Topics for Today

1.) Empirical Evidence on UIP

2.) Potential Explanations of the "Forward Premium Puzzle".

3.) Why Study Fixed Ex. Rate Systems?

4.) The Mechanics of Central Bank Intervention in the FX market

5.) Sterilized Intervention

6.) Risk Premia in the FX Market.

Table 1

Regressions of Quarterly Depreciation on 3-Month Forward Premium

$$\Delta s_{t+1} = \alpha + \beta(F_t - s_t) + \varepsilon_{t+1}$$

	USD/GBP	USD/DEM	USD/JAY	GBP/DEM	GBP/JAY	DEM/JAY
			1976:I-1994:I			
$\hat{\alpha}_{OLS}$	-1.340	0.638	3.294	1.622	7.702	1.041
	(0.895)	(0.886)	(0.964)	(1.116)	(1.687)	(0.648)
$\hat{\beta}_{OLS}$	-1.552	-0.136	-2.526	-0.602	-4.261	-0.755
	(0.863)	(0.839)	(0.903)	(0.782)	(1.133)	(1.042)

Table 1: Predictable Excess Returns

	$q_{t+1} = \alpha + \beta(i_t - i_t^*) + \epsilon_{t+1}$		
Currencies	β	$\sigma(\beta)$	R^2
DEM	-1.8344**	0.8189	0.05
GBP	-2.9537***	1.1214	0.10
JPY	-4.0626***	0.7438	0.16
CND	-1.5467***	0.5305	0.05
CHF	-2.3815***	0.8068	0.09
EW Average	-2.5558***	0.6192	0.09
GDP Average	-2.9821***	0.6223	0.11

Note: $q_{t+1} = \Delta s_{t+1} - (i_t - i_t^*)$. Δs_{t+1} refers to the 3-month change in the log exchange rate. The exchange rate is measured as net-of-period rate from IFS. Interest rates are 3-month rates as quoted in the London Euromarket and were obtained from Datastream (Thomson Financial). *** and ** denote significance at respectively the 1% and 5% level. SUR system estimated from 109 quarterly observations over sample from December 1978 to December 2005. Newey-West standard errors with 1 lag. "EW Average" refers to the equally weighted average of the regression coefficients. The last row reports the GDP weighted average.

Caveats

1.) UIP works better for developing countries
   - Bansal & Dahlquist (JIE, 2000)

2.) UIP works better at very low frequencies (Chinn & Meredith (2005)) and very high frequencies, [Chaboud & Wright (JIE, 2005)]

Potential Explanations

1.) Jensen's Inequality

2.) Real vs. Nominal Returns

3.) Risk Aversion / Time-Varying Risk Premia

4.) Peso Problems. $E_t S_{t+1}$ not well approximated by sample average. Infrequent "regime changes".

5.) Simultaneity Bias / Endogenous Monetary Policy
  - McCallum (JME, 1994)

6.) Adaptive Learning
  - Evans & Chakraborty (2007)

7.) Non-Rational Expectations (Froot & Frankel)
  - Noise-Traders (Mark & Wu (EJ, 1998))
  - Distorted Beliefs (Gourinchas & Tornell (JIE, 2004))

8.) Info. Processing Constraints [Bacchetta & VanWincoop (2006)]

