International Macroeconomics

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Problem Set 9 – AA-DD Model with Flexible Exchange Rates Questions

- **9.1** Consider an open economy, where the price level is initially equal to the foreign price level, which is constant ($P = P^* = 1$), and the nominal exchange rate is equal to 1. The interest rate is initially equal to the foreign interest rate, i*=0.1. The home money demand is given by $m^D = Y/10i$, nominal money supply is M=100, and the economy is initially at the full employment output is $Y_f = 100$.
 - (a) Assuming that no policy change is expected:
 (a1) Describe the money market equilibrium.
 (a2) Find out the expected exchange rate and use the uncovered interest parity to relate the spot exchange rate to the interest rate.
 (a3) Describe the AA curve for this economy. Explain why it is negatively sloped.
 - (b) Suppose now that the central bank decides to increase the money supply to 200.(b1) Examine the effects of the shock on the AA curve if it is temporary.(b2) Examine the effects of the shock on the AA curve if it is permanent, explaining the adjustment. Find the new expected exchange rate.
- **9.2** Consider an open economy, where domestic and foreign goods are imperfect substitutes. Initially, the price level is equal to the foreign price level, which is constant ($P = P^* = 1$), and the nominal exchange rate is equal to 1. The components of the aggregate demand D=C+I+G+TB have the following expressions: C=10+0.5Y, I=10, G=30, $TB = 5(\theta 1)$, where $\theta = eP^*/P$. It is also known that full employment output is $Y_f = 100$ and the foreign interest rate is constant and equal to $i^* = 10\%$.
 - (a) Assuming that no policy change is expected:
 (a1) Find out the equilibrium level of output in the short term, and describe it graphically using the Keynesian cross.
 (a2) Explain what would happen if the nominal exchange rate changed to e=0.5..
 (a3) Find out the expression of the DD curve and describe it in a graph. Explain why it is positively sloped.
 - (b) Suppose that government expenditures increase by 2.5.
 - (b1) Examine the effects of the shock on the DD curve if it is temporary.
 - (b2) Examine the effects of the shock on the DD curve if it is permanent, explaining the adjustment. Find the new expected exchange rate.

9.3 The following table displays estimated export and import price elasticities of export and of imports relative to the exchange rate, measured over three successively longer time horizons, and thus allows for the possibility that export and import demands adjust gradually to relative price changes, as in our discussion of the J-curve effect. "

Country	η			η*		
	Impact	Short-run	Long-run	Impact	Short-run	Long-run
Austria	0.39	0.71	1.37	0.03	0.36	0.80
Belgium	0.18	0.59	1.55	_	_	0.70
Britain	_	_	0.31	0.60	0.75	0.75
Canada	0.08	0.40	0.71	0.72	0.72	0.72
Denmark	0.82	1.13	1.13	0.55	0.93	1.14
France	0.20	0.48	1.25	_	0.49	0.60
Germany	_	_	1.41	0.57	0.77	0.77
Italy	_	0.56	0.64	0.94	0.94	0.94
Japan	0.59	1.01	1.61	0.16	0.72	0.97
Netherlands	0.24	0.49	0.89	0.71	1.22	1.22
Norway	0.40	0.74	1.49	_	0.01	0.71
Sweden	0.27	0.73	1.59	_		0.94
Switzerland	0.28	0.42	0.73	0.25	0.25	0.25
United States	0.18	0.48	1.67	_	1.06	1.06

Note: Estimates are taken from Jacques R. Artus and Malcolm D. Knight, *Issues in the Assessment of the Exchange Rates of Industrial Countries*, Occasional Paper 29. Washington, D.C.: International Monetary Fund, July 1984, Table 4. Unavailable estimates are indicated by dashes.

Given these figures, what can you say about the slopes of the DD curve, in the short run and in the long run, in (a) Denmark; (b) France; (c) Switzerland?

- **9.4** Consider an open economy, where aggregate demand is given by the following expression: Y = 90 + 10(e/P). The demand for money is given by $m^D = Y/10i$, nominal money supply is M=100, the foreign price level is constant and the foreign interest rate is equal to i*=0.1. The economy is initially at the full employment, $Y_f = 100$, with a constant price level and a constant exchange rate.
 - (a) Describe the initial equilibrium in the AA-DD diagram.
 - (b) Examine, numerically and graphically, the implications of a temporary expansion in the money supply to M=200.
 - (c) Examine, numerically and graphically, the implications of a permanent expansion in the money supply to M=200. In particular, compute:
 - (c1) The expected exchange rate.
 - (c2) The new AA curve.
 - (c3) The short-term equilibrium (in terms of output and nominal exchange rate).
 - (c4) The long run AA and DD curves and the long run equilibrium.
- **9.5** Consider an open economy, where the AA curve is described by the following equation: Y = 1000E(e)/e 900. The goods market equilibrium is described by the following expression: $Y = 2(\overline{A} + TB)$, where TB = 5(e-1). Initially, $\overline{A} = 50$, the economy is at full employment, $Y_f = 100$, and no change in policy is expected.
 - (a) Describe the initial equilibrium in the AA-DD diagram.
 - (b) Examine, numerically and graphically, the implications of a temporary fiscal expansion, so that $\overline{A}' = 52.5$.
 - (c) Examine, numerically and graphically, the implications of a permanent fiscal expansion, so that $\overline{A}' = 52.5$.

