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FINANCIAL INTEGRATION AND CRISES
2021

Lecture 7

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Sovereign Debt Crises

- Debt solvency/sustainability
  - Debt sustainability analysis
  - Determinants of debt solvency/sustainability
- Solvency versus Liquidity Crises
  - Fundamentals vs. Expectations
- The Developing Country Debt Crisis of the 1980s
  - Bad policies and external shocks

References: Corsetti (2018); Wyplosz (2011); Blanchard (2019);

SUW (2019) Ch.15, Reinhart-Rogoff (2009), Reinhart et al. (2015).

Debt Crises

Debt crises

Crises can be due to **repayment difficulties** and/or **lack of credit,** possibly leading to **default**, long negotiations with creditors, **debt restructuring**.

Debt crises can be of

- **Solvency**, say, a violation of the Intertemporal Budget Constraint.
- **Liquidity** if rolling over maturing debt becomes impossible because of investors' 'lack of confidence' or panic.

Both solvency and liquidity features are present in contemporary debt crises while repayment difficulties (balance of payment crises) are a better description of the crises of the 1970s-1980s

Debt Solvency/Sustainabilty

Start from debt sustainability analysis

Usual assumptions: Net Current, Capital Transfers and Labor Income = 0

Focus on External Debt instead of Net Foreign Liabilities; i.e. leave aside Equities and FDI that help finance trade deficits but reduce investment income (a good assumption/approximation until the late 1990s).

External Debt dynamics

$$D_t^d = (1 + i_t^d) D_{t-1}^d - TB_t^d \qquad (1)$$

where D_t^d is net external debt in foreign currency, eg in dollars, and i_t^d is the **cost of debt service**, i.e. the average interest payment per unit of debt (which is a function of past interest rates depending on debt maturity).

TB_t^d is either the trade surplus or the primary budget surplus in case equation (1) shows the dynamics of **public debt.**

Expressing everything in dollars is consistent with the fact that emerging and developing countries did not issue local currency debt until the 2000s.

Accumulation of Net External Debt

To have the **evolution of net debt in terms of GDP**, divide eq. (1) by the nominal GDP evaluated in foreign currency $P_t Y_t / S_t$ where S_t is the nominal exchange rate; ie the price of 1 dollar in domestic currency:

$$\frac{S_t D_t^d}{P_t Y_t} = \frac{S_t(1+i_t^d) P_{t-1} Y_{t-1}}{P_t Y_t S_{t-1}} \frac{S_{t-1} D_{t-1}^d}{P_{t-1} Y_{t-1}} - \frac{S_t TB_t^d}{P_t Y_t} \qquad (2)$$

Defining the debt and the trade balance relative to GDP in small letters, d_t and Tb_t, the debt-to-GDP ratio evolves as

- $$d_t = (1 + R_t) d_{t-1} - Tb_t \qquad (3)$$

where

- $$1 + R_t \equiv \frac{(1+i_t^d)(1+e_t)}{(1+\pi_t)\,(1+g_t)} \qquad (4)$$

It can be argued that Exports instead of GDP is the relevant base for repayment capacity

is the **accumulation factor** that increases with the interest rate and the rate of nominal depreciation $e_t = \Delta S_t / S_{t-1}$ and decreases with the growth rate of nominal GDP: $(1 + \pi_t)(1 + g_t) = (1 + g_t^N)$

Rate of return greater than growth rate

- **Consider the standard case the rate of accumulation is positive**

$$R_t \equiv \frac{(1+i_t^d)(1+e_t)}{(1+\pi_t)\,(1+g_t)} - 1 > 0 \qquad (5)$$

This amounts to assume **the real rate of return is greater than GDP growth**

- Recall the Uncovered Interest Rate Parity $(1 + i_t{}') = (1 + i_t^{d\prime})(1 + Ee_t)$ where $i_t{}'$ is the interest rate on domestic currency bonds (different from the average nominal rate of return i_t) and note that:
  - $Ee_t \to e_t$ on average with rational expectations (over a long horizon the currency denomination does not matter)
  - the real return is $1 + r_t = (1 + i_t)/(1 + \pi_t)$
- Then, R_t is approximately the "**growth-adjusted real rate of return**"