9.) Heterogeneous Beliefs / Higher-Order Belief Dynamics
  - Bacchetta & vanWincoop (AER, 2006)
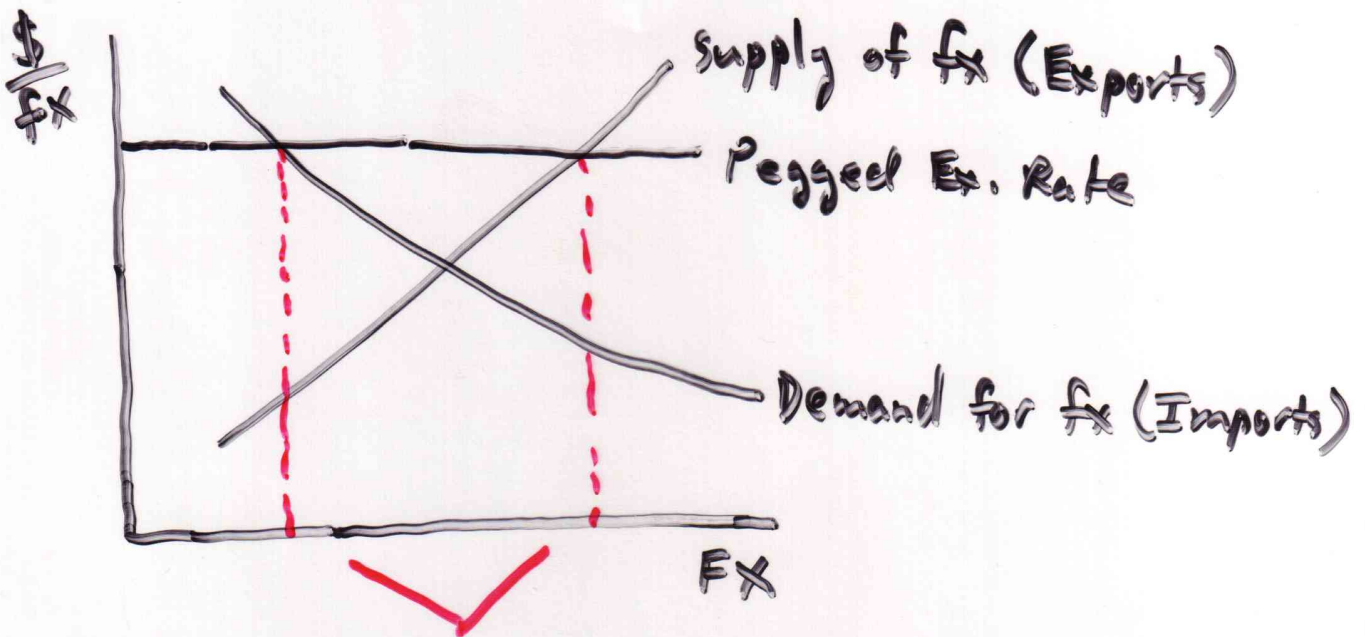 - Kasa, Walker, Whiteman (2007)

Why Study Fixed Exchange Rates?

1.) Many countries + regions operate under a fixed exchange rate system

   - Individual European Countries, China, Hong Kong, Singapore, many small developing countries

2.) Even countries with officially floating currencies try to "manage" their exchange rates at various times.

   - U.S., Europe, Japan, U.K., Canada

3.) Policy Evaluation - Many proposals to reform the international financial system call for various kinds of fixed ex. rate systems. Are these proposals good or bad?

4.) History - For most of recorded human history, "countries" have operated under effectively fixed ex. rates (currency pegged to the price of gold or silver).

How do you Fix an Ex. Rate?

Basic issue : Since an ex. rate is the relative price of 2 currencies, a country has many bilateral ex. rates. Need to decide what you are going to peg to. Without cooperation from foreign countries, you can only peg your currency to one other currency (or linear combo. of currencies).
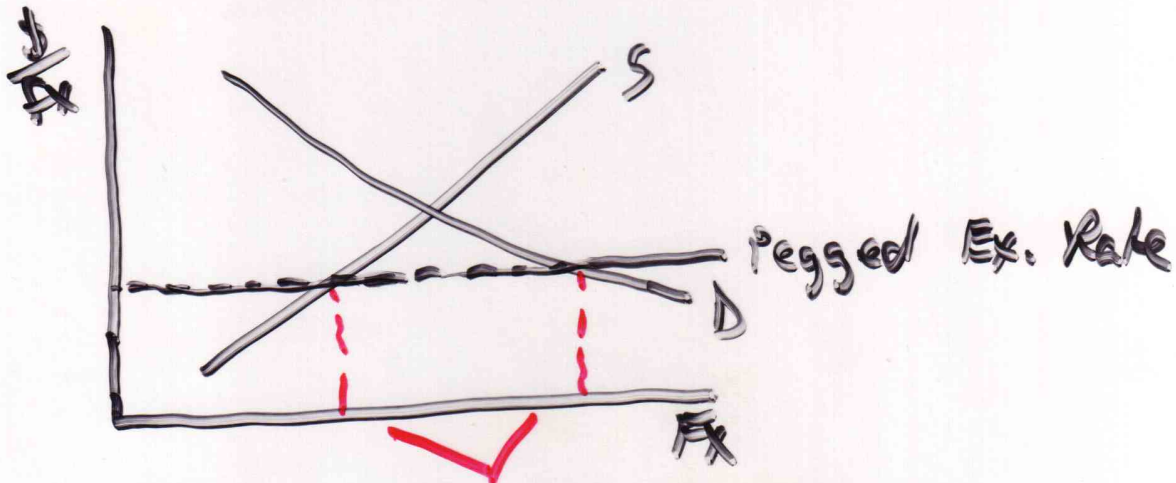
Essentially, pegging the value of your currency is no different from pegging the price of wheat or milk. The govt. needs to intervene in the market to soak up excess supply or to supply any excess demand.

