INTERNATIONAL FINANCE

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2 BASIC TRENDS

2.1 DEREGULATION

- Examples of capital controls: Tobin tax, exchange controls, minimum stay requirements
- Chinn and Ito (2006) construct KAOPEN index to measure a degree of capital account openness:
    - For industrial countries happened during 1970s-early to 1990s
    - For developing countries began during 1990s Washington Consensus
    - But… in China credit is still mostly domestic and has little financial openness

2.2 SHARE OF COUNTRIES IN DEFAULT

- Diaz and Alejandro (1985): "Goodbye financial repression, hello financial crash"
    - Liberalization in late 1970 followed by outbursts of severing debt crisis, especially Latin America. Consequences depressed capital markets until early 1990s
- Capital flows did pick up during 1990s and 2000s but then collapsed again with 2007 crash

2.3 CA IMBALANCES

- $GNP = Y + rB = C + I + G + NX + rB$ where $(C + I + G)$ is 'absorption', B stock of net foreign asset and r net return
- Trade balance: $NX = Y - (C + I + G)$ is difference between domestic production and 'absorption' (domestic consumption):
- Current account $CA = NX + rB = Y + rB - (C + I + G) = S - I$ is difference between GNP and absorption – or national saving and investment:
    - Let T denote net taxes, and split B into private and public components:
    - $CA = \left(Y + rB^{\text{private}} - C - T\right) + \left(rB^{\text{public}} + T - G\right) - I = S_{\text{private}} + S_{\text{public}} - I$
    - Government dis-saving (i.e. budget deficit) worsens CA all else equal!

2.4 SUSTAINED FALL IN (SAFE) INTEREST RATE

- King & Low (2014): Since 1990 the interest rate (both real and nominal) has been steadily declining, especially in advanced countries. But… return to capital has not declined!

2.5 GLOBAL IMBALANCES: NET FOREIGN ASSET

- Domestic saving can finance either domestic investment I or acquire foreign assets
- $CA > 0$ implies $S > I$ so country is accumulating net foreign wealth
    - $B_{t+1} - B_t = CA_t = Y_t + r_t B_t - (C_t + I_t + G_t)$
- Rate of growth of gross stocks FA/FL can be much larger than changes in net position B_t
    - Recall $B_t = FA_t - FL_t$ (foreign assets – foreign liabilities)
    - Thus $B_{t+1} - B_t = (FA_{t+1} - FA_t) - (FL_{t+1} - FL_t)$
    - In UK FA_t=4xGDP; in US FA_t=GDP

- Return on net foreign assets results from (1) income paid by FA e.g. coupon from bond and (2) capital gain and losses, including valuation effects due to exchange rates
    - In national accounts returns are measured only by income payments, but with large stocks capital gains/losses are potentially much larger
    - In UK 2005-2013: income change -11.3, valuation effects -9.6, growth adjustment +16.1

2.6 US EXORBITANT PRIVILEGE

- USA is banker of the world by engaging in 'maturity-currency' transformation
    - US FL are (borrows in) largely short-term and denominated in dollars
    - US FA are (lends by) long-term and denominated in foreign currency
- Three key benefits:
    1. Different maturity of FA and FA: Returns generally higher from long-term than short-term, so makes net gain
    2. Liquidity premium: Investors willing to pay liquidity premium to acquire US short-term bills (as used to settle international payments)
    3. Dollar depreciation: tends to increase value of external assets owned by US, improving US net foreign position , independently of effects of export boost!
- Two complementary interpretations:
    - Gourinchas et al (2011): US earns higher return on assets than it pays on liabilities –
    - US provides "insurance against global catastrophic risk" – investing in US assets remained attractive even though 2007 FC originated there (premium for safety)
- UK privilege decreased as sterling became progressively marginalized: Gourinchas et al (2007) 3.51 1952-1972 to 0.79 1973-2005

2.7 ORIGNIAL SIN

- Eichengreen and Hausmann (1999) define original sin as a situation "in which the domestic currency cannot be used to borrow abroad or to borrow long term"
    - Has an international and domestic investor components.
    - When attempt to denominate in own currency charged prohibitively high interest rates
- Eichengreen, Hausmann, and Panizza (2002): almost all countries (excl. US-Euro-Japan-UK-Switz) suffered from (international) original sin over time.
- Hausmann and Panizza (2003) note no consensus on causes: (i) GDP/capita (ii) monetary credibility, (iii) debt level (iv) exchange rate regime, (v) yield curve slope, (vi) size of investor base.
    - Eichengreen et al. (2002): Not related to weakness of macro policy or institutions but global capital market imperfections outside an individual country's control
    - Reinhart, Rogoff and Savastano (2003): emerging economies should learn to borrow less (debt intolerance) rather than how to borrow more in their domestic currency
- Consequences are clear: negative 'valuation effect' reduces benefits from exchange rate flexibility
    - If FL are denominated in foreign currency, a nominal devaluation of domestic currency raises value of debt in domestic currency terms for all agents
    - Any potential competitiveness gain from deprecation outweighed by balance-sheet effects (e.g. banks cut down on lending, households consumption, firms can't borrow)
    - A form of OS also affects euro area. If country tries to restore competitiveness by lowering prices, burden of its euro-denominated debt will be correspondingly higher

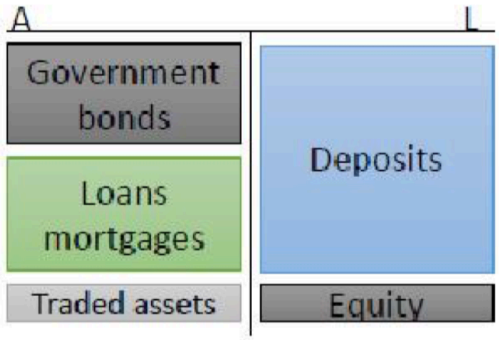
2.8 INTERNATIONAL RESERVES ACCUMULATION

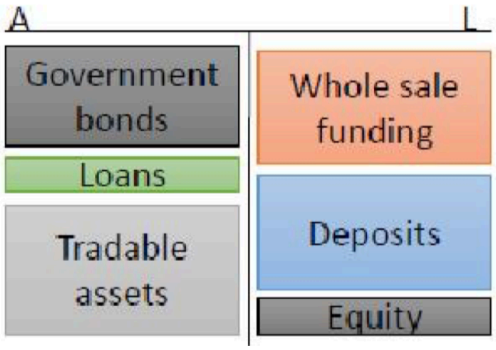
- Balance of Payments: $Current\ Account + Capital\ Account = Financial\ Account = non\ reserve\ FA + Official\ Settlement\ Transaction$
- Rationale for reserve accumulation
    - No capital mobility: when country runs trade/CA deficit monetary authorities need to finance it using own or borrowed reserves
    - Free capital mobility: inflows and outflows of private capital are main driver of FA. What matter is "external financing need" = sum of CA deficit and liabilities coming to maturity

- BoP deficit arises to extent that international investors do not refinance country and this is where OST is needed
- International capital flows can be quite volatile with 'sudden stops'. Large stocks of reserves is accumulated to insure against this.

2.9 Globalization and Cross-border banking

- Deregulation accompanied by cross-border banking
- Consider differences between traditional and "international and global banks" balance sheets:
    - In the whole-sale market, they engage in 'secured' (i.e. repo – lender gets securities as collateral as a protection against default by the borrower) and 'unsecured' transactions





- Note distinction by Niepmann (2012, 2015):
    - Global banks: Raise funds in foreign markets (via foreign affiliates, FDI) and invest the capital in same foreign market. FL-to-FA ratio close to 1.
    - International banks: Raise funds domestically (via depositors) and lend abroad. FL-to-FA ratio close to 0.
- Securitization: International banks' activity fed by local banks, via securitized loans (mortgages)
    - Shadow banking system: During banking boom, financial intermediaries offered same services but operated outside regulatory oversight, exacerbating information asymmetry

3 CA and global Imbalances

3.1 Two-Period Model

3.1.1 Motivation

- In public discourse, CA often related to country's competitiveness. But as $CA = S - I$ we note it is ultimately determined by the intertemporal saving decisions from household/firm/government
- Running CA deficit is desirable when country experiences
    - Temporary contraction of output: smooth consumption during recession
    - Fast growing: finance investment and raise consumption to permanent level
    - Faces fall in uncertainty reduces precautionary motive for saving
- Borrowing/lending in international financial markets allows for (1) consumption smoothing and (2) efficient allocation of capital

3.1.2 Set Up

- World: Small open economy (does not affect world allocation or prices); domestic representative agent; one common 'tradable good'; two periods

- Budget:
    - At time 0, agent endowed with exogenous income Y and B
        - Set $B = 0$ so simply get $CA = B_1 - B = B_1$
    - Can invest in either:
        - Foreign asset B_1 that return interest rate $R = R^W$
        - Domestic I that produces Y_1 with decreasing returns $[F'(I) < 0, F''(I) < 0]$
- Preferences: Agent maximizes intertemporal utility: max $U(C) + \beta U(C_1)$

3.1.3 SOLVING

- Set up problem: max $U(C) + \beta U(C_1)$ s.t. [budget constraint] $B_1 = Y - C - I$ and $C_1 = Y + RB_1$

Basic Case (Capital Integration)

- Rewrite this as max $U(Y - I - B_1) + \beta U(F(I) + RB_1)$ and take FOCs:
    - FOC wrt B_1: obtain Euler equation $U'(C) = \beta U'(C_1)R^W$
        - Marginal utility of cost of giving up one unit of output to buy foreign bonds is equal to anticipated discounted marginal utility of bond return
    - FOC wrt I: obtain $U'(C) = \beta U'(C_1)\frac{dY}{dI}$
    - Combine FOCs: obtain $\frac{dY_1}{dI} = R^W$
        - I chosen so marginal return in terms of future output is equal to international rate of return. All agents are indifferent between I and B_1

