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FINANCIAL INTEGRATION AND CRISES 2021

Lecture 8

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Debt Crises and Default

- Confidence/Liquidity Crises
  - A roll-over crisis - Alesina-Prati-Tabellini (1990)
  - The role of Expectations and Fundamentals
- Debt Default and Relief
  - The costs of default
  - Debt overhang and debt forgiveness
  - The holdout problem

References: Alesina-Prati-Tabellini (1990), SUW (2019) Ch.15, Reinhart-Rogoff (2009), Panizza et al. (2009), Reinhart et al. (2015)

Lack of confidence is self-fulfilling

Confidence crisis

- The lack of confidence in the government willingness/ability to honor the debt may trigger a liquidity crisis in which investors refuse to roll-over (refinance) the maturing debt.
- **Fears of default can be self-fulfilling** because servicing the debt becomes more difficult and costly if investors ask for repayment of maturing debt (or higher interest rates).

A default equilibrium is possible because creditors cannot coordinate on the good debt-roll-over equilibrium:

- It is rational for a single investor to stop buying the debt if she expects that the other investors are doing the same.

A simple model of a roll-over crisis

Alesina-Prati-Tabellini (1990)

The **the Utility function** is maximized

- $U_t = E_t \sum_{i=0}^{\infty} \beta^i \, u(C_{t+i})$ (1)

subject to the flow **budget constraints**

- $q_t d_{t+1} + \beta e_{t+1} + C_t = \mathrm{Y}(\tau_t) + e_t + d_t(1 - \theta_t) - D(\theta_t)$ (2)

where d_{t+1} is one-period government debt bought at time t at the price q_t

- e_{t+1} are foreign default-free assets bought at the price β
- $1/\beta = (1 + r^*)$ is the world risk-free gross interest rate; $1/q_t = (1 + r_{t+1})$
- θ_t is the 'haircut': the fraction of debt not repaid; $D(\theta_t)$ the cost of default
- $\mathrm{Y}(\tau_t) = 1 - \tau_t - f(\tau_t)$ is disposable income, net of a distorting tax τ_t and deadweight loss $f(\tau_t)$ with $f(0) = 0$; $f'(.) > 0$; $f''(.) > 0$. Alternatively, raising taxes is increasingly costly which provides motivation for tax-smoothing

The cost of default

- **Default is costly**; it reduces income by $D(\theta_t)$ because of, say, financial disruption, erosion of domestic institutions, future debt-market access, loss of reputation, trade disruption, etc.
- **Assumptions:**
  i) the cost of default, A, is fixed → in case of default, $\theta_t = 1$.
  ii) the cost is borne only once, so that no debt will ever be issued.
  - $D(\theta_t) = A$ for $\theta_t = 1$
  - $D(\theta_t) = 0$ for $\theta_t = 0$ or $\theta_{t-i} = 1$ for any $i > 0$

The government is benevolent; it maximizes (1) subject to (2) and the

- **Government budget constraint:** $\tau_t + q_t d_{t+1} = d_t(1 - \theta_t)$ (3)
- The timing of events: first debt-market transactions take place –investors form expectations, then the government decides τ_t and θ_t that satisfy the budget constraint --given the debt sold $q_t d_{t+1}$

Government choice and Investors' expectations

Default is evitable: the government decides whether to raise taxes or default

The Government faces a trade-off

- **Honor the debt and pay the cost of taxes**: recession, distortions, political
- **Give up and pay the cost of default**: financial disruption, etc. (see slide 5),

Investors' expectations affect the trade-off that the government faces

- If investors expect $\boldsymbol{\theta_{t+1}^{e} = 0}$, the debt is rolled over and the government can choose to raise taxes to **pay the interests or default** fully $\theta_t = 1$.
- If investors expect $\boldsymbol{\theta_{t+1}^{e} = 1}$ no debt d_{t+1} is issued and the government can choose to **repay the all debt, $\tau_t = d_t$, or default** $\theta_t = 1$.

Investors expectations plays a crucial role in that they alter the trade off that the government faces between the costs of taxes and default.

