EC916: Topics in Global Finance

Fatih Kansoy

kansoy

Lecture - 7 -

* University of Warwick

This Week: Outline

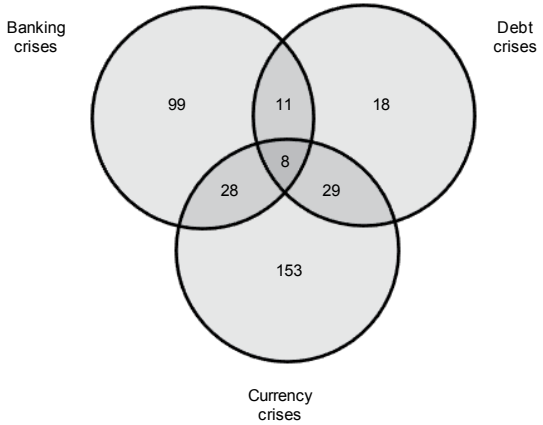
This Lecture - Overview

Crises in Open Economies

1. Balance of Payment Crises
   - First, Second and Third Generation of BOP Crises

Readings: For 1: Sarno & Taylor, Chapter 8 (2002), *Economics of Exchange Rate*. Krugman (1999), Blanco, H. and P. M. Garber. (1986). Section 8.4 in M. Obstfeld and K. Rogoff (1996), *Foundations of International Macroeconomics* , Giancarlo Gandolfo Section 16.3 - 16.4 *International Finance and Open-Economy Macroeconomics*

Banking, Currency and Sovereign Debt Crises (1970-2011)

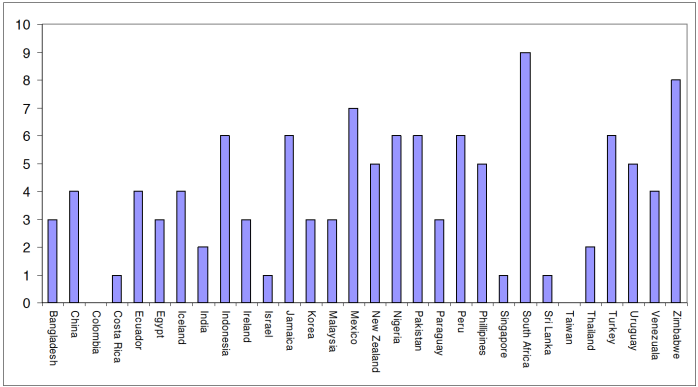


Source: Laeven & Valencia (2012). 346 crises between 1970 and 2011 (about 45% are currency crises only).

Currency Crisis

1. Empirical definition:
   - a 30% depreciation wrt U.S. dollar that is also at least 10 percentage points higher than the rate of depreciation in the year before.
2. Laeven & Valencia (2012) identify 218 currency crisis between 1970 and 2011. Currency crisis are common!

Some countries experience repeated crises: # of currency crises per country.



Source: Coeurdacier (2013)

→ Three Types of Balance of Payment Crises

1. First Generation:
   - Fiscal policy is at odds with fixed exchange rate → speculative attacks.
2. Second Generation:
   - Fundamentals are fine, but speculative attacks can be self-fulfilling and trigger a currency crisis.
3. Third Generation:
   - Foreign currency debt and exposure to exchange rate can lead to a crisis.

First Generation Models of BOP Crises

- Based on Krugman (1979), Flood and Garber (1984), Sarno et al (2002).
- Expansionary fiscal policy is inconsistent with fixed exchange rate.
- This creates conditions for speculative attack and leads to the abandonment of the fixed ER.
- The behaviour of investors (speculators) is justified due to the inconsistency of the fiscal and ER policies.
- Depict the scenario of Latin American countries in the 1970s and 1980s, when monetisation of budget deficits depleted foreign exchange reserves.

Set up

- Small open economy with fixed exchange rate (ER).
- No uncertainty/ Perfect foresight.
- Free movement of capital (uncovered interest rate parity (UIP) holds)
- Free trade. Prices are flexible (purchasing power parity (PPP) holds).
- The government runs an exogenous fiscal deficit.
- The Central Bank (CB) has two tasks:
  - to buy government bonds and monetise deficit (priority).
  - to keep exchange rate fixed until it runs out of reserves.

