – 180 мин.

Решите все три задачи

Веса задач приведены в скобках

Инструкции

- Решение может быть представлено как на русском, так и на английском языке. Никаких дополнительных баллов, впрочем, как и штрафов, за решение на английском языке не предусмотрено.
- Решение должно быть хорошо структурированным, изложено грамотным языком, а почерк – распознаваемым. Ответы на качественные вопросы должны быть убедительно аргументированы, но длинные рассуждения, не относящиеся к сути дела, могут негативно повлиять на оценку.
- Все шаги в решении должны быть обоснованы, все вычисления должны присутствовать в работе. Калькуляторами пользоваться запрещено.
- Черновики не предусмотрены, решение сразу оформляется на чистовик.
- Если приведенное решение является неверным, перечеркните его (перечеркнутое решение не проверяется) и приведите корректную версию.
- При наличии нескольких вариантов решения одного и того же задания, проверяющий сам определяет, какое из решений подлежит проверке, а апелляции с просьбой проверить другой вариант решения не принимаются.

1. [50 points] Answer the following short questions

(a) [8 p.] The two countries with the largest international reserves are China ($3,900 bln) and Japan ($1,260 bln). China has a fixed exchange rate regime and grows with the average rate of 8% while Japan's exchange rate is flexible and the country is stagnating.

(i) What do you think is the best argument in favour of having immense international reserves?

(ii) What is the strongest objection to have excessively high international reserves?

(iii) Discuss pros and cons of different exchange rate regimes.

Solution and Marking Scheme

(i) Financial stability, i.e. the ability of monetary authorities to smooth potential negative consequences of the balance of payments shocks. **[2 p.]**

(ii) The process of FCR accumulation is normally associated with an increase in money supply in the economy. Hence, greater inflationary pressure may force CB to accommodate adhere to contractionary measures. **[2 p.]**

(iii) Pros and cons of fixed and float regimes **[1 p. per each reasonable argument, but no more than 4 p. total]**.

- Fixed exchange rate regimes may provide for a nominal anchor for inflationary expectations in the countries with high inflation.
- However, in case of negative BP shocks and insufficient FCR the stability of the national currency and highly linked to it stability of the whole economy puts at risk.
- Flexible exchange rate regimes help CB pursuing independent monetary policy and encapsulate BP shocks in the foreign currency market, making the domestic production less prone to external market shocks.
- However, excessive volatility in the foreign currency markets may cause undesirable loss of confidence of the public, undermines their ability to forecast and make investment decisions.

Typical mistake:

- In ***ii)*** the purpose of FCR accumulation is described instead of negative consequences of FCR accumulation

Comment:

For each argument only 1 point can be obtained, even if the argument is listed both con one regime and in favour of the other. Example:

cons of float exchange rate: excessive volatility and instability discourage investments

pros of fixed exchange rate: stability due to predictability of exchange rate encourages investments

Obviously, this is the same argument in both sentences, only 1p is given

(b) [8 p.] Consider an open economy in equilibrium with recessionary gap and fixed prices and wages. The exchange rate is fixed and the current account is fully offset by the capital account. The failure to repay its national debt causes a complete restriction of foreign capital flow in and out of the economy. How will the economy adjust to the new equilibrium without capital mobility? Illustrate graphically and explain economic intuition.