The strategic interaction between investors' expectations and authorities' decisions accounts for self-fulfilling crises and multiple equilibria.

The cost of honoring the debt

The cost of honoring the debt depends on expectations:

- If investors expect debt to be honored, $\theta_{t+1}^{e} = 0$, the debt is rolled over and taxes are raised just to pay the interests (the debt and taxes are kept constant over time);
- If investors expect a default, $\theta_{t+1}^{e} = 1$, they refuse to roll over the debt, and the government can either default at t or raise taxes to repay the entire debt.

- In case the debt is rolled over, taxes are $(1-\beta)d_t = r^* d_t/(1+r^*)$ and the cost is the loss of output $f([1-\beta]d_t)$ in all periods:

  Cost with good expectations $\frac{1}{1-\beta} f([1-\beta]d_t)$

- In case the debt is fully repaid the tax cost is higher as $f(.)$ is convex:

  Cost with default expectations $f(d_t)$

For a formal derivation see the Appendix

No crisis equilibrium vs Default equilibrium

No crisis equilibrium

With optimistic expectations, $\theta_{t+1}^{e} = 0$, the government does not default if the cost of default, A, is greater than cost of (constant) taxation to roll over the debt (the PDV of output losses).

No default is an equilibrium if

- $\frac{1}{1-\beta} f([1-\beta]d_t) \leq A$

Default equilibrium: Investors expect the government to default next period, $\theta_{t+1}^{e} = 1$, a confidence crisis breaks up, no debt is sold, and the government defaults immediately; it chooses $\theta_t = 1$.

With default expectations the government defaults if the tax cost of repaying the debt at t is greater than the fixed cost of default.

Default is an equilibrium if

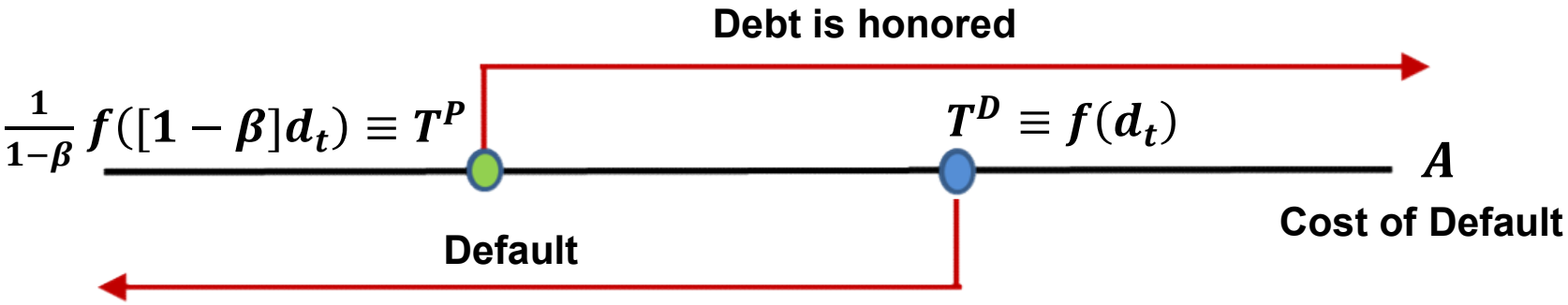
- $A < f(d_t)$

Characterization of equilibria

Note that convexity of $f(.)$ implies $f(1-\beta) < 1-\beta$ and thus

$$\frac{1}{1-\beta} f([1-\beta]d_t) < f(d_t)$$

Characterization of Equilibria



- If $A < T^P$ The cost is so low that "default" is the only equilibrium and it occurs immediately
- If $A > T^D$ The cost is so high that "honor" is the only equilibrium and default never occurs
- If $T^P < A < T^D$ Both equilibria are possible and **whether the good or the bad equilibrium occurs depends on expectations**

The role of fundamentals

Note the role of fundamentals.

