7. Financial Integration, Financial Development, and Global Imbalances

This Chapter is based on:

We discuss a simplified version in the context of our simple 2-period model.

Recall: Global Imbalances (Chapter 1)
- Why are savings rates so much higher in emerging markets?
- Why has capital flowed to the US from emerging markets?
- Why don’t they invest more in their own country?

→ MQR suggest a theory based on different degrees of financial development

It is also a good opportunity to learn a bit of asset pricing theory...
Observe

- Financial liberalization progressed in both OECD and emerging economies
- The gap between the 2 groups of countries has not changed
- The decline of the US CA (and NFA) began roughly at the same time as the financial globalization process.
Fig. 3.—Net foreign asset positions in debt instruments and risky assets. A, NFA in debt and international reserves. B, NFA in portfolio equity and FDI. Data from Lane and Milesi-Ferretti (2007). Solid line = United States; dashed line = OECD countries except United States; dotted line = emerging economies. See Appendix A.

Observe: with increasing financial globalization

- US holds more risky assets and less riskless assets
- the opposite holds for emerging markets.
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The Model.

- 2 periods
- 2 (big) countries
- 1 complete financial markets (USA): Arrow-Debreu securities trades
- 1 incomplete financial markets (China): only risk-free bonds traded
- notice: these are extreme cases approximating a less extreme reality
- endowment economy
- but idiosyncratic risk
- endowment in period 1: $w_1$ for all
- endowment in period 2 is state-contingent: $w_2(s)$ in state $s$

- no aggregate risk and no growth and thus

$$\sum w_1^i = \sum w_2^i$$ (1)
Agents maximize:

\[ V = U(c_1) + E\beta U(c_2) \]  \hspace{1cm} (2)

- with \( U' > 0, \ U'' < 0, \ U''' > 0 \)
- \( E \) is the expectation operator
- \( \beta \) is the discount rate for future utility \((0 < \beta < 1)\).

Case 1: Autarky and Complete Markets (CM)

- agents can completely insure against idiosyncratic risk
- they trade state-contingent claims (Arrow-Debreu securities)
- a security of state of nature \( s \) pays 1 unit if state \( s \) occurs and zero in all other states

For an introduction to AD securities, see Obstfeld and Rogoff (1995), Foundations of International Economics, Chapter 5.1
Period 1 budget constraint:

\[ w_1 = c_1 + \sum_s q(s)B(s) \]  

(3)

where

- \( B(s) \) are holdings of claims contingent on state \( s \)
- notice: if \( B(s) < 0 \), the agent sells the claim
- \( q(s) \) price of the security

Period 2 budget constraint:

\[ w_2(s) + B(s) = c_2(s) \]  

(4)

for any state \( s \). Probability that state \( s \) occurs: \( \pi(s) \).
Insert the budget constraints in the utility function:

\[ V = U \left[ w_1 - \sum_s q(s)B(s) \right] + \beta \sum_s \pi(s)U \left[ w_2(s) + B(s) \right] \]

FOC for utility maximization: For any \( B(s) \):

\[ -q(s)U'(c_1) + \beta \pi(s)U'(c_2(s)) = 0 \]

Providing the Euler equation:

\[ U'(c_1) = \frac{\beta \pi(s)}{q(s)} U'(c_2(s)) \quad (5) \]

Observe:

- \( \beta \pi(s)/q(s) \) is the same for any agent
- implying that all agents consume the same ratio \( c_2/c_1(s) \equiv \phi \) (despite their idiosyncratic risk)
- perfect risk-sharing
Market clearing requires:

\[
\sum_i c^i_1 = \sum w^i_1 \\
\sum_i c^i_2(s) = \sum w^i_2(s)
\]

And thus

\[
\sum_i c^i_1 = \sum_i c^i_2(s) \implies \sum_i c^i_1 = \phi \sum_i c^i_1
\]

Implying \( \phi = 1 \) such that all individuals consume the same in any period and for any state \( s \) or \( s' \):

\[
c_1 = c_2(s) = c_2(s') \quad (6)
\]

Conclude:

- complete consumption smoothing
- full insurance.
In a complete market there are also risk-less bonds
- they pay off 1 unit regardless of the state of nature
- thus price of a bond \( q = \frac{1}{1+r} \)

