Public Affairs 854   Menzie D. Chinn
Spring 2021   Social Sciences 7418
University of Wisconsin-Madison

Problem Set 1 Answers <mark>(rev'd 3/1)</mark>

Due on Canvas, Tuesday, February 23, 5pm.

1. Balance of payments identities. Recalling the balance of payments identity, $CA + FA + ORT \equiv 0$, answer the following questions.

    1.1 If CA > 0 and the central bank is neither accumulating nor decumulating foreign exchange reserves, what must be true about private capital inflows?

The statement that the central bank is neither accumulating or decumulating foreign exchange means that ORT=0. Combining this with the given identity yields CA = -FA, so with CA > 0, FA < 0.

    1.2 If a country maintains a pegged exchange rate and runs a balance of payments surplus, then what must be true about ORT? Explain what this means in words.

This is a trick question, since the answer doesn't depend upon whether the regime is pegged or not. Define the economic measure of the balance of payments, BP, as BP=CA+FA. Then BP + ORT ≡ 0, so BP > 0 → ORT < 0. This means that the central bank is building up foreign exchange reserves. What is true is that under floating exchange rates, CA+FA adjusts in response to exchange rates so that ORT=0.

    1.3 From the Chinese perspective, if the Chinese central bank is purchasing U.S. securities (T-bills, corporate bonds and stocks) and the U.S. central bank is purchasing no Chinese securities, then what is the value of FA (Ignore direct investment for purposes of this question)? What is the value of ORT?

This is not possible to answer without knowing what the CA is. If CA = 0, and ORT is negative (accumulating reserves), then FA must be positive.
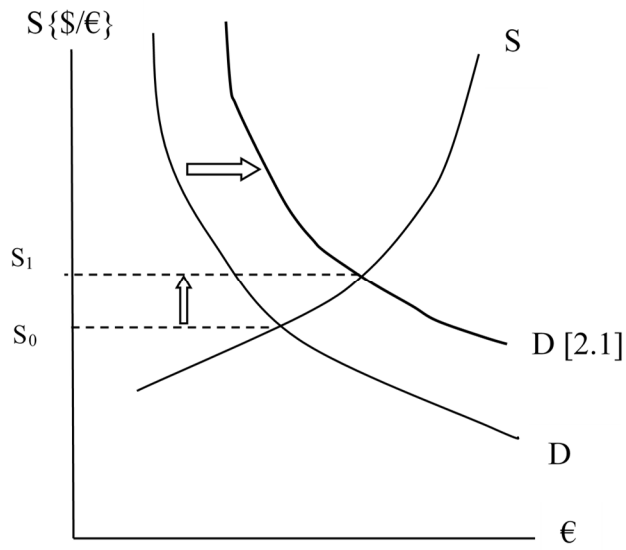
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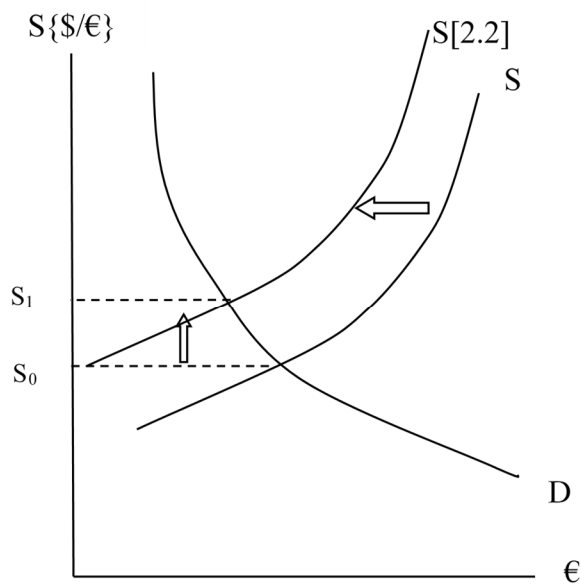
    1.4 What is the Current Account for 2019? (No calculation necessary.) –480,226 million

2. The foreign exchange market. Using a supply and demand diagram, and defining the US as the home country and either euro area as the foreign, show what happens in the following situations (assuming a flexible exchange rate regime).

2.1   US demand for French cheese increases.

2.2   French demand for American stocks declines.

Using the Table reproduced from the *Economist* (February 13th edition, https://www.economist.com/economic-indicators/2021/02/13/economic-data-commodities-and-markets), answer the following questions. **Show your work, and "box in" your answers.**

2.3   From an American perspective, has the US dollar (USD) appreciated or depreciated against the yen over the past year? (The *Economist* data is expressed as foreign currency units per US dollar, and a positive value for % change entry means the local currency is appreciating against the US dollar).

Yen ~~per dollar~~ has ~~de~~appreciated 4.8% over the past year. That means the dollar has

~~ap~~**de**preciated over the past year. Notice that because you're looking at changes of 1/x when switching from yen/dollar to dollar/yen, then percentage changes won't be inverses of each other. ~~(i.e., dollar doesn't appreciate by exactly 4.8% against yen).~~

2.4 How many US dollars does it take to buy a single Australian dollar (AUD) now? How many did it take a year ago? Has the US dollar appreciated or depreciated?