Given the cost of default A

- For good fundamentals, ie low d_t, honoring the debt is the only equilibrium
- For bad fundamentals, ie high d_t, default is the only equilibrium
- **For intermediate values of fundamentals there are multiple equilibria:**

$$\frac{1}{1-\beta} f([1-\beta]d_t) < A < f(d_t)$$

If investors expect $\theta_{t+1}^e = 0$ the government's best response is $\theta_t = 0$.
If investors expect $\theta_{t+1}^e = 1$ the government's best response is $\theta_t = 1$,

- **Default expectations are self-fulfilling;** If matuting debt cannot be rolled over, repaying it all at once is too costly and the government defaults.

Long-maturity debt reduces the risk of crises

A long and balanced maturity structure reduces the probability of a confidence crisis as only the maturing debt must be repaid.

- Suppose the governement issues only two-period bonds, b, so that the debt outstanding is $d_t = b_{t-2,t} + b_{t-1,t+1}$
- If a confidence crisis breaks up, the government must repay half debt at time t and half at time $t+1$

The tax cost of repaying the debt is then $f\left(b_{t-2,t}\right) + \beta f\left(b_{t-1,t+1}\right)$

The condition for a Default equilibrium

- $A < f\left(b_{t-2,t}\right) + \beta f\left(b_{t-1,t+1}\right)$

is less likely to hold because $f\left(b_{t-2,t}\right) + \beta f\left(b_{t-1,t+1}\right) < f(d_t)$

- A lengthening of debt maturity reduces the probability of a liquidity crisis and, in the limit, if only consols (perpetuities) are issued, the default equilibrium is ruled out.

Definition of debt default

- **Default is the failure to repay a debt,** including interest or principal on a loan or security, as well as the violation of other contractual conditions.
- More formally, default is the failure to meet the legal obligations (or conditions) of a loan or security.

Ability or Willingness to pay?

The classical debate on debt default

Since the seminal paper by Eaton-Gersovitz (1981), it has long been debated whether default is due to the '**inability to pay**' or to the '**unwillingness to pay**'

It matters for modelling default.

- The '**ability to pay**' view is that default happens because the solvency condition (IBC) is violated, i.e. the debt is no longer sustainable.
- The '**willingness to pay**' view is that default is the result of a government choice between repayment costs and default costs, as in APT (1990).
- In principle, it is only willingness since the sovereign could sell the country.
- In practice, drawing a line between the two is difficult.

APT say: "lack of confidence forces the government to default" but, in their model, the debt is sustainable; the IBC is satisfied and the government could always repay. So, they mean that **full repayment is too costly**.

- It is largely a matter of what 'ability' means.

Default is the result of a difficult choice

The government "carrying-debt capacity" depends on economic, social and political acceptability of the costs of repayment.

- As Reinhart-Rogoff (2009) put it: 'country default is often the result of a complex **cost-benefit analysis involving political and social considerations**, not just economic and financial ones'.
- Certainly, **default is not the result of opportunistic behavior**: there is substantial evidence that governments struggle to honor their debts, possibly for political reasons, even when it would be better to default.

BUT

- If deafult is the result of a choice, this raises the issue of **whether the costs of default are sufficiently high** for sovereign external debt to exist in the first place.

Default must be costly for debt to exist

- A huge literature (see Panizza et al 2009, R&R 2009) investigates the costs of default and thus **the reasons for the existence of debt**.
- As **debt repayments cannot be enforced** –i.e. a Sovereign borrower is not constrained by Court ruling – **for debt to exist we need costs**:
  - Cut off from future borrowing (Eaton-Gersovitz 1981);
  - Seizure of borrower's asset abroad;
  - Trade+FDI disruptions, lack of Export credits, seizure of exports;
  - Erosion of domestic institutions, financial disruption
- Evidence of no significant costs may not be due to the absence of punishment but to the fact that **most defaults are not opportunistic and thus excusable**.
- There is a crucial distinction between **defaults** and **repudiations** (very few in history and very costly). Unlike repudiation, default does not imply deliberate action and as such is excusable (Missale 2015).
- Moreover, as Law is respected not just because of sanctions, debt contracts are honored for a sense of belonging to the international community and/or maintain good international relations.

