Lecture 10: Sovereign Default

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Source Material: Feenstra and Taylor, International Economics, Chapter 22

Where we've been, and where we're going

- We've studied international capital flows between countries
  - Showed that fixed exchange rates lead to reduced costs of trade, but leave a country **vulnerable to currency crises**
  - In a currency union, countries that face asymmetric shocks have considerable difficulty stabilizing output

    The key constraint is their ability to borrow in international financial markets

- Lurking in the background: specter of default
  - What happens if countries **choose not to pay their debts**
  - Mexico (1982), Argentina (2002), Greece (2012), and many more
- This week:
  - Under what circumstances might countries choose to default on their debts?
  - How does the possibility of default affect their borrowing costs ex ante?
  - What are the implications for macroeconomic stability?

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Sovereign Default

- When a country defaults on its debt, we call it a **sovereign default**
  - A government defaulting is very different from a consumer or a business defaulting
  - There is basically no recourse for creditors: in the modern era, countries don't tend to invade each other to enforce debt collection.

    Notable counterexample: France invaded and occupied Mexico in 1862 in response to a default
- Defaults are relatively common as a historical matter:
  - At least 46 defaults in Europe between 1500 and 1900.

    England in 1343 (Edward III), Spain in 1557 (Phillip II); German states, Portugal, Austria, and Greece all defaulted multiple times in the 19th century...
  - Many US states defaulted on Revolutionary War debt, before it was assumed and paid by the federal government

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Sovereign Default: Modern Era

- In recent times, developed countries haven't defaulted very often

  Eurozone crisis is a notable exception

  - Defaults have tended to occur in developing countries
  - Countries like Argentina, Brazil, Mexico, Turkey, and Venezuela have defaulted between 5 and 9 times since 1824, and at least once since 1980
  - On average, spend 30% of the time in some sort of default or partial default
  - 48 sovereign defaults from 1976 to 1989, and another 16 from 1998 to 2002

    Particularly bad cases: Russia (1998), Argentina (2002)

- Developed countries seem to be able to sustain higher levels of debt than developing countries
  - Many developed countries (like Japan) have rather high debt to GDP ratios
  - But markets do not behave as though they are a serious risk of default
  - This is an ongoing puzzle: may have to do with the fact that there are relatively few financial flows into/out of the countries other than government debt

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Why do countries default?

- When issuing debt, countries have **limited commitment**
  - Military response to nonrepayment is not viable
  - Legal response is mostly futile
  - No one can force you to repay, nor can you commit to forcing yourself in the future
- Benefits are clear: keep the money that would have been paid to creditors
- What are the costs?
  - Financial market penalties: exclusion from credit markets
    - If you default today, creditors may refuse to lend to you in the future
  - Macroeconomic costs (loss of output)
    - E.g., higher risk premiums, credit contractions, capital flight, exchange rate crises, banking crises
- Countries will repay their debts if and only if it is in their best interest
- Note: Economics is not a morality play. Our goal here is to be descriptive, not prescriptive

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Probability of Default

- We will use a one-period model to think about default
- Suppose that output Y fluctuates:
  - Y is equally likely to take any value between the minimum $\overline{Y} - V$ and the maximum $\overline{Y}$
  - V controls the **volatility of output**
  - When V is high, there is large uncertainty over output
  - When V is small, output can be predicted with greater certainty
- The government is the only borrower in the economy, and they took out a one-period loan L yesterday, with a promise to pay an interest rate r_L
- The loan is supplied competitively, by foreign creditors with access to the risk-free rate r
- **Key assumption**: The government chooses L before seeing Y

Repayment Choice

- We assume that there is some cost of defaulting

  If not, they would always default, which cannot persist in equilibrium, because then no one would ever lend

  - Some fraction of output c is lost. Total costs are cY
  - Note: these are *not payments to creditors*. It's pure deadweight loss
- Country chooses between default and repayment
  - If you repay, you consume output minus loan principal and interest: $Y - (1 + r_L)L$
  - If you default, you consume output minus the penalty cY: $Y - cY$
- Choose whichever yields higher consumption:

$$\text{Repay if } \underbrace{Y - (1 + r_L)L}_{\text{Consumption after repayment}} > \underbrace{Y - cY}_{\text{Consumption after default}}$$

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Default Region

- Countries repay if:

$$\underbrace{Y - (1 + r_L)L}_{RR} > \underbrace{Y - cY}_{NN}$$

- Solve for repayment threshold:

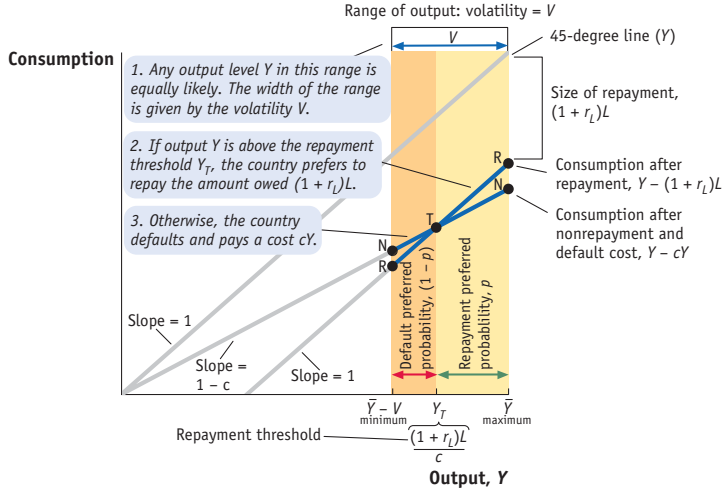
$$Y_T = \frac{(1 + r_L)L}{c}$$

- Default in terms of debt to GDP ratio

$$\frac{L}{Y} > \frac{1 + r_L}{c}$$

- Probability of repayment:

$$p = \frac{\overline{Y} - Y_T}{V}$$



Feenstra and Taylor, Fig. 22.8.

