Management 495 — Spring 2016

Topics in Finance: International Macroeconomics

Policy Discussion Assignment 3

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Due: **Fri, June 3 *before* 5:00pm**

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1 Balance-of-Payments Crisis

A small open economy pegs its exchange rate to a foreign currency at the level $\bar{E}$. The government expands its debt steadily and forces its monetary authorities to buy (monetize) the new debt at a rate μ. The government also requires the monetary authorities to maintain the exchange rate peg as long as they have foreign reserves. Once foreign reserves are depleted, monetary authorities float the exchange rate freely.

- In this scenario, government debt and therefore the monetary base expand at a rate μ. Depict the time path of foreign reserves of the monetary authorities. Is the peg sustainable indefinitely?
- Define the *shadow exchange rate*. Use Uncovered Interest Parity and Purchasing Power Parity to express the shadow exchange rate as a function of the monetary base. Depict the time path of the shadow exchange rate.
- Explain why an attack on the currency will occur when the shadow exchange rate hits the exchange rate peg $\bar{E}$. Depict the immediate response of the domestic interest rate and the domestic price level to the attack.
- Suppose the government forces its monetary authorities to monetize new debt at an even faster rate μ'. How is the timing of attack affected? Infer the new *shadow exchange rate* and position it, given anticipated money supply growth after foreign reserve depletion or after the attack.

2 Self-fulfilling Currency Attack

Consider the following attack game (with foreign and domestic asset holdings such that $W^{\text{CB}} < B^{\text{CB}}$). There is a number J of small investors who all own one unit of currency, and one big investor who owns K units of currency. In the case of a defense, the central bank incurs losses of R per unit of foreign reserves that it has to use for the intervention.

		Central Bank: *Defend* ($\Delta E = 0$)	Central Bank: *Devalue* ($\Delta E > 0$)
Investor i	*Attack*	$-c$ $-R(J+K)$	$\Delta E - c$ $\Delta E(W^{\text{CB}} - B^{\text{CB}})$
	Hold	0 0	$-\Delta E$ $\Delta E(W^{\text{CB}} - B^{\text{CB}})$

- State the condition for a self-fulfilling attack to be an equilibrium.
- Explain under what condition a successful attack becomes a best response for any small investor (among the J investors) when he or she observes the big investor in a fire sale of K units of the currency but the $J-1$ other small investors holding on to the currency.
- Suppose $K = 0$. Investor i and the central bank anticipate that $J-1$ other investors will attempt to attack. Show that a successful attack is an equilibrium for every investor i if there is a large number J of other attacking investors. Also show that a no-attack-no-devaluation equilibrium exists.
- Why is a discrete foreseeable devaluation $\Delta E > 0$ possible in a self-fulfilling crisis but not in a fundamentals-driven crisis?
- Evaluate the following statement.

  > One way to reduce the chance of a self-fulfilling attack is to raise the transaction cost c so that investors are more reluctant to run.

  Is this statement correct in the strategic framework above? Why or why not?

3 Speculation against the ERM

Short before the British government gave in to speculative pressure on the British Pound against the German Deutschmark and abandoned the European Exchange Rate Mechanism (ERM) in September 1992, *The Economist* magazine wrote ("Crisis? What Crisis?", in *The Economist*, August 29, 1992):

> The [British] government's critics want lower interest rates, and think this would be possible if Britain devalued Sterling, leaving the ERM if necessary. They are wrong. Quitting the ERM would soon lead to higher, not lower, interest rates, as British economic management lost the degree of credibility already won through ERM

membership. Two years ago British government bonds yielded three percentage points more than German ones. Today the gap is half a point, reflecting investors' belief that British inflation is on its way down—permanently.

Evaluate this statement.

- Why might "the British government's critics" have thought it possible to lower interest rates after taking Sterling out of the ERM? Britain's economy was in a recession in fall 1992.
- Why did *The Economist* think the opposite would occur soon after Britain exited the ERM? In what way might ERM membership have lent credibility to British economic policy makers? Britain entered the ERM in 1990.
- Why would elevated British nominal interest rates relative to German rates have suggested an expectation of high future British inflation? Can you think of alternative explanations? Suggest two reasons why British interest rates might have exceeded German rates at the time of the writing of the article, despite the alleged "belief that British inflation is on its way down—permanently."

4 Bank Run

There are 3 investors who live for two periods and have one unit of savings each. A storage technology returns the investment without interest after one period; a long-term project returns gross interest $r^* > 1$ after two periods (or just the principal 1 if cancelled after one period).

One investor will be needy (impatient) and withdraw in period 1, two investors will be greedy (patient) and hold deposits until period 2; but investors do not know whether they will be needy or greedy at the time of investment in period 0.

Banks offer deposit contracts that pay a gross interest of $\underline{r} > 1$ for withdrawals in period 1 and $\bar{r} < r^*$ for withdrawals in period 2. Risk-averse investors prefer bank deposits over direct investments and lend their units of savings to the bank. The single needy investor will withdraw $\underline{r} > 1$ in period 1, whereas the two greedy investors may withdraw early or hold. The strategic framework for the two greedy investors A and B can be summarized as in the bank run game below (the lower-right payoffs are for investor B).

- Determine each investor's best responses to the other investor's possible choice.
- Show that there are two equilibria if $(3 - \underline{r})r^*/2 > (3 - 2\underline{r})r^*$: a bank run and no bank run.

Now suppose that, in the case of withdrawals by all investors, the central bank serves as a lender of last resort, prints money and pays $\underline{r}$ in cash to every investor. Of course, rational investors know that these $3\underline{r}$ money units only buy 3 units of real goods under the storage technology so that the real payoffs in this crisis case are 1 to each investor.