Solutions: Debt restructuring

Defaults are partial

- Countries that default are not brought to Court; It is in the interest of both creditors and debtors to find a solution; to renogotiate the debt.

Solutions to debt problems feature

- **Loans from the IMF** conditional on adjustment programs;
- **Debt relief**:
  - **Debt rescheduling**; ie a change in terms and conditions which may or may not result in a lower burden in present-value terms.
  - **Debt forgiveness**: a reduction in the amount of a debt obligation.
  - **Exchanges with other assets**: debt-for-equity swaps and other conversions; prepayments or debt buybacks.

IMF External debt statistics (2003)
http://www.imf.org/external/pubs/ft/eds/Eng/Guide/file2.pdf

‘Moral Hazard’ of International Lending

Costs of renegotiation

- Debt relief often follows from long and contentious negotiations (maybe needed to assess repayment capacity)* See next slide.
- **Delays are inefficient and costly in terms of lost output.**
- Because of negative externalities to trade and the financial system, International financial institutions (IFIs) and the creditors’ governments get involved; IFIs provide bridge credit and bailout funds.
- Official sector intervention can make defaulting on debt easier, a problem known as the **‘Moral Hazard’ of International Lending**

* Note: The need for a Supranational Legal Framework; e.g. a Sovereign Restructuring Mechanism has long been debated.

Length of negotians and 'Haircuts'

Table 1. Cases of Sovereign Debt Restructurings

Countries	Episode of Restructuring Negotiation	Delay Length (Months)	Hair Cut (Per cent)
18 countries[1/]	08/1982 - 05/1994	141	30 - 35
Argentina	12/2001 - 04/2005	40	65
Ecuador	08/1999 - 08/2000	12	6.5
Pakistan	02/1999 - 12/1999	10	30
Russia	11/1998 - 07/2000	20	69

1/ Mexico, Argentina, Brazil, Bulgaria, Costa Rica, the Dominican Republic, Ecuador, Ivory Coast, Jordan, Nigeria, Panama, Peru, the Philippines, Poland, Russia, Uruguay, Venezuela and Vietnam.

Debt forgiveness may not work

- In the crisis of 1980s traditional rescheduling with IMF lending was first attempted but it became soon clear that the problem was not one of liquidity but of solvency and debt forgiveness was needed.

Debt forgiveness may not work

- Consider a debt with face value = 100
- It pays 100 w.p. 1/3 in good state and 25 w.p. 2/3 in bad state
- Expected payments = 100 x 1/3 + 25 x 2/3 = 50
- This debt is worth 50 and trades at 0.50 = 50/100 on secondary market

Suppose 20 is forgiven so that the face value is reduced to 80

- New debt pays 80 w.p. 1/3 in good state and 25 w.p. 2/3 in bad state
- Expected payments = 80 x 1/3 + 25 x 2/3 = 43.3

- Creditors are worse off because they receive less in the good state. Debt forgiveness does not improve the debtor's capacity to pay in the bad state.

The Debt Overhang

- **For debt forgiveness to work, it must improve the debtor's capacity to pay in the bad state**. This happens if a debt reduction provides incentives for investment and reforms (Krugman 1988, Sachs 1989).

A Debt Overhang is a situation where:

- The debt is so large that **any effort to improve the economy mainly benefits the creditors** (in the form of higher repayments) giving the debtor little incentive to improve its economic fundamentals.
- The debt burden acts as tax on capital income (in that the government must tax to meet debt obligations) and is thus a disincentive for domestic investment.