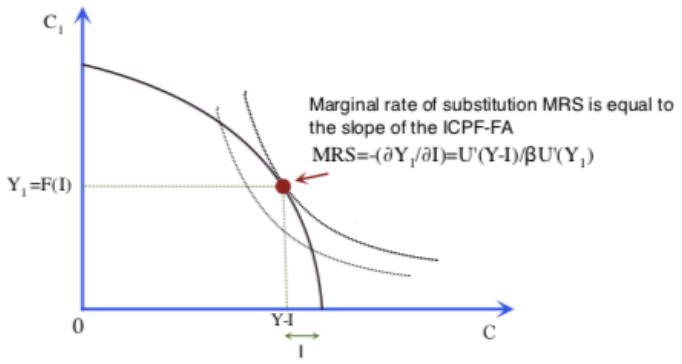
Financial Autarky Case ($B_1 = 0$)

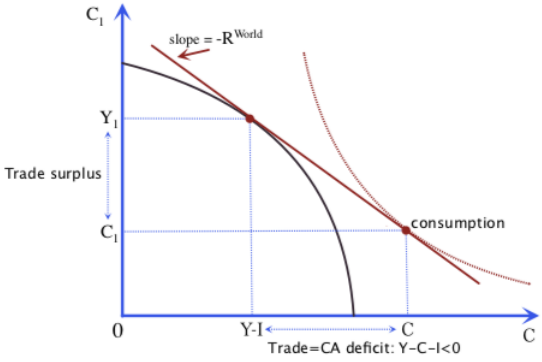
- No financial trade so R now determined endogenously by $S = I$ condition. Resolve as follows:
    - FOC wrt B_1: same as before
    - FOC wrt I: now obtain $U'(Y - I) = \beta U'(Y_1)R^{FA}$
    - Combine FOCs: now obtain $R^{FA} = \frac{U'(Y-I)}{\beta U'(Y_1)} = \frac{dY_1}{dI}$
        - This could be smaller or greater than R^W

3.1.4 GRAPHICAL ANALYSIS

- Intertemporal consumption possibility frontier under financial autarky: Plot $C_1 = F(I) = F(Y - C)$
    - Decreasing C increases C_1: Use more of initial endowment Y to finance I, increasing Y_1
    - Not straight because marginal productivity of investment is decreasing in I
- Indifference curves: Assume agent prefers average to extreme, thus convex curve between C and C_1

- Financial Autarky: Equilibrium simply given by $MRS = MRT$ condition
- Capital Integration:
    - Now R is pinned down so $\frac{dY_1}{dI} = R^{World}$ so that investors are indifferent between domestic I and foreign assets B_1
        - If $\frac{dY_1}{dI} > R^W$ then will get influx of funds into I, driving down its return
        - If $\frac{dY_1}{dI} < R^W$ then will get exodus of funds out of I, driving up its return
    - Budget line is thus straight line with slope $-R$ and goes through point $(Y - I, F(I))$
        - With access to foreign bonds, resident can exchange present for future consumption by borrowing/lending in international finance markets at rate R
    - Equilibrium now given by condition $MRS = -R$





3.1.5 *Interpretation*

- If country runs a deficit we can think of it having a "comparative advantage" in producing future consumption over current consumption
    - Countries optimally run CA deficit when $R^{FA} > R^{W}$ and surplus vice versa
    - Any factor raising R^{FA} gives country comparative advantage to export future consumption
- R^{FA} is the interest at which residents find it optimal to neither borrow or lend in the international market, thus choosing $B_1 = 0$. We cannot observe this but useful theoretical concept.
    - Determined by slope of IC going through the endowment point $C^{FA} = Y - I, C_1^{FA} = Y_1$
    - $R^{FA} = \frac{U'(Y-I)}{\beta U'(Y_1)}$. All else equal it is higher in countries with: higher growth prospects $\uparrow Y_1$, temporary downturn $\downarrow Y$, impatience $\downarrow \beta$
- We can show that $R^{FA} > R^{W} \leftrightarrow CA\ Deficit$
    - If $R^{FA} > R^{W}$ then necessarily implies $U'(C^{FA}) > \beta U'(C_1^{FA}) R^{W}$
    - Marginal utility is decreasing, so residents can improve welfare by transferring consumption from future to present
    - In trade equilibrium they will optimally borrow to increase C^{FA}, running a CA deficit

3.2 Uncertainty Extension

3.2.1 *Motivation*

- Two predictions of this model are at odds with empirical evidence
    - Expect that it is optimal for country with high growth prospects to run CA deficit
        - $I > S$ in highly capitalized, moderate growth Advanced Economies until 2010. 2000-14 fast emerging market economies $I < S$
    - Capital should flow into countries where returns on investment are high
        - Capital inflows are negatively correlated with productivity growth. But… Alfaro et al (2011) find FDI is indeed higher in high productivity growth countries

3.2.2 *Extending the model with uncertainty*

- Bernanke (2005): Developing countries face uncertainty, creating strong incentive to save for precautionary purposes. Thus CA deficit in US is reflection of global savings glut

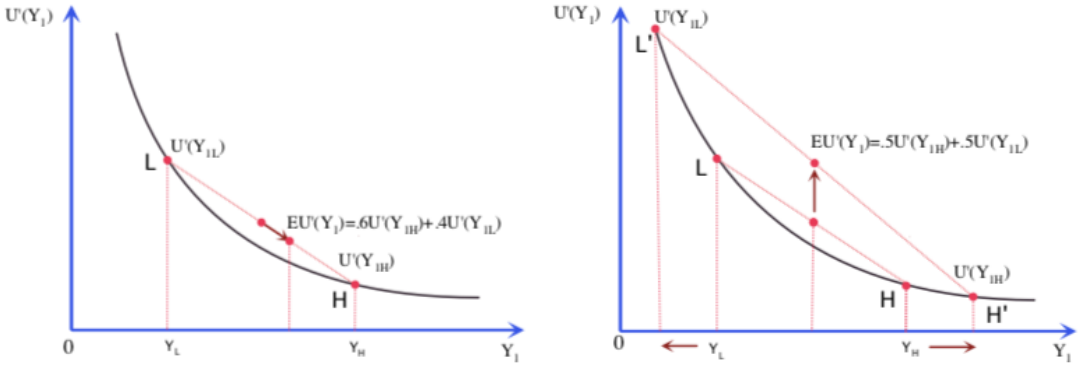
Model

- Now future output can take on Y_{1H} or Y_{1L} with equal probability
    - $\max U(C) + \beta[0.5\ U(C_{1H}) + 0.5\ U(C_{1L})]$ s.t. $B = Y - C;\ C_{1i} = Y_{1i} + R^{W} B_1$ for $i = H, L$

- Solve FOCs to obtain stochastic Euler equation and combine to get $R^{FA} = \frac{U'(Y)}{\beta EU'(Y_1)}$

- Assume convex risk attitude $U''' \geq 0$ (no increasing absolute risk aversion). Again $U' > 0, U'' < 0$
  - Thus compute ex-ante expected marginal utility $EU'(Y_1) = p_L U'(Y_{1L}) + p_H U'(Y_{1H})$

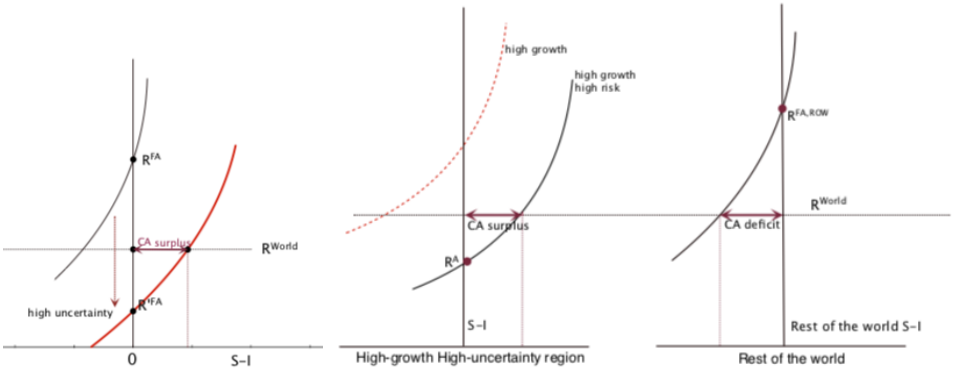
- Now consider comparative statistics:
  - An increased in expected output tend to reduce $EU'(Y_1)$ and thus raise R^{FA}
  - Increase in output variance (mean preserving spread) will raise $EU'(Y\_1)$ [as it's convex] and thus lower R^FA



