

SØK 2009 International Macroeconomics
Teacher: Simone Valente
Fall term exam: 5 December 2014

Question 1: Asset Approach and Money Market

The spot exchange rate $E_{\$/\text{€}}$ between dollars (\$) and euro (€) is determined according to the asset approach. The equilibrium in the US money market is represented according to the theory of liquidity preference. Focus exclusively on the short-run, assuming fixed price levels and fixed expectations. Answer the following questions.

- (1.a) Write the condition for Uncovered Interest Parity.
- (1.b) Describe in a diagram the simultaneous equilibrium of the foreign exchange and the US money market. Suppose that, all else equal, the Federal Reserve decides to restrict money supply. Describe the effects of the shock in the diagram and verbally explain how market forces drive the US interest rate and the exchange rate from the initial equilibrium to the new respective levels.

Question 2: Aggregate Demand and Exchange Rates

Consider a generic open economy. The simultaneous equilibrium in the goods' market and in the asset market is represented by the $DD-AA$ curves. In equilibrium, real output equals $Y = Y_1$ and the exchange rate is $E = E_1$. Focus exclusively on the short-run, assuming fixed price levels and fixed expectations. Answer the following questions.

- (2.a) What is the short-run effect of a temporary fiscal expansion (i.e., a reduction in taxes or an increase in public spending) on real output, and on the exchange rate? What is the implicit effect of this shock on the interest rate in the money market?
- (2.b) Suppose that, observing the fiscal expansion, the Central Bank wishes to keep the exchange rate at its initial level E_1 . What kind of intervention should the Central Bank undertake on the foreign exchange market? If this operation is enacted, what happens to official reserves and to real output in the new equilibrium?
- (2.c) Based on your previous answers, discuss the economic reasoning behind the following two statements: first, "Adopting fixed exchange rates amplifies real shocks"; second, "Adopting fixed exchange rates requires fiscal discipline otherwise monetary authorities find it difficult to stabilize prices in the long run".

Question 3: International Monetary Systems

- (3.a) Briefly discuss the Trilemma of open economies. Explain why, in each possible subcase, only two of three options are feasible.
- (3.b) Explain the mechanism of imported inflation which led to the collapse of the Bretton Woods system.

Question 4: Crisis and Foreign Debt

Answer the following questions.

- (4.a) What is a balance-of-payment crisis?
- (4.b) What is a foreign-debt default crisis?
- (4.c) Consider the hypothetical situation in which a developing country (e.g., Senegal) has a positive stock of foreign debt and keeps a fixed nominal exchange rate against a major currency (e.g., Senegal's Franc is pegged to the Euro). Suppose that the developing country is subject to the so-called "original sin". Show how a balance-of-payment crisis inducing devaluation in the developing country may lead to a foreign-debt default crisis as a result of the "original sin".

SØK2009 – fall 2014

Student: 10033

The international macroeconomics course 2009 is based on a textbook used all over the world (Krugman, Obstfeld, Melitz) combining diagrams and good policy discussion. The exam fall 2004 asks for a discussion of core diagrams and policy issues of the book. It was hard to grade this exam because most (serious) students can replicate the book, and there was no out of the way question challenging the best students (question 2C was the most difficult).

Student 10033 does this very well, and gets a solid A. Unfortunately the exam answer is hard to read because of exceptional handwriting. Question 1 concerns the joint equilibrium of foreign exchange and money markets, the diagram is well presented and well understood. Question 2 deals with the joint equilibrium of goods and asset markets (DD-AA-model). Again the student offers good understanding and presentation of the key diagrams, in particular the questions about shocks and price stability in 2C.

Questions 3 and 4 are more verbal, and the student shows a good ability to use the theory learned to discuss policy problems. The understanding of the problems related to trilemma and Bretton Woods collapse (question 3) and balance of payments crisis, foreign debt crisis, and 'original sin' (question 4) is very good, impressive I will say at this level. I suggest that you take time to read the answer of this student to learn how to do it, but it will take you some effort to understand the writing.