- A simple formalization of the debt overhang argument is that the probability of the good state, π, depends negatively on the face value of the debt D, that is, $\pi(D)$ decreases with D.
- The expected repayment$\equiv ER = \pi(D)D + [1 - \pi(D)]25$ (1)

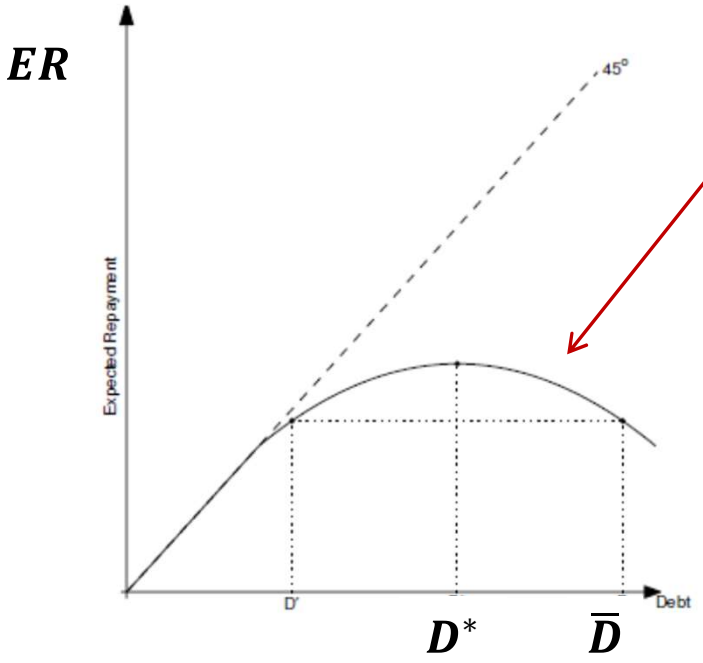
  may increase when D is reduced-forgiven, because $\pi'(D) < 0$

The debt Laffer curve

Expected Repayments $ER = \pi(D)D + [1 - \pi(D)]25$

Debt forgiveness, a reduction in D, increases Expected repayments when

$\partial E / \partial D = \pi(D) + \pi'(D)[D - 25] < 0$ (second term is negative for $D > 25$)



Expected repayment is maximized by forgiving $\overline{D} - D^*$

The empirical literature supports the debt-overhang hypothesis as debt reduces growth when the debt ratio exceeds a certain threshold. But the channels through which debt affects growth remain unclear.

Debt Swaps

- Debt exchanges (or swaps) consist in the issuance of new debt that is used to retire old debt. The new debt can be ***de facto*** senior to the existing debt (i.e. be paid first) as in the Argentine swap or not as in the Greek swap.

Debt exchanges make debtors better off

- In the previous example, the face value of the debt, 100, is paid with probability $1/3$ and 25 is paid with probability $2/3$. Thus, expected payments, EP, are 50 and the market price is 0.5.
- Suppose the debtor issues 25 units of new debt **that is made senior to the old debt**. The new debt is default free and its price is 1.
- The expected payments on the outstanding old debt remained after the swap, D^0, are $(1/3)D^0+0$ and its price falls from 0.5 to $0.33 = \mathrm{EP}/D^0$
- The gov't uses new debt worth 25 to swap, $25/0.33 = 75$ of old debt
- EP fall from 50 to $33.3 = 25 + (1/3)\ 25$ (new debt $+1/3$ remaining old)

The debtor gains 16.6 at the expenses of creditors.

The Holdout problem

- Debt forgiveness and debt swaps, as the Brady Plan or the Greek Debt restructuring, are difficult to implement even when creditors benefit from higher expected repayments (as is the case with debt overhang).
- **Each single creditor is better off by not participating to the debt reduction** With the swap, the "holdouts" gamble that the restructuring takes place potentially allowing for the full repayment of their bonds. (This is not the case in the previous example but in the real world usually $\pi \uparrow$ and the market value of old debt rises.) The best strategy is to **hold out and free ride on the debt reduction efforts** of the other creditors.
- Holdout problems in the 1980s were not as severe as today because of banks' syndicates as opposed to dispersed bond holders. Nevertheless, Brady deals (since 1989) had to offer a menu of favorable options.
- Nowadays **Collective Action Clauses** (**CACs**) are included in bond issues.
- In the Greek swap of 2012 such clauses have been introduced ex-post on bonds issued under domestic law. Such clauses bound all debt holders to the swap if more than two-thirds of them consented to do it.

Thank You!