3.2.3 Metzler Diagram Interpretation

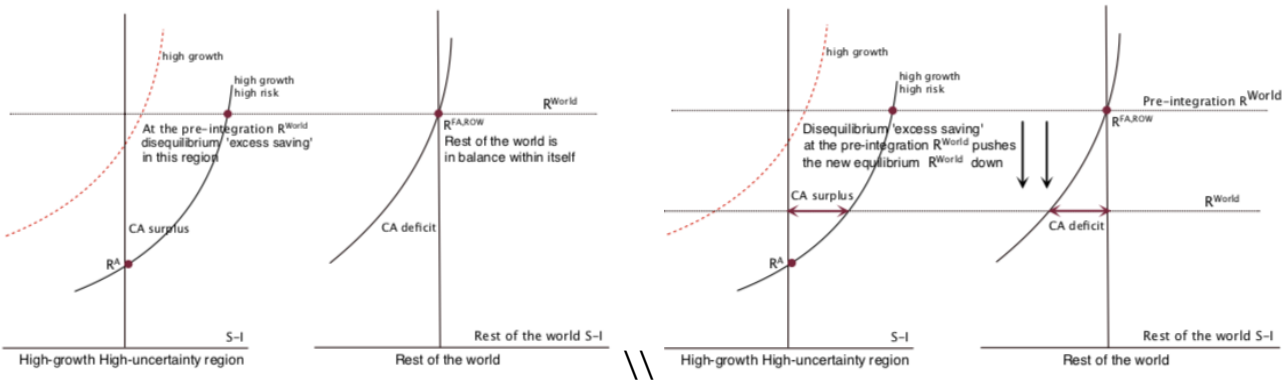
Set Up

- Consider diagram in $(S - I, R)$ space:
  - R^W given so horizontal line
  - $S - I$ schedule is monotonically increasing in interest rate
  - By definition R^{FA} is where $S - I = 0$
- In equilibrium:
  - Optimal CA of a country is where R^W and $S - I$ schedule cross
  - Sum of CAs in world is zero
- High uncertainty country has low R^{FA}, thus likely $R^{FA} < R^{RoW}$, thus likely $CA > 0$ and $CA^{RoW} < 0$



Explaining Global Savings Glut

- Consider large economic region with high domestic uncertainty (i.e. China) that suddenly integrates into global financial market. We have $R^{FA} << R^{RoW} = R^W$
- China, having low R^{FA}, wants to run large surplus and creates excess global savings. Restoring equilibrium requires lower R^W and shift in CA of RoW (from initial balance to deficit) to absorb



4 Risk Sharing

4.1 Household Risk

4.1.1 Set Up (Broner, Martin and Ventura, 2012)

- World: small open economy, fully integrated, two periods, many households
- Lenders/investors: Risk neutral and do not discount the future; linear utility $U(C) = aC$ and $\beta = 0$
  - Thus set the price of any asset equal to the expected cash flow from it
- Households/borrowers: Risk averse and face same idiosyncratic income risks
  - $y_{i,0} = 0.5 \qquad y_{i,0} = \begin{cases} 2 \text{ with } p = 0.5 \\ 1 \text{ with } p = 0.5 \end{cases}$
    - While in period 1 resident's income may end up being quite different, they are symmetrically poorer in period 0. Everyone has incentive to borrow (given $U = \ln(C)$)
    - While in period 1 income is random from an individual perspective, there is no aggregate uncertainty

4.1.2 Non-Contingent Debt Contracts

- Non-contingent: interest rate fixed at R^W (i.e. not contingent on ex-post realization of income)
- Household: $\max U(c_{i,0}) + EU(c_{i,1})\ s.t. c_0 = y_{i,0} + b_0; c_{i,1} = \begin{cases} c_{i,1}^H = y_{i,1}^H - x_1 \\ c_{i,1}^L = y_{i,1}^L - x_1 \end{cases}$ where $x_1 = R^W b_0 = b_0$
- Lender: what they are willing to lend b_0 cannot be higher than expected discounted flow of cash payments. Given credibility, participation constraint is given by $b_0 \leq \frac{1}{2}x_1 + \frac{1}{2}x_1 = x_1$

Solving

- Combining we get optimisation problem:
  - $\max U(y_{i,0} + b_0) + \left[\frac{1}{2}U(y_{i,1}^H - x_1) + \frac{1}{2}U(y_{i,1}^L - x_1)\right]$
  - $= U(0.5 + x_1) + \left[\frac{1}{2}U(2 - x_1) + \frac{1}{2}U(1 - x_1)\right]$
- Takin FOC wrt x_1. Then just substitute in $U(C) = \ln(C)$ and solve
  - $U'(0.5 + x_1) = \frac{1}{2}U'(2 - x_1) + \frac{1}{2}U'(1 - x_1)$

Interpretation

- Consumption is smoother and welfare higher than under financial autarky

- But… allocation is inefficient. Period 1 consumption when income is low is quite low (borrow based on more future income that never exists). Households face substantial income risk!

4.1.3 Contingent Debt Contracts

- Contingent: payments in period 1 are contingent on ex-post realization of household income
- Household: $\max U(c_{i,0}) + EU(c_{i,1})\ s.t.\ c_0 = y_{i,0} + \tilde{b}_0; c_{i,1} = \begin{cases} c_{i,1}^H = y_{i,1}^H - x_1^H \\ c_{i,1}^L = y_{i,1}^L - x_1^L \end{cases}$
- Lender: Given credibility, participation constraint is given by $\tilde{b}_0 \leq \frac{1}{2}x_1^H + \frac{1}{2}x_1^L$

Solving

- Combining we get optimisation problem:
  - $\max U(y_{i,0} + \tilde{b}_0) + \left[\frac{1}{2}U(y_{i,1}^H - x_1^H) + \frac{1}{2}U(y_{i,1}^L - x_1^L)\right]$
- Takin FOCs wrt x_1^H and x_1^L
  - $U'(0.5 + \tilde{b}_0)\frac{d\tilde{b}_0}{dx_1^H} = \frac{1}{2}U'(2 - x_1^H)$ and $U'(0.5 + \tilde{b}_0)\frac{d\tilde{b}_0}{dx_1^H} = \frac{1}{2}U'(2 - x_1^L)$
- Instead of solving we see that: if pledge $x_1^H = 1$ and $x_1^L = 0$ in respective states they can smooth consumption completely. This also satisfies participation constraint

Interpretation

- Smoother consumption relative to contingent and financial autarky cases. This is first-best!

4.2 Sovereign Risk

- We have a credibility issue:
  - Ex-post lucky residents have no incentive to honour their contracts and make payment x_1^H
  - Sovereign government has no incentive to rule against domestic residents
- Anticipating this outcome, foreign investors know ex post they will get $x_1^H = 0$ so under rational expectations not willing to lend at all! Return to unfavourable financial autarky case

4.2.1 Default Cost as a solution

- Suppose default incurs some cost Ω
  - E.g. Exclusion from international capital markets; legal cases disrupt business; default also affects domestic borrowers as hard to separate; rise in macroeconomic uncertainty
- Residents will prefer "to pay" rather than "default" as long as $x_i^H \leq \Omega$
- Lenders thus willing to lend $\tilde{b}_0 < \frac{1}{2}\Omega + \frac{1}{2}0$ (depend on Ω and probability!)
- Default is costly, Ex post an economy in default suffers drastic reduction in efficiency. But precisely this cost enables residents to enter international financial contracts and smooth consumption

4.2.2 Types of Contracts

Verifiable, enforceable

- Get first-best scenario: country is constrained only by its <u>ability to pay</u> in period 1: $x(y_1) \leq y_1$ and risk is shared efficiently with creditors
- Contracts contingent on economic fundamentals e.g. GDP indexed bonds. Look like <u>equity</u>!

Verifiable, unenforceable

- Get default cost scenario: country is constrained by its <u>willingness to pay</u> in period 1: $x(y_1) \leq \Omega$ and risk is shared inefficiently with creditors

- Still looks like equity but with understanding that payments never exceed the default cost Ω

Unverifiable, unenforceable

- E.g. may not have power to bring country to agree on their assessment of state of world
- Lenders will set terms to provide incentives to country to 'reveal the truth', similar to non-contingent debt studied above $x^H = x^L = x$
- And again, country will never repay in excess of default cost Ω
- Cannot be generally efficient and countries are generally credit constrained. Their ability to pay is higher than what investors are willing to do!

4.2.3 Application

- Why did we see higher growth in cross-border assets/liabilities since 1990s?
    - Perception of default costs increased – capital markets became more integrated and did not want to be excluded from this
    - General underestimation of risk, including sovereign risk (financial "bubble")
    - Perception of negative spill overs from a country's default meant debtors may borrow excessively on expectations of being bailed out under adverse circumstances (moral hazard)

- When debt is state-contingent the "lucky ones" default. When debt is non state contingent, the incentive to default is also high when unlucky!

5 Sovereign Debt Crises

5.1 Model Set Up

- World: Small open economy, exogenous business cycle, no domestic and external debt distinction

Government

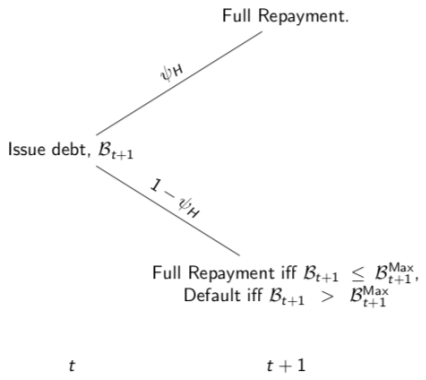
- Outstanding stock of debt inherited from past
- May enter recession with probability $1 - \phi_H$

Investors

- Can invest in two assets
    - International one-period bond with no risk of default and price $Q^* = 1/R^W$
    - One-period bonds issued by country with risk of default. $R_t = 1/Q_t$
- To simplify set $R^W = 1$ and $Q^* = 1$. International investors are risk neutral

Default

- Price at which investors are willing to finance government depends on their assessment of sustainability. Government takes this as given
- Government may not be willing/able to honour debt obligation when they are both in recession and debt is above its critical threshold $\mathcal{B}_{t+1}^{Max}$