Excess Supply of FX

Supply of fx (Exports)

Pegged Ex. Rate

Demand for fx (Imports)

FX

Excess Supply of fx
Govt. needs to purchase fx with domestic currency.

Excess Demand for FX

S

Pegged Ex. Rate

D

FX

Excess Demand for fx
Govt. needs to sell fx in exchange for domestic currency

Note: With flexible ex. rates, the govt. doesn't have to intervene. The price adjusts to clear the mkt.

The Mechanics of Central Bank Intervention

To understand exactly how Central Banks fix the ex. rate, we need to understand the Central Bank's balance sheet.

Assets	Liabilities
Domestic Assets	Bank Deposits
↑↓ Foreign Assets	Currency in Circulation

Remember, an economy's money supply is a multiple of the liabilities of the Central Bank. If total liabilities change, then the money supply changes.

Fixing the ex. rate involves buying and selling foreign assets

If at the pegged ex. rate there is
an overall Balance of Payments deficit
(sum of current + financial accts), then
the Central Bank needs to sell fx,
which reduces the domestic money supply

If at the pegged ex. rate there is
an overall Balance of Payments surplus,
then the Central Bank needs to buy fx,
which increases the domestic money supply

Main Point: With fixed exchange rates,
there is an automatic
link between BOP deficits
and supluses and changes
in the domestic money supply

BOP Deficit $\Longrightarrow$ Money Supply $\downarrow$

BOP Surplus $\Longrightarrow$ Money Supply $\uparrow$

Note: These Money Supply changes tend to restore balance in the BOP.

Money Supply $\downarrow \Longrightarrow$ Domestic Prices $\downarrow$

$\Longrightarrow$ Domestic Goods become more competitive

$\Longrightarrow$ NX $\uparrow$

$\Longrightarrow$ BOP deficit eliminated

Money Supply $\uparrow \Longrightarrow$ Domestic Prices $\uparrow$

$\Longrightarrow$ Domestic Goods become less competitive

$\Longrightarrow$ NX $\downarrow$

$\Longrightarrow$ BOP surplus eliminated

This is just Hume's "price-specie-flow mechanism"

Sterilized Intervention

Sometimes govts. want to avoid the money supply implications of fx market intervention.

They may fear that a $M^s \downarrow$ will lead to a recession or that a $M^s \uparrow$ will produce inflation.

Hence, they may try to sterilize the fx intervention, by undertaking offsetting transactions with domestic assets.

Sterilized Sale of fx

A		L
↑ Domestic Assets		Bank Deposits
↓ Foreign Assets		Currency

To offset sale of fx, buy domestic assets.

Note, total liabilities (mont. base) does not change

Sterilized Purchase of fx

A		L
↓ Domestic Assets		Bank Dep.
↑ Foreign Assets		Currency

To offset purchase of fx, sell domestic assets.

Again, total liabilities do not change.

The net impact of sterilized intervention is to change the currency composition of the Central Bank's balance sheet (with an opposite change in the private sector's balance sheet).

Under certain conditions this can influence the exchange, even when the money supply isn't allowed to change.

Problem with Sterilization: The automatic adjustment of the BOP is short-circuited, BOP imbalances persist.

Risk Premia in the FX Market

So far we have assumed investors are risk neutral, which means they only care about expected returns. This assumption was an important ingredient in our analysis of fx market equilibrium (i.e., UIP).

However, there is lots of evidence suggesting investors are risk averse, which means they also care about the variance of returns.

It is important to remember that only "systematic" (nondiversifiable) risk is priced in efficient capital markets. To study risk premia in the fx market, we therefore need to adopt a portfolio perspective, i.e., we must ask "How does a given asset contribute to the overall variance of a portfolio?" (as opposed to its own individual variance).