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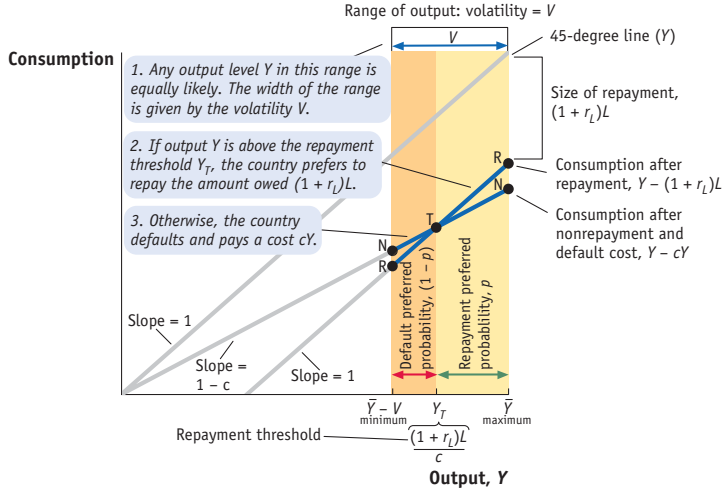

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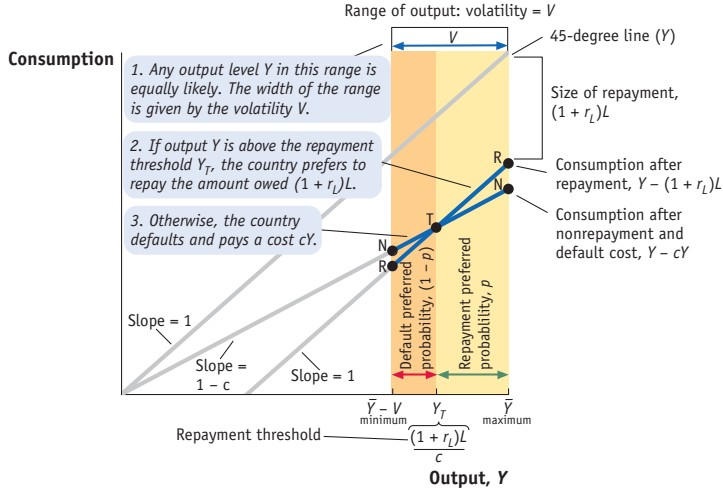

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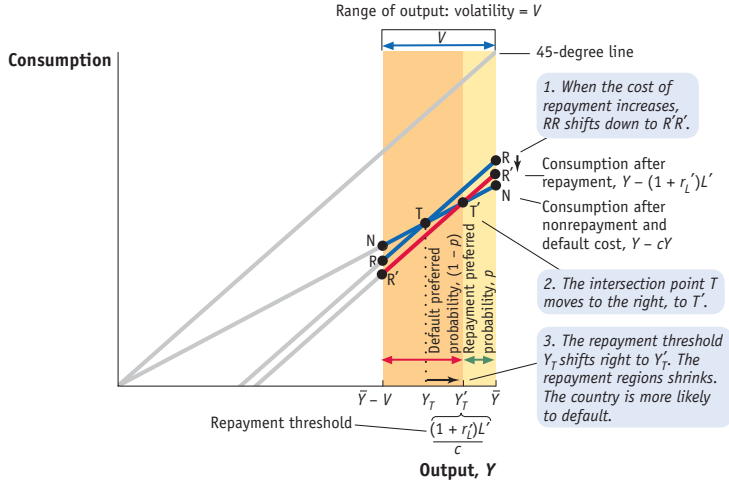
Increase in Debt Burden

- If $r_L \uparrow$ or $L \uparrow$, then consumption after repayment shifts down

$$RR = Y - (1 + r_L)L$$

- Does not change consumption after defaulting
- Moves default threshold down
- Probability of default increases
- If it increased enough, repayment region would vanish (default for sure)
- If it decreased enough, default region would vanish



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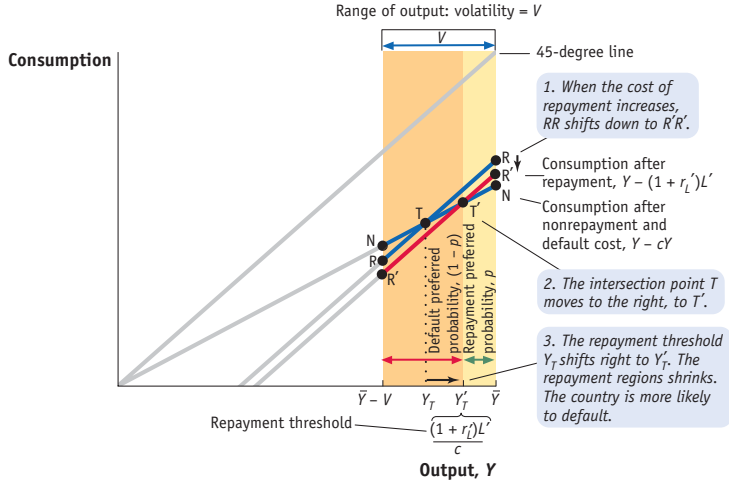

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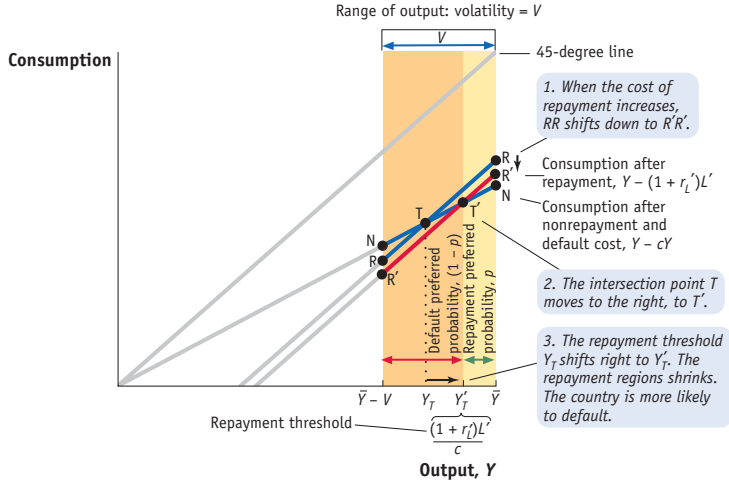