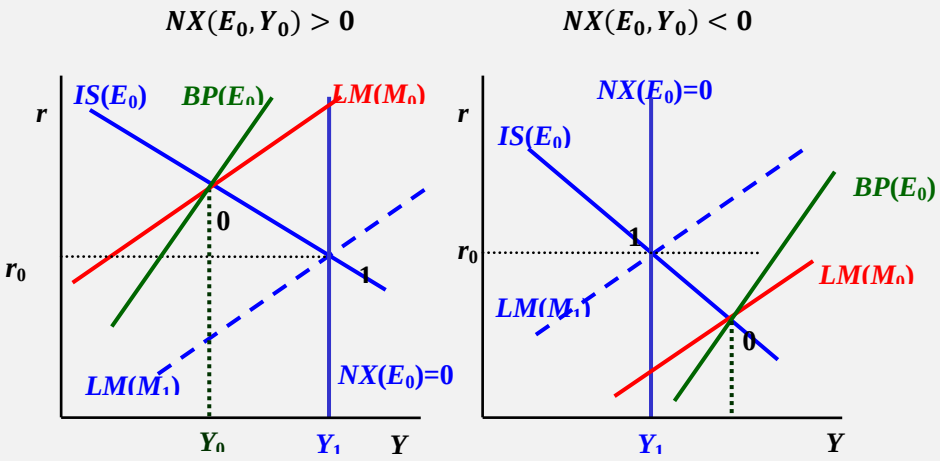
Solution and Marking Scheme

Generally speaking, an open economy is in equilibrium when internal equilibrium (i.e. simultaneous equilibrium in the goods and money market) coincides with the external one (i.e. foreign currency market is equilibrium and the balance of payments condition holds).

Consider the economy at point 0 where the three curves IS, LM and BP intersect. Generally speaking, balance of payments BP=NX+CA=0 may be maintained when current account is either in surplus (NX>0) or in deficit (NX<0). Correspondingly, the capital account CA (which is the sum of capital flow CF and change in the foreign currency reserves ΔFCR) then should 'mirror' the NX and thus can be either in deficit or in surplus. It is very unlikely to have trade balance under fixed exchange rate regime.

When capital flow is restricted the BP condition becomes NX=ΔFCR and BP curve transforms to NX=0 constraint which is vertical since it does not depend on interest rate.

Further adjustment is needed to restore the foreign currency equilibrium. For the case NX>0 CB increases money supply to keep the exchange rate fixed, while in case of NX<0 CB pursues money contraction. (see the graph).



For each case (NX>0 and NX<0): **[2p.]** for intuitive explanation, **[2p.]** for graphical analysis (**[8 p.]** in total).

Typical mistakes:

- Only one case is mentioned (either NX>0, or NX<0)
- Vertical BP curve before the restriction of foreign capital flow
- The shift of IS curve
- An increase in government expenditures is declared to be necessary to attain a new equilibrium

(c) [8 p.] Suppose that several students work over a group assignment. The class-teacher announced that each member of the group will get the same mark for this assignment based on the quality of the paper submitted. Comment on the statement: 'Under these rules the quality of the final paper will be below the optimal level for this group.'

Solution and Marking Scheme

The mark that each student gets depends positively on the quality of the paper that plays a role of a public good. **[1 p.]**

Each student understates the group's benefit from his efforts. This happens because he takes into account only his private marginal benefit which is less than the total group marginal benefit. **[3 p.]**

Individual level of efforts is given by $PMB_i(e_i + e_{-i}) = MC_i(e_i)$ but

$PMB_i(e_i + e_{-i}) < SMB(E) = PMB_i(E) + \sum_{j \neq i} PMB_j(E)$, which implies that the aggregate level of level of efforts E is below the efficient level and so is the level of quality that depends positively on E. **[4 p.]**

Typical mistakes:

- Comparison of the equilibrium levels of efforts for individual assignment and group assignment, without mentioning the optimal level.
- The properties of optimum in terms of marginal benefits and costs are not explained

(d) [8 p.] Consider the Solow model of a closed economy with technological progress that follows a balanced growth path. An influx of refugees increases labour supply in the country of asylum while the growth rate of the population remains intact.

(i) What will be the immediate effect on GDP per worker? Sketch a graph showing the path of the growth rate of GDP per worker over time following this shock.

(ii) What will be the immediate and the long-run effect on consumption per worker?

Solution and Marking Scheme

The standard Solow model studies the closed economy without a government described by the neoclassical production function with constant returns to scale(CRS) and the labour-augmented technological progress: $Y = F(K, AL)$.

Due to CRS we can rewrite the production function in the intensive form: $f(k) \equiv F(K/AL, 1) = F(K, AL)/AL$, where $k \equiv K/AL$ is capital per effective labour.

The capital formation dynamic equation in the intensive form (i.e. per unit of effective labour):

$\dot{k} = sf(k) - (n + g + \delta)k$, where $n \equiv \dot{L}/L$ and $g \equiv \dot{A}/A$ are the exogenously given growth rates of labour L and technological level A.