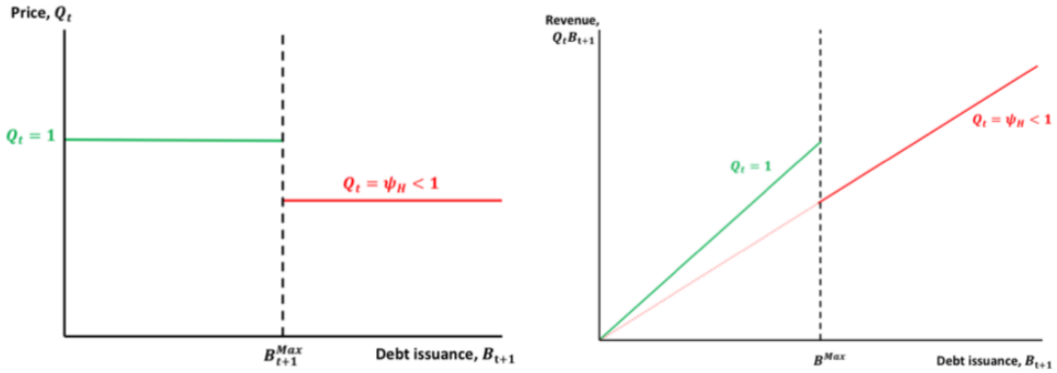


5.2 Multiple Equilibrium Q_t

5.2.1 Solving

How much government can borrow

- If $\mathcal{B}_{t+1} > \mathcal{B}^{Max}_{t+1}$ then risk means expected cash flow becomes $0 * (1-\phi_H) + 1 * \phi_H = \phi_H$
    - Bond price is equal to probability that economy will operate at full employment
- Have two cases with discontinuity in between $Q_t = \begin{cases} \frac{1}{R^W} = 1 \text{ if } \mathcal{B}_{t+1} \leq \mathcal{B}^{Max}_{t+1} \\ \phi_H \text{if } \mathcal{B}_{t+1} \geq \mathcal{B}^{Max}_{t+1} \end{cases}$



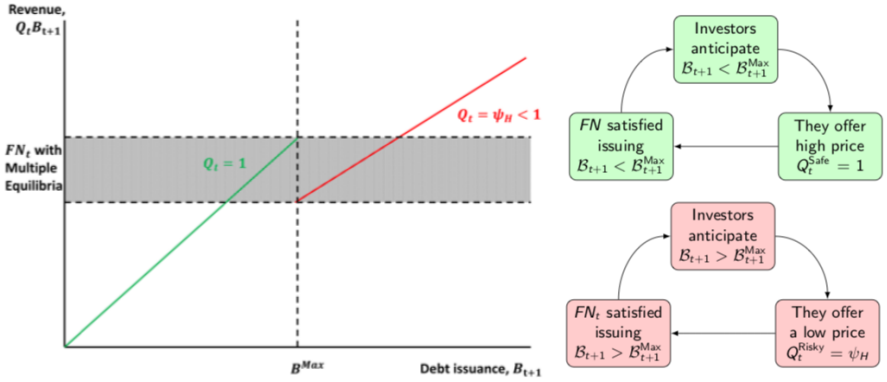
- Laffer Curve shows revenue the government is able to obtain as a function of the debt it issues

How much government wants to borrow

- Financing Need given by $Q_t \mathcal{B}_{t+1} = G_t - T_t + \mathcal{B}_t = FN_t$
    - Period's primary deficit plus maturing debt and interest payments
- Lower price Q_t the higher the stock of new bonds $\mathcal{B}_{t+1}$ government needs to issue to satisfy FN_t

5.2.2 Case of Multiple Equilibria

- If FN is neither too low nor too high then possible we get belief-driven: Investors may coordinate their expectation on either despite same economic fundamentals
    - Rational expectations are self-fulfilling!
- Given FN_t the following must simultaneously hold for this to be true:
    - $\mathcal{B}_{t+1} = \frac{FN_t}{Q_t^{riskless}} \leq \mathcal{B}^{Max}_{t+1}$ and $\mathcal{B}_{t+1} = \frac{FN_t}{Q_t^{risky}} \geq \mathcal{B}^{Max}_{t+1}$
    - Thus range FN_t that satisfy this is: $Q_t^{risky} \mathcal{B}^{Max}_{t+1} \leq FN_t \leq Q_t^{riskless} \mathcal{B}^{Max}_{t+1}$

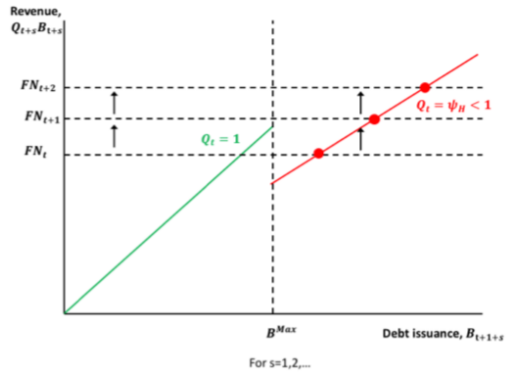


Logic of belief driven debt crises

- Economics does not provide a general theory for how investors coordinate expectations but instead models on realizations of some exogenous random variable (sunspot)
- Economic outcomes may vary depending on an "extrinsic random variable" – a random influence that matters only because agents think it matters

5.3 Dynamics

- Risk of default does not mean government will default when $\mathcal{B}_{t+1} > \mathcal{B}_{t+1}^{Max}$
- But in absence of strong G/T correction both stock of risky debt and FN will be increasing
  - $\mathcal{B}_{t+1} < \mathcal{B}_{t+2} < \cdots$ and $FN_t < FN_{t+1} < \cdots$
- As debt accumulates and government stays above threshold will default as soon as hit recession
- We show this as a slow moving debt crisis:



Endogenous deterioration of the economy

- In more general models, financial conditions worsens alongside increase in government debt:
- Government financial condition worsens; Household/firms financial condition worsens; less consumption/investment; lower output and tax revenues; higher financing needs…

Time and state contingency

- Thresholds are "latent variables": difficult to estimate based on observables
- So far assumed constant $\mathcal{B}_t^{Max}$ but irl may actually shift leftwards when conditions worsen…

- Decision to default is assessment of the cost of default versus cost of adjustment required to avoid it
  - Government will honour debt as long as not forced to generate surpluses larger than PS
- How much adjustment is acceptable varies and may be lower in a recession: $PS^L \leq PS^H$

- Consider now definition that $\mathcal{B}_t^{Max} = PS_t^s + Max(\quad)$

- Debt threshold depends on maximum adjustment willingness PS_t^s and governmnet's ability to rollover debt $Q_t\mathcal{B}_{t+1}$, which itself depends on future adjustments PS_{t+j}^s!
- Thus $\mathcal{B}_t^{Max}$ can actually fall during recessions!

Smoothing Adjustment and Gambling on Recovery – see Dan's notes

- Fiscal consolidation and adjustment to be less painful if they may be spread over many periods
- Suppose government cannot repay full debt today so either defaults or issues risky debt:
- Note that we may have $\mathcal{B}_t^{Max} = PS_t^L + Max\left(Q_t^{risky}\mathcal{B}_{t+1}^{risky}\right) \geq \mathcal{B}_t \geq PS_t^L + Max\left(Q_t^{riskless}\mathcal{B}_{t+1}^{riskless}\right)$
  - More revenue is obtained issuing risky debt than riskless, but this puts gov above threshold
  - Government is not able to repay full debt today ($\mathcal{B}_t^{Max} > PS_t$) so either sustains via issuing risky debt (as $\mathcal{B}_{t+1}^{riskless} \leq \mathcal{B}_{t+1}^{risky}$) or defaults (desirable if $FN_t \geq PS_t$)
  - Issuing risky debt is smoothing adjustment burden but "gambles" on future recoveries, as new debt will only be repaid if in good state. Arises when either equality is strict
    - For this to be possible Q^{risky} cannot be too low relative to $Q^{riskless}$, e.g. expected haircut and probability of bad economic times ahead need to be small enough
    - And probability of recession cannot be too large else revenue falls short of $\mathcal{B}_t - PS_t$

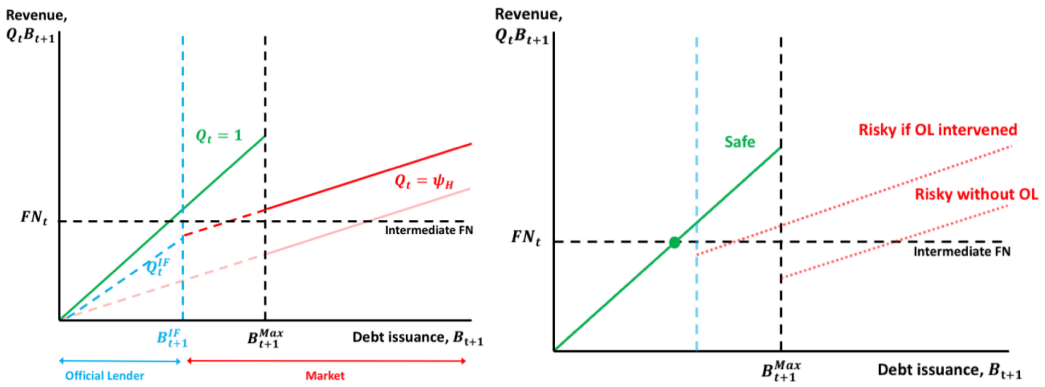
ADDRESSING DEBT CRISES

- Sovereign debt crisis may spill over across borders from the origin country via trade and financial contagion channels
- Thus may want international institutions to help countries contain and manage the risks