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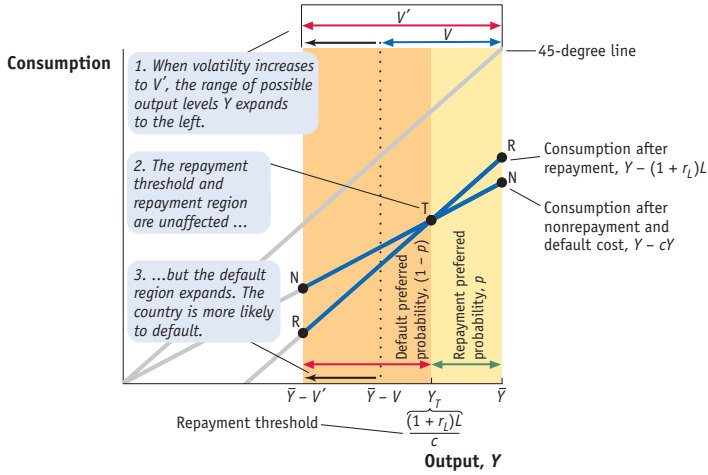
Increase in Volatility of Output

- If $V \uparrow$, then there is a wider range of possible output levels
  More ways for things to go wrong
- Weather shocks to agriculture, political instability, price fluctuations, etc...
- Does not change the default threshold
- Does increase the probability that income falls below it



Feenstra and Taylor, Fig. 22.10.

Lending Rate

- We assumed a given interest rate r_L. How is the interest rate determined?
- Since lenders are competitive, we know they need to make zero profits

$$\underbrace{p}_{\text{Repayment prob}} \times \underbrace{(1+r_L)}_{\text{Revenue if repaid}} = \underbrace{(1+r)}_{\text{Costs}} \tag{1}$$

- Lower probability of repayment compensated with higher interest rates demanded
- This is called a **risk-premium**
- Sharp implication: expected lender profits should be constant across countries

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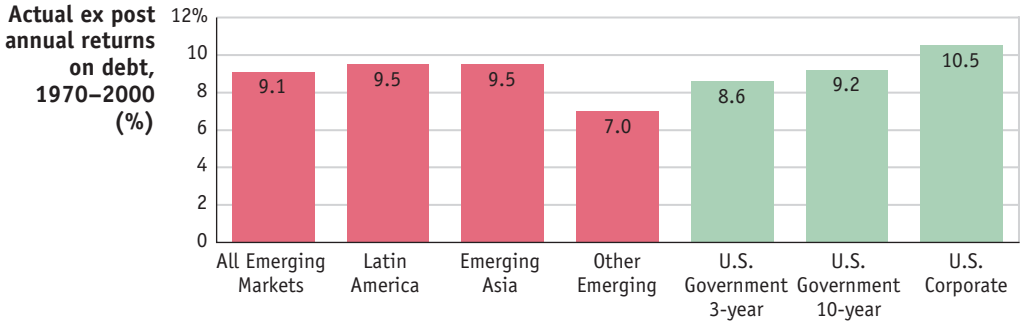
Lending Returns Across Markets



- Emerging markets tend to have much more generous contractual terms
- Much higher risk – sometimes the government defaults and you lose everything

Default Probability depends on Debt Burden

- We figured out that so long as the default threshold is between $\overline{Y} - V$ and $\overline{Y}$, the repayment probability will be

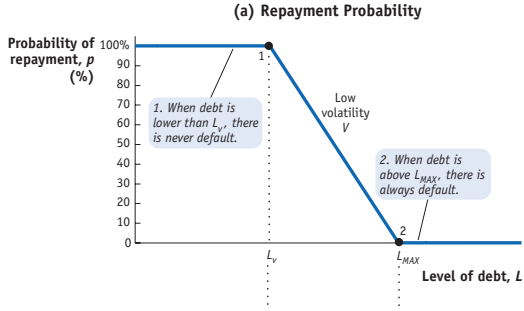
$$p = \frac{\overline{Y} - Y_T}{V} \qquad Y_T = \frac{(1 + r_L)L}{c}$$

- We re-write it as:

$$p = \max\left\{\min\left\{\frac{\overline{Y}}{V} - (1 + r_L)\left(\frac{L}{Vc}\right), 0\right\}, 1\right\}$$

The max and the min ensure that $0 \leq p \leq 1$

- Probability of repayment is decreasing in the size of the loan L



- L_V is the debt level where the country repays for sure

$$\overline{Y} = V + (1+r)\frac{L_V}{c} \implies L_V = \frac{c}{1+r}(\overline{Y} - V)$$

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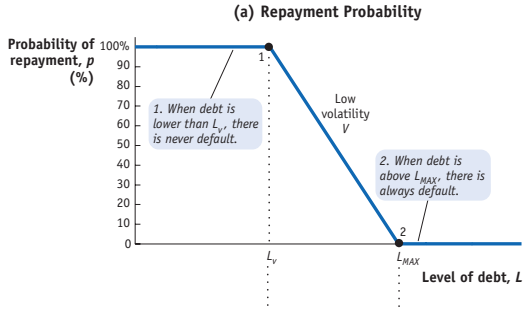

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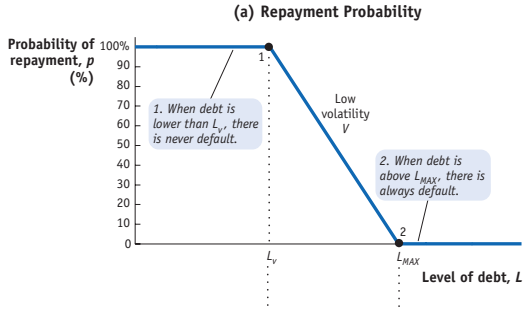

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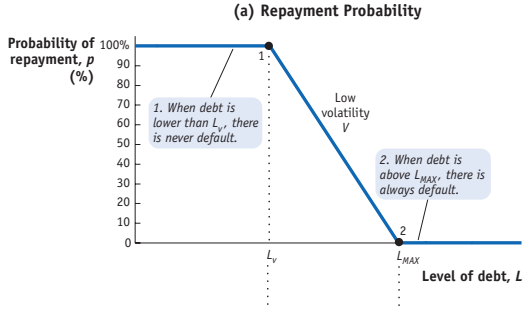

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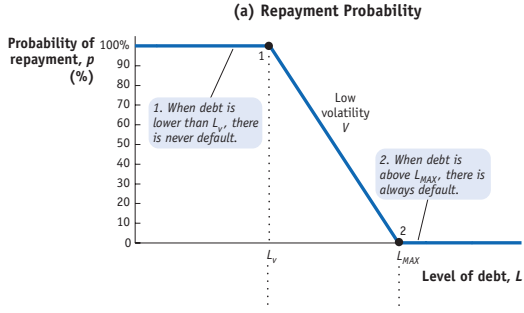