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1A

The Uncovered Interest Parity condition ~~between~~ ~~and~~ giving the equilibrium in the Forex market, is for two currencies, given by

$$R_{\$} = R_{\text{€}} + \frac{E_{\$/\text{€}}^e - E_{\$/\text{€}}}{E_{\$/\text{€}}}$$

where $R_{\$}$ is the expected rate of return of dollars (in dollar terms) and $R_{\text{€}}$ (or also denoted $\tilde{R}_{\text{€}}$) is the expected rate of return of euros, in dollar terms.

$R_{\text{€}}$ is the nominal interest rate on euro assets, $\frac{E_{\$/\text{€}}^e - E_{\$/\text{€}}}{E_{\$/\text{€}}}$ is the rate of

depreciation of dollar. If the expression is positive, it means that the dollar is expected to depreciate (be worth less, able to buy less euros with) in the future. The two sides of the equation are identical in this equilibrium condition, which means no arbitrage (risk-free gain) in equilibrium. If we have $R_{\text{€}} < R_{\$}$, we will have $\frac{E_{\$/\text{€}}^e - E_{\$/\text{€}}}{E_{\$/\text{€}}} > 0$, means that the

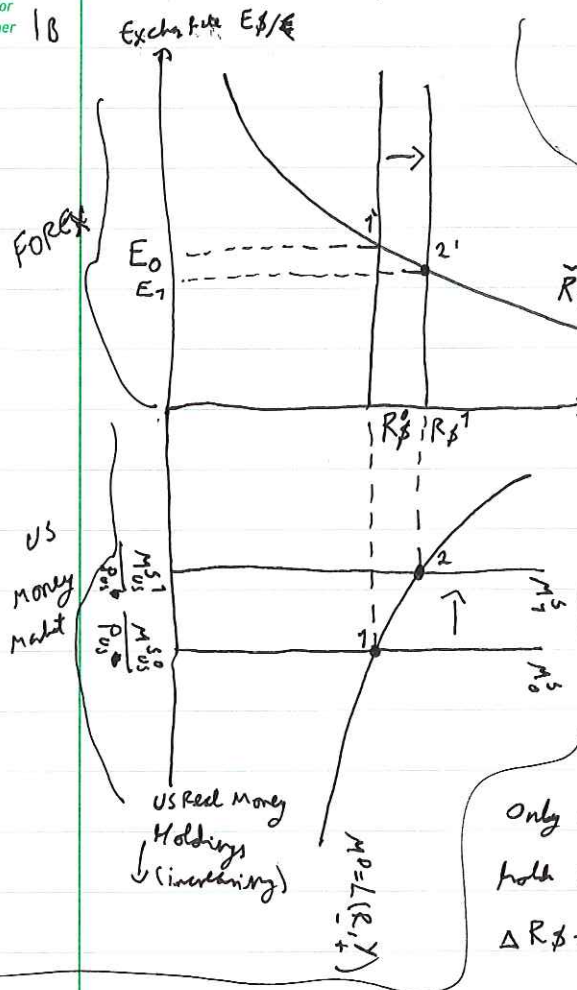
dollar is expected to depreciate in the future. In this way, investors will be willing to hold euros, as the expected appreciation of euros will make up for the difference in nominal interest rate.

~~HP~~ ~~is~~ For UIP to hold, we must have free financial flows, ~~and~~ with uncorrect expectation (for instance, unforeseen $M^s \uparrow$ and $R_{\$} \downarrow$), we will have arbitrage opportunities in the transition between old and new equilibrium.

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Diagram showing linkage between FOREX and US Money Market



Explanation: $R_{\$}$ decided by equilibrium in US money market ($M^S = M^D$). For $M^S \uparrow \rightarrow R_{\$} \downarrow$, $M^D \uparrow \rightarrow R_{\$} \uparrow$ ($M^D \uparrow$ up through $Y \uparrow$).