Uncovered Interest Rate Parity: Free Capital Mobility

- If markets are efficient, free capital mobility should assure that the return on capital assets are equalised between currencies. No arbitrage. This relationship is formalised in the uncovered interest rate parity, that can be written as:

$$(1 + i_{t+1}) = (1 + i^*_{t+1})\mathbb{E}_t\left(\frac{s_{t+1}}{s_t}\right) \tag{1}$$

where i is the interest rate and $*$ represents foreign country values, $\mathbb{E}_t$ is the expectation operator, s_t and s_{t+1} are the spot and forwar exchange rate, respectively.

- By taking logs, using the approximations $i_{t+1} \approx log(1 + i_{t+1})$ and perfect foresight assumptions:

$$i_{t+1} = i^*_{t+1} + (s_{t+1} - s_t)$$

where $s_{t+1} - s_t = \dot{s}$.

$$i = i^* + \dot{s} \tag{2}$$

Purchasing Power Parity: Free Trade

- Law of one price (LOOP) states that if a good is priced differently in two countries, arbitrage would assure that the good is bought in the country where it is cheap, and transported to the country where it is expensive. Over time this should trade away the price difference.

- PPP implies that the exchange rate between two countries shall equal the relative ratio of the price levels between two countries:

$$P_t = sP_t^* \tag{3}$$

By taking logs eq-(3) can be expressed as

$$p_t = p_t^* + s \tag{4}$$

The PPP (Eq-(4)) states that the price level should be the same in all countries if prices are re-calculated to one currency.

First Generation Models of BOP Crises

$$Money\ demand \quad \Longrightarrow \quad m^d - p = -\lambda i \tag{5}$$

$$Money\ supply \quad \Longrightarrow \quad m^s \equiv d + r \tag{6}$$

- Both UIP((7) and PPP((8)) hold

$$\dot{s} = i - i^* \tag{7}$$

$$s = p - p^* \tag{8}$$

- Money market equilibrium

$$m^d = m^s \tag{9}$$

where p is the domestic price level, $\lambda > 0$, i the domestic nominal interest rate, d domestic credit (gov. bonds), r international reserves and s exchange rate. All variables in logarithm except for the interest rate. an asterisk -*- denotes foreign variables

Understanding the logic

- Recall the money market equilibrium, $m^d = m^s$:

$$d + r = -\lambda i + p \tag{10}$$

- Under a fixed exchange rate, $\dot{s} = 0$ and $i = i^*$ (UIP condition). Re-express (10):

$$d + r = -\lambda i^* + p$$

- If the government runs a fiscal deficit and the Central Bank monetise it $\rightarrow$ the money supply increases ($d \uparrow$).
- Since i^* is exogenous (and constant), the local price should increase ($p \uparrow$) (assume for now r is fixed). Given the PPP ($p = s + p^*$), there will be a currency depreciation. Then,

$$\uparrow d + r = -\lambda i^* + \uparrow s + p^*$$

First Generation Models of BOP Crises

[•] ***But*** to prevent the currency from depreciating, the Central Bank intervenes and looses reserves.

$$\uparrow d + \downarrow r = -\lambda i^* + \bar{s} + p^*$$

[•] The intervention is successful when the rate of fall of foreign reserves, $\dot{r}$ is equal to the rate of expansion of domestic credit, $\dot{d}$ which is $\dot{r} = \dot{d}$.

[•] Eventually, the Central Bank runs out of reserves and is no longer able to defend the exchange rate

$\rightarrow$ Knowing this, ***speculators attack the currency.***

[•] Let $\bar{s}$ be the fixed exchange rate, then

$$\bar{s} = d + r - p^* + \lambda i^*$$

Since $d \uparrow$, but p^* and i^* are fixed exogenously, r needs to $\downarrow$ to keep $\bar{s}$ constant.

[•]CB intervention can't be successful in the long run, as CB runs out of reserves.