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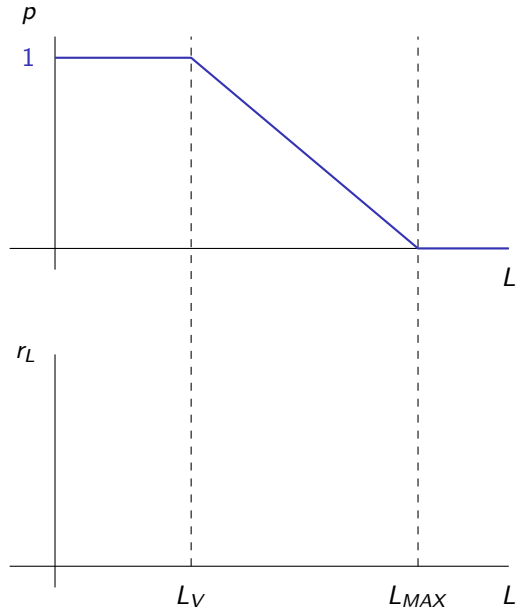
Loan Supply

- In the interior region, we use the break-even condition to solve for r_L as a function of L:

$$(1 + r_L)\frac{\overline{Y}}{V} - (1 + r_L)^2 \left(\frac{L}{Vc}\right) = (1 + r)$$

- Quadratic equation in $(1 + r_L)$
  Could solve if we needed to
- Since p is decreasing in the size of the loan, we know that the interest rate r_L is upward sloping in the level of debt L
  - Below L_V, no risk, so $r_L = r$
  - As $p \to 0$ (at L_{MAX}) the interest charged goes to infinity
  - If there's no chance of repayment, you're not willing to lend at any price



Loan Supply

- In the interior region, we use the break-even condition to solve for r_L as a function of L:

$$(1 + r_L)\frac{\overline{Y}}{V} - (1 + r_L)^2 \left(\frac{L}{Vc}\right) = (1 + r)$$

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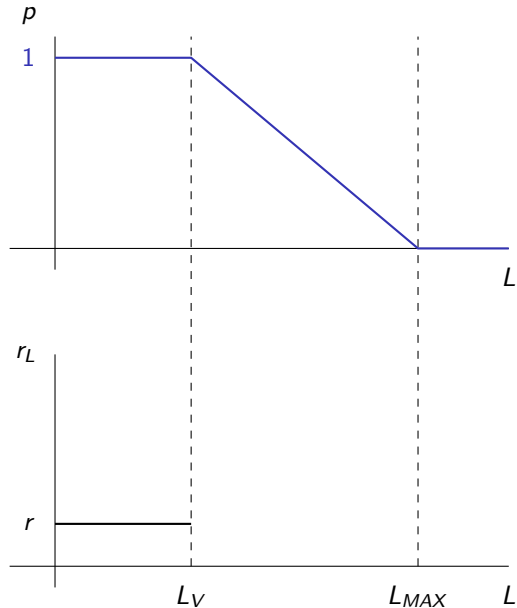

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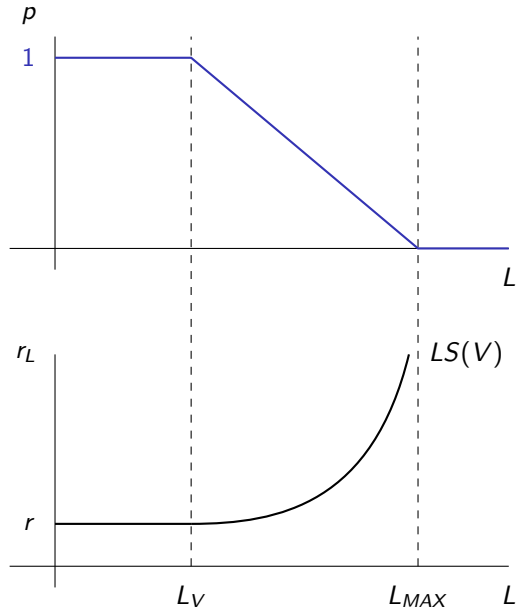

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- Formal derivation of loan demand $LD(V)$ is difficult
- Requires you to make assumption about the country's preferences, discounting rate, risk aversion, etc...
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  - Higher interest rates mean you will borrow less
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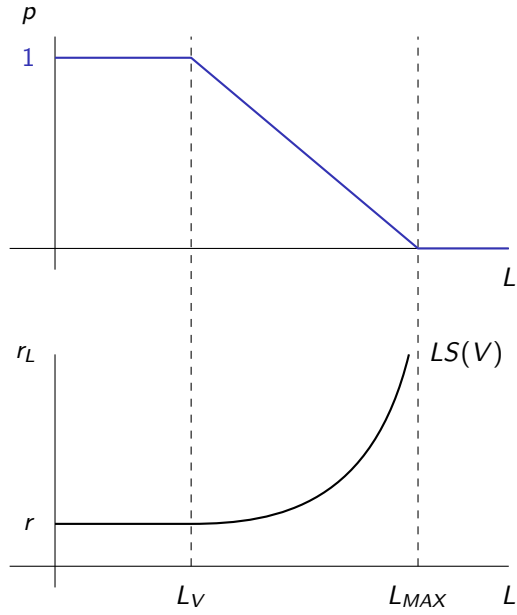
    This is true in the one-period model, but it will not be true in a richer class of models
- Equilibrium loan quantity determined by intersection of $LD(V)$ and $LS(V)$



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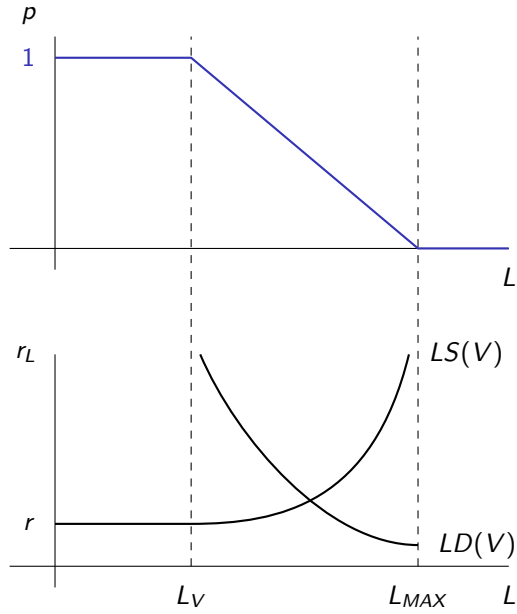