No-arbitrage: the price of buying the complete portfolio of Arrow-Debreu securities is the same as the price of bonds:

\[
q = \frac{1}{1 + r} = \sum_s q(s) \tag{7}
\]

Actuarially fair prices: From the Euler equation follows:

\[
\frac{\beta \pi(s)}{q(s)} U'(c_2(s)) = \frac{\beta \pi(s')}{q(s')} U'(c_2(s')) \Rightarrow \frac{\pi(s) U'(c_2(s))}{\pi(s') U'(c_2(s'))} = \frac{q(s)}{q(s')}
\]

and since \( c_2(s) = c_2(s') \):

\[
\frac{\pi(s)}{\pi(s')} = \frac{q(s)}{q(s')} \tag{8}
\]
Combining, (7) and (8), we have

\[ \sum_s q(s) = \frac{1}{1 + r} = \sum_s \pi(s) = \frac{1}{1 + r} \sum_s \left( \frac{\pi(s') q(s)}{q(s')} \right) = \frac{1}{1 + r} \pi(s') \sum_s q(s) \]

providing the price of the security:

\[ q(s') = \frac{\pi(s')}{1 + r} \quad \text{(9)} \]

for any \( s' \). Inserting this information in the Euler equation:

\[ U'(c_1) = \beta (1 + r) U'(c_2(s)) \quad \text{(10)} \]

for any state. Since \( c_1 = c_2 \) this implies

\[ \beta (1 + r) = 1 \quad \text{(11)} \]
Case 2: Autarky and Incomplete Markets (IM)

- only risk-free bonds are traded
- no complete insurance possible
- period 1 budget constraint: \( w_1 = c_1 + B \)
- period 2 budget constraint: \( w_2(s) + (1 + r)B = c_2(s) \)

Insert budget constraints into utility function (2):

\[
V = U(w_1 - B) + \beta E [U(w_2(s) + (1 + r)B)]
\]  \hspace{1cm} (12)

FOC:

\[
U'(c_1) = \beta (1 + r) E [U'(c_2(s))]
\]  \hspace{1cm} (13)

Observe:

- the expectation operator \((E)\) does not disappear
- uncertainty prevails.
With incomplete markets:

\[ \beta (1 + r) < 1 \]  

(14)

We proof this by contradiction. Assume \[ \beta (1 + r) \geq 1 \]. Then:

\[ U'(c_1) \geq E [U'(c_2(s))] > U' [E(c_2(s))] \Rightarrow c_1 < E(c_2). \]  

(15)

Which cannot be true for all agents. It would imply that period 2 aggregate consumption is larger than period 1 consumption, which cannot be true since there is no growth.

Recall: the inequality condition on the RHS of (15) invokes Jensen’s inequality.
Summary: in Autarky with complete markets

- $\beta(1 + r^{CM}) = 1$
- $c_1 = c_2(s)$ at all states
- full insurance perfect consumption smoothing

In Autarky with incomplete markets

- $\beta(1 + r^{IM}) < 1$
- $c_2(s)$ is idiosyncratic
- additional precautionary savings by risk averse agents

Conclude: $r^{CM} > r^{IM}$

Next: Financial market integration:

- capital flows from IM to CM until $r^*$ prevails
- $r^{CM} > r^* > r^{IM}$
Suppose, US is CM-economy. The model predicts:

- capital flows from emerging markets to the US
- NIIP of US declines
- reason: precautionary savings of agents from emerging markets in terms of US bonds
- the US interest rate declines. Recall from Chapter 4 (global savings glut):
Extension: Composition of Capital Flows: Debt vs. FDI

The theory explains that with financial globalization
- the NIIP of the US improves in terms of FDI and deteriorates in terms of debt
- and why it is the opposite for emerging markets.