$\rightarrow$ Inconsistency between fiscal and exchange rate policies.

$$\bar{s} = d + r - p^* + \lambda i^* \tag{11}$$

- Let assume that domestic credit grows at a positive constant rate γ, for example in order to finance increasing government expenditure:

$$\dot{d} = \gamma$$

- The only way to keep $\bar{s}$ constant in the face of an increasing d is to adjust international reserves, namely the economy runs a balance-of-payments deficit and the stock of reserves decreases at the same rate at which domestic credit increases, since from Eq-(6) we have:

$$\dot{r} = -\dot{d} = -\gamma \tag{12}$$

First Generation Models of BOP Crises

Let us consider the equation-(12)

$$\dot{r} = -\dot{d} = -\gamma$$

Integrating both sides we obtain

$$\int \dot{r} d_t = A - \int \gamma d_t$$

where A is an arbitrary integration constant. Thus we have

$$r = A - \gamma$$

where A turns out to equal r_0; given that $r = r_0$ for $t = 0$.

$$r = r_0 - \gamma t$$

First Generation Models of BOP Crises

- From Eqs -(6) and (12)

$$r = r_0 - \gamma t \tag{13}$$
$$d = d_0 + \gamma t \tag{14}$$
$$m^s = r + d = r_0 + d_0 \tag{15}$$

where r_0 is the given initial stock of reserves. Hence the stock of reserves will fall to zero at time

$$t = \frac{r_0}{\gamma}$$

- When the stock of reserves is exhausted, these happen
  - the fixed exchange rate collapses
  - the exchange rate is left free to float.

Shadow Exchange Rate

- To find the collapse time, Flood and Garber(1984) introduce the notion of *shadow exchange rate*, which is the exchange rate that balances the money market following an attack in which foreign exchange reserves are exhausted.
- Shadow exchange rate $\tilde{s}$: exchange rate upon the exhaustion of reserves:

$$\tilde{s} = d - p^* + \lambda i^* + \lambda \dot{\tilde{s}}$$

- Again γ is the depreciation after the attack ($\dot{\tilde{s}} = \gamma$). Replace γ into the above equation and differentiate wrt time,

$$\dot{\tilde{s}} = \dot{d}$$

- Then, the depreciation rate just after the attack should be equal to the rate of expansion of domestic credit: $\gamma = \dot{\tilde{s}} = \dot{d}$.

Speculative Attack and Timing of the Attack

- Speculators can run the attack at any point in time, but
  - if the fixed rate is higher than the shadow rate, the attack is unprofitable.
  - if the fixed rate is below than the shadow rate, the attack is profitable.
- If the attack is unprofitable, then the shadow rate must approach the fixed rate and eventually exceed it.
- Once the shadow rate equals the fixed rate, the attack is launched.
- During the attack, there will be a discrete drop in reserves as the CB tries to defend the peg, which will imply a drop in the money supply

$$\Delta m^s = \Delta r$$

- The money demand drops by

$$\Delta m^d = -\lambda\gamma$$

as the domestic interest rate jumps by γ (UIP holds)

Timing of the Attack con't

- Then, the money market equilibrium implies that

$$\Delta r = -\lambda\gamma$$

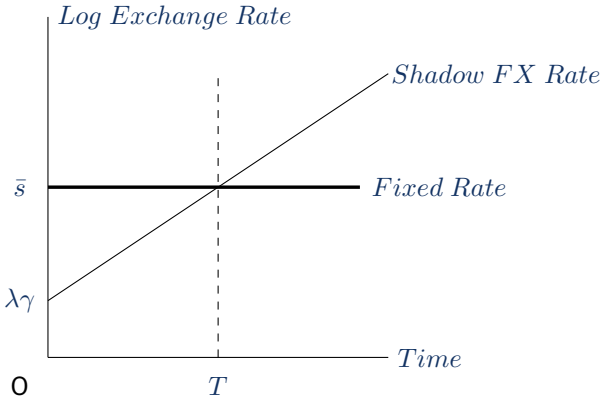
- Define r_0 the stock of reserve at an initial period and T the period of the attack.
- The level of reserves at the instant before the attack is $r_0 - \gamma T$. Then,

$$r_0 - \gamma T = -\Delta r$$

- The timing of the attack is

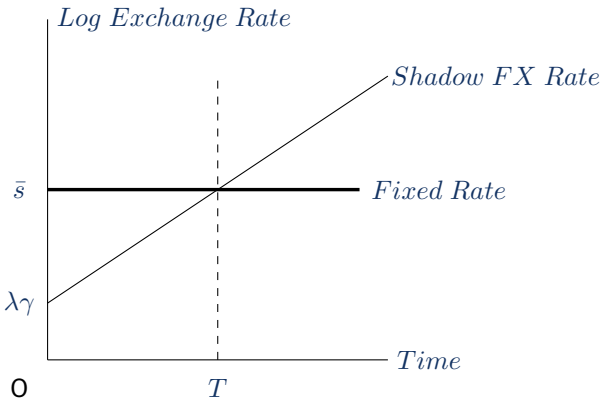
$$T = \frac{r_0 - \lambda\gamma}{\gamma}$$