There is no widely agreed upon, empirically consistent, model of risk premia in financial markets!

Instead, there are several theories that are consistent with some aspects of the data, but inconsistent with others.

We're going to examine one called the "portfolio balance approach", which focuses on the relative supplies of "outside" assets denominated in different currencies.

Bonds that are in "zero net supply" (i.e., they are issued by one person + bought by another) do not affect the aggregate risk exposure of the economy (ignoring default risk!). This is because one person's loss will be offset by another's gain.

However, govt. bonds are sometimes regarded as 'outside' assets, or net wealth, since people might not fully capitalize their future tax liabilities. (Note, this assumes Ricardian Equivalence does not hold).

Therefore, we focus on net supplies of govt. bonds.

UIP with Risk Premium

$$R = R^* + \frac{E^e - E}{E} + \rho$$

ρ : Risk Premium on <u>domestic</u> assets

Note, 1.) When domestic assets become riskier, they must offer a higher expected return.

   2.) ρ can be negative if foreign assets are riskier.

Our goal is to determine ρ as a function of exogenous variables.

We first assume that the demand for domestic assets is upward sloping function of their expected rate of return,

$$\text{Demand} = B^d \left[R - R^* - \frac{E^e - E}{E} \right]$$

Before, with risk neutrality, this demand schedule was perfectly flat, or "infinitely elastic".
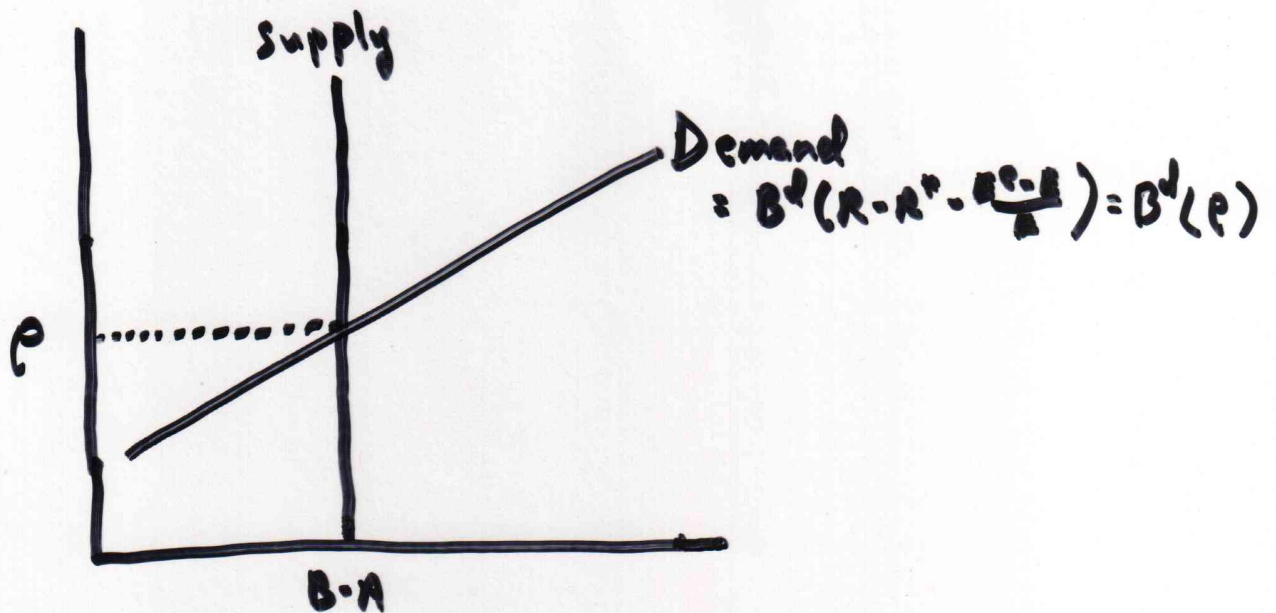
Next, let

B = Total supply of govt. bonds (determined by fiscal policy)