FOREX: For our desired $R_{\$}$, and given exogenous $R_{€}$, we have equilibrium, through UIP condition, with

exchange rate E_0 . $\bar{R}_{€}$ drawn for given euro nominal interest rate: $\bar{R}_{€}$. $\Delta R_{€} \rightarrow$ shift in $\bar{R}_{€}$ curve. Why is $\bar{R}_{€}$ downward sloping? For given $R_{€}$ and E^e , a higher $R_{\$}$ implies a lower $E_{\$/€}$ (which indicates a relative to high E) future depreciation of dollar). Only with high expected depreciation of dollar will Euro hold keep holding euro while dollar interest rate goes up. $\Delta R_{\$} \rightarrow$ shift in $R_{\$}$ curve. $\Delta R_{€}$, shift in $\bar{R}_{€}$ -curve.

All else equal FED decides to restrict money supply. $M^S \downarrow$. M^S -curve shift leftward, new money market equilibrium with lower level of US Real Money Holdings and $R_{\$} \uparrow$. This shifts $R_{\$}$ curve/line in FOREX market. To the right (high expected rate of return on dollar assets). For given $R_{€}$ and E^e , this implies \leftarrow a dollar appreciation of dollar $E_{\$/€} \downarrow$. Movement from old equilibrium to new ($1' \rightarrow 2'$) along the $\bar{R}_{€}$ -curve. In transition, arbitrage possible.

Verbal explanation of mechanism that drive $R_{\$}$ and $E_{\$/€}$ to new equilibrium level. $M^S \downarrow$, gives $M^S \neq M^D \rightarrow$ excess demand for money, people want more money, want to borrow, borrowing cost \uparrow , $R_{\$} \uparrow$. Alternatively: Want to move money from instrument (bonds) to cash. Price of bonds goes down, and with fixed payment at bond expiration and possibly also annuities, this increases the rate of interest on bonds. (Price \downarrow , payment fixed \rightarrow bigger profit). Anyway $R_{\$} \uparrow$. In FOREX this implies

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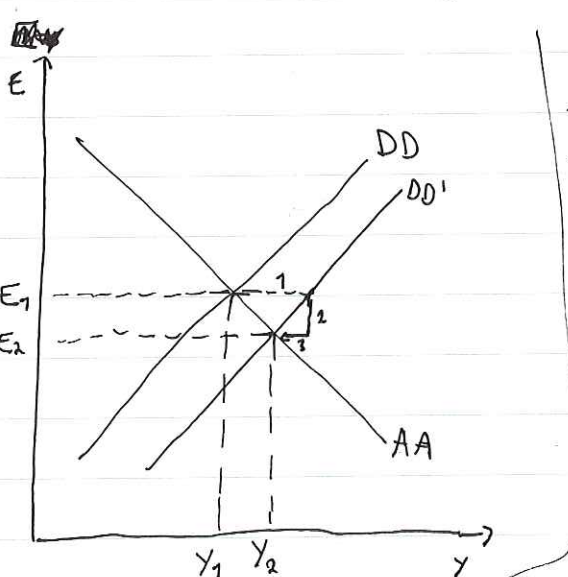
arbitrage possibilities. The rate of return in dollar term is now higher for dollars than for euros. $R_{\$/\$} > R_{\$/\text{€}} + \frac{E^e - E}{E}$. People want to swap to dollars. (and, we remember, E^e is fixed and $R_{\text{€}}$ is determined elsewhere in Euro money market. We take $R_{\text{€}}$ as given.). As they swap to dollars, the price of dollars goes up (as demand for dollars ↑ while supply ^{now} unchanged) and price of euro down for ~~the~~ ~~dollar~~ ~~market~~ as demand goes down for fixed supply. This process gives appreciation of dollar, in essence it ~~tries~~ to increase the price of dollars.

When we are in 2', we have that, for fixed expectation E^e , the expected rate of depreciation for dollar has gone up so enough for the euro holder to keep to euro, although the relative nominal interest versus US has fallen. The expected rate of return on the two assets/currencies, are again equal.

Denote ~~the~~ $E_{\$/\text{€}}$
↳ E to save time and hassle

1. The original equilibrium $Y=Y_1, E=E_1$

2. First we draw the DD-AA diagram. We have short run, Price and expectation - fixed.



DD-curve: all combination of Y and E that give equilibrium in goods market. ~~Fully~~ ~~in~~ ~~the~~ ~~market~~ ~~because~~ ~~the~~ ~~positive~~ ~~slope~~ ~~decrease~~ ~~the~~ ~~increase~~ ~~depreciation~~ $E \uparrow$, gives $Y \uparrow$, through positive effect on current account.