$$R_t \cong \frac{r_t - g_t}{(1+g_t)} \cong r_t - g_t > 0 \qquad (6)$$

Solvency

Assume a constant positive growth-adjusted real rate of return, $R > 0$

- The economy lasts forever and the debt-GDP ratio, d_t, evolves as:
  - $d_t = (1 + R)d_{t-1} - Tb_t$ (7)
- Iterating eq. (7) forward and taking the limit as $T \to \infty$
  - $d_0 = \frac{Tb_1}{(1+R)} + \frac{Tb_2}{(1+R)^2} \ldots . + \frac{Tb_\infty}{(1+R)^\infty} + \lim_{T\to\infty} \frac{d_T}{(1+R)^T}$ (8)

The solvency/sustainabilty condition is the No Ponzi Game Condition

- $\lim_{T\to\infty} \frac{1}{(1+R)^T} d_T \leq 0$ with variable R_t $\lim_{T\to\infty} \frac{1}{\prod_{j=1}^{T}(1+R_j)} d_T \leq 0$
- The debt-GDP ratio must grow at a rate lower than the growth-adjusted rate of return; i.e. the debt must grow at a rate lower than its real rate of return, because no rational investor would finance an insolvent government that borrows to pay the interests on debt.
- **Trade/budget surpluses, $Tb_t > 0$, must be run in future periods**

Feasible Ponzi Games

Suppose (future) growth-adjusted rates of return are negative:

- $R_{t+j} \cong r_{t+j} - g_{t+j} \cong i_{t+j} - g^N_{t+j} < 0$
- Then, the accumulation factors, $1 + R_{t+j}$, would be less than 1, and even if the government finances interest payments with other debt, i.e. it plays a Ponzi Game, so that
- $d_{t+T} = \prod_{j=1}^{T}(1 + R_{t+j})d_t$ (9)

  the debt-GDP ratio, d_{t+T}, would tend to 0.
- **Ponzi Games would be feasible,** the country could refinance debt and interest payments by issuing new debt, **if future rates of return were lower than the growth rate of the economy (most of the time).**

$g^N_t \cong \pi_t + g_t \equiv$ nominal growth rate

When growth is greater than the interest rate

Is solvency still a concern?

- Interest rates lower than GDP growth were considered an anomaly until 10 years ago.
- Emerging economies have high growth rates but often borrow at high interest rate including a country-risk premium or default premium
- However, low interest rates have been observed for a long time in the US and in other advanced economies (Germany, Switzerland) and may remain below the growth rate in the future.
- **Blanchard (AER 2019)** points out that the debt is not as bad as usually thought; it can provide an opportunity for, say, more public investment.

Note that **future interest rates must remain below the growth rate** for Ponzi games. The debt ratio depends on uncertain interest rates that may turn out to be greater than the growth rate in the future.

Assessing sustainability is impossible

With $R_{t+j} > 0$ the No-Ponzi game condition (and Transversality condition) imply the **Intertemporal Budget Constraint**

- $$d_t = \frac{Tb_{t+1}}{(1+R)} + \frac{Tb_{t+2}}{(1+R)^2} + \frac{Tb_{t+3}}{(1+R)^3} \ldots . + \frac{Tb_{\infty}}{(1+R)^{\infty}} \qquad (10)$$

Debt sustainability depends on

- the country's ability to run trade/budget surpluses in the future and thus on investment-generating growth, export capacity, saving, fiscal austerity;
- future growth and future interest rates (borrowing costs);
- the initial level of debt (and its maturity, denomination, etc.)

Debt sustainability is a forward looking concept that cannot be tested as it depends on future variables, shocks and policy reaction to future conditions.

Any rule/procedure to assess debt sustainability is pointless.

- For **Wyplosz (2011)** it is a 'Mission Impossible': "Dealing with sustainability requires passing judgment on events that have not happened yet, that cover a long horizon and that are largely unpredictable."

An error correction mechanism

Bohn (QJE 1998, JME 2007) shows that a positive reaction of the budget/ trade balance to the debt ratio is a sufficient condition for No Ponzi Games.