A = The supply of govt. bonds held by the Central Bank (determined by monetary policy, i.e., open market operations).
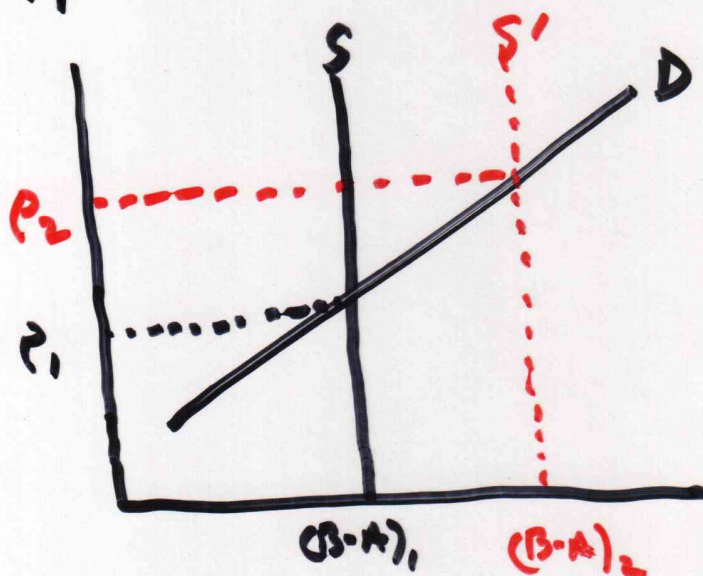
Therefore,

Market Supply (held by public) = $B - A$

As always, the equilibrium is determined by the equality of Demand & Supply!

supply

Demand
$= B^d(R - R^* - \frac{R_e - 1}{4}) = B^d(\rho)$

ρ

B-A

Suppose $(B-A)\uparrow$, either because $B\uparrow$ or $A\downarrow$

S   S'   D

ρ_2

ρ_1

$(B-A)_1$ $(B-A)_2$
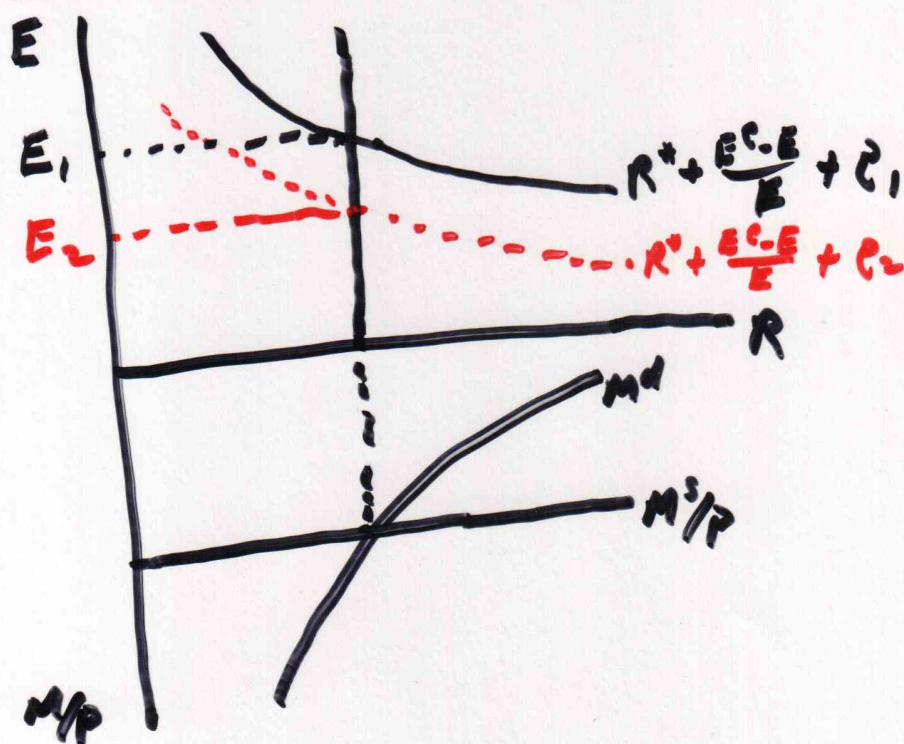
Therefore, $(B-A)\uparrow \Rightarrow \rho\uparrow$

Intuition: As $(B-A)\uparrow$, people are being asked
to devote more of their portfolios to
domestic assets. This exposes them to
more ex. rate risk. They will only
hold the extra domestic assets if they
offer a higher expected return

There are many reasons why B-A might increase. For example, a bond-financed fiscal expansion that is not monetized by the Central Bank would increase B.