Appendix: APT (1990) - No crisis equilibrium

- Recall that θ_t can only take two values 0 or 1 which implies
  - If investors expect $\theta_{t+1}^e = 0$ then $q_t = \beta$
  - If investors expect $\theta_{t+1}^e = 1$ then debt cannot be issued (or $q_t = 0$)

No-default equilibrium: at any t, the debt is expected to be honored $\theta_{t+1}^e = 0$ and the government chooses $\theta_t = 0$

If the government does not default, the optimal tax-smoothing policy (that maximizes the PDV of disposable income) is to set a constant tax rate high enough to pay the interest on debt and roll over the principal:

- $\tau_{t+i} = \bar{\tau} = (1-\beta)d_t \qquad \rightarrow d_{t+i} = d_t \qquad \forall\, i > 0$

- Note: the government IBC is satisfied; the debt is sustainable

The consumer maximizes utility (1) subject to

- $\beta d_{t+1} + \beta e_{t+1} + C_t = 1 - \bar{\tau} - f(\bar{\tau}) + e_t + d_t$

Condition for debt roll-over

FOC $u'(C_t) = u'(C_{t+i}) \rightarrow C_{t+i} = C_t$ constant consumption

From the Intertemporal Budget Constraint (IBC)

- $C_t \sum_{i=0}^{\infty} \beta^i = e_t + d_t + [1 - \bar{\tau} - f(\bar{\tau})] \sum_{i=0}^{\infty} \beta^i$
- $C_t = (1-\beta)e_t + (1-\beta)d_t + [1 - \bar{\tau} - f(\bar{\tau})]$
- $C_{t+i} = (1-\beta)e_t + 1 - f\big((1-\beta)d_t\big) \equiv C_t^P \qquad \forall\, i \geq 0$

If the government defaults, the debt is cancelled, and no taxes are ever raised but the fixed cost, A, is paid, and the consumer IBC is

- $C_t \sum_{i=0}^{\infty} \beta^i = e_t + 1 \sum_{i=0}^{\infty} \beta^i - A$
- $C_{t+i} = (1-\beta)e_t + 1 - (1-\beta)A \equiv C_t^D \qquad \forall\, i \geq 0$

No default is an equilibrium if $C_t^P \geq C_t^D$

- $A \geq \frac{1}{1-\beta} f([1-\beta]d_t) \equiv T^P$

If the cost of default exceeds the PDV of output losses from tax-distortions

Default equilibrium

Default equilibrium: At any t, investors expect the government to default next period, $\theta_{t+1}^e = 1$, a confidence crisis breaks up, no debt is sold and the government defaults immediately; it chooses $\theta_t = 1$. (Investors realize that $\theta_t = 1$ is the best response to $\theta_{t+1}^e = 1$ and thus they expect $\theta_t^e = 1$; ie expectations are correct).

If the government defaults, there are no taxes but the fixed cost A is paid, and consumption is as before

- $C_{t+i} = (1-\beta)e_t + 1 - (1-\beta)A \equiv C_t^D \qquad \forall\, i \geq 0$

If the government does not default, it must repay all (maturing) debt in the current period t (no taxes are raised thereafter): $\boldsymbol{\tau_t = d_t}$

- $C_t \sum_{i=0}^{\infty} \beta^i = e_t + d_t + 1 \sum_{i=0}^{\infty} \beta^i - \tau_t - f(\tau_t)]$
- $C_{t+i} = (1-\beta)e_t + 1 - (1-\beta)f(d_t) \equiv C_t^{PA}$

