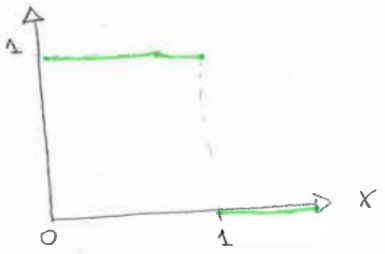

x = nr of investors having one unit of capital $\Rightarrow X$ = fund available or nr of investors

$S > 1$: Return on safe asset

$R(x) = \frac{R + R^* x}{}$: Return on the risky investment

a) $R(x) > S$ even when $x = 0 \Rightarrow \underline{R > S}$

b) $R(x) < S \Rightarrow$ investing in the asset is the unique equ. Even if everyone invests in the project, the return S dominates.

$\underline{R + R^* < S}$

c) $\underline{R} < S < \underline{R + R^*}$

(1) Many identical investors, the symmetric equilibria are:

- Everyone invests in the project : $X = 1$

$$\underline{R} + R^* > S$$

- Everyone invests in the safe asset : $X = 0$

$$\underline{R} < S$$

(2) Just one investor, no coordination problem : $X = 1$ since $R > S$.

d) Two periods:

$t = 1$: $R = 1$ in case of liquidation and $S = 1$ [indifference]

$t = 2$: $S > 1$

At the end of period 1, change in investors's mind can lead to bad equilibria since they are afraid nobody will refinance the project $\Rightarrow$ project is liquidated and resources re-invested in safe asset. This resembles a sudden stop.

EXERCISE 1 : LIQUIDITY CRISIS

$F \begin{cases} d = \text{foreign borrowing at } t=0 \\ b = \text{foreign borrowing at } t=1 \end{cases}$

L = Liquidation of long-term investment

r = Liquidation value [gross return and price] [otherwise R]

L^S/L^+ = max level of liquidation (when commitment to repay all foreign debt as part of K).

K = Amount invested in the domestic illiquid asset [long-term technology ⇒ if you need your money back you have to liquidate the capit. but you get less]

Condition for liquidity crisis triggered by a sudden stop in $t=1$, i.e. $b=0$ (foreigners stop lending) when bank can commit to repay two-period debt only; i.e. Depositors are repaid on first come, first served basis but F always repaid.

$R(K-L) \geq d \Rightarrow L^S = K - d^*/R$

$Z^S = C_1^* - rL^S \overset{!}{=} C_1^* - r(K - d^*/R) > 0$: condition for sudden stop ⇒ Liquidity crisis

BOTH FOREIGN AND DOMESTIC INVESTORS PANIC.

= Also investors abroad panic ($b^*=0$) and therefore serves the withdrawal requests by liquidating only

$R(K-L) \geq F \Rightarrow L^+ = K - F/R$

$Z^+ = C_1^* - (b^* - rL^+) > 0$: condition for domestic bank run ⇒ Liquidity crisis. Bank serves withdrawal requests C_1^* by borrowing $b^* = F - d^*$ and liquidating rL^+

(VS) FOREIGN DON'T PANIC ≠ DOMESTIC PANIC

(VS) SHORT-TERM DEBT

= Request from impatient investors [C_1^*] higher than serving capacity. Measure of bank illiquidity.

$Z^D = C_1^* + d^* - rK^* > 0$: condition for debt-bank run ⇒ Liquidity crisis. It makes a difference if debt is short-term.

$\boxed{Z^D > Z^S > Z^+}$:

- Run is more likely if foreign investors don't lend
- Short-term debt increases vulnerability b/c countries can refuse to roll over debt

a) Condition for a bank run triggered by a sudden stop given the beliefs on defaulting on d:

If investors think the bank is defaulting on the debt, then they may refuse to roll it over (depositors individually run): $d^* = 0 \Rightarrow$ Eqm condition for sudden stop : $Z^S = C_1^* - rL^S = C_1^* - rK^* + rd^*/R$ (rL^S)

$Z^S = C_1^* - rK^* + rd^*/R > 0$; I "eliminate" a positive term, so more difficult to expect crisis

Bank can more easily face sudden stops → Run eqm could be not possible → impatient consumers won't withdraw b/c run would fail → It could be in bank's interest to make believe (d) will be liquidated.

b) Now the depositors are uncertain regarding the bank: they don't know whether it will liquidate (d) or not. If depositors believe that the bank won't liquidate (d), they also believe there will be a run ⇒ They want to withdraw deposits. Therefore, there may be a run even if the bank did want to liquidate.