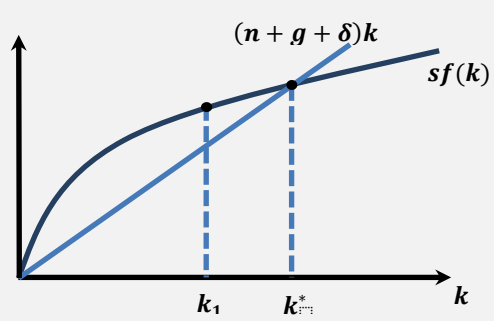
In the steady state, $\dot{k} = 0$, so we can define the balanced growth path (BGP) level of k^* from the condition: $sf(k^*) = (n + g + \delta)k^*$. In the balanced growth path GDP per capita Y/L grows with the growth rate g.

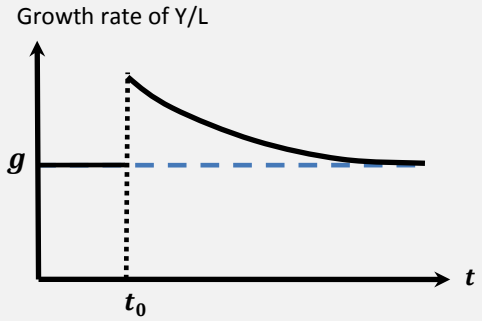
(i) The immediate effect **[1 p.]**

An influx of refugees causes an increase in L and an immediate drop in GDP per capita Y/L.

Time chart for the growth rate of Y/L with comments **[3 p.]**

Capital per effective worker also drops (from k^* to k_1) and starts growing since $\dot{k}|_{k=k_1} > 0$. Consequently, GDP per capita also starts growing faster than in the BGP. Finally, when capital per effective labour converges to the original steady state, k^*, the growth rate of GDP per capita diminishes and returns to the rate of g.





(ii) The level of consumption per capita $\frac{C}{L}$ is equal to a fixed fraction of GDP per capita: $\frac{C}{L} = (1 - s)\frac{Y}{L}$. Thus the immediate shock, transitory dynamics and the long run growth path of consumption per worker replicates that of GDP per capita.

Immediate effect: an influx of refugees causes an increase in L and an immediate drop in GDP per capita, as a result C/L also drops**. [2 p.]**

LR effect: due to the growth of capital per effective labour converges to the original steady state, k^*, and $f(k^*)$ so that consumption per effective labour moves back and C/L grows along BGP. **[2 p.]**

(e) [8 p.] Albert Hirshman emphasized two general types of actions through which members of an organization can respond to its malfunctioning: exit and voice. In the first case, a member withdraws from an organization. In the second she 'raises her voice' to improve matters. Would you typically expect these two mechanisms to be substitutes or complements? That is, once exit becomes cheaper, would you expect more voice? Illustrate your answer with examples.

Solution and Marking Scheme

These mechanisms are more likely to substitute, rather than complement each other. **[1 p.]**

Indeed, when a member contemplates whether to raise voice against certain practices in her organization or community, she is less tempted to do so once simply leaving the organization becomes cheaper. **[3 p.]**

Examples. **[2 p. per each but no more than 4 p. total]**

For instance, residents of a polluted area are less likely to protest against environmental damage if an option to move to another area becomes more accessible (e.g., die to some subsidy or a change in the real estate market). Similarly, some authoritarian regimes do not prevent emigration to allow people who are most unhappy with the regime to leave the country rather than participate in the protest activity.

(f) [10 p.] Give an example of two two-person games that would differ only in whether the first player's action is observed by the second player, and where the first player would gain from this observability. Give also an opposite example, where observability would decrease the first-player's payoff.

Solution and Marking Scheme

Example with first-mover advantage **[5 p.]**

A standard example is the Cournot and the Stackelberg duopolies that model quantity competition with simultaneous and consecutive moves respectively. It is well known (and easy to check) that the firm that moves first in the Stackelberg game gets a higher profit then the second firm, and a higher profit than it would get under simultaneous

moves. If the first firm's choice were not observed by the second firm, the game would be strategically equivalent to the game simultaneous moves, i.e. the Cournot game.