Extension of the model with production:
- each country has a unit supply of internationally immobile asset (like e.g. land)
- traded at price $p_t$ in period $t$
- the asset ($k$) can be used by any agent to produce a homogenous good with one period lag:

$$y_{t+1} = z_{t+1} k_t^\nu, \quad \nu < 1$$

(16)

- productivity $z_{t+1}$ is random
- we call producing with $k$ investment (and later FDI).
Everything as before. In particular
- there is no aggregate uncertainty
- only idiosyncratic risk (each agent has his own production function $y_{t+1}$)

1. Autarky: Complete Markets:

New budget constraints:

\[ w_1 = c_1 + \sum_s q(s)B(s) + p_1 k \]
\[ w_s(s) + B(s) + z_2 k' + p_2 k = c_2(s) \]

Insert the budget constraints in the utility function:

\[
V = U \left[w_1 - \sum_s q(s)B(s) - p_1 k\right] + \beta E \left[\sum_s \pi(s)U \left[w_2(s) + B(s) + z_2 k' + p_2 k_t\right]\right]
\]
1. FOC for utility maximization wrt $B(s)$:

$$-q(s)U'(c_1) + \beta \pi(s) U'(c_2(s)) = 0 \quad \Rightarrow \quad U'(c_1) = \beta (1 + r) U'(c_2(s))$$

as before.

2. FOC for utility maximization wrt $k_t$:

$$-p_1 U'(c_1) + \beta E \left[ U'(c_2(s)) \left( p_2 + \nu z_2 k^{\nu - 1} \right) \right] = 0 \quad \Rightarrow \quad U'(c_1) = \beta E \left[ R_2(k, z_2) \right] U'(c_2(s))$$

with expected gross return on investment

$$ER_2(k, z_2) \equiv E \frac{\nu z_2 k^{\nu - 1} + p_2}{p_1}$$

Conclude:

- $c_1 = c_2(s)$ for all $s$ as before
- $\beta (1 + r) = 1$ as before
- and by combining both FOCs: $E(R_2(k, z_2)) = 1 + r$
This means:

- there is complete insurance of investors through A-D securities
- they expect return \(1 + r\)
- there is no risk premium for investing in equity
- no precautionary savings

2. Autarky: Incomplete Markets:

- period 1 budget constraint: \(w_1 = c_1 + B + p_1 k\)
- period 2 budget constraint: \(w_2(s) + (1 + r)B + p_2 k + z_2 k' = c_2(s)\)

Insert budget constraints into utility function (2):

\[
V = U(w_1 - B - p_1 k) + \beta E [U(w_2(s) + (1 + r)B + p_2 k + z_2 k')] 
\]

FOCs:

\[
U'(c_1) = \beta (1 + r) E [U'(c_2(s))] 
\]

\[
U'(c_1) = \beta E \left[ R_2(k, z_2) U'(c_2(s)) \right] 
\]
Conclude:

- state-dependent consumption
- no complete insurance
- investors demand a risk premium

To see this explicitly, combine the FOCs:

\[(1 + r)E[U'(c_2(s))] = E[R_2(k, z_2)U'(c_2(s))]\] (19)

And recall calculus with expectations: \(E(xy) = ExEy + \text{cov}(x, y)\). Thus:

\[E[R_2(k, z_2)U'(c_2(s))] = ER_2(k, z_2)EU'(c_2(s)) + \text{cov}[R_2(k, z_2), U'(c_2(s))]\]

Using this condition (19) becomes a condition for the risk premium:

\[ER_2(k, z_2) - (1 + r) = -\frac{\text{cov}[R_2(k, z_2), U'(c_2(s))]}{EU'(c_2(s))}\] (20)
Observe:

- solution of complete markets only for $\text{cov} = 0$
- generally, (equity-) risk premium $ER_2(k, z_2) - (1 + r)$
- $R_2 > (1 + r)$ in incomplete markets

To understand the equity premium, recall $U'(c)$ is high when $U(c)$ is low i.e. when $c$ is low
- it is likely the positive/negative shocks on productivity $z$ and income $s$ appear together
- $-\text{cov}$ is thus positive (and large when shocks are highly correlated)
- shocks are particularly severe for developing countries: weather, commodity prices,...
Next: Financial Market Integration

- as before, capital flows from IM to CM as long as $r^{CM} > r^{IM}$
- world market interest rate $r^*$ for the risk-less asset

- in the CM-economy $R_2(k^{CM}, z_2) = 1 + r^*$
- in the IM-economy $R_2(k^{IM}, z_2) > 1 + r^*$ before opening up
- implying $k^{CM} > k^{IM}$
- after opening, equity capital (FDI) flows from CM to IM until returns are equalized
- Why? IM-citizen are ensured against risk.
Conclude: after financial market integration

- country CM (the US) has a negative NIIP but a positive position in equity (FDI)
- the average return of country CM’s assets is larger than the average return of its liabilities (recall the NIIP-NII paradox from Chapter 1).