Timing of the Attack



$$T = \frac{r_0 - \lambda\gamma}{\gamma}$$

Timing of the Attack



The timing of the attack is

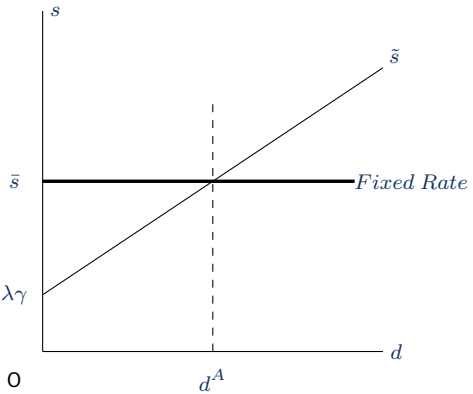
$$T = \frac{r_0 - \lambda\gamma}{\gamma}$$

Hence

[$-$] the higher the initial reserves, the longer it takes for the attack to happen.

[$-$] the lower the rate of domestic credit, the longer it takes for the attack to happen.

Timing of the Attack



- When the stock of reserves is exhausted,the fixed exchange rate collapses and the exchange rate is left free to float.
- However, the exchange rate collapses *before* this time, because there will be a final speculative attack that extinguishes any remaining stock of reserves. This is the collapse time.
- Suppose that d is smaller than d^A. If speculators attack at such a level of d then speculators will experience a capital loss. There will be no attack, therefore, when $d < d^A$.
- Suppose instead that speculators wait until $d > d^A$. Now $\tilde{s} > \bar{s}$, meaning that there is a capital gain to speculators for every unit of reserves purchased from the government. Speculators can foresee that capital gain and will compete against each other for the profit. The way they compete is to get a jump on each other and attack earlier.

- Such competition continues until the attack is driven back in time to the point where $d = d^A$. It follows that a foreseen attack must take place when $\tilde{s} = \bar{s}$. Exchange-rate jumps are ruled out by speculative competition.

First Generation Models of BOP Crises

- In this model, attacks always happen as a result from the inconsistency between fiscal and ER policies.
  - if solve fiscal problem, there will be no attack.
- The crisis is a deterministic event and intervention will always fail.
- There is a unique timing for the speculative attack.
- Signalling effects of intervention are ruled out as agents know that monetary policy is ultimately unsustainable.
- Empirical tests of this model:
  - Latin American countries 1970/1980:
  - Mexico 1973-1982 (Blanco and Garber 1986): probability of devaluations jump before major devaluations.
  - Argentina 1978-1981. (Cumby and Wijnbergen 1989): estimate probability of collapse of a crawling peg and show that depends on fiscal policy.

Empirical Limitations

- Crises are hard to predict based on macroeconomic variables
  - Early models predict that fiscal deficits, rising debt levels, and/or falling reserves should precede crises. But some crises are not preceded by obvious macroeconomic imbalances (EMS 1992; East Asia 1997-98).
  - Bad news about prospective deficits can trigger a currency crisis: If agents expect an increase in government spending, a currency crisis can actually occur before the government starts printing money (Burniside, Eichenbaum, and Rebelo, 2001)

Theoretical Limitations

- Assumptions about government behaviour
  - While investors are optimising agents, the government follows an exogenously given mechanical rule.
  - Government policy is unresponsive to macroeconomic conditions or investor actions

Second Generation Models of BOP Crises

- Speculative attack might be successful even when the fiscal policy is consistent with the level of the ER that it is pegged.
- However, the government might have the *temptation* of devalue the currency in order to pursue a more expansionary domestic policy.
- The fact that speculators know about the government's *temptation* to devalue might trigger the devaluation.
- Thus, speculative attacks might be self-fulfilling.
- The possibility of multiple equilibrium could be view as a coordination problem.