For example, consider an industry with two firms, which have identical cost functions $TC(q_i) = q_i$, q_i is the output produced by firm i ($i \in \{1,2\}$). The inverse demand function is $P = 10 - q_1 - q_2$.

Cournout equilibrium: $P^C = 4$, $q_1^C = q_2^C = 3$, $\pi_1^C = \pi_2^C = 9$

Stackelberg equilibrium with firm 1 leader: $P^S = 3{,}25$, $q_1^S = 4{,}5$, $q_2^S = 2{,}25$, $\pi_1^S = 10{,}125$, $\pi_2^S = 5{,}0625$.

As π_1^S is higher than π_1^C, the first mover has an advantage of the observability.

Opposite example **[5 p.]**

However, moving first is not always an advantage. Consider Matching Pennies game:

	Heads	Tails
Heads	1, -1	-1, 1
Tails	-1, 1	1, -1

It is obvious that there is no equilibrium in pure strategies in this simultaneous game. Let ***p*** denote the probability of the first player to choose "Heads". q stands for the probability of the second player to choose "Heads". Expected payoff of the first player is equal to $1 - 2p - 2q + 4pq$, while the expected payoff of the second player is equal to $2p + 2q - 4pq - 1$. Maximization of expected payoffs gives the equilibrium values of p and q which are equal to 1/2. Thus, both players get 0 on average. If the first player were to move first, and this move were observed by the second player, her payoff would fall to -1. (If the first player moves "Heads", the second chooses "Tails" and vice versa).

Typical mistake:

- The game proposed is not solved, the effect of observability on the equilibrium payoff is not demonstrated. Maximum **[2p]** for correct example without explanation/solution.

2. [25 p.] In a closed economy with fixed prices and wages the government decides to cut the tax rate which is levied proportionally on households' income.

(a) Derive the autonomous expenditure multiplier for the case of balanced budget policy and without balancing the budget.

(b) Compare the two multipliers and explain intuitively why they are different.

(c) Illustrate graphically using IS-LM model the effects of the tax cut for the two cases mentioned in (a).

Assume now that money demand depends on the households' consumption rather than total income and money supply is constant.

(d) Derive analytically the formula for the new LM schedule.

(e) Analyze graphically and explain intuitively the effects of the tax cut in the economy with and without the balanced budget rule.

Solution and Marking Scheme

With fixed prices and wages and proportional taxation the IS-LM model is pretty standard:

$\mathrm{Y} = \mathrm{AE}(\mathrm{r}, \mathrm{Y}) = \mathrm{C} + \mathrm{I} + \mathrm{G}$, where $\mathrm{C}(\mathrm{Y}) = \mathrm{c}_0 + \mathrm{c}_1(1 - \mathrm{t})\mathrm{Y}$, $\mathrm{I}(\mathrm{r}, \mathrm{Y}) = \mathrm{I}_0 - \mathrm{I}_1\mathrm{r}$, $\mathrm{G} = \mathrm{G}_0$.

Define $\mathrm{AE}_0 = \mathrm{c}_0 + \mathrm{I}_0 - \mathrm{I}_1\mathrm{r}_0 + \mathrm{G}_0$,

(a) Case 1. Without balancing the budget the autonomous expenditure multiplier becomes **[2 p.]**:

$$\frac{\partial \mathrm{Y}}{\partial \mathrm{AE}_0} = \frac{1}{1 - \mathrm{c}_1(1-t)} \quad (1)$$

The balanced budget condition $G = ty$ may be met

- either when the tax rate is adjusted to the exogenously given level of government spending $t = G_0/Y$.
- or when the level of government spending is adjusted, so $G = t_0 y$.