Consider the simple policy reaction

- $Tb_t = \rho(1 + R_t)d_{t-1}$ with $\rho > 0$ (11)

that substituted for Tb_t in the equation $d_t = (1 + R_t)d_{t-1} - Tb_t$ yields

- $d_t = (1 + R_t)(1 - \rho)d_{t-1}$ (12)

If this policy is maintained over time the debt grows at a rate lower than R_t, which, together with a bound on debt, is sufficient for sustainability.

What is crucial for sustainability is not whether a policy rule is currently being followed but whether such rule will be implemented in the future.

Estimation of policy reactions can at most test whether policy was sustainable in the past (or show the need for a future policy change).

The IMF-WB approach

IMF and WB Debt Sustainability Analysis (DSA)

- The IMF and WB rely on projections of the debt ratio based on the debt accumulation eq. (3). The evolution of the debt is simulated for a baseline scenario of the relevant macro variables, and stress-tests are carried out for shocks to such variables.
- The debt is deemed sustainable if it is projected to remain below a given debt threshold that differs across countries depending on the quality of their policies and institutions (as assessed by the WB with the CPIA exercise).

Debt thresholds are arbitrary - Wyplosz (2011), **Corsetti (2018)**

- Although debt cannot grow without bound (debt service cannot exceed GDP), **we cannot identify a level of debt beyond which a default takes place** because it would depend on many other economic conditions and, in the end, on the amount of resources that can be collected to service the debt which **depends on economic costs and social/political acceptability**.

Debt stabilization

A more pragmatic approach is to look for debt stabilization

We can find conditions to stop an increasing debt-to-GDP ratio and, eventually, set it on a downward sustainable trend.

- The trade/budget surplus, Tb_t^* needed to stabilize the debt-GDP ratio is obtained by setting $\Delta d_t = 0$ in eq. (3):

$$Tb_t^* = \frac{i_t^d - g_t^N}{1+g_t^N} d_{t-1} + \frac{e_t(1+i_t^d)}{1+g_t^N} d_{t-1} \qquad (13)$$

- The stabilizing surplus, Tb_t^*, points out the needed correction/adjustment.
- As the (fiscal) adjustment may have a negative impact on growth, g_t^N, stabilizing the debt is difficult.

Note that even a stable debt can be vulnerable to shocks:

- A permanent fall in GDP growth may set the debt on an unsustainable path;
- Foreign currency debt is exposed to exchange rate depreciatian;
- The impact of higher interest rates depends on debt maturity; frequent refinancing of short-term debt exposes to changes in market interest rates.

Confidence crises

Investors' expectations also play a crucial role for debt sustainability

- Debt sustainability depends on investors' willingness to hold/buy debt and thus on their assessment of the IBC.
- A debt crisis may break up because of investors' lack of confidence in the country's ability to generate future surpluses.
- **A confidence crisis can be self-fulfilling**: As investors fear an incoming crisis, they stop lending and liquidate their assets which triggers the crisis thus validating the initial pessimistic expectations.
- If investors ask for higher interest rates, this becomes a main transmission channel for a debt crisis as higher rates increase the debt burden and reduce growth which imply greater stabilization costs - Calvo (1988).

Note that the instability of expectations is favored by the uncertainty surrounding the variables and policy actions that determine the IBC.

Liquidity crises

In a liquidity crisis investors refuse to refinance the debt (and high interest rates cannot help) **because each investor fears that the other creditors will stop lending and liquidate the debt as in a bank run;**

- It is rational for a single investor to stop lending and liquidate the debt if she expects that the other creditors will do the same.
- A **run on debt** may take place as a run on deposits in a bank panic. Liquidity crises can be viewed as the result of a coordination failure among many dispersed investors.

Two important conditions for a liquidity crisis are that

- The debt must be held by many dispersed private creditors difficult to coordinate (as in the crises of the 1990s 2000s)
- The amount of debt to be rolled over must be substantial, as it occurs with a short and unbalanced maturity structure and marketable debt instruments (bills and bonds as opposed to loans).