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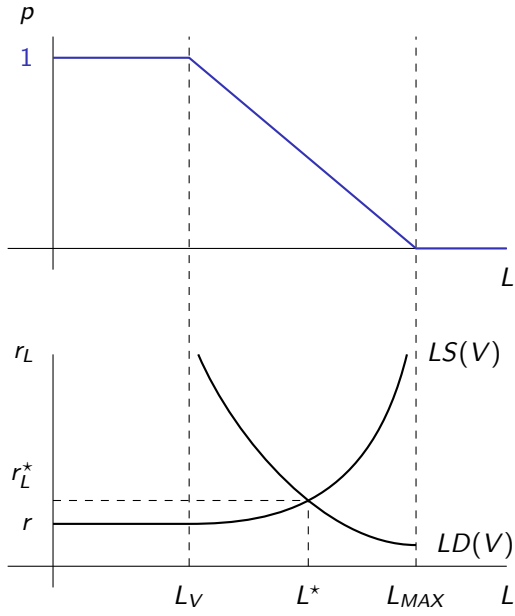

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- Repayment schedule shifts in
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- This means loan supply curve shifts in
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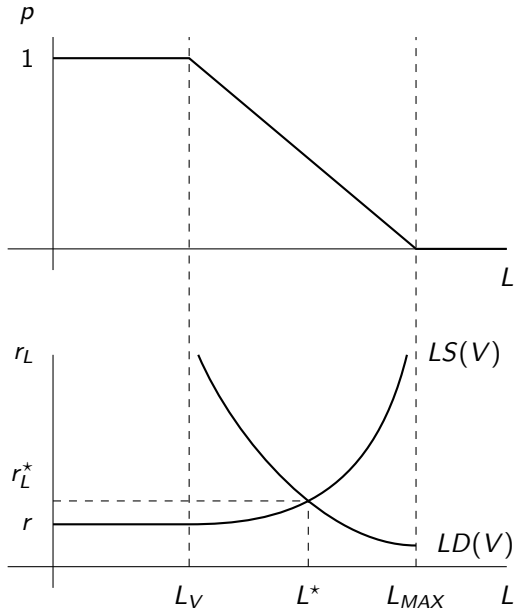
- In emerging markets, supply effect probably dominates: lower debt, higher risk-premia, higher default probabilities



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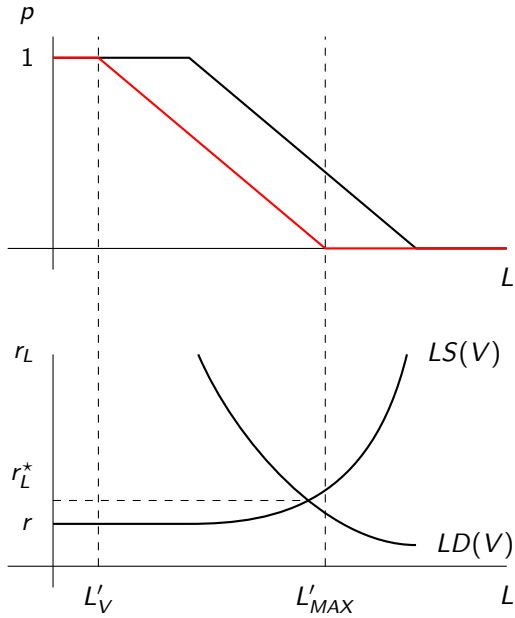

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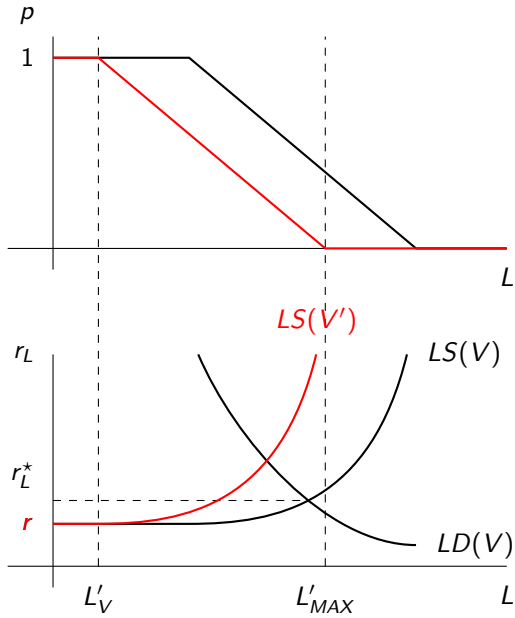

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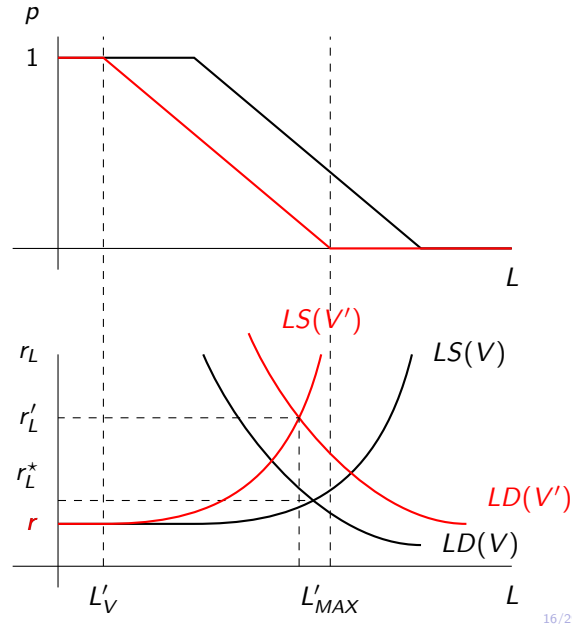

Costs of default

- We've assumed some sort of output costs involved when countries default
- We want to think more carefully about what those look like
- Two main costs:
  1. Financial Market Penalties
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Financial Market Penalties