Case 2. When the tax rate is adjusted the balanced budget autonomous expenditure multiplier is:

$$\left.\frac{\partial \mathrm{Y}}{\partial \mathrm{AE}_0}\right|_{t = G_0/Y} = \frac{1}{1 - \mathrm{c}_1} \quad (2)$$

where $\mathrm{AE}_0 \equiv \mathrm{c}_0 - \mathrm{c}_1\mathrm{G}_0 + \mathrm{I}_0 - \mathrm{I}_1\mathrm{r}_0 + \mathrm{G}_0$ is the autonomous expenditure.

Case 3. When the level of government spending is adjusted the balanced budget multiplier is:

$$\left.\frac{\partial \mathrm{Y}}{\partial \mathrm{AE}_0}\right|_{G = t_0 y} = \frac{1}{1 - \mathrm{c}_1(1 - t_0) - t_0} \quad (3)$$

where $\mathrm{AE}_0 \equiv \mathrm{c}_0 + \mathrm{I}_0 - \mathrm{I}_1\mathrm{r}_0$ is the autonomous expenditure

[4 p.] were given for a derivation of <u>any</u> autonomous expenditure multiplier under balanced budget policy with a proper explanation.

(b) Comparison of the multipliers **[1 p.]:**

$$\frac{1}{1 - \mathrm{c}_1(1 - t_0) - t_0} > \frac{1}{1 - \mathrm{c}_1} > \frac{1}{1 - \mathrm{c}_1(1 - t)}$$

Explanation of the difference. **[3 p.]**

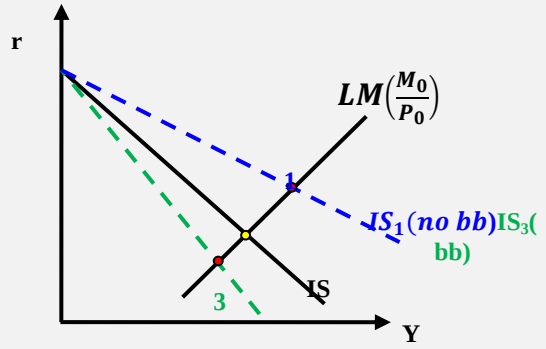
The balanced budget multiplier in case of government spending being adjusted to taxes turns out to be the largest since it reflects the pro-cyclical fiscal policy that induces further the aggregate demand via budget spending. On the contrary, without balanced budget proportional tax system serves like automatic stabiliser, causing leakages from the economy.

NB! Points were given only if the correct formulae for multipliers were provided.

(c) For the case (1) tax cut appears to be expansionary. The multiplier increases making the IS curve flatter (rotation around the intercept with vertical axis). Graph. **[2 p.]**

For the case (2) when the budget is balanced through the adjustment of the tax rate, such a policy becomes meaningless, since the tax rate is not an independent variable. **[1 p.]**

For the case (3) tax cut proves to be contractionary, since the government with the higher marginal propensity to spend sacrifices more than the households with smaller marginal propensity to consume. Graph. **[2 p.]**



(d) Derivation of modified LM **[4 p.]**

When money demand depends on consumer expenditure it implicitly becomes sensitive to changes in the tax rate. Indeed, for the linear representation the money market equilibrium becomes:

$$\frac{M^s}{P} = L(C(Y), r) = a\left[c_0 + c_1(1-t)Y\right] - br$$

Algebraically: $r = \frac{1}{b}\left[ac_0 - \frac{M^s}{P}\right] + \frac{a}{b}c_1(1-t)Y$.

Points also were given for a general nonlinear formula of LM curve dependent on consumption.

(e) Analyse graphically and explain intuitively the effects of the tax cut in the economy with and without the balanced budget rule.

Intuitive or formal explanation for LM slope **[2 p.]**

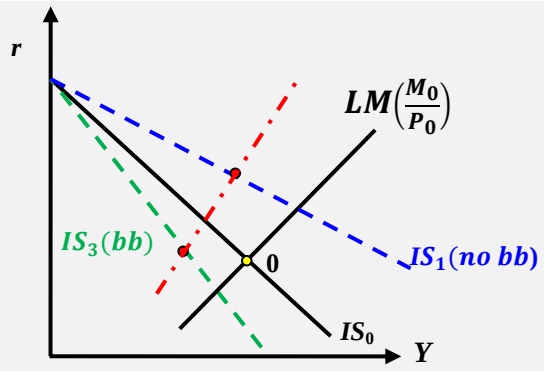
Effectively, the tax cut brings about an increase in money demand which becomes more sensitive to changes in output. With the tax cut the LM slope increases and the schedule becomes steeper.