First, re-express the exchange rates in terms of how many USD to buy a single AUD. 10 Feb.: 1.29 A$/US$ = 0.775 US$/A$, Year ago: ~~1.11 A$/US$ = 0.902 US$/A$. Calculate the change as:~~ Suppose I look up the US$/A$ exchange rate a year ago – it is 0.668.

$$\frac{S_t - S_{t-1}}{S_{t-1}} = \frac{0.775 - 0.668}{0.668} = 0.160 \text{ or } \textbf{16.0\%} ~~\textbf{ap}~~\textbf{depreciation of dollar}$$

2.5 What is the exchange rate of Japanese yen (JPY) for Australian dollars (AUD) (i.e., how many Japanese yen does it take to purchase a single Australian dollar)?

Given 105 ¥/US$ and 1.29 AUD/US$, divide S {¥/US$} by S {AUD/US$} to obtain S {¥/AUD}. That is, the exchange rate is 105/1.29 = **81.4 Japanese yen per Australian dollar**.

2.6 Suppose you expect the exchange rate on February 10, **2022** is going to be 0.67 British pounds to buy one US dollar. What is the expected change (in percent terms), or depreciation, of the US dollar that you expect over the next year?

The current exchange rate is 0.72 £/US$ = 1.389 US$/£ . The expected exchange rate in one year is 0.67 £/US$ = 1.493 US$/£ . Then the expected depreciation is
$$\frac{S_{t+1}^e - S_t}{S_t} = \frac{1.493 - 1.389}{1.389} = 0.075 \text{ or } \textbf{7.5\% } \textit{expected} \textbf{ depreciation of dollar}$$

Economic data

	Current-account balance % of GDP, 2020†	Budget balance % of GDP, 2020†	Interest rates 10-yr gov't bonds latest,%	change on year ago, bp	Currency units per $ Feb 10th	% change on year ago
United States	-2.2	-14.9	1.1	-41.0	-	
China	1.5	-5.2	3.1 §§	51.0	6.44	8.4
Japan	2.7	-12.2	nil	-8.0	105	4.8
Britain	-1.3	-19.7	0.5	-11.0	0.72	6.9
Canada	-2.1	-13.5	1.0	-32.0	1.27	4.7
Euro area	2.6	-9.2	-0.5	-4.0	0.82	12.2
Austria	2.4	-8.5	-0.3	-1.0	0.82	12.2
Belgium	-1.1	-9.4	-0.2	-8.0	0.82	12.2
France	-2.3	-10.9	-0.2	-9.0	0.82	12.2
Germany	6.8	-7.0	-0.5	-4.0	0.82	12.2
Greece	-6.6	-9.2	0.8	-25.0	0.82	12.2
Italy	2.9	-11.3	0.5	-46.0	0.82	12.2
Netherlands	7.2	-6.9	-0.5	-18.0	0.82	12.2
Spain	0.8	-12.0	0.2	-14.0	0.82	12.2
Czech Republic	1.3	-6.7	1.5	-5.0	21.3	7.8
Denmark	8.5	-3.6	-0.3	4.0	6.13	11.6
Norway	3.2	-1.3	1.2	-19.0	8.44	9.9
Poland	3.6	-7.9	1.3	-79.0	3.70	5.7
Russia	2.0	-3.8	6.6	38.0	73.9	-13.2
Sweden	4.8	-3.5	0.2	14.0	8.32	16.2
Switzerland	9.1	-3.7	-0.3	32.0	0.89	10.1
Turkey	-5.4	-3.4	12.5	170	7.05	-14.8
Australia	1.2	-7.3	1.2	17.0	1.29	16.3
Hong Kong	6.2	-7.6	1.1	-40.0	7.75	0.3
India	1.3	-7.2	6.0	-43.0	72.8	-2.1
Indonesia	-1.6	-7.2	6.2	-39.0	13,983	-2.1
Malaysia	4.8	-7.4	2.8	-22.0	4.04	2.7
Pakistan	0.1	-8.1	10.0 †††	-133	159	-2.9
Philippines	3.4	-7.8	3.1	-130	48.0	5.7
Singapore	18.2	-13.9	1.1	-66.0	1.33	4.5
South Korea	3.8	-5.7	1.8	22.0	1,107	7.2
Taiwan	13.8	-1.5	0.3	-25.0	28.0	7.4
Thailand	3.7	-6.4	1.3	23.0	29.9	4.6
Argentina	0.6	-8.6	na	-464	88.3	-31.0
Brazil	-0.7	-15.8	7.8	122	5.38	-19.9
Chile	1.4	-7.9	2.6	-80.0	726	9.6
Colombia	-3.6	-8.8	4.9	-72.0	3,558	-3.2
Mexico	2.3	-4.5	5.3	-133	20.0	-6.3
Peru	1.0	-8.0	3.8	-10.0	3.64	-6.6
Egypt	-3.6	-8.5	na	nil	15.7	0.5
Israel	3.9	-11.8	0.9	4.0	3.26	4.9
Saudi Arabia	-3.7	-10.6	na	nil	3.75	nil
South Africa	0.6	-16.0	8.6	-34.0	14.7	2.2

Source: Haver Analytics. §§5-year yield. †††Dollar-denominated bonds.