AA-curve: all combination Y and E that give equilibrium in asset market. Fully because high Y gives $m^d \uparrow \rightarrow R \uparrow \rightarrow E \downarrow$

Short-run effect of temporary fiscal expansion.

GP or TB. Both imply high Y for given E . They are ~~two~~ factors that are part of AD, altho not DD, which isolates E 's effect on Y . Let's take GP gives $Y \uparrow$ for given $E \rightarrow$ shift in DD-curve to the right. The process toward new equilibrium and new value for Y (real output), E and R , is threefold: 1) Direct effect, $GP \rightarrow Y \uparrow$. 2) Indirect effect $\rightarrow Y \uparrow$ gives $m^d \uparrow \rightarrow m^d > m^s \rightarrow R \uparrow \rightarrow E \downarrow$.

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3) Correction: $E \downarrow$ gives $CA \downarrow$ (assum Marshall-Lerner Condition holds \rightarrow volume effect $>$ price effect). $CA \downarrow$ gives $Y \downarrow$.

Effect on real output. $Y \uparrow$ from Y_1 to Y_2

Exchange rate, $E \downarrow$ appreciation of home currency.

Interest rate, $R \uparrow$ through $Y \uparrow \rightarrow MP \uparrow$. $R \rightarrow$ the intermediary connector between real output ~~and~~ /income and the exchange rate.

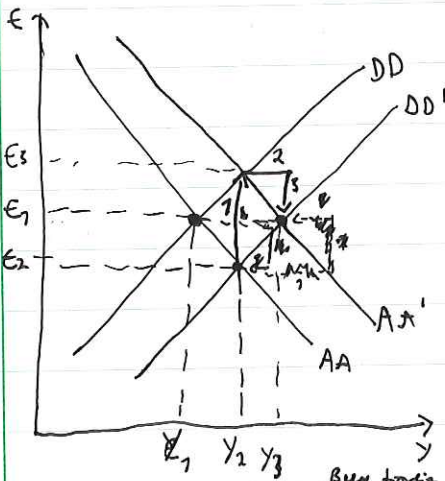
2b) Observing Fixed expansion. CB wants to keep E at level E_1 .

What kind of open market / FOREX intervention. Effect on official reserves and output

Draw diagram again. : If CB wants to keep E_1 , they must now make depreciation from E_2 . E went down because of

$R \uparrow$, (M^D increased, while M^S fixed), now CB must get R down to original level. Must increase money supply enough to reduce R back to original level.

$M^S \uparrow$, $M^S > M^D \rightarrow$ excess supply \rightarrow borrow out / low interest/profit on loans $\rightarrow R \downarrow \rightarrow E \uparrow$. ~~Now~~ Increase M^S through buying foreign assets with ~~foreign~~ domestic currency.



Assum E in direct terms

Direct effects: $M^S \uparrow \rightarrow R \downarrow \rightarrow E \uparrow$. 2) Indirect effects $E \uparrow \rightarrow CA \uparrow \rightarrow Y \uparrow$

3) Correction effect: $Y \uparrow \rightarrow MP \uparrow \rightarrow R \uparrow \rightarrow E \downarrow$

AA shift upwards, high E for given Y .

Real output increases further, from Y_2 to Y_3 . $Y \uparrow$

Official reserve increase. As CB he bought foreign currency for domestic currency. \rightarrow Foreign currency holdings \uparrow .