Graphical analysis for case one with comments. **[2 p.]**

In case one increase in private consumption due to increased disposable income takes place simultaneously with reduction in private investment due to increased interest rate as a result of an increase in money demand. Thus the overall change in Y is ambiguous.

Graphical analysis for case (3) with comments. **[2 p.]**

The policy is necessarily contractionary in case (3) as initial contractionary impact is reinforced by reduction in private investment due to increase in the rate of interest as a result of increase in money demand.



3. [25 p.] Consider an industry with two firms that have identical cost functions given by $c(q_i) = 0.5(q_i)^2$, where q_i stays for the output produced by firm i $(i = 1, 2)$. The inverse demand function is $P(Q) = 16 - Q$.

(a) [10 p.] Compute the Cournot equilibrium. Find the resulting profits.

Marking Scheme

Let us find best response function for firm i given that output chosen by firm j is q_j. As each firm maximises profit at the point, where its marginal revenue equals marginal cost, we get the following condition for optimal response of firm i: $MR_i^{residual} = 16 - q_j - 2q_i = MC_i = q_i$.

Summing up, we get $32 = 4Q$, $Q = 8$, $q_i = 4$, **[8 p.]**

$P = 8$, $\pi_i = 8 \times 4 - 8 = 24$. **[2 p.]**

(b) [5 p.] Suppose, now both firms can sell output at world market at the competitive world price of p per unit. But these firms are still the only producers at domestic market due to high import tariffs (and citizens can purchase the product at domestic market only as otherwise they have to pay extremely high import tariffs). Find all possible world prices p under which it is profitable for domestic producers to sell both at domestic and foreign markets.

Marking Scheme

Domestic sales would be positive if world price is less than maximum willingness to pay at domestic market

$p_w < P(0) = 16$. **[2 p.]**

Sales at world market would be positive at any $p_w > 4$ as with zero sales at world market domestic $MR_i = MC_i = q_i = 4$, which makes domestic sales less profitable than world. **[2 p.]**

Thus $p_w \in (4, 16)$ **[1 p.]**

(c) [10 p.] Suppose that both firms can sell output at world market at the competitive world price of 7 per unit and all other conditions of part (b) are satisfied. Find the resulting domestic and foreign sales. Calculate each firm's profit and compare with the profits from part (a). Explain the result.

Marking Scheme

Problem of firm i: $\max\limits_{q_i\geq 0, q_i^f\geq 0}\left((16-q_i-q_j)q_i+7q_i^f-0.5\left(q_i+q_i^f\right)^2\right)$

FOC (for interior solution) of firm i: $\begin{cases}\left(16-2q_i-q_j\right)=q_i+q_i^f\\ 7=q_i+q_i^f\end{cases}$

We have the following system that defines Nash Equilibrium domestic sales: $\begin{cases}16-2q_i-q_j=7\\ 16-2q_j-q_i=7\end{cases}$,

Summing up, we get $32-14=3\left(q_i+q_j\right)$, $Q=q_i+q_j=6$, $p^d=16-6=10$, $q_i=16-7-Q=9-6=3$, $q_i^f=7-q_i=7-3=4$. **[6 p.]**

$\pi_i=10\times 3+7\times 4-0.5\times 49=33.5>24=\pi^a$ **[2 p.]**

Although the world price is lower than domestic one found in (a), the possibility to sell at the world market increases profit of both firms. With reduced domestic sales, competition at domestic market becomes less aggressive. This increases market power and drives domestic price up. As a result even with reduced domestic sales firm gets only slightly lower revenue (3*10 instead of 4*8). The last unit sold at domestic market gives MR of 4 but at foreign market MR is 7, thus firm gains from reallocation this unit in favour of world market. Moreover as world market is competitive, firm has an incentive to increase output and sell more as current MC=4<MRworld=7. **[2 p.]**