5.4 BACKSTOPS / INTERNATIONAL LENDER OF LAST RESORT / LIQUIDITY SUPPORT

5.4.1 MODEL

- Consider case of multiple equilibria where self-fulfilling expectations can lead to bad convergence. Can we eliminate this?
  - World where $FN_t = Q_t^{Market}\mathcal{B}_{t+1}^{Market} + Q_t^{IF}\mathcal{B}_{t+1}^{IF} = \left(Q_t^{Market}\frac{\mathcal{B}_{t+1}^{Market}}{\mathcal{B}_{t+1}} + Q_t^{IF}\frac{\mathcal{B}_{t+1}^{IF}}{\mathcal{B}_{t+1}}\right)\mathcal{B}_{t+1}$
- Suppose International Fund IF ready to buy country debt at price above market $Q_t^{IF} \geq Q_t^{Market}$. A sufficiently large such program $\mathcal{B}_{t+1}^{IF}$ prevents overall debt rising above $\mathcal{B}_{t+1}^{Max}$:
  - If $\mathcal{B}_{t+1}^{IF}$ s.t. $\mathcal{B}_{t+1}^{Market} + \mathcal{B}_{t+1}^{IF} = \frac{FN_t - Q_t^{IF}\mathcal{B}_{t+1}^{IF}}{Q_t^{Market}} + \mathcal{B}_{t+1}^{IF} < \mathcal{B}_{t+1}^{Max}$
  - In bad equilibrium investors offer low price Q_t^{Risky}
  - Now IF offers better price Q_t^{IF} for $\mathcal{B}_t^{IF}$ units
  - IF intervention reduces debt left that market finances (Q_t^{Risky} curve does not start at origin)
  - Even if investors buy remaining FN_t at Q_t^{Risky}, total debt remains below threshold $\mathcal{B}_{t+1}^{Max}$
- Thus, equilibrium market price cannot be Q_t^{Risky} as expectations of default one period ahead would never be fulfilled. unique equilibrium debt price is the "default-risk free" equilibrium $Q_t^{Riskless}$



- IF does not need to purchase debt to be effective ex post! Its backstop just needs to be
  - Credible, ready to purchase debt if ex post markets challenge
  - Sufficiently large "big bazooka" $Q_t^{IF}\mathcal{B}_{t+1}^{IF}$
    - Borrow on a large scale without losing status of low-risk borrower
    - Leverage bond price $Q \geq Q_t^{IF} > Q_t^{Risky}$

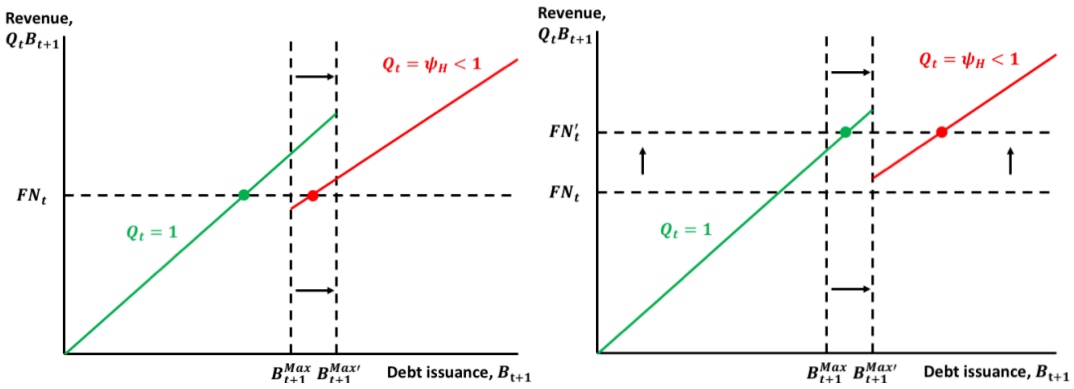
5.4.2 *Challenges*

- **Analytical limitations:** Difficult to tell if sovereign risk crisis is driven by arbitrary beliefs as opposed to fundamentals, and thus if backstop is appropriate
- **Residual Risk:** Eliminating belief crisis does not eliminate default for fundamental reasons
  - Suppose have "good", "bad" and "disaster" case
  - In unique good equilibrium bond price includes a (small) premium for disaster scenario
  - If IF intervenes it may put "taxpayers" money at stake.
  - If possibility of losses hampers willingness of IF to intervene it may undermine the credibility of the backstop
- **Moral Hazard:** Eliminating self-fulfilling debt crises may weaken the incentives for a country to implement good but costly policies and reforms
  - But… literature shows opposite may be true: shielding economy from debt runs enhances benefits from good policies
- **Dynamic vulnerability to fundamental crises:** Government has no incentive to keep FN_t in "good" region (unique, default-free) but borrows to upper edge of multiple equilibria range.
  - Now if have small fundamental shock am really screwed
- **Political economy distortions:** Once IF is in place governments exert political pressure for it to buy their bonds well beyond objective of ruling out belief driven crises

5.5 Bailouts / Loans with concessional rates

5.5.1 *Model*

- Official lenders provide loans issued at a concessional interest rate $Q^{Official} > Q^{Market}$ (or lengthens maturity to smooth flow of payments)
- Effective if this makes country at least indifferent between repaying and defaulting (i.e. liabilities in line with max adjustment) $\mathcal{B}_t = \mathcal{B}_t^{Market} + \mathcal{B}_t^{Offical} \leq PS^L + Q^{Official}\mathcal{B}^{Offical} + Q^{Safe}\mathcal{B}^{Market}$



5.5.2 Challenges

- **Moral Hazard**: Prospective bailouts may lead government to borrow more and take on more risk [ex-ante] (Tirole, 2015) or less likely to make fundamental adjustment during crisis [ex-post]
    - To prevent IMF attaches "surveillance" (ex-ante) and "conditionality" (ex-post)
- **Do not eliminate multiplicity**
- **Senior Debt**: IMF paid back before market with justification that IMF intervention helps avoid deeper crisis, thus enhancing capacity to pay others
    - But… in some case may lead to other being paid less and thus discourages private lending
- **Stigma**: Countries may be reluctant to request help as investor expectations worsen

- Note: Cross-border solidarity may actually be "self-interested." (as defaults cause damage abroad). Debt crisis also leads to global inefficiency and default costs are waste (leave resources idle)

5.6 Debt Reductions

5.6.1 Model

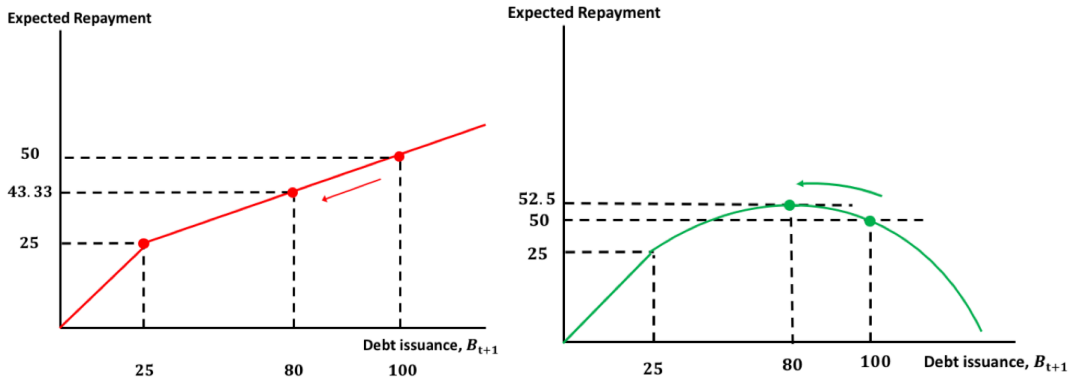
- World: One period, face value stock 100
- Two possible future states: Good (p=1/3) where pay back 100, Bad (p=2/3) where pay back 25
- Expected repayment $100 * \frac{1}{3} + 25 * \frac{2}{3} = 50$
- Now suppose forgive 20…

Simple Case

- New expected repayment: $(100 - 20) * \frac{1}{3} + 25 * \frac{2}{3} = 43.33$
- Creditor stands to lose 6.67 (as only has effect in good state)
- No incentive for this to happen – only helps when doesn't need help!

Interesting Case

- Now probability of good state is decreasing function of liabilities: $\pi(\mathcal{B}) * L + \big(1 - \pi(\mathcal{B})\big) * 25$
    - When government has large debt, benefits of reforms just increase resources that go to creditors. Thus, less likely to implement them
- Get a non-linear we now get a Laffer curve and forgiving can increase expected repayments!
    - $(100 - 20) * \frac{1}{2} + 25 * \frac{2}{2} = 52.5$
- Although country pays more we suppose social benefits are increasing in probability of good state



5.6.2 *Challenges*

- **Free riding**: When group forgives debt, individual investor has profit incentive not to. Thus contracts have Collective Action Clauses: if supermajority agree restricting all must abide

Debt Buy Backs

- Since market price of debt issued by a country in distress is cheap, government could in reduce debt burden by buying back liabilities in secondary markets at low price
- But… at the announcement of the buy-back, the market price of debt will jump up:
  - Pre-announcement: $\frac{100*\frac{1}{3}+25*\frac{2}{3}}{100} = 0.5$. Thus cost of buy-back is $20 * 0.5 = 10$
  - Post-announcement: $\frac{(100-20)*\frac{1}{3}+25*\frac{2}{3}}{100-20} = 0.541$. Thus cost of buy-back is $20 * 0.541 = 10.82$
- We see that creditors benefit from this, so government must lose:
  - Government: Same as debt forgiveness $50 - 43.33 = 6.67$
  - Creditor: $10.82 + 43.33 - 50 = 4.15$. This is more than pre-buy back state!!