Then, why the bank doesn't say that (d) will be liquidated? If the bank does so, it won't get any lending at time $t=0$. Thus, at $t=0$ it has to promise that all the debt will be repaid, and only when a sudden stop occurs, the bank declares that also the past debt (d) will be liquidated. Liquidate = not paying back

EXERCISE 2: ! Eqm achieved by a change in the real exchange rate which clears the mkt for goods/services.

Fixed Exchange rate ⇒ output depends on investment demand.

a) Rearranging the equation for the exchange rate that clears the market:

$$y_t = \frac{\bar{p}x + (1-\mu) I_t}{1-(1-\mu)(1-\alpha)}$$

↑ Real exchange rate that clears the mkt

: Lower investment leads to output contraction. } output depends on investment demand.

! OUTPUT IS SUPPLY-DRIVEN

$$Y = (1-\mu)(1-\alpha)Y + (1-\mu) I + pX$$

$$P_t = \frac{1}{x}\left[1-(1-\mu)(1-\alpha)\right] Y_t - \frac{1}{x}(1-\mu) I_t$$

$$x P_t = \left[1-(1-\mu)(1-\alpha)\right] y_t - (1-\mu) I_t$$

$$y_t = \frac{P_t x + (1-\mu) I_t}{\left[1-(1-\mu)(1-\alpha)\right]}$$

b) $$\frac{\partial I_t^f}{\partial I_t} = \frac{\partial I_t^f}{\partial w_t} \cdot \frac{\partial w_t}{\partial y_t} \cdot \frac{\partial y_t}{\partial I_t} = (1+\lambda)\,\alpha\,\frac{(1-\mu)}{1-(1-\mu)(1-\alpha)} \;(>1)$$

(λ: given; α: given)

I_t^f = max amount that can be financed when constraint is binding.

multiple equilibria

Defending the real exchange rate closes one channel for financial collapse but opens another one: A decline in I_t and output leads to a decrease of wealth.

High leverage → output contraction is self-reinforcing through:

- its effect on firms' balance sheet
- and then their access to credit

c) $\alpha = 0.4$ and $\mu = 0.2$? λ | self-fulfilling balance sheet crisis is possible

$$\frac{\partial I_t^f}{\partial I_t} (>1) \Rightarrow (1+\lambda)(0.4)\frac{0.8}{1-0.8\cdot 0.6} > 1 \Rightarrow \lambda \cdot 0.615 > 1 - 0.615 \Rightarrow \lambda = \frac{0.385}{0.615} = 0.626$$

(>1) → Slope of 45°-line

EXERCISE 3:

P_t = flexible exchange rate

y_t = supply-determined output

$W_t = \alpha y_t - D_t - P_t \bar{F}_t$: net wealth of firms: value of assets – domestic determined debt – foreign currency determined debt

$I_t^p \leq (1+\lambda) W_t$: IT DEPENDS ON FIRMS' QUALITY OF BALANCE SHEET

a) ? P_t

Labor income $(1-\alpha) y_t$: consumed

capital income αy_t : invested

$(1-\mu)$ = share consumption/investment on domestic goods

X = Exports.

Eqm in the mkt for good/services implies: $y_t = (1-\mu)(1-\alpha) y_t + (1-\mu) I_t + P_t X$

$$\Rightarrow P_t = \left[1 - (1-\mu)(1-\alpha)\right] \frac{Y_t}{X} - \frac{(1-\mu)}{X} I_t$$

The impact of investment on the real exchange rate is negative and equal to $-\frac{(1-\mu)}{X}$. Higher investment leads to a real depreciation.

b) $$\frac{\partial I_t^p}{\partial I_t} = \frac{\partial I_t^p}{\partial W_t} \cdot \frac{\partial W_t}{\partial P_t} \cdot \frac{\partial P_t}{\partial I_t} = (1+\lambda)(-\bar{F}_t)\left(-\frac{(1-\mu)}{X}\right) = (1+\lambda)\frac{\bar{F}_t}{X}(1-\mu)$$

The condition for multiple equilibria is: $\frac{\partial I_t^p}{\partial I_t} = (1+\lambda)\frac{F_t}{X}(1-\mu) > 1$

c) $\mu = 0.2$ $F_t/X = 0.8$? λ | self-fulfilling balance sheet

$$\frac{\partial I_t^p}{\partial I_t} = (1+\lambda)\frac{F_t}{X}(1-\mu) = (1+\lambda)(0.8)(1-0.2) > 1 \Rightarrow \lambda > 0.5625$$

To prevent a crisis, the govt should impose limits on foreign currency borrowing, or forbid firms (and banks) from having debt (of any maturity) denominated in foreign currencies. See slide 20 of Lect. 11.