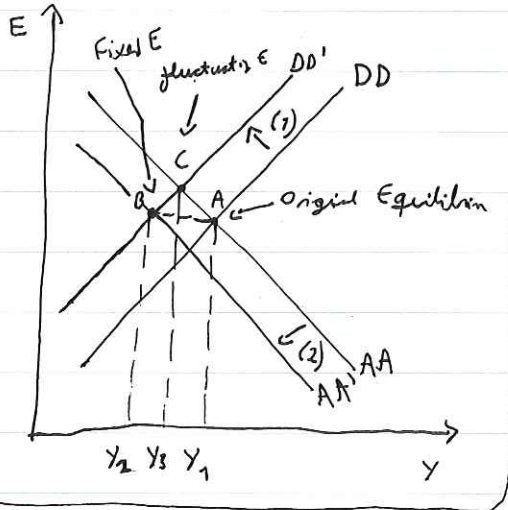
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2c

'Adopting fixed Exchange Rates amplifies real shocks'

Economic reasoning: Lets use an example. Negative (exogenous) shock in investment demand. ↓



Gives $Y \downarrow$ for given $E \rightarrow$ leftward shift in DD curve.

~~Movement~~ Direct effect: Movement from A to B in B, Y is lower, $M^D \downarrow$, with excess supply of money, pressure for $R \downarrow$ (which would lift Y , through effect ~~on~~ via E on AA). But, this reduction in R can't happen, as it would violate UIP and hence the fixed exchange rate regime.

But, M^D is lower than M^S . CB must offset

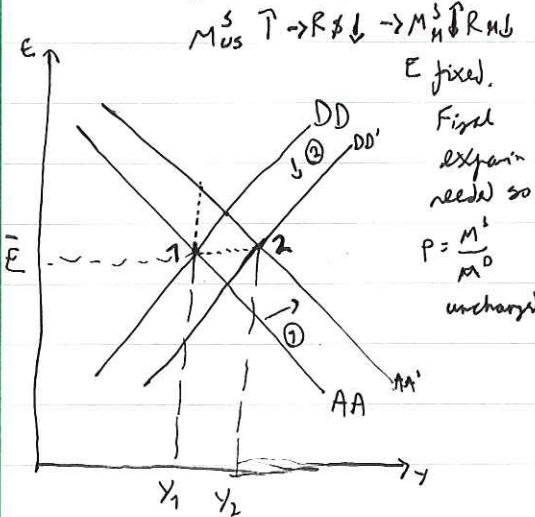
imbalances by reducing M^S in proportion to reduction in M^D . $M^S \downarrow$ gives shift

in AA curve \rightarrow lower E for given Y . Keeps E fixed, but at the price of a larger reduction in Y , as the interest rate reduction compensation effect is unavailable. And symmetrically for positive real shocks:

Fixed E amplifies real shocks in the economy.

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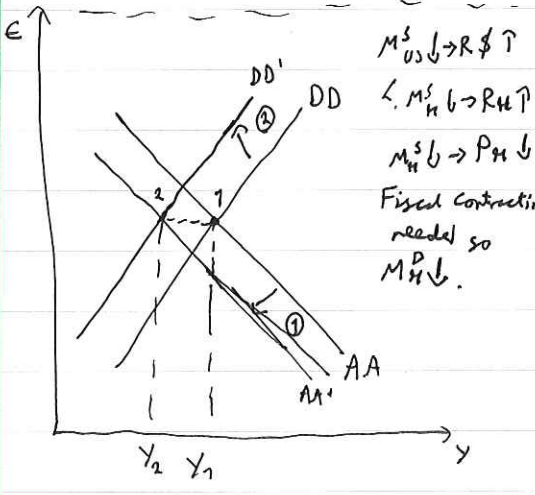
'Adopting fixed exchange rates requires fixed discipline, otherwise monetary authorities find it difficult to stabilize prices in the long run'



In the long run, prices are flexible. The price depends on M^S and M^D , and adjust immediately to a change in one of these.