Debt Swaps

- Swaps old debt for new debt but this gets senior status
- Once new senior debt is issued, old debt is worthless in bad state. Thus worth $1 * (1/3) = 1/3$
- Thus, at equilibrium country exchanges 3:1, that is 75 old units for 25 new units
- Expected repayment now *is* $(25\ old + 25\ new) \cdot 1/3 + (25\ new) \cdot 2/3 = 100/3 = 33.33$
- Government saves 16.7 entirely at cost of creditors
- But… problems in practice
  - Strong incentive for individuals to free ride via hold out problem: non-consenting bondholders retain their legal right to demand repayment

6 National and International Money

6.1 Money definitions

Money

- Money serves three key purposes: Unit of account; Medium of exchange; Store of value
- Key feature is liquidity: Does not lose value when holder converts it into other assets and occurs with minimal transaction costs
- Note following characteristics
  - Agents must have confidence in stability of asset

- As serves function, agent will hold legal tender even if it pays lower cash interest
- Widespread use is rooted in network externality

Private Alternative

- Consider world with no official national currency, monetary asset with intrinsic value (i.e. gold), and private financial intermediaries (i.e. bank) that issue notes with guarantee to convert at fixed rate
- Two issues with tension between: to grow banks must issue freely convertible notes but this in turn may increase riskiness
  - Market concertation caused by network externalities
  - Bank bankruptcy and instability for fundamental reasons (bad lending) or belief-driven runs (Diamond-Dybvig model)
- Thus national states address by (1) claiming public monopoly over issuing legal tender and (2) guarantee bank deposits to ensure convertibility plus CB to act as lenders of last resort

International Money

- National state solutions have no international counterpart: (1) which currencies have international status is determined by history/economics and (2) bailouts are limited in scale

- What determines if currency has "international status"? Dollar is he most "international currency" but others exist to use in cross-border transaction, hold as reserves, used to denominate contracts
- Eichengreen (2013) criteria:
  - Scale: rooted in network externalities correlated to size and share of key markets
  - Stability of value: Since WWII Fed has done good job
  - Liquidity: US Treasury is deepest in world
- Bernanke (2016) adds:
  - Safety: Dollar is 'safe haven' that appreciates during crisis
  - Lender of last resort: Fed backstop provider of dollars by instituting currency swaps (with 14 central banks during Great Recession)

- May not want status as costs outweigh exorbitant privilege:
  - If international status there is appreciations status so exports less competitive (Germany)
  - Tension between international and national objectives

6.2 Issues of Supply

6.2.1 Stability and safety conditions require strong fiscal capacity

Deriving Budget Constraint

- Note following (where $Q_t = \frac{1}{R_t}$)
  - $G_t = T_t + Q_t B_{t+1}^G - B_t^G$: government finances spending through tax or debt
  - $\frac{M_{t+1} - M_t}{P_t} = Q_t B_{t+1}^{CB} - B_t^{CB}$: CB increases monetary base via Open Market Operations (bonds)
  - $B_t = B_t^G - B_t^{CB}$: government discounts debt held by CB as it is the government!
- Thus rearrange to get $-PS_t = T_t - G_t = Q_t \mathcal{B}_{t+1} - \mathcal{B}_t + \frac{M_{t+1} - M_t}{P_t}$
  - Where $\frac{M_{t+1} - M_t}{P_t}$ is seignorage value: how much public "saves on borrowing costs" when CB purchases bonds (with interest) against money (without). Akin to tax on money

Model

- Set up as follows:
  - Budget constraint must hold every period $t = 0,1,2, \ldots$
  - For $t \geq 2$ economy is in long run/stationary: constant real values, constant growing nominal
  - Suppose no output growth for simplification: $\frac{M_{t+1}}{M_t} = \frac{P_{t+1}}{P_t} = 1 + \pi$ thus $\frac{M_{t+1} - M_t}{P_t} = \frac{M}{P}\pi$
- In Long Run: $-PS = QB - B + \frac{M}{P}\pi$ thus permanent surplus $PS + \frac{M}{P}\pi = \frac{R-1}{R}B$
  - Sustain higher debt through larger surplus PS or seignorage revenue $\frac{M}{P}\pi$
- In Short Run: $Q_1 B = -PS_1 - \frac{M_2 - M_1}{P_1} + B_1 = FN_1$
  - Given B any excessive financing need FN_1 requires short run adjustment
  - Either via surplus PS_1, default on debt B_1, money growth $M_2 - M_1$, or inflation P_1
- Weak fiscal capacity -> rely on inflation to sustain debt -> unstable currency

Laffer Curve

- May be maximum savings that can get through seignorage
- Note $\frac{M}{P} = f(+Y, -i) = f(+Y, -[r + \pi])$ thus $\frac{M}{P} = f(-\pi)\pi$
- Thus inflation raises tax on money balances but also reduces from which to tax

6.2.2 Triffin Dilemma

Original Dilemma

- Case for: ↑ world growth; ↑ transaction demand; ↑ $ demand. To match US must ↑ supply via CA deficit. Eventually, $ circulating larger than US/world gold reserves can convert (since 1960s)
- Case against: But Despres et al. argue this is not case:
  - US is banker of world and banks don't have 100% reserve ratio
  - Under Bretton Woods only state monetary authorities were allowed to convert dollars into gold. Political pressure could be applied so they don't (via cold war)

New Dilemma: Satisfy rising demand vs. keep currency stable

- Three major changes:
  - Reserve currency is no longer pegged to gold (no fixed conversion rate)
  - No capital controls hence run on dollar can be market based
  - US can increase $ supplies by issuing debt, not just CA deficit
- Only US treasury default that impaired major global reserve asset
- Case for: ↑ world growth; ↑ transaction demand; ↑ $ demand. To match US increases fiscal debt…
  - $ demand, ↓ R. US can sustain ↑ B without ↑ PS!
  - But at some point B exceeds level sustainable given PS, leading to crisis
  - Farhi et al (2011) and Obstfeld (2011): ↓ US share of world economy; ↓ US fiscal capacity to satisfy demand for treasuries
- Case against: Farhi and Maggiori (2016): what matter is that US asset is relatively safe but… if $ risk rises (default or inflation debasement) assets held across world become riskier, destabilising world

6.3 Current Account and Liquidity Shocks (Jeanne, 2016) – SEE DAN NOTES

6.3.1 Set Up

- Three Groups:
  - Domestic resident: Borrow b_0 at rate $R^w > 1$ to fund consumption and buy reserves

        - Endowed $y_0 = 0$ and $y_1 > 0$, creating borrowing/smoothing motive
    - Intermediary: Lends out b_0 to resident and holds deposit from investor
    - Foreign investor: Hold deposit for one period and earn R^W or withdraw fraction s early
- Intuitively, key shock is that lenders (i.e. global banks) may be subject to bank run with prob χ. If bank run arises share of banks s will seek to raise funds through fire-sale of assets
- Formally, if investors withdraw sb_0, intermediaries need to acquire that worth in reserves from residents $M = \int^1(m)d_j$ in exchange for debt contracts b_0
    - If $M \geq sb_0$ have sufficient liquidity to do this
    - If $M \leq sb_0$ then depositor suffers loss q_0 where $q_0 sb_0 = M$ (where $M \to 0, q_0 \to 0$). In this case investors unwilling to lend via intermediaries
- Thus get timing:
    - 0 (morning) households decide b_0, c_0, m and banks issues loans b_0 whilst holding m subject to value-at-risk constraint $M \geq sb_0$ (so in aggregate always cover costs)
    - 0 (afternoon) fraction s of banks engage in fire-sale sb_0 in exchange for m. Price $qsb_0 = m$ implies that b_0 are not liquid but m is
    - 1 households repay remainder of loan and consume c_1

6.3.2 SOLVING

- Residents $\max_{b_0,m} U(c_0) + E_0(c_1)$ s.t.
    - for each individual $c_0 + m = b_0$, $\begin{cases} c_1 = y_1 - R^w b_0 + m & \text{with prob } 1-\chi \\ c_1 = y_1 - R^w(1-s)b_0 & \text{with prob } \chi \end{cases}$
    - for aggregate $M \geq sb_0$ (as m yields no interest but b_0 is costly, this binds)

Private Failure

- Resident does not want to hold m: costs R^w but bears no interest
- Residents (being atomistic) take M and b_0 as given, thus fail to internalize that if they lower m at the margin this will reduce q_0. Care about m only in relation to χ
    - In extreme case $\chi \to 0, E(c_1) \to y + m - R^w b_0$ and rational choice $m \to 0, U'(c_0) \to R^w$. Decision to borrow and consume determined exclusively by R^w
- When left to own devices, households may choose sub-optimal level of international reveres as the marginal private benefit of holding reserves will not generally coincide with marginal social benefit

Government Solution

- Thus rationale for international reserve policy: design policies to satisfy $M = sb_0$ (borrowing generated need to accumulate s extra reserves for each extra dollar of debt)
- Reserve management: CB acquires reserves, financed through taxation in period 1 so $b^g = \frac{b_0 s}{1-s}$
- Make private agents internalize costs of reserves in borrowing decisions by solving maximization subject to all constraints: $U'(c_0) = \frac{R^w - s}{1-s} > R^w$
    - Regulation: intermediaries required to hold reserves, raising cost of borrowing
    - Taxes: tax capital flows so cost of borrowing: $R^w + tax$ where $tax = \frac{s(R^w-1)}{1-s}$

7 INTERNATIONAL FINANCIAL INTERMEDIARIES

7.1 LEVERAGE CYCLES (ADRIAN AND SHIN, 2010)

7.1.1 *Model*

- Note definitions: Assets A, Liabilities L, Equity $A - L$, Leverage ratio $\mathcal{L} = \frac{A}{A-L}$ representing equity can absorb loss of $\mathcal{L}\%$ in A
- Given L, higher A raises equity and lowers $\mathcal{L}$. But may want to use extra equity to expand L, A
    - US commercial banks have <u>constant leverage</u> (expand A, L until $\mathcal{L}$ back)
    - US brokers and dealers tend to increase $\mathcal{L}$ <u>pro-cyclically</u>
    - US households $\mathcal{L}$ is <u>counter-cyclical</u>: if house prices rise, households do not systematically refinance mortgage or buy new houses
- Higher target $\mathcal{L}$ leads to larger balance sheet responses, with consequences for financial stability…

7.1.2 *Booms and Busts*

- **Boom:** Exogenous appreciation of securities A, endogenous hike in lending and demand for assets, higher price of A…. Positive spiral
- **Bust:** Reverse above but with key asymmetry: may wipe out equity completely, causing bankruptcy! Asset price adjustment may be too strong/fast relative to bank's ability to de-leverage
    - High leverage ratio $\mathcal{L}$ increases the risk of such bank fragility.

