

Problem Set 6

Sovereign Debt Crises

Due: Thursday, November 25th, before the class

Exercise 1

The dynamics of the debt-to-GDP ratio is equal to

$$\Delta d_t = \frac{i_t^d - g_t}{1 + g_t} d_{t-1} + \frac{e_t(1 + i_t^d)}{1 + g_t} d_{t-1} - T b_t$$

where g_t is the growth rate of nominal GDP and i_t^d is the average interest payment on debt.

Suppose that the debt ratio is 70%, nominal GDP growth is 3% and the average interest payment is 5%.

- a) By how much does the debt increase if the domestic currency depreciate by 20%?
- b) Suppose the government aims to stabilize the debt-to-GDP ratio, i.e. it targets $\Delta d_t = 0$. If the exchange rate does not change, is a trade balance surplus of 1% of GDP sufficient for stabilization? If not, by how much should nominal GDP growth increase or decrease to stabilize the debt ratio?
- c) Compute the effect on the debt ratio of a fall in GDP growth by 2 percentage points. Repeat the same exercise for a debt ratio of 40% and a debt ratio of 100%. Discuss.

Exercise 2:

The external debt is 40% of GDP, it is denominated in local currency and pays interests at a nominal rate equal to $i = 0.03$.

- a) How much is the trade surplus, if the debt is maintained stable at 40% of GDP, and nominal GDP growth is 2% (i.e. $g^N = 0.02$)?

Suppose, now, the government implements a plan of infrastructures that amounts to an investment of 2% of GDP for 5 years to be financed with foreign capital. The project is expected to increase GDP growth but only starting in the sixth year after all investments have taken place.

- b) As the trade balance worsens by 2% of GDP per year, the debt ratio starts increasing. What is the country's debt ratio at the end of the five years during which growth has not changed yet? Why will the debt ratio exceed 50%?
- c) As the country enters the sixth year with a debt ratio as in part b), by how much must the growth rate increase to stabilize the debt ratio if the trade balance goes back to the initial surplus of point a)?

Exercise 3

If the debt is in local currency and nominal GDP growth, g_t^N , is not too big, the dynamics of the debt-to-GDP ratio can be approximated by

$$\Delta d_t = i_t d_{t-1} - g_t^N d_{t-1} - Tb_t$$

- Suppose the trade surplus is sufficiently high to maintain a constant debt ratio, $\Delta d_t = 0$. Solve for the trade balance Tb_t^* that stabilize d_t in terms of the cost of debt service, i_t , the growth rate, g_t^N , and the level of debt, d_{t-1} .
- Suppose there is a recession, and the growth rate of nominal GDP falls by 3 percentage points. What is the effect of this output contraction on the stabilizing trade balance, Tb_t^* , when the debt ratio is 50%? And when the debt ratio is 100%? What do you conclude about the fiscal vulnerability implied by a high (though stable) debt-to-GDP ratio?
- So far we assumed the growth rate, g_t^N , to be independent of the trade balance. More realistically an improvement of trade balance implies a restraint on private and/or government consumption that leads to a further contraction of economic activity. How does your answer to part b) change if an increase in the trade balance by 1% of GDP reduces nominal GDP growth half percentage point? [Hint: you must write g_t^N as the sum of an independent component and another component which negatively depends on Tb_t]

Exercise 4

A government has to decide whether to issue debt in domestic or in foreign currency. The interest rate on domestic currency debt is 5% while that on foreign currency debt is 2%.

- The liquidity premium on local currency debt is zero, i.e. $p_t = 0$. What should a risk-neutral government expect about the evolution of the exchange rate to find foreign currency debt convenient?
- Does your answer to part a) change if the 5% interest rate on domestic currency debt includes a liquidity premium $p_t = 1\%$? Explain.
- How does your answer to part a) change if the government is risk averse?
- Why may foreign investors ask for a higher interest rate than 5% on domestic currency debt if the government showed a clear preference for such debt?

Exercise 5

Suppose the Trade surplus reacts to debt according to the following rule:

$$Tb_t = \rho(1 + R)d_{t-1} \quad (1)$$

where $\rho > 0$ is the “correction coefficient” that measure the strength of the trade balance reaction to a debt increase and R is the growth corrected interest rate (i.e. the rate at which the debt-to-GDP ratio increases when $Tb_t = 0$).

- Suppose the rule (1) is followed in all future periods. Find the rate at which the debt ratio grows by substituting the rule for the trade balance in the debt accumulation equation.
- Find the value of ρ (call it $\bar{\rho}$) that stabilize the debt ratio as a function of R .
- What happens to the debt ratio if ρ is less than $\bar{\rho}$? Does the evolution of the debt violate the No-Ponzi game condition? Is there any other concern for debt sustainability that you may think of?

Exercise 6

Once we focus on Sovereign debt the relevant primary balance is the government primary balance or primary surplus (as opposed to the trade surplus). Denoting with s_t the primary surplus relative to GDP, the condition for debt stabilization becomes:

$$s_t = \frac{i_t - g_t^N}{1 + g_t^N} d_{t-1}$$

Given that the primary surplus is equal to the difference between taxes and government expenditures net of interest payments, discuss why this condition is more restrictive the higher the ratio of expenditure relative to GDP.