Second Generation Models of BOP Crises

→ Explicitly model the government's decision on whether to defend the currency:

1. Policymakers have reasons to defend the fixed ER (e.g. financial stability).
2. Policymakers have reasons to give up the fixed ER (e.g. use independent monetary policy, boost exports through devaluation).
3. The cost of maintaining a fixed ER increases if a devaluation is expected.

→ 1. and 2. imply that there is a trade-off for policymakers: there are costs and benefits of maintaining the exchange rate. 3. implies that investors can determine where the policymaker is positioned in this tradeoff.

Second Generation Models of BOP Crises

- There is **multiple equllibria**: currency crises can be self-fulfilling.
- Multiplicity arises because government policy changes in response to market sentiment, which in turns depends on beliefs about government policy.
- The timing of the attack. -and whether it will occur- cannot be determined, as it is no longer unique.
- Speculation against the currency can create conditions that make a devaluation more likely.
  - Fixed exchange rates that could be sustained in the absence of a speculative attack can succumb to adverse market sentiment.
- However, fundamentals are not irrelevant, as they determine the range of possible equilibria.

Setup

- Exchange rate fixed at 1 peso=1 dollar
- Players
  1. Central Bank: Commits a certain amount of reserves R to defend the currency peg.
  2. Two speculators hold 6 pesos each.
- Two possible actions: hold the pesos or sell them to the Central Bank.
- If they sell them, they get dollars. There is a cost of 1 peso to sell to the Central Bank.
- If the Central Bank runs out of reserves, it will have to devalue: the exchange rate will jump to 1.5 pesos per dollar.
- So speculators gain if they sell their pesos to the Central Bank and the Central Bank then devalues.

Good Fundamentals

- Assume $R = 20 > 6 + 6$
- The Central Bank has enough reserves to sell to both speculators

Speculator 1 \ Speculator 2	$Hold$	$Sell$
$Hold$	$(0, 0)$	$(0, -1)$
$Sell$	$(-1, 0)$	$(-1, -1)$

- The fixed exchange rate will be maintained, irrespective of what speculators do
- If one speculator sells his 6 pesos to the Central Bank, he will pay a cost of 1 peso and gain nothing, as the exchange rate will not change
- If both speculators sell their 12 pesos to the Central Bank, they will pay a cost of 1 peso each and gain nothing, as the exchange rate will not change

Good Fundamentals

- Assume $R = 20 > 6 + 6$
- The Central Bank has enough reserves to sell to both speculators
- The fixed exchange rate will be maintained, irrespective of what speculators do
- In equilibrium, no speculator wants to sell his pesos
- **Unique Nash equilibrium:** no run, no devaluation

Speculator 1 \ Speculator 2	$Hold$	$Sell$
$Hold$	$(0, 0)$	$(0, -1)$
$Sell$	$(-1, 0)$	$(-1, -1)$

Bad Fundamentals

- Assume $R = 6$: One speculator is enough to make the CB run out reserves and devalue.
- If both speculators run at the same time, they will get 3 dollars each.

Speculator 1 \ Speculator 2	$Hold$	$Sell$
$Hold$	$(0, 0)$	$(0, 2)$
$Sell$	$(2, 0)$	$(0.5, 0.5)$

- If one speculator sells his 6 pesos, he will pay a cost of 1 peso and get 6 dollars, which after the devaluation are worth 9 pesos: net gain=2.
- If both speculators sell their pesos, they will pay a cost of 1 peso each and get 3 dollars each, which after the devaluation are worth 4.5 pesos, net gain=0.5 each.

Bad Fundamentals

- Assume $R = 6$: One speculator is enough to make the CB run out reserves and devalue.
- In equilibrium, both speculators want to sell their pesos.
- **Unique Nash equilibrium**: run, devaluation.

Speculator 1 \ Speculator 2	$Hold$	$Sell$
$Hold$	$(0, 0)$	$(0, 2)$
$Sell$	$(2, 0)$	$(0.5, 0.5)$

Intermediate Fundamentals

- Assume $R = 10$.
- One speculator is not enough to make the CB run out reserves.