- For this scenario, show which payoffs in the game below need to be replaced with 1.
- Under the scenario, state a condition on the relevant payoff when exactly one greedy investor holds on so that the only equilibrium is no bank run.

		Investor B	
		Withdraw	*Hold*
Investor A	*Withdraw*	$(3-\underline{r})r^*/2$ $(3-\underline{r})r^*/2$	$\underline{r}$ $(3-2\underline{r})r^*$
	Hold	$(3-2\underline{r})r^*$ $\underline{r}$	$\bar{r}$ $\bar{r}$

Note. The rationale for the payoffs is as follows. If one greedy investor withdraws $\underline{r}$ early, the bank cancels $\underline{r}$ long-term investments to honor its contract and pays out $\underline{r}$ as a second withdrawal so that the remaining greedy investor receives $(3-2\underline{r})r^*$. If both greedy investors try to withdraw $\underline{r}$ each early, the bank goes bankrupt and each greedy investor gets $(3-\underline{r})r^*/2$.

5 Debt Management

The face value of a country's external debt is D. The country's default probability is p_{default}. If the country does not default, then it pays D. If it defaults, then the country pays nothing. The market value of the debt $V(D, I)$ is a function of the face value D and the country's investment I. The market price v of one unit of debt is $v = V(D, I)/D$.

Explain how investment I affects the probability of default p_{default}, and explain how investment I in turn depends on D. Briefly describe the rationale for the resulting Debt Laffer Curve. Why does the market value of debt not increase one-to-one with the face value of debt?

What is the difference between a debt buyback and debt forgiveness? Show a level of debt for a country that does not qualify as a candidate for debt forgiveness; label that point N.

Then show a level of debt for a country that does qualify as a candidate for debt forgiveness; label this point F. For the candidate country to receive debt forgiveness, show the *maximum* amount of debt forgiveness that the lenders will approve; label it Δ_L. Why will the lender not forgive more debt than Δ_L? For

the candidate country to receive debt forgiveness, show the *minimum* amount of debt forgiveness that the borrower will ask for; label it Δ_B. Why will the borrower not ask for less forgiveness than Δ_B?

Now turn to the case of Greece (at point N) and its debt buyback in December 2012 (announced in November 2012): The Greek government took out a loan of €11.3 billion from the EU under the European Financial Stability Facility (EFSF) program and used it to retire Greek bonds with a face value of €31.9 billion. The buyback was announced on November 23, 2012 when the price of Greek bonds stood at 27.8 cents on the Euro. From November 23, 2012 until December 12, 2012, when the buyback was complete, the market value of Greek debt dropped from €17.1 billion to €10.1 billion. What is the price of Greek bonds (cents on the Euro) on December 12, 2012?

At an expense of €11.3 billion, do you think the buyback was a "good deal" for the Greek taxpayer? In an attempt to answer the same question, Jeromin Zettelmeyer, Christoph Trebesch and Mitu Gulati argue in the journal *Economic Policy* (2013: 28(75), pages 513-563) that Greece's buyback was itself debt financed with an EFSF loan, and discount the value of the €11.3 billion loan to a present value of just €2.7 billion. What is the implied price in cents on the Euro? Do you agree with their valuation? At what valuation (default risk) does the buyback become a "good deal" for the Greek taxpayer? Comment on the conclusion by Jeromin Zettelmeyer, Christoph Trebesch and Mitu Gulati that "it is not possible to condemn this buyback unless one assumes that the risk of a Greek default to the EFSF is significantly lower than that of a new default to the private sector."

6 Brazil Between a Rock and a Hard Place

Consider yourself in the role of an advisor on monetary policy for Brazil's central bank. You may but need to use diagrams for your arguments; you may but need not use bullet points to keep your recommendations concise.

In the second quarter of 2016, Brazil's nominal exchange rate has devalued to more than R$3 (three Brazilian Reais) per U.S. dollar. Inflation forecasts are around 7 percent. Brazil's GDP is expected to contract by 0.5 percent in 2016 and to grow by merely 1.5 percent in 2016, partly due to a severe drought (leaving major cities with water rationing and hydroelectric power generation uncertain), while Brazil's largest company Petrobras is afflicted by a corruption scandal that involves leading politicians.

On the financial side, gross public debt stands at 66 percent of GDP, with a bond yield of 13 percent per annum. Total credit to the private sector has risen from 25 percent in 2005 to now 55 percent. Household debt (mostly mortgages and consumer credit for cars and credit cards) has reached a historic peak level of 46 percent of disposable income, with a projected debt service at 21 percent of disposable income. Corporate debt is subsidized, given high interest rates at commercial banks, with 55 percent of outstanding corporate debt channelled through government-subsidized public banks at below-market

interest rates. Importantly, most remaining corporate debt from private-sector lenders is U.S. dollar denominated and has reached $250 billion (up from $100bi in 2010); given the Brazilian Real devaluation this dollar-denominated debt now stands at R$655 billion (up from R$210bi in 2010). A large fraction of these foreign debt contracts has been secured under central bank swap contracts that insulate corporate borrowers from Real devaluation, at a cost of R$38 billion just in Q3 and Q4 of 2014.

What do GDP growth and inflation forecasts suggests for conditions in the domestic money market? Suppose you were to recommend restrictive monetary policy to Brazil's central bank, what are the upsides and downsides? Consider consequences for GDP growth, inflation, and financing conditions for Brazilian households. Given your projections for U.S. monetary conditions, also consider consequences for the nominal exchange rate, dollar-denominated foreign debt service, and likely costs to the central bank under its swap contracts that insure firms against a Real devaluation. Suppose you were to recommend relatively expansionary monetary policy to Brazil's central bank instead, what are the upsides and downsides then? What is your overall recommendation for a monetary policy path?