- Defaulters are usually excluded from borrowing for a period
  - Typically at least until they negotiate a settlement with their creditors
  - De Paoli, Hoggarth, and Saporta (2006, BoE WP) found that defaulters typically were excluded from credit access for 4.5 years in the 80s, although this fell to much shorter periods in the 90s and 2000s
  - If you cannot borrow in the future, you will find it harder to smooth consumption
- Reputation Damage: downgrade in credit ratings following default leads to higher borrowing costs in the future
  - Historically, past defaulters pay higher rates on their debt
  - Cruces and Trebesch (2013) find that between 1970 and 2010, even a partial default of 22% leads to 1.2% higher spreads 4 to 7 years after the crisis
  - Recent work (Fourakis, 2021) has called into question whether default actually causes the reputation damage, or simply coincides with it
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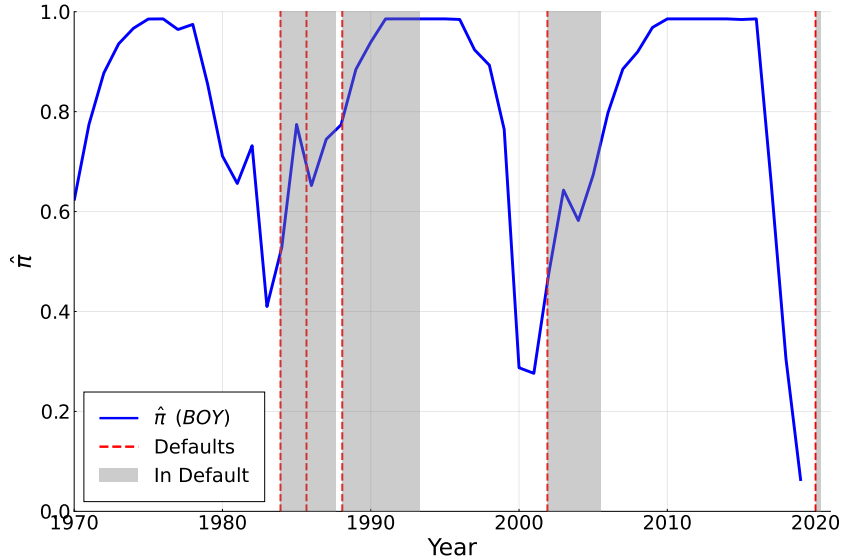
Reputation Damage Seems to Precede Default

Source: Fourakis (2021, JMP)

Figure 7: Reputation of Argentina (1970-2019)



Financial Market Penalties: Borrowing in your own currency

- We've seen how valuable it is to be able to borrow in your own currency
- Most countries who have avoided defaults in the past (like India, China, Korea, Czech Republic, Malaysia, Hungary) have been able to issue more than 70% of their debt in their own currency
- Defaulters (like Brazil, Mexico, Philippines, Chile, Venezuela) can only issue 40-70% in their domestic currency
- This means that currency fluctuations can have *big* wealth effects, and cause much larger problems in the future

Macroeconomic Costs of Default

- Direct Costs
  - Often households own government debt
  - If you default, a lot of their assets disappear
  - Decreased wealth leads to lower consumption today
- Banking Crisis
  - Banks also own a lot of government debt
  - Default wrecks their balance sheet, and they will be subject to bank runs
  - Government needs to try to bail them out, but that would require even more government borrowing (right when they are the most credit constrained)
  - If the banks survive, they'll decrease lending (to consolidate their balance sheet)
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Macroeconomic Costs of Default

- Exchange Rate Crisis
  - Default on the debt leads to capital flight
  - If you have a fixed exchange rate, leads to large economic contractions
  - Fear of future devaluation can lead to exchange rate crisis
  - Even if you have a floating exchange rate, can cause problems if household debt is denominated in foreign currency
- Exchange rate crisis can cause a banking crisis
  - If an exchange rate crisis damages bank balance sheets, then can spawn a bank run
  - Interest rates go up because of fears of bank runs (risk premium), etc...
  - Cause even more damage
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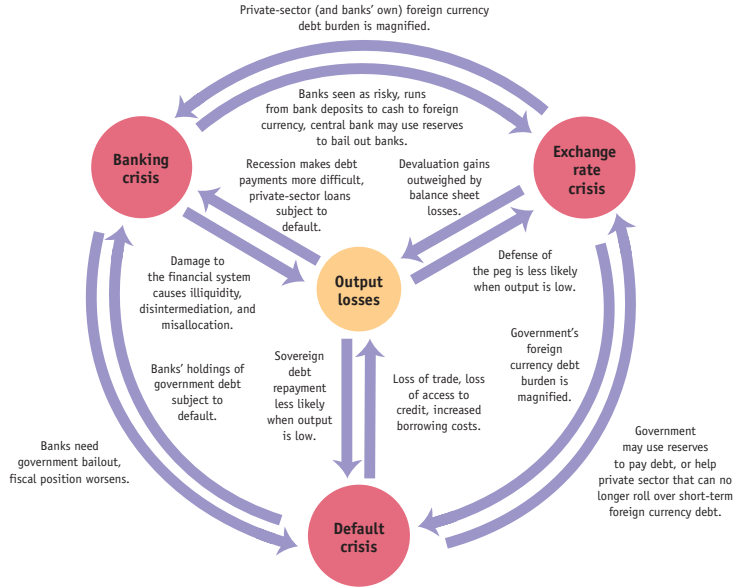
Vicious Circle: Twin and Triple Crises



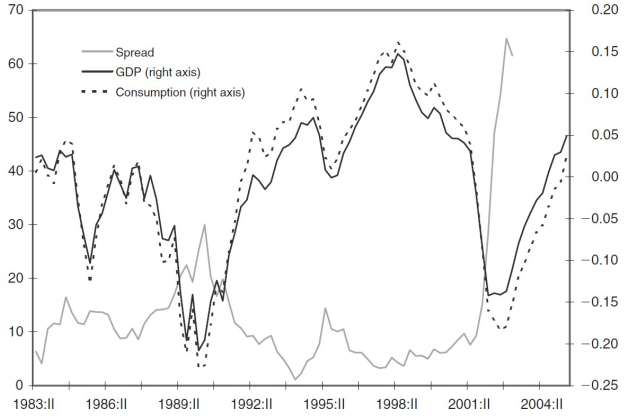
Output losses are large if things get out of hand