- Procyclical leverage reduces loss absorption capacity of banks during asset price and economic booms. Thus end of boom is more likely to coincide with banking crisis!
    - Jorda et al. (2013) studying 150 recessions: Downturn is worse when preceded by credit boom, especially if bubble financed by credit from intermediaries not equity from households (2008 vs. dotcom)
        - Also, financial crisis are worse than normal recession: larger fall in output (-5% vs. -1.5%) and take longer to recover (5 years vs. 2 years)
        - Also, downturns worse when public debt is elevated as limits fiscal capacity to fix it

7.2 Diabolical Loops (Brunnermeier et al., 2016)

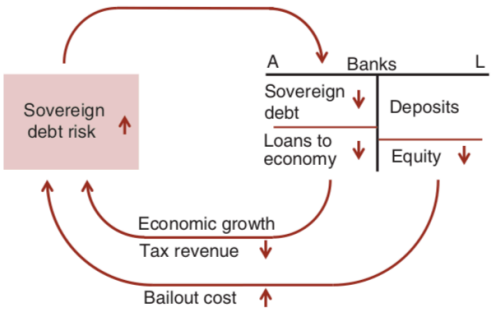


Figure 1. Two Diabolic Loops

- Eurozone suffered vastly from this: Intermediaries had leverage ratios of 40-50 and relied on too-big-to-fail logic:
    - Ex ante: creditors pursue excessive risk taking because know will be bailed out
    - Ex post: bill may exceed fiscal capacity to deal with it

7.3 Providing Liquidity

Uncertainty is key

- Pre-crisis Kohn (2005) thought cross-border banking would allow diversification of country-specific risk
- But since price of opaque and complex securities was difficult to determine, crisis coincided with outburst of uncertainty regarding solvency around world

- Bernanke (2013): 2008 crisis was classical financial panic but in a different institutional setting
    - Note framework: Bank has illiquid assets (loans) but liquid liabilities (deposits). Thus bank run is self-fulfilling, leading to fail or dump long-term assets at discounted value
    - If all subprime mortgages in US defaulted size would be "one bad day at the stock market" but due to complexity no-one knew who would suffer it and how toxic assets were
        - $\mathcal{L} = \frac{A-\text{loss}}{\max(0,\ A-\text{loss}-L)}$
    - Investors adopted most precautionary strategy as wholesale funding had no deposit insurance so series of runs generating huge pressure on key financial firms

Solving this

- Key measures: higher capital ratios, liquidity coverage ratios but these still fall short of addressing pro-cyclicality fundamentally
- Need international cooperation: European banks used dollars, but ECB can't provide dollars. Thus Fed set up currency swaps
- But… costly arbitrage may mean markets are less integrated, and thus less liquid, than before and allow for regulatory arbitrage (international cooperation required to enforce)

Dollar Cycles (Bruno and Shin, 2015)

- Bank managers maximize value subject to a given value at risk
- Appreciation of dollar raises value of dollar-denominated debt and foreign borrower's profits weaken, making them riskier. May exceed level bank managers are willing to tolerate
- Banks reduce exposure to now riskier dollar denominated loans to foreign borrowers, reducing cross-border lending

MONETARY UNION

- Economic union is by nature political. "Yet it is clear for all its resilience, our union is still incomplete" – Draghi
- "to do whatever it takes"

7.4 ORIGINS

History

- Bretton Woods regime falls, and European policymakers express political preference for "exchange rate stability"
- Werner (1969) drafts reports for monetary union, forming basis for European Monetary System during the 1980s
- Treaty of Maastricht launches monetary unification (1991) but suffers from large currency crises 1992-93 (e.g. UK abandons). Irrevocably fixed in January 1999; Euro launches 2002

Justifications

- Catalyst for deeper political integration

    - Maintaining peace in continent by setting premise for 'ever increasing integration' and beginning principle of 'shared sovereignty'
- Prerequisite for single market, so to reap benefits from large economically integrated area
    - Reduces transaction costs, increases price comparison transparency, further integrates capital markets, eliminates exchange rate uncertainty
- Political exchange between strong core and weak periphery:
    - Core countries could benefit from (a) constraint on competitive devaluation by periphery and (b) weaker exchange rate that if they maintained their own currency
    - Periphery is supposed to benefit from participating in area of economic/financial stability, trading off gains from competitive devaluation with lower risk premia

7.5 Optimum Currency Area

7.5.1 Motivation

- In having a shared currency, countries give up policy instruments (central bank) and adjustment margins (exchange rate and inflation) that could stabilize country-specific shocks.
- Friedman (1953) compares this to daylight savings time: flexible exchange rates change price of domestic output automatically and efficiently in reaction to country specific shocks
    - Much more favourable than changing loads of prices, requiring price and wage flexibility
- But… Mundell (XXXX): If flexible regimes are so desirable why not introduce regional currencies? We need a set criterion to judge whether countries/regions should form a monetary union

7.5.2 Criteria

- The economic inefficiencies caused by giving up
    - Autonomous monetary policy (policy instrument)
    - Exchange rate and national inflation (margins of adjustment)
- are less consequential if…

1. Exogenous business cycle shocks tend to be symmetric across states
    - i.e. similar industrial structure and economic/financial conditions
2. Each country can effectively use its domestic fiscal policy to stabilize country-specific shock
    - i.e. region hit by a shock has automatic stabilizers or gets special regional assistance
3. Macroeconomic risk is sufficiently diversified/shared across border via capital markets
    - i.e. XXX
4. Production factors are sufficiently mobile, at low private and social costs
    - i.e. labour is mobile so region doing well absorbs unemployment from others
5. Prices and wages are sufficiently flexible
    - i.e. region hit can engage in international devaluation

7.5.3 Does US satisfy OCA?

1. It is clear there is business cycles acre not always synchronized across sates. Thus needs some mechanism to offset this…

The Good (differences to EU)

2. Fiscal policy plays far greater role than in EU, allowing sharing of income risk across locations
    - During the Great Recession, Florida, received $40bn, largely from 'automatic stabilisers' such as federal welfare, hence recovered quicker
3. US financial markets are deep and large, providing market instruments to diversify local risk

- Fiscal and monetary authorities ensure federal debt is nominal safe asset, shielded from threat of destabilizing speculation and confidence crises.
  - Guarantee not extended to municipal bonds (trade at premium), but borrowing costs of households and firms is still anchored and does not rise with risk premia!
- Deposit insurance and lender of last resort facilities operate at federal level

The Bad

4. Labour mobility is higher than Europe but not clear it helps adjustment
   - Blanchard and Katz (1992): Amongst US states 1952-92 main adjustment mechanism is labour mobility but long-term state differences persist. Why might this be?
     - Wages not responsive enough to labour market conditions
     - Liquidity constraints force workers who become unemployed to leave rather than borrow and wait for upturn, leading to excessive labour out-migration
     - Shiller: Workers less mobile as inelasticity of residential housing stock ties down population. Firm stock is more elastic!
     - Increasing fiscal burdens and fiscal crises in states that experience adverse shocks may deter firms from coming, despite lower wages
5. Not clear prices adjust significantly to local cyclical conditions
   - Mian and Soufi (2013): During Great Recession locally concentrated shocks caused large variation in demand and thus unemployment
   - Corsetti et al. (2019): No evidence local price index responded: Unemployment rose sharply in areas where housing prices fell more sharply but general prices did not respond more

7.5.4 Risk polarization of 2008: US vs EA

- Initially incidence of crisis highlighted asymmetries across US metropolitan areas and states. But over time the recover coincided with marked convergence in economic conditions
- Euro area initially experienced less variations in economic activity across member states relative to US. But regional differences exacerbated after 2010 and remained persistent
  - In 2010 bonds issued by member states started to trade at very different prices, affecting financial conditions on a national level (because had no proper banking union)
- Fragmentation of economic and financial space of EA amplified asymmetries in business cycle across member states. This also affected union-wide stabilizations:
  - Monetary policy constrained by effective lower bound so unable to stabilize union-wide economy efficiently
  - If sovereign risk crisis develops, independent financial authorities are unlikely to provide stimulus: High-risk countries must cut deficits and low-risk countries have no incentive to expand (want to keep tight as precautionary measure)
  - Aggregate demand is thus too tight, hampering recovery

- Collins: In Italy legislation prohibits wage differentials between north and south. This has been suggested as an important reason for persistent, long-term differences in unemployment (Question méridionale)
- Alexander: In Germany during period of high in-migration during 1950s , regional unemployment differences were virtually eliminated

During the Great Recession, Florida, received $40bn, largely from 'automatic stabilisers' such as federal welfare, hence recovered quicker.