Default is an equilibrium if $C_t^D > C_t^{PA}$

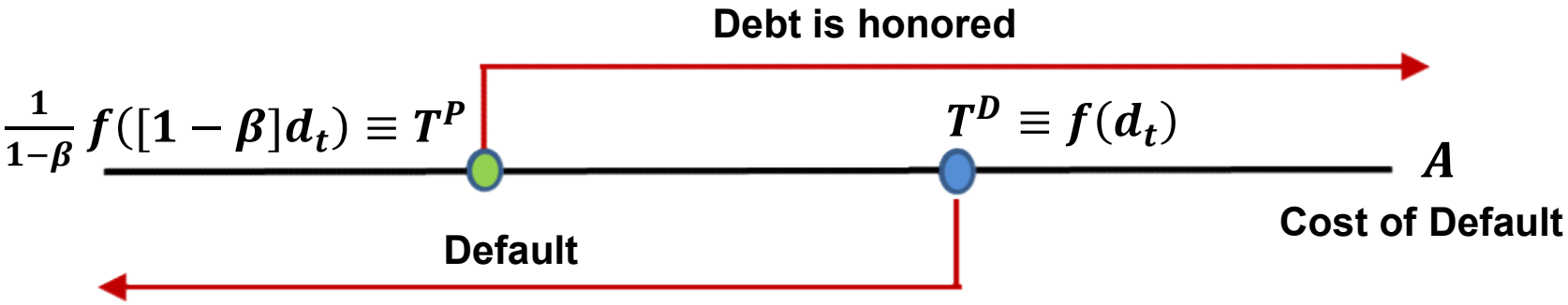
- $A < f(d_t) \equiv T^D$

Characterization of equilibria

Note that convexity of $f(.)$ implies $f(1-\beta) < 1-\beta$ and thus

$$\frac{1}{1-\beta} f([1-\beta]d_t) \equiv T^P < T^D \equiv f(d_t)$$

Characterization of Equilibria



- If $A < T^P$ The cost is so low that "default" is the only equilibrium and it occurs immediately
- If $A > T^D$ The cost is so high that "honor" is the only equilibrium and default never occurs
- If $T^P < A < T^D$ Both equilibria are possible and **whether the good or the bad occurs depends on expectations**

Equilibrium indeterminacy

For an intermediate range of default costs $T^P < \mathrm{A} < T$ there are 2 equilibria

- If investors expect $\theta_{t+1}^e = 0$ the government's best response is $\theta_t = 0$.
- If investors expect $\theta_{t+1}^e = 1$ the government's best response is $\theta_t = 1$, **hence expectations/fears of default are self-fulfilling; if no debt is sold the government has to repay it all at once by raising taxes so much that tax costs exceed the cost of default.**

Alesina et al. argue that default can take place only in the current period t. They point out that with $\theta_{t+2}^e = 1$ the gov't best response would be $\theta_{t+1} = 1$ so that investors would expect $\theta_{t+1}^e = 1$ thus precipitating the crisis at period t. Put simply, in a deterministic model a future crisis would ravel backward to t.

- Hower consider the case that in period t we have $\theta_{t+1}^e = \theta_{t+2}^e = 0$ and the debt is rolled over. At period $t+1$ the problem is the same as of period t but now expectations can change $_{t+1}\theta_{t+2}^e = 1 \neq \theta_{t+2}^e = 0$.
  The indeterminacy of the equilibrium intrododuces some intrinsic uncertainty so that rational agents would take $\theta_{t+1}^e = 0$ only with some probability.

Long maturity structure reduces the risk of crises

A long and balanced maturity structure reduces the probability of a confidence crisis, and in the limit rules out the default equilibrium

- Suppose the governement issues only two-period bonds, b, so that the debt outstanding is $d_t = b_{t-2,t} + b_{t-1,t+1}$
- If a confidence crisis breaks up, the government can default so that
- $C_t^D \equiv (1-\beta)e_t + 1 - (1-\beta)A$ as before or it can repay which calls for
- $\boldsymbol{\tau_t} = b_{t-2,t}$ and $\boldsymbol{\tau_{t+1}} = b_{t-1,t+1}$ and
- $C_t^{PA} \equiv (1-\beta)e_t + 1 - (1-\beta)[f(b_{t-2,t}) + \beta f(b_{t-1,t+1})]$

Condition for Default to be an equilibrium $C_t^D > C_t^{PA}$ is less likely to hold

- $A < f(b_{t-2,t}) + \beta f(b_{t-1,t+1})$ instead of $A < f(d_t)$

As the condition for no default is the same, the range of values of A for a confidence crisis shrinks.