Speculator 1 \ Speculator 2	$Hold$	$Sell$
$Hold$	$(0, 0)$	$(0, -1)$
$Sell$	$(-1, 0)$	$(1.5, 1.5)$

- If one speculator sells his 6 pesos, he will pay a cost of 1 peso and get nothing as the exchange rate will not depreciate.
- If both speculators run, the CB will run out of reserves and devalue.
- If both speculators sell their pesos, they will pay a cost of 1 peso each and get 5 dollars each, which after the devaluation are worth 7.5 pesos, net gain=1.5 each.

Intermediate Fundamentals

- Assume $R = 10$.
- One speculator is not enough to make the CB run out reserves.

Speculator 1 \ Speculator 2	$Hold$	$Sell$
$Hold$	$(0, 0)$	$(0, -1)$
$Sell$	$(-1, 0)$	$(1.5, 1.5)$

- If one speculator sells his 6 pesos, he will pay a cost of 1 peso and get nothing as the exchange rate will not depreciate.
- If both speculators run, the CB will run out of reserves and devalue.
- **Multiple Nash equilibria**:
  - If I expect the other speculator to run, I run: the run on the currency has a self-fulfilling element.

Second Generation Models of BOP Crises - A Simple Game

- Intermediate fundamentals make a collapse possible, but not necessary.
- Conditional on speculators not expecting a run, the Central Bank maintains the fixed exchange rate.
- Conditional on speculators expecting a run and a depreciation, the Central Banks depreciates.
  - **Multiple equilibria**: crises are self-fulfilling
- The state of fundamentals determines the existence of multiple equilibria
  - In first generation models, fundamentals are inconsistent with long run fixed exchange rate, making an attack inevitable.
  - In second generation models intermediate fundamentals are not strong enough to make an attack impossible nor so weak to make it inevitable.
  - Speculators may or may not coordinate on an attack.

The optimal response to crises depends on the underlying causes

→ If first generation models are right, then addressing the imbalances between monetary and fiscal policies would avoid the crisis.
- Reduce the fiscal deficit or let the exchange rate float.
- Countries that are hit by crises should not be bailed out by the IMF or international agencies.

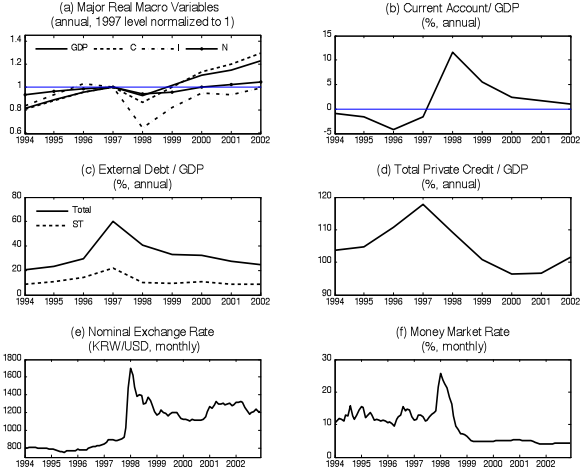
→ If second generation models are right, then addressing expectations and making it harder to attack the currency could help
- Provide emerging market countries with credible insurance against speculative attacks (e.g. central bank swap lines, etc.)
- Capital controls
- Reserve accumulation for precautionary motives

https://youtu.be/WBZnau8Px5E?t=43

Krugman (1999):

- Asian crisis 1997-1998:
  - Government budgets were in good shape in some of the countries.
  - There was not a strong case that countries needed a devaluation.
  - Stiglitz (1998): difficult to come up with any set of conventional indicators that could indicate the risk of a crisis.
- What caused the crisis?
- Two new characteristics of these crises:
  - Role of companies balance sheets in determining investment.
  - Capital flows affecting the real exchange rate.

Figure 1: Aggregate Data



Note: The data source is Korea National Statistical Office.

Characteristics of third generation models of BOP crises:

1. *Contagion:* global contagion from countries in different parts of the world. Crisis must involve multiple equilibria.

2. *Currency Account Reversal* (transfer problem): Reversal of the CA from large deficit to surplus. Parallel recession, import contraction and depreciation.