- **9.6** Consider an open economy with sticky prices under flexible exchange rates. In this economy, money supply is equal to M=100, money demand is given by $m^D = Y/5i$, and full employment output is $Y_f = 100$. The interest rate parity holds instantaneously, and the foreign interest rate is equal to i*=0.2. The components of the aggregate demand D=C+I+G+TB have the following expressions: C=12.5+0.75(Y-T), I=10, G=T=10, $TB = \overline{X} + 5(\theta 1)$, where $\theta = e/P$.
 - (a) Assuming that X
 = 0 and that the economy is at full employment:
 (a1) Find out the expression of the DD curve.
 (a2) Find out the price level and the nominal exchange rate.
 (a3) Compute the trade balance and the government balance.
 - (a4) Find the expression of the AA curve.
 - (b) Consider now that there was a temporary fall in foreign demand, so that $\overline{X} = -5$: (b1) Find out the short-run equilibrium, and display it in the AA-DD diagram. (b2) What happens to the nominal exchange rate and to the trade balance?
 - (c) Describe the automatic adjustment of the economy if the external shock was of permanent nature instead. What would happen to the nominal exchange rate, output, and to the trade balance in that case? Represent in a graph.
- **9.7** Consider an open economy with sticky prices under a flexible exchange rate regime. In this economy, money demand is given by $m^D = \frac{Y}{10i}$ and full employment output is $Y_f = 100$. The interest rate parity holds instantaneously, the foreign interest rate is equal to $i^* = 10\%$, and $P^* = 1$. The goods market equilibrium is described by the following expression: Y = 4 ($\overline{A} + TB$), where $\overline{A} = 25$, $TB = 5(\theta - 1)$ and $\theta = \frac{eP^*}{P}$. Also, M = 50 and $E^e = \frac{1}{2}$. Initially, no policy change is expected.
 - (a) Assuming that P = 1:
 - (a1) Derive the expression for the AA & DD Curves.
 - (a2) Find the equilibrium level of the exchange rate and output.
 - (a3) Compute the value for the trade balance.
 - (a4) Is there internal and/or external balance in this economy? Justify.
 - (b) Describe the adjustment in the long run, assuming no policy intervention:
 - (b1) Find the long-run value for the price level.
 - (b2) Find the long-run expression for AA & DD.
 - (b3) Compute the value for the trade balance.
 - (b4) Explain the adjustment with the help of the AA-DD diagram.
 - (c) Departing from (a), assume instead that the government tasks the central bank with achieving full-employment in the short-run with a permanent monetary expansion.
 - (c1) Compute the value for the real money demand when $Y = Y_f$ and $i = i^*$.
 - (c2) Using the money market equilibrium, find the implied money supply.
 - (c3) Using the DD curve found in (e1), find the new expected exchange rate.
 - (c4) Do prices need to adjust in the long run?
 - (c5) Find the expression for the AA curve.
 - (c6) Was this policy successful in achieving internal/external balance?
 - (c7) Explain the adjustment with the help of the AA-DD diagram.

- **9.8** Consider an open economy, with sticky prices under flexible exchange rates. The foreign interest rate is i*=0.1. The home money demand is given by $m^D = Y/10-10i$ the nominal money supply is M=20, and full employment output is $Y_f = 210$. The goods market equilibrium is described by $Y = 4(\overline{A} + TB)$, where TB = 5(e/p 1.8), and initially $\overline{A} = 52.5$.
 - (a) Assuming that the economy is initially at full employment and no changes in the exchange rate are expected:
 - (a1) Find the expression of DD curve.
 - (a2) Find the initial price level.
 - (a3) Find the nominal exchange rate.
 - (a4) Find the expression of the AA curve.
 - (b) Assume that, due to a permanent shift in the foreign demand, the equation describing the trade balance shifted to TB = 5(e/p 2.5). Assuming that there were no changes in policy:
 - (b1) Find the new expression of the DD curve.
 - (b2) Find the new expected exchange rate.
 - (b3) Find the new expression for the AA curve.
 - (b4) Find the short-run equilibrium. Is there internal and/or external balance?
 - (c) Assume now that, instead of permanent, the shock described above was of temporary nature.
 - (c1) What will be the formulas for the AA and DD curves?
 - (c2) Find the equilibrium (output and nominal exchange rate) after the shock.
 - (c3) Is there internal and/or external balance?

(c4) Suppose the monetary authorities, concerned with price stability, want to use a temporary monetary expansion to bring the economy back to full employment. Will that be possible? Why?

- (d) Departing from c), suppose that was up to the fiscal authorities to stabilize the output level.
 - (d1) How should the level of autonomous spending be adjusted?
 - (d2) What will be the expressions for the AA and DD curves?
 - (d3) Is this policy successful in achieving internal and/or external balance?
- (e) Now suppose the monetary authorities gave away price stability, to engage in in a permanent, once-and-for-all, credible monetary expansion.

(e1) Why is a permanent monetary expansion successful in restoring full employment when a temporary is not?

- (e2) Find the new expected exchange rate.
- (e3) Find the long-run price level.
- (e4) Find the long-run DD curve.
- (e5) How should the money supply be adjusted?
- (e6) Find the short and long-run AA curves.
- (e7) Is internal and/or external balance achieved?

- **9.9** Consider an open economy, where P = 1. The foreign interest rate is i*=0.1. The home money demand is given by $m^D = Y/10 10i$, nominal money supply is M=20, and the expected exchange rate is 1.8.
 - (a) Assume initially that Y=100.
 - (a1) Describe the money market in this case.
 - (a2) How much will be the exchange rate?
 - (a3) What would change if Y=210?
 - (b) Describe and represent graphically the AA curve in each of the following cases: (b1) Initial scenario.
 - (b2) If the money supply increases to M=40.
 - (b3) If the expected exchange rate increases to E(e)=3.6.