Relation: $P = \frac{M^S}{L(R, Y)} = \frac{M^S}{M^D}$

Implication for fixed Exchange rate regime. With fixed E , a country must follow/copy the monetary policy of the country one is pegging its currency against, as UIP allow so derivation of $R^* = R$ with $\frac{E^e - E}{E} = 0$. If you are US in better mood, this is not a constraint, as others are following your monetary policy, not the other way round. But if you are pegging against US, and they change Money Supply (or through demand change) to alter interest rate, you must follow. Say you peg to US. $M^S_{US} \uparrow \rightarrow R\$ \downarrow$. You must follow. Let's call you Home: Give $M^S_{Home} \uparrow$, $R_H \downarrow$. Relation $P_H = \frac{M^S_H}{M^D_H}$. As $M^S_H \uparrow$, P_H immediately goes up $P_H \uparrow$. To stabilize prices, Home must



increase M^D_H by same proportion \rightarrow through $Y \uparrow \rightarrow$ fiscal expansion. Inversely, if $R\$ \uparrow$ (through increase in demand for US goods or reduces US money supply). Home must also increase nominal interest rate R_H through $M^S_H \downarrow$, P_H immediately goes down. $P_H \downarrow$. To maintain unchanged/stable price. M^D_H must go down \rightarrow Fiscal contraction ($T \uparrow$, $G \downarrow$).

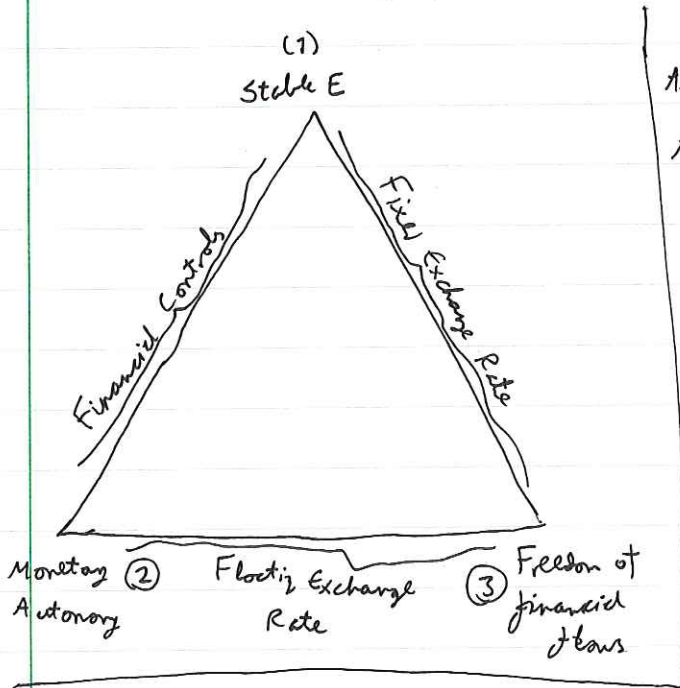
So, with fixed E and goal of stable prices, fiscal policies are dependent on monetary policy, which is dependent on (in this case) US monetary policy. Hence, there is not much room for fiscal freedom, fixed discipline is needed. [Figure: $R\$ \downarrow \rightarrow AA$ upwards, then DD leftwards

$R\$ \uparrow \rightarrow AA$ downwards, then DD rightwards

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'The trilemma' of open economies is that out of the three desirable factors. 1) stable Exchange Rate, 2) ~~Free~~ Autonomy in Monetary Policy and 3) Freedom of financial flows, only two are desirable at a time. The trilemma is graphically illustrated in the triangle below.



All three conditions have obvious benefits. A stable exchange rate gives continuous/stable conditions for exporters/importers, making it easy to plan in advance, ~~and~~ ~~easy~~ ~~large~~ for companies, and on the aggregate level, reduce CA fluctuations.

Autonomy in monetary policy lets you use ~~the~~ the control/change of money supply to manipulate the interest rate, which among other, affects the

current account and the level of investment in the economy.

Freedom of financial flows gives home opportunity to seize profitable ~~investments~~ investment opportunities abroad, and attract foreign investment to projects in home. Especially important to country with low levels of capital (say, large parts of Africa).

Why can't one have all three? Well the combination of stable exchange rate and freedom of financial flows, characterized by a fixed exchange rate regime, does by definition not allow floating E (E can't be both floating and stable at the same time. Although of course also the so-called floating regimes often operate with exchange rate targets or bands, so the distinction is blurred).