Type of Crisis	Number of Crises	Average Length (years)	Mean Cost per Year (% of GDP)
Default only	4	3	−1.0
Default and exchange rate crisis	13	5	10.3
Default and banking crisis	7	8	13.2
Triple crisis	21	10	21.7
All crises	45	8	15.1

Source: Feenstra and Taylor, Chapter 22

Triple Crisis Example: Argentina 2001-2002

- Hyperinflation in the 80s – ended with 1:1 peg of the peso to the dollar
- Had fast growth, and built up high debt
- Most of the debt was external
- Debt crisis in Brazil (in 1998) hurt a major trading partner
- Appreciating dollar made Argentinian exports less competitive
- Went into a recession in 1998



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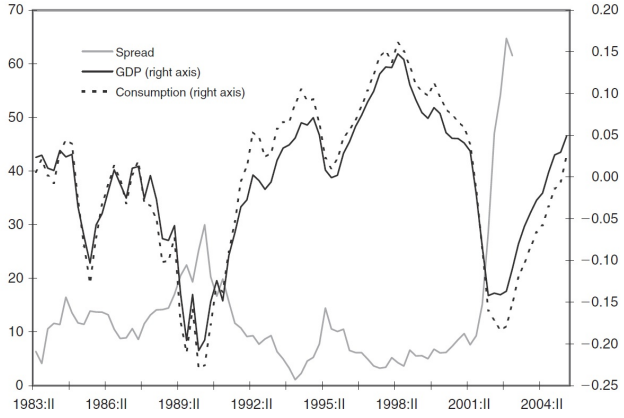

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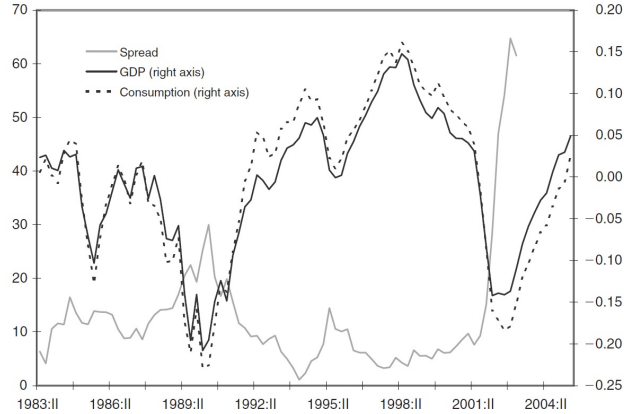

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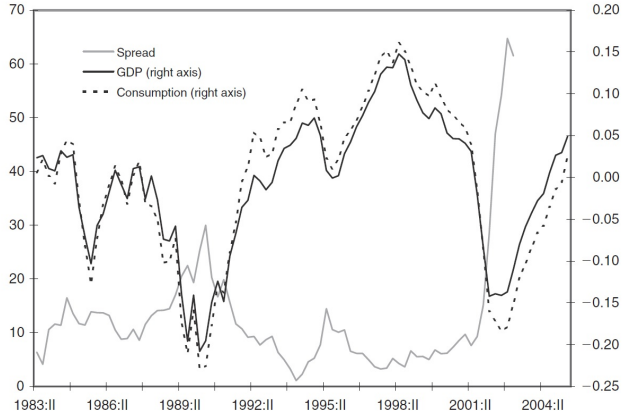
Triple Crisis Example: Argentina 2001-2002

- Public debt grew from 41% of GDP in 1998 to 64% of GDP in 2001
- Spreads doubled: from 3-4% in 1997 to 7-8% in 2000
- High interest rates reduced demand
- Damaged bank balance sheets, potentially requiring government bailouts
  Loans go bad, and assets decline in value
- People started to worry about a loss in confidence in the exchange rate peg. Why?
  - If credit is turned off, then government would have to impose huge austerity mid-recession
  - Only alternatives is to devalue the currency



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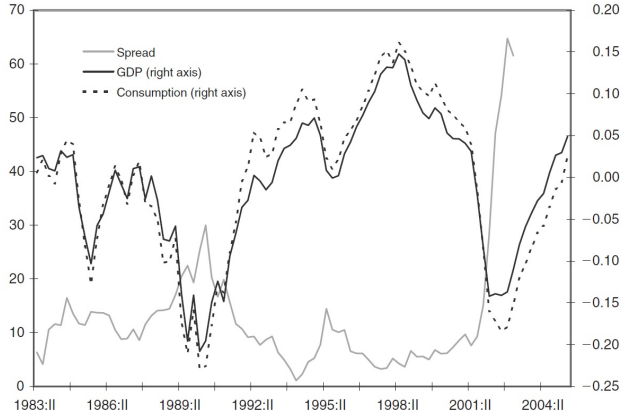

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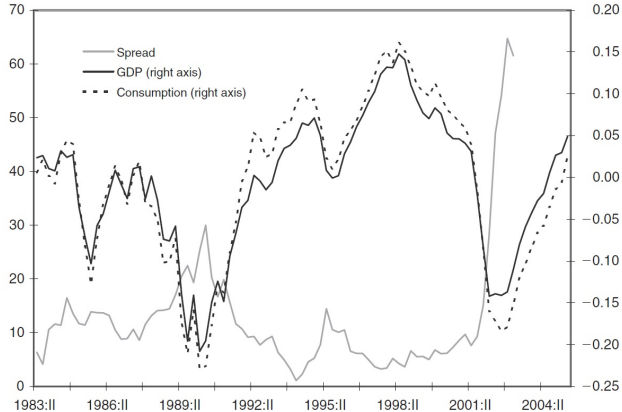

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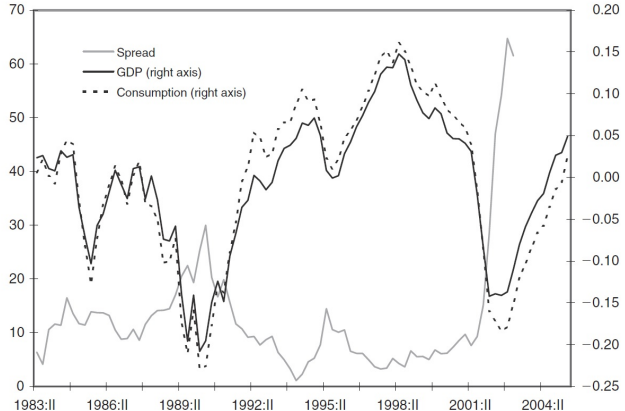