3. *Balance sheet problems:* firms were indebted in foreign currency. Depreciation created balance sheet effects. Further decline with contraction of local demand and increase in interest rate.

Setup- Open economy

- Production: a single good with $y_t = K_t^{\alpha} L_t^{1-\alpha}$. Full depreciation: $K_{t+1} = I_t$
- Two types of agents: workers and capitalists.
  - Workers spend all their income. Capitalists save and invest.
- Imports: μ share of consumption and investing goods spent on imports. ($1 - \mu$ spent in domestic goods).
- Exports: X in terms of foreign goods, and p the relative price of foreign goods (RER). pX value of exports in domestic goods.

→ In equilibrium, supply (output) of the domestic good must equal its demand.

→ Thus **market clearing condition for domestic goods**:

$$y = (1-\mu)C + (1-\mu)I + pX$$

Bearing in mind that workers spend all their income (which is $C = (1-\alpha)y$ given the Cobb-Douglas production function) we can rewrite this as

$$y = (1-\mu)(1-\alpha)y + (1-\mu)I + pX \tag{16}$$

which gives the real exchange rate as

$$p = \frac{y_t[1-(1-\alpha)(1-\mu)] - (1-\mu)I_t}{X} \tag{17}$$

→ **Investment**:

- As regards the determination of investment, Krugman observes that the ability of entrepreneurs to invest may be limited by their borrowing ability and, more specifically, that lenders impose a limit on leverage, so that entrepreneurs can borrow at most λ times their wealth. Simply, financial frictions such that entrepreneurs only borrow a fraction of their wealth:

$$I_t \leq (1+\lambda)W_t \tag{18}$$

→ where **entrepreneurs' wealth** is defined as

$$W_t = \alpha y_t - D_t - p_t F_t \tag{19}$$

where entrepreneurs can borrow/lend in local currency D and foreign currency F:

- The constraint-(18) need not be binding: if it is true that entrepreneurs always invest all their wealth, it is not necessarily true that they decide to borrow up to the maximum. In fact, investment decisions are taken by comparing the real return on domestic investment r with the real return on investment abroad, r^*.
- A way of doing this is to compare r^* with the return obtained by converting foreign into domestic goods at time t at price p_t; then converting the result obtained in period $t+1$ back into foreign goods at price $p_t + 1$; namely

$$(1 + r_t)(p_t/p_{t+1}) \geq 1 + r_t^* \tag{20}$$

  which expresses the statement that the return on domestic investment must be at least as large as the return on foreign investment (perfect capital mobility).

- Finally, there is the assumption that investment cannot be negative

$$I_t \geq 0$$

→ Financial Crisis

- **Crisis**: a decline in capital inflows can adversely affect the balance sheet of entrepreneurs, reducing their ability to borrow and further reducing capital inflows.

$$p = \frac{y_t[1-(1-\alpha)(1-\mu)] - (1-\mu)I_t}{X} \tag{21}$$

$$W_t = \alpha y_t - D_t - p_t F_t \tag{22}$$

$$I_t \leq (1+\lambda)W_t \tag{23}$$

According to this model, a decline in capital inflows may cause a crisis because it affects the real exchange rate [Eq.(21)] and consequently, the balance sheet of domestic entrepreneurs [Eq.(22)]. This reduces the ability of domestic entrepreneurs to borrow and hence to invest [Eq. (23)], further reducing capital inflows, and so forth.

Third Generation Models of BOP Crises

- First, define the relationship between investment and wealth of entrepreneurs.

$$\frac{dW}{dI} = \frac{dW}{dp}\frac{dp}{dI} = \frac{(1-\mu)F}{X} \tag{24}$$

- We now define the **financeable** level of investment (I^f) as the level of investment that would occur if the leverage constraint (Eq-(22)) were binding, namely

$$I^f = (1+\lambda)W \tag{25}$$

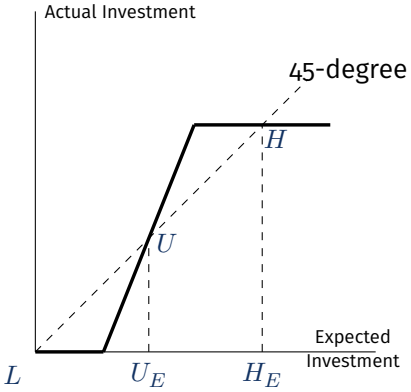
$$\frac{dI^f}{dI} = \frac{dI^f}{dW}\frac{dW}{dI} = \frac{(1+\lambda)(1-\mu)F}{X} \tag{26}$$

- If $\frac{dI^f}{dI} < 1$, investment would be constrained, but there would not be a crisis.