The combination of free financial flows and floating exchange rate will by definition not allow a stable exchange rate. Why? Monetary autonomy implies possibility to change R independent of R^* . For UIP to hold in this case,

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we must have fluctuating E , th $\frac{E^e - E}{E}$ must be able to vary if R and R^* are allowed to vary independently.

~~For~~ There is a way to at least approximately, keep E stable even though R and R^* varies independently. That is through financial controls, or third possible solution. Here a change in R through autonomous monetary policy will not make as big deviations in E (we assume R^* fixed), since arbitrage possibilities are limited through financial controls / obstacles (such as a cap volume on international asset transaction, a ^{minimum} ~~maximum~~ placement time for foreign asset investment, and a max limit for how much ~~currency~~ ~~single~~ ~~invest~~ ~~can~~ ~~move~~ ~~across~~ ~~countries~~. money / assets an investor can move from one currency to another.

36)

The mechanism of imported inflation led to the collapse of the Bretton-Woods (BW) system. The BW was a ~~more~~ international monetary system in which each country held ~~assets~~ official assets ~~is~~ ~~for~~, ~~and~~ ~~hence~~ ~~a~~ ~~guarantee~~ ~~in~~ ~~trade~~ in form of gold and US Dollars \$. And here, CBs guaranteed to trade in domestic currency against these assets, which had fixed prices. (few ~~except~~ but some exception (de/revaluation were made).

In practice, more and more of the reserves were dollar assets. Which effectively made it a reserve currency system with $N-1$ countries pegging their currency to the ^{US} dollar, and with only the N th country (US) left with monetary policy autonomy. A deeply asymmetric problem, which yield problems when ~~the~~ pegging countries have very different domestic situation and policy needs than the US.

Imported inflation. US accumulated big public debt throug ~~over~~ spending on Vietnam War and new Social Security / Welfare program. (ex 'Great Society', L.B. Johnson). Debt denominated in dollars \rightarrow real value of debt reduce if dollar depreciates. Incentive for M^ST. So, M^SU^ST.

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Th N-1 other countries must follow policy to maintain fixed E.
~~Country~~ Oth countries therefor forced to increase money supply and hence reduce interest rate. As more and more (European) countries struggled with this inflationary and expansionary policy. (Other countries could have conflicting goals, such as keeping inflation down) imposed upon them by the US. As several countries opted out of the Bretton-Woods system in the ~~early~~ early 1970's, the system was abolished. ~~Problem~~: Potential problem of reserve currency system
 < Deeply Asymmetric nature:
Potential problem realized when domestic economic situation and hence domestic policy needs are widely divergent.

4A) A balance of ~~payments~~ payment (BOP) crisis is a ~~sharp~~ rather sudden sharp reduction of the official reserves of a country. (official reserves, typically in presence of foreign currency). Typically come about ~~the~~ the, with a fixed exchange rate, is expected a depreciation of home currency. Such expectation might form because of fundamental economic weakness (such as the CB ~~constantly~~ constantly loan financing Gov. deficit, and hence reducing official reserves), or of more speculative reasons, which nonetheless usually has some basis in economic weaknesses. Ex. Banks in a country have most liabilities in form of short-term deposits (vulnerable for bank run), and most assets are risky (business loans, firm ability to pay heavily dependent on business fluctuations in the economy). Investors may see this balance sheet structure as vulnerable, they see the possibility of banks going bankrupt → CB must save → loan out official reserves → official reserves ↓ → less ability to peg currency (must hold enough foreign currency to guarantee swap Foreign/Home).
 Either way. ~~Foreign~~ ~~and~~ ~~UPP~~ reduced official reserves mean investors might think a devaluation is coming up. Incentive to be in ~~an~~ the the currency when this depreciation takes place. They sell Home for Foreign (speculative attack) → off. reserves, further down, demand for Home down. → vicious circle.

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by This is the mechanism of a BOP crisis, fueled ~~by~~ by expectations and of speculative attacks, but attacks rarely come about without weakness in economic structures.

If off. reserve to low to guarantee transfer ^{between} Home/Foreign currency → the currency will be devalued.