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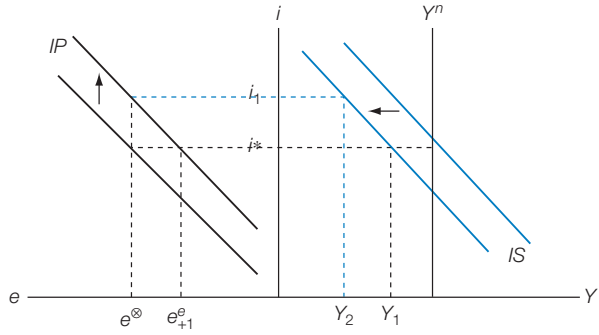

- Loss in confidence is a self-fulfilling prophecy
- People try to pull their money out of banks at home, and convert them to dollars
- Requires higher interest rates, which make the underlying problems worse

Triple Crisis Example: Argentina 2001-2002

- As crisis got worse, spreads exploded
  Only made the underlying fiscal sustainability of the debt worse
- IMF loan in August 2001 temporarily stopped the bleeding
- In November, when IMF cut off credit, the bank runs started
- Argentina imposed capital controls and froze almost all bank deposits
- Most savings disappeared overnight
- Massive social unrest/police repression of protesters
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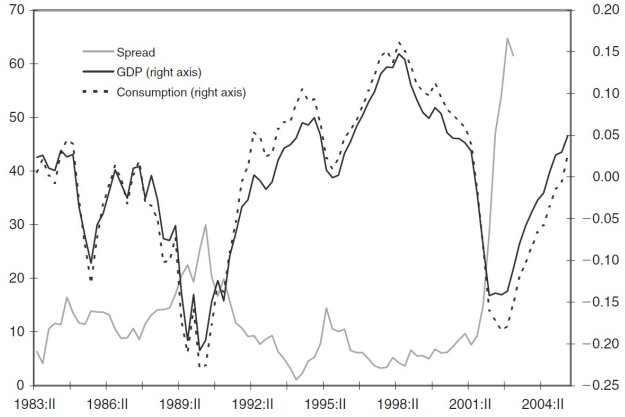

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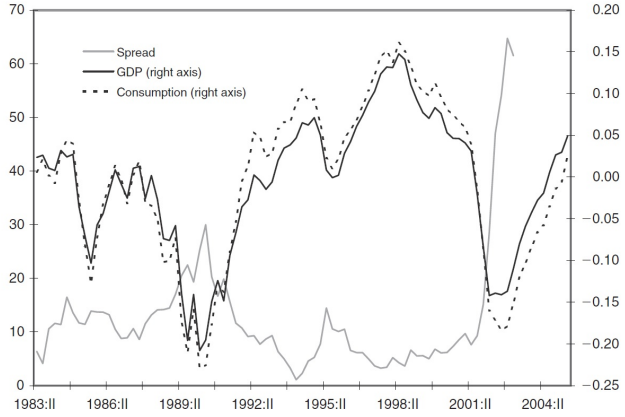

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- Government balanced the budget with tax hikes, spending cuts
- Recession became unimaginably bad

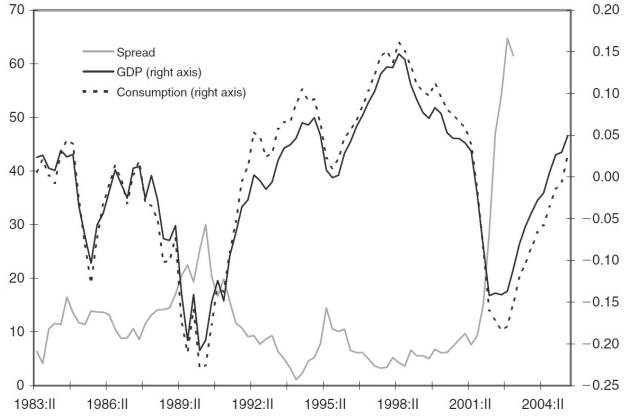

FIGURE 1. ARGENTINA'S DEFAULT

Source: Arellano (2008)

Triple Crisis Example: Argentina 2001-2002

- As crisis got worse, spreads exploded
  Only made the underlying fiscal sustainability of the debt worse
- IMF loan in August 2001 temporarily stopped the bleeding
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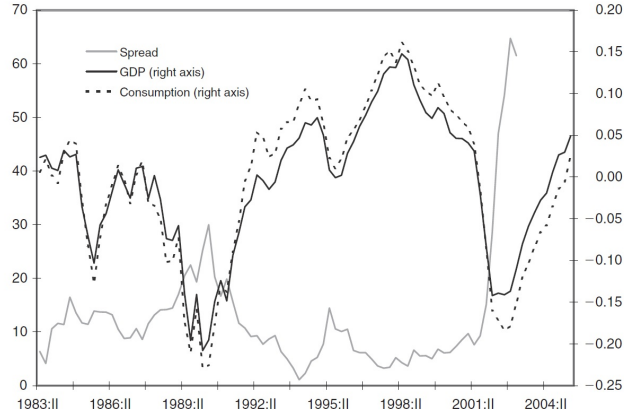

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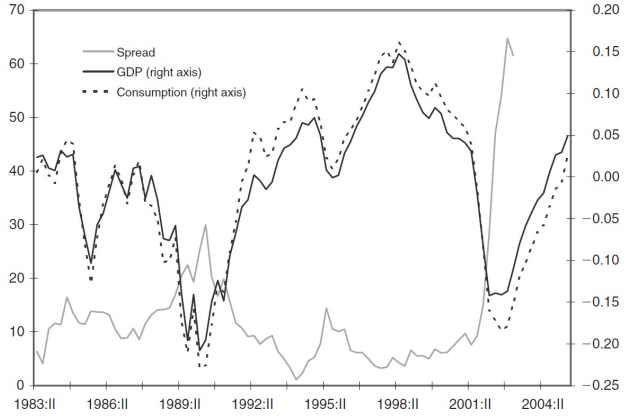

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Big Picture

- Developed model of sovereign default
  - Repayment of debt is determined by willingness of the government
  - State-contingent repayment means debt functions as a form of insurance against bad shocks
  - Volatility in income drives defaults
- We've seen how debt crises are interlinked with currency crises and banking crises
- Major source of risk, especially in developing economies

Good luck on your exams, and have a great summer!