Solvency and Liquidity/Confidence Crises

- We would like to distinguish between:
  - **Solvency crises** due to fundamentals
  - **Liquidity/confidence crises** due to expectations

  but both fundamentals and expectations usually play a role.
- Crises due to fundamentals and bad policies however exist:
  - **The debt crises in low-income countries;**
  - **The debt crises of the1980s.**

In both cases, expectations matter little as **foreign capital comes from loans provided by few coordinated lenders:**

- Governments and International organizations (MDB, WB, IMF)
- Bank's Syndicates; ie groups of investment banks making a loan jointly

The debt crisis of the 1980s

The debt crises of the 1970s -1980s were crises of solvency

- The most famous occurred in the 1980s starting with Mexico in1982 and involving many countries in Latin America, SSA, Central-Eastern Europe.
- Trade and government deficits accumulated because of fiscal profligacy, low investment in the export sector, high private consumption, overvalued real exchange rate, etc.
- Crises materialized because of **repayment difficulties** by Governments that called for 'moratoria' and renegotiations.

The Mexico 1982 Crisis

External and internal factors are at the origin of the large debt accumulation

- Easy access to foreign credit at low interest rates in the 1970s was facilited by the large surpluses of oil-producing countries intermediated by US banks;
- Financial deregulation allowed domestic banks to borrow internationally (often under State guarantees) and invest in risky projects;
- Foreign capital mainly financed Government deficits and consumption (fueled by oil discoveries and expectations of sustained high growth) instead of productive investment in the tradable sector needed to generate trade surpluses and service the debt.
- Fixed exchange-rate policy and inflation led to real appreciation and current account deficits;

The Mexican default was rooted into bad policies/fundamentals and was triggered by a change in external conditions: a rise in US interest rate and a contraction in world demand.

The rise in world interest rates

Default became inevitable when the US interest rate reached 19% in 1981 to fight inflation under the Volcker administration of the Fed.

- The rise in US interest rates led to a dramatic increase in debt service costs, because **73% of the Mexican debt was at floating interest rates** (65% on average in Latin America).

Country	Percent of Debt at floating rate	Interest Payment to Exports ratio (%)
Argentina	58	15
Brazil	64	28
Colombia	39	16
Chile	58	28
Mexico	73	19
All Latin America	65	28

- The devaluation of the peso against the dollar in February 1982 did not stop the loss of reserves and contributed to repayment difficulties by increasing the burden of dollar denominated debt (see later).

Trade contraction and default

- Net exports had little benefit from exchange rate depreciation as US monetary tightening led to a world recession and contraction of world trade.
- The dramatic fall in the price of oil and other commodities caused a significant **deterioration in the terms of trade** of debtor countries.
- **In August 1982 Mexico announced that it could no longer service its debt,** and declared a moratorium of 90 days while asking for debt renegotiation.
- Mexico was followed suit by Argentina, Brazil….

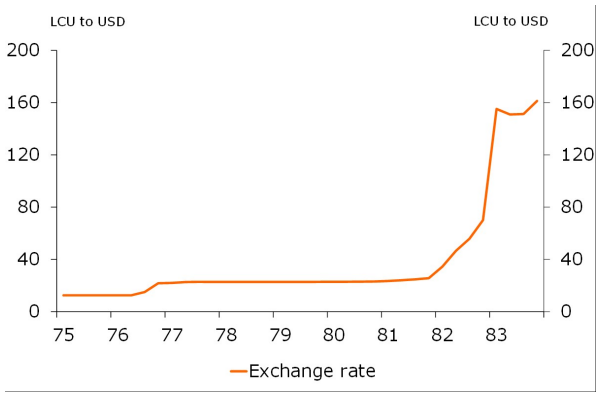
Currency depreciation increases the debt burden

The currency depreciation increased the debt burden because of the negative valuation effect on the dollar denominated debt:

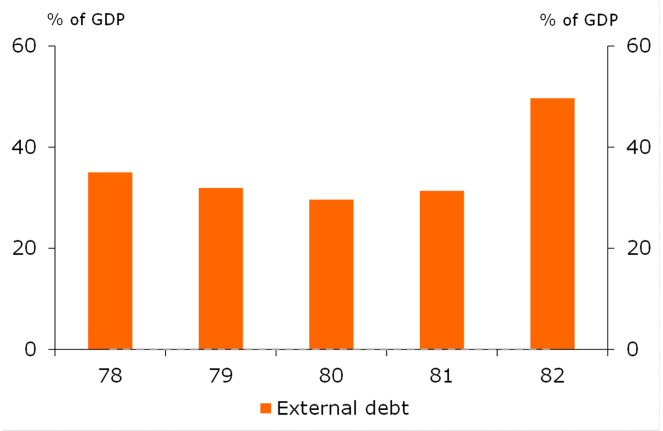
Valuation effect $= e_t(1 + i_t^d)d_{t-1}$

- $\Delta d_t = \frac{i_t^d - g_t^N}{1+g_t^N} d_{t-1} + \frac{e_t(1+i_t^d)}{1+g_t^N} d_{t-1} - Tb_t$

Exchange rate depreciation



External debt-to-GDP ratio



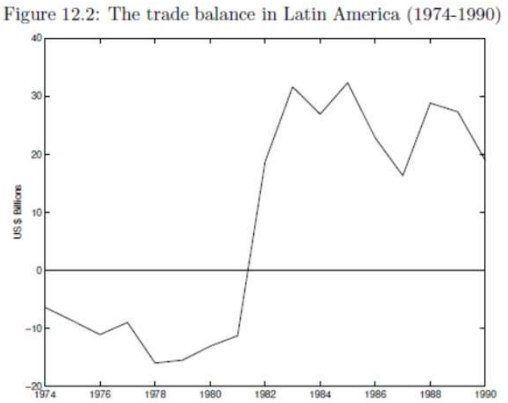
Currency depreciation increases the debt burden

Debt crises usually come with an increase in the debt-to-GDP ratio despite the stop in foreign lending* and the reversal of the trade balance.

Debt relative to GDP

	1980	1982	1985
Argentina	.48	.84	.84
Brazil	.31	.36	.49
Mexico	.30	.53	.55

Latin America
Trade Balance to GDP



* Yearly lending to developing countries fell from 38 billion dollars in 1981 to 3 billion dollars in 1983.

Why do countries borrow in foreign currency?

Countries borrow in foreign currencies, even though such debt exposes to the risk of large valuation losses, because its expected cost is lower

- The cost of borrowing in domestic currency, i_t (known at t-1) is
  - $(1 + i_t) = (1 + i_t^d)(1 + E^L e_t)(1 + p_t)$ (1)

  depends on lenders' expectations, E^L, of exchange-rate depreciation, e_t, and a pure exchange-rate risk premium and/or liquidity premium, p_t.
- The ***expected*** (local-currency) cost of borrowing in foreign currency is
  - $(1 + i_t^d)(1 + E^B e_t)$ (2)

  and depends on the borrower's expectations, E^B, of depreciation, e_t.
- **The expected cost differential** (1) – (2)
  - $(1 + i_t) - (1 + i_t^d)(1 + E^B e_t) \cong [E^L e_t - E^B e_t + p_t]\,(1 + i_t^d)$

  is positive because either $E^L e_t > E^B e_t$ or $p_t > 0$.

Two explanations for foreign currency debt

The expected cost of domestic currency debt, i_t, is greater for

- $(1 + i_t) - (1 + i_t^d)(1 + E^B e_t) \cong [E^L e_t - E^B e_t + p_t]\left(1 + i_t^d\right) > 0$

Two reasons

1. **Original Sin hypothesis. Eichengreen-Hausmann-Panizza (2002)** argue that local-currency bonds are traded in thin, illiquid markets at high transaction costs, so that a high liquidity premium, $p_t > 0$, is required by lenders to hold such illiquid bonds.
2. **Jeanne (2003)** contends that lenders expect a higher exchange-rate depreciation, $E^L e_t > E^B e_t$, because they don't trust borrower's ability to maintain the exchange rate or because they fear that the borrower will depreciate the currency and inflate local-currency debt away. In fact, the borrower would have a temptation to act opportunistically and reduce the value of local-currency debt.

Unfortunately, foreign currency debt is much riskier and its costs may turn out to be much greater ex-post.