The Economist

3. Equilibrium income and multipliers. Consider the following model of the economy:

Eq.No. Equation   Description

(1) $Y = AD$ Output equals aggregate demand, an equilibrium condition
(2) $AD \equiv C + I + G + X - IM$ Definition of aggregate demand
(3) $C = \bar{C} + c(Y - T + Tr)$ Consumption function, c is the MPC
(4) $Tr = \overline{Tr}$ Govt transfers function (Unemployment insurance, SNAP)
(5) $T = tY$ Tax function
(6) $I = \bar{I}$ Investment function
(7) $G = \bar{G}$ Government spending on goods and services
(9) $X = \bar{X}$ Export spending
(10) $IM = \bar{I}\bar{M} + mY$ Import spending

3.1   Solve for Y, setting $\bar{A} \equiv \bar{C} + \bar{I} + \bar{G}$
$$Y = AD = \bar{C} + c\overline{Tr} + c(1-t)Y + \bar{I} + \bar{G} + \bar{X} - \overline{IM} - mY$$
Collect up terms:

$$Y = \bar{A} + c\overline{Tr} + c(1-t)Y - mY + \bar{X} - \overline{IM} \quad \text{where} \quad \bar{A} \equiv \bar{C} + \bar{I} + \bar{G}$$

Shift "Y" terms to the left hand side:

$$Y - c(1-t)Y + mY = \bar{A} + c\overline{Tr} + \bar{X} - \overline{IM} \quad \text{where} \quad \bar{A} \equiv \bar{C} + \bar{I} + \bar{G}$$

So:

$$Y[1 - c(1-t) + mY] = \bar{A} + c\overline{Tr} + \bar{X} - \overline{IM}$$

Divide both sides by the term in the square bracket to obtain equilibrium income, Y_0:

$$Y_0 = \bar{\alpha}[\bar{A} + c\overline{Tr} + \bar{X} - \overline{IM}] \quad \text{where} \quad \bar{\alpha} \equiv \left(\frac{1}{1-c(1-t)+m}\right)$$

3.2   Calculate the change in income for a given change in (autonomous) investment. Show your work!
       Take the total differential of the answer to question 3.1.

$$\Delta Y = \bar{\alpha}[\Delta A + c\Delta Tr + \Delta X - \Delta IM] \quad \text{where} \quad \bar{\alpha} \equiv \left(\frac{1}{1-c(1-t)+m}\right)$$

Set $\Delta A = \Delta I$ and $0 = \Delta Tr = \Delta X = \Delta IM$

$$\Delta Y = \bar{\alpha}\Delta I$$

3.3   Calculate the change in income for a given change in transfers expenditures. Show your

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work!
Take the total differential of the answer to question 3.1.

$$\Delta Y = \bar{\alpha}[\Delta A + c\Delta Tr + \Delta X - \Delta IM] \quad \text{where } \bar{\alpha} \equiv \left(\frac{1}{1-c(1-t)+m}\right)$$

Set $\Delta A = 0 = \Delta X = \Delta IM$

$$\Delta Y = \bar{\alpha}c\Delta Tr$$

3.4   Calculate the change in the budget balance for 3.2, and for 3.3. Recall the budget balance in this economy is *T-G-Tr* . (Government transfers differ from government spending on goods and services because government transfers – like Social Security payments, unemployment insurance payments, and food stamps/SNAP – do not involve purchases of goods and services; rather they augment personal income).

$BuS \equiv T - G = tY - \bar{G} - \overline{Tr}$
For 3.2:
$\Delta BuS = t\Delta Y - \Delta Tr = t\bar{\alpha}\Delta I > 0$
For 3.3:
$\Delta BuS = t\Delta Y - \Delta G - \Delta Tr = t\bar{\alpha}c\Delta Tr - \Delta Tr = (t\bar{\alpha}c - 1)\Delta Tr < 0$

3.5   Calculate the change in the trade balance for 3.2, and for 3.3. Hint: $TB \equiv X - IM$, so $\Delta TB = \Delta X - (\Delta IM + m\Delta Y)$. Show your work!

For 3.2:
$\Delta TB = \Delta X - \Delta IM - m\Delta Y = -m\bar{\alpha}\Delta I < 0$
For 3.3:
$\Delta TB = \Delta X - \Delta IM - m\Delta Y = -m\bar{\alpha}c\Delta Tr < 0$

3.6   In words, explain why in one case the budget balance and trade balance move in the same way, and in another case, they move in opposite directions.

In the case of 3.2, with an increase in autonomous investment, the correlation between the budget balance and the trade balance is negative. In the case of 3.3, with an increase in government spending, the correlation between the budget balance and the trade balance is positive. That's because in the former case, the shock to investment boosts tax revenues while in the former, the increase in government spending overwhelms the increase in tax revenues.