4b) A foreign debt - default crisis is a situation in which a borrowing country is not able to pay its downpayments and loan interest rate as the contract / condition / demand. Such a situation can occur by a country simply borrowing more than its future capacity to pay, but a crisis is usually started by a further development, such as a sudden increase in interest rates on (new) loans, due to, say, political instability, economic irresponsibility, negative demand shocks, or other factors that make the investors more ~~and~~ skeptical to the country's ability to pay, and therefore makes them demand a higher risk premium on the investment, and hence a higher interest rate.

A crisis can also be come about as a consequence of currency depreciation or devaluation (if the debt is denominated in a foreign currency), for instance of the kind we saw in 4a)

A Foreign Debt - Default crisis typically ends in a i) refinancing ii) relieving of some of the debt, through negotiation iii) a full default, which make the 'first-priority' creditor able to collect first, and so on until all assets are annexed. As ~~foreign debt~~ is the weight of foreign debt is ~~for~~ more meaningfully ~~what~~ looks upon as a ratio of the total size of the economy, economic growth is, if possible, a way out.

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4c

Senegal, positive stock of foreign debt. Keeps a fixed nominal exchange rate $E_{FR/\text{€}}$ against Euro (Senegal Franc is Senegal's currency). How will a BOP crisis ~~lead~~ lead to Foreign Debt Default crisis as a result of original sin?

Q: 'Original sin': Developing countries often forced to borrow in foreign currencies. Why? Well, some argue that it is because of a 'new/original' sin, that it is because of the structure of the capital market, and more specifically, that major investors already have diversified their assets in the ~~by~~ different currencies, and hence have no interest in investing in say, Senegal Franc. Others argue that the 'punishment' of borrowing in Foreign currency come from a history of ill-advised economic policies, such as excessive inflation (ex. Latin-America). Also, the 'sin' is not 'original'

Nevertheless: 'original sin' implies that developing countries borrow in foreign currencies. This means they cannot reduce real value of debt through increased money supply. It further means that the real shock in the economy are amplified: A negative real shock ~~is~~ ~~which~~ ~~leads~~ ~~to~~ ~~devaluation~~ ~~when~~ ~~E~~ ~~is~~ ~~fixed~~. Excess supply, ~~people~~ ~~will~~ ~~not~~ ~~buy~~ ~~the~~ ~~new~~ ~~issue~~ ~~of~~ ~~money~~ ~~if~~ ~~floating~~. Real value ~~can~~ ~~not~~ ~~also~~ ~~increase~~ ~~through~~ ~~effect~~ ~~a~~ ~~€~~ ~~(↑)~~ ~~and~~ ~~(↑)~~, ~~which~~ ~~is~~ ~~amplified~~ ~~with~~ ~~fixed~~ ~~exchange~~ ~~rates~~, as explained in 2c.

How can 'original sin' lead BOP crisis to foreign default crisis. BOP crisis with reduction of Official Reserves, will, if not credibility ~~and~~ funds are ~~to~~ increased, reduce in capital flight and ultimately a devaluation of the ~~for~~ Home currency. $E_{FR/\text{€}}$. In 'original sin', ~~to~~ with borrowing in Foreign currency, this means the real value of the debt increase. Why? Senegal must purchase a given amount of Euros in the FOREX market to pay debt payments. With a depreciation of Franc. This given amount of Euro cost more Senegal Franc. The real debt is increased, and the danger of defaulting (insolvency, assets < liabilities) ~~is~~, a Foreign Debt Default Crisis, increases. With borrowing in home currency (which is the normal practice

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4c.

for developed countries), the effect would be reserved, the real value of the debt would decrease. (If Senegal borrowed in France, and France ~~devalued~~ devalued was devalued, this would mean that their debtors in Euro countries would have fewer euros coming for them. ~~It is not Senegal~~ ~~and a great amount of~~ ~~the~~ when ~~the~~ We see that borrowing in Home currency, devaluation (and also depreciation, in a floating regime) is a buffer, while it is an ~~asset~~ amplifier if you borrow in foreign debt. Hence, developed countries have a debt buffer the developing countries do not have,

-- Whether the original sin come from ~~the~~ the structure of capital markets or a bad history of economic policy.