7.5.5 *Does EA satisfy OCA?*

- Three legged 'minimal' economic constitution:
  - ECB law – price stability and central bank indepdence (cannot finance governments)
  - Growth and Stability Pact: Public deficits and debt are to be kept low enough so minimal risk of default and confidence crisis
  - No bailout clause
- Clearly not built to be a transfer union.. But credibility of GSP and 'no bailout' clearly in doubt

- Euro launched with
  - No fiscal union
  - No common regime of financial markets and banking supervision (required coordination of 30-40 institutions)
  - No common institutions/funds: no monetary capcity to help country in trouble and avoid financial contagion from sovereign and financial crises
- Something lost in translation when formed monetary union
- Consider stress test:
- PASTE IN MECHANISMS
- Difficulty to contain diabolical loop between sovereign and financial bankjing crisis at member state level, that in turn fed divergence in country risk
- Need to (1) restate commitment to fiscal compact and also…
  - Monetary backstop: OMT
  - European Stability Mechanism
  - Banking Union

7.6 Monetary Policy and Self-Fulfilling Sovereign Risk Crisis

- "Ready to do whatever it takes" speech left deep impact on financial market expectations
- Launched Outright Monetary Transactions programme OMT: If country requests help through European Stability Mechanism, ECB can buy 1-3y sovereign debt
  - To date no country has requested help but still "most successful monetary policy measure undertaken in recent time"

7.6.1 *Backstop*

Model

- Simillar to backstop analysis before but with nominal prices $\mathbb{Q}$ and quantity $\mathbb{B}$
- Debt is one term, all investors are risk neutral, price of risk-free nominal bonds is $\mathbb{Q}_t = 1$
- Initial period t government with financing need $\mathbb{FN}_t$ issues new debt
- In period $t+1$ recession occurs with probability ϕ_L. If economy enters and outstanding debt exceeds $\mathbb{B}^{Max}$ government defaults
- Now if default occurs government imposes "haircut" on bond holders of X. Thus…
- $\mathbb{Q}_t = \begin{cases} \mathbb{Q}_t^{riskless} = 1 & \text{if } \mathbb{B}_{t+1} \leq \mathbb{B}^{max} \\ \mathbb{Q}_t^{risky} = (1-\phi_L) * 1 + \phi_L * (1-X) & \text{if } \mathbb{B}_{t+1} \geq \mathbb{B}^{max} \end{cases}$
- $\mathbb{FN}$ results from primary deficit $-\mathbb{PS}_t + \mathbb{B}_t = \mathbb{Q}_t \mathbb{B}_{t+1}$
- Second price $\mathbb{Q}_t^{risky} < 1$ is equilibrium if $\mathbb{B}_{t+1} = \frac{-\mathbb{PS}_t + \mathbb{B}_t}{\mathbb{Q}_t^{risky}} > \mathbb{B}_{max}$
- Can monetary policy do something to eliminate this equilibrium when it is driven by self-validating expectations of default?

- CB stands ready to by government bonds at better price $\mathbb{Q}_t^{CB} \geq \mathbb{Q}_{t+1}^{market}$
- $\mathbb{B} = \mathbb{B}^{market} + \mathbb{B}^{CB}$
- $-\mathbb{P}\mathbb{S}_t + \mathbb{B}_t = \mathbb{Q}_t^{market}\mathbb{B}_{t+1}^{market} + \mathbb{Q}_t^{CB}\mathbb{B}_{t+1}^{CB}$
- With large $\mathbb{B}_{t+1}^{CB}$ CB can thus prevent debt exceeding $\mathbb{B}^{max}$
- $\mathbb{B}_{t+1}^{market} + \mathbb{B}_{t+1}^{CB} = \frac{-\mathbb{P}\mathbb{S}_t + \mathbb{B}_t - \mathbb{Q}_t^{CB}\mathbb{B}_{t+1}^{CB}}{\mathbb{Q}_t^{market}} + \mathbb{B}_{t+1}^{CB} < \mathbb{B}^{max}$
- Can thus eliminate bad equilibrium

- Needs to borrow enough, credibly be expected to intervene ex post, borrow at better rate than sovereign borrower
- Monetary liabilities in form of "bank reserves" are risk free in nominal terms
    - Nominal risk free price =1 when purchasing M even if $\mathbb{Q}_t^{market} < 1$
- Financing purchases by issuing monetary liabilities: $\uparrow \mathbb{Q}_t^{CB}\mathbb{B}_{t+1}^{CB} = \uparrow M_{t+1}^{CB}$
- Liquidity trap: close to zero lower bound thus $\mathbb{Q} = 1$, as money and debt are close substitutes. As long as government bonds remain risk free they pay same interest rate (zero) as money
- If not in liquidity trap? CB can pay positive interest on reserves. Debt purchases would result in an inflationary expansion unless financed by issuing monetary liabilities remunerated at positive equilibrium interest rates

- Backstop: Is it inflationary?
- When there is no default CB receives full payments on holdings of government debt and can use these to 'buy back' liablieis, reducing outstanding stock of reserves without need to 'print money'
- Expansion in period 0 offset by contraction in period 1
- What if it exposes itself to risk of losses? i.e. country may default for fundamental reasons
- Shortfall of payments. CB can still make good on liabilities by printing money! This has inflationary consequences
- Propsect of deviating from its inflation objectives ex post may make CB reluctant to intervene ex ante
- Size of ECB relative to a member states makes backstop easier to implement in practice. But ensuring liquidity assistance creates moral hazard

7.7 Banking Union

- Two pillars
- Single Supervisory Mechanism: oversees 117 banks managing 82% of assets in euro area
- Single Resolution Mechanism: common authority to manage bailouts of banks in eurozone
- Single Rulebook: set of rules providing standards e.g. common deposit guarantee
- Bank Recovery and Resolutions Directive: established principle that public resources can be used to save bank only after bail-in (creditors take hit)
- EA banks are highly exposed to government debt (gamble on sovereign default or for political reasons), intensifying diabolical loops
- Risk sharing must be preceded by risk reduction

EU ESSAY FROM PART I

7.8 Fiscal Transfers

Why it is necessary

Why it is not working

- Typically require central body control 40% of tax revenues. EU budget is small, a mere 1% of GDP, and ineffective: CAP (half of budget) allocates 80% of funds to 20% wealthiest farmers.
- ECB's restrictive mandate means not guaranteed lender of last resort for Eurozone (quasi-fiscal). Explains why 2012 UK gilt yields as low as Germany's despite deficit similar to Italy

Why it can never work

- 2012 Outright Monetary Transactions 'corrects' interest rates of lagging economies; after €110bn Troika Greece bailout European Stability Mechanism created. But… only for crisis.
- No-bail out clause in Stability and Growth Pact . Each MS wants to more than they're paying. Germany only tolerates a little: dismissed Eurobonds and EU deposit insurance scheme.

7.9 Economic Convergence

Why it is necessary

- Homogeneity should make asymmetric shocks rarer. Note this is a weak substitute.
- Has been the main focus of EMU since the start as it is the least controversial. Part of Delor's Plan, which set foundation for euro and demanded "macro discipline"

Why it has not worked

- EU is political project so enlargements not scrutinised properly (e.g. Greece lied). Also focused on nominal not real indicators (Maastricht criteria vs. Brown's five economic tests)
- Created asymmetric shocks by giving periphery countries access to low IR: Irish property prices grew 10%p.a. until 2008 FC; Greek sovereign debt 170% of GDP; doom loops

Why it can never work

- Six-pack Law limited deficits to 3% of GDP and government debt to 60% with automatic sanctions. Banking Union enables ECB to monitor and unilaterally intervene in commercial.
- But… no enforcement (9 MS have already breached Six-pack; Italy €17bn bail-out with no ECB involvement) and requirement of unanimity (no treaty after 2007 Lisbon "housekeeping")

7.10 Flexible Prices

Why it is necessary

- Recall $\varepsilon = E\frac{P}{P^*}$. If E is fixed, ε can still be controlled by changes in P
- Many bailouts are conditional on structural adjustment programmes or "internal devaluations" to achieve just this

Why it has not worked

- Friedman's "day-light saving time" argument says this is much harder to do compared to flexible exchange rate (change one vs. a million).
- Frictions in the economy include sticky prices (menu costs) and sticky wages (minimum wage laws and welfare)

Why it can never work

- European Social Model envisions tightly regulated labour markets, generous welfare state, and a limited role of the market. Most spend ~30% of GDP compared to 20% Anglo-Saxon
- No political appetite for thorough reforms: Greek Bailout Referendum saw 61% vote against due to "excessive austerity", including a majority in every single region.

7.11 Labour Mobility

Why it is necessary

- With perfect labour mobility, unemployed migrate from affected country to where more jobs are available. This eases the impact of shock and makes countries more homogenous.
- Should be enshrined in EU's principle of "freedom of movement" and Schengen Area

Why it has not worked

- Adverse Selection: Most productive (i.e. rich) can reallocate, whilst must vulnerable (i.e. poor) are left behind. "Brain Drain" can also prevent convergence (0.4m Hungarians have left)
- Could explain why five years after 2008 Financial Crisis, the Spanish unemployment rate remains three times higher than before

Why it can never work

- Not just physical barriers to migration but also cultural (language) and institutional (3 months search period then "habitual residence test" for benefits).
- Could explain why US has higher migration rates and why the EMU's has a more amplified cyclical unemployment rate