- If $\frac{dI^f}{dI} > 1$, there could be multiple equilibria, if the lender loses confidence to validate the financial collapse.

$\rightarrow$ Financial Crisis ($\frac{dI^f}{dI} > 1$)

- There are three equilibrium points in this model. The two extreme points L and H are stable, while the intermediate point U is unstable, for if lenders become slightly more optimistic or pessimistic.
- At the low level equilibrium L; lenders do not believe that entrepreneurs have any collateral and hence do not offer funds; this implies a depreciated real exchange rate which in turn means that entrepreneurs are actually bankrupt.
- At the high-level equilibrium H; investment takes place so as to equalise the domestic and foreign rate of return.
- The stable equilibrium points are *locally stable but globally unstable.*
- Take for example H: a wave of pessimism causes a cumulative motion towards L.



Role of expectations:

Thus we have an explanation of the crisis: if, for whatever reason, lenders become suddenly pessimistic, the result is a collapse from H to L: This does not mean that previous investments were unsound, because the true problem is financial fragility.

$\rightarrow$ **Asian crisis**

- Something caused agents to become pessimistic about expected investment.
- This reduced financeable investment and led the economy to the low equilibrium.
- Collapse doesn't indicate that previous investment was unsound. The cause is financial fragility.

$$\frac{dI^f}{dI} = \frac{(1+\lambda)(1-\mu)F}{X} \tag{27}$$

$\rightarrow$ **Three factors can make the financial collapse possible:**

1. High leverage (high λ).
2. Low marginal propensity to import (low μ).
3. large foreign currency debt relative to exports (large F/X).

$\rightarrow$ Asian countries had high leverage and foreign currency borrowing.

→ **Dilemma of Stabilisation**

- Should we keep the exchange rate (p) fixed at any cost?
- If p is constant, output will become

$$y = \frac{pX + (1-\mu)I}{1-(1-\alpha)(1-\mu)}$$

- Since a share of output α goes to profits, a decline in output lowers entrepreneurs' wealth

$$\frac{dW}{dI} = \frac{\alpha(1-\mu)}{1-(1-\alpha)(1-\mu)}$$

- and there is a feedback to financeable investment

$$\frac{dI_f}{dI} = \frac{(1+\lambda)\alpha(1-\mu)}{1-(1-\alpha)(1-\mu)}$$

- Stabilising the exchange rate can lead to a financial collapse. If leverage is high, the economy might stabilise its RER only at the expense of reinforcing the drop in output.

→ Policy Recommendations

- How can prevent the crisis?
  - Need to discourage foreign currency borrowing because it is the interaction of expectations with the real exchange rate and therefore foreign debt that causes the problem.
- How should we deal with the crisis?
  - stabilising exchange rate does not necessarily improve things.
  - need loans to entrepreneurs to continue, but these could be large.

Summary of Models of BOP Crises

→ **First Generation BOP Crises** First generation models were applied to currency crises in developing countries (e.g., Mexico 1973–1982,Argentina 1978–1981),where the cause of the crisis could indeed be shown to be an overly expansionary domestic policy. (Mexico 1973–1982, Argentina 1978–1981)
→ **Second Generation BOP Crises** This models introduce nonlinearities and the reaction of government policies to changes in private behaviour. For example, rather than given targets (the fixed exchange rate, the expansion of the domestic economy) the government faces a trade-off between the various targets (the exchange rate, employment, etc.). More generally, the commitment to the fixed exchange rate is state dependent rather than state invariant as in first generation models, so that the government can always exercise an escape clause, that is, devalue, revalue, or float. (Europe in the early 1990s and Mexico 1994)
→ **Third Generation BOP Crises** Third-generation models, in fact, emphasise the links between banking crises and currency crises (the twin crises), but these links are not clear. The chain of causation might, in fact, run either way. (Asian crisis that broke out in the late 1990s)