However, a more interesting possibility for us now would by a sterilized sale of fx reserves. Remember, in this case the CB buys domestic assets at the same time it sells foreign assets. That is, $A \Uparrow \Rightarrow B-A \downarrow \Rightarrow e \downarrow$

Sterilized Sale of fx

$$R^* + \frac{E^e - E}{E} + \mathcal{C}_1$$

$$R^* + \frac{E^e - E}{E} + \mathcal{C}_2$$

Note
The ex. rate appreciates even though the money supply does not change!

In principle, the ability to influence p gives the CB some additional policy leverage.

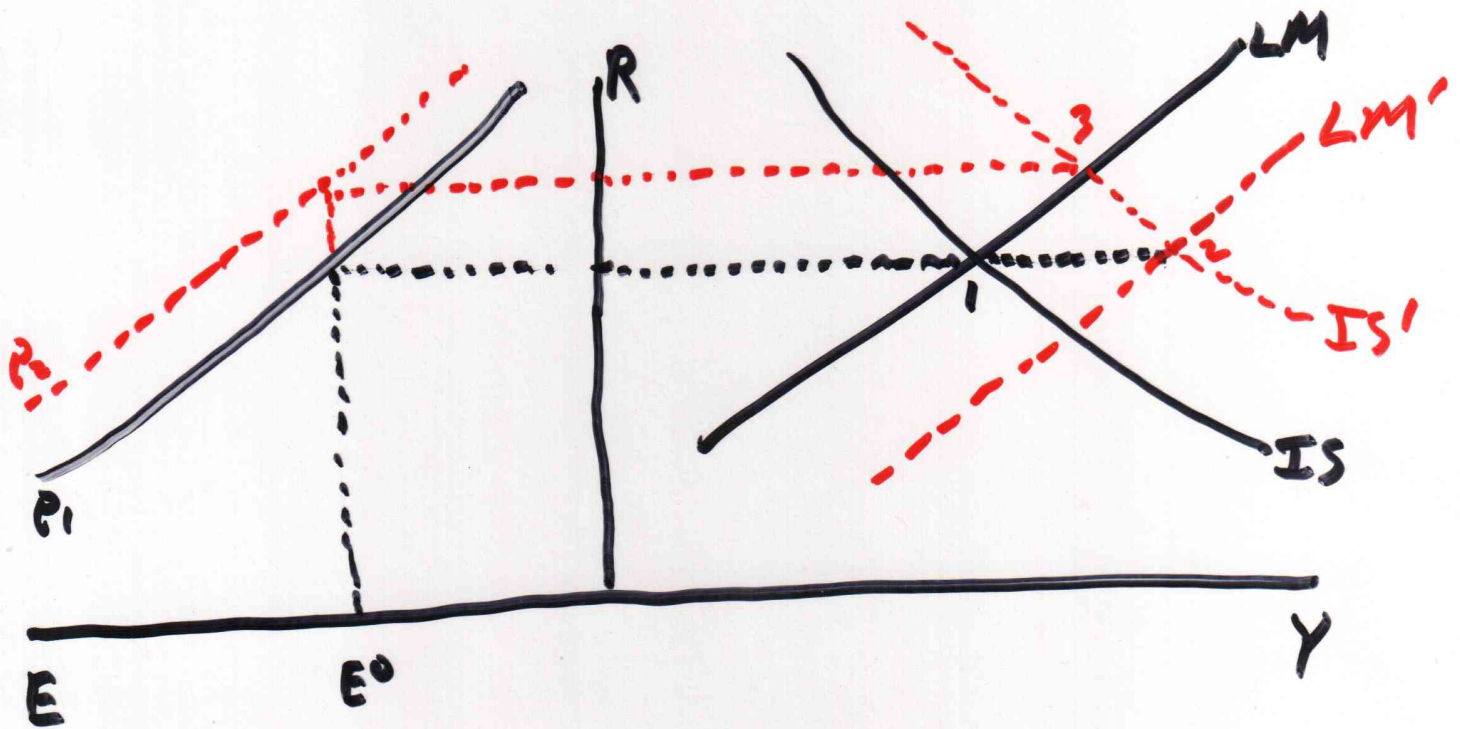1.) It can influence ex. rates without changing the money supply (and inflation),

Or,

2.) It can change the money supply (in order to address domestic macroeconomic conditions) without changing the ex. rate.

Recent experience in China + Mexico provides examples of both.

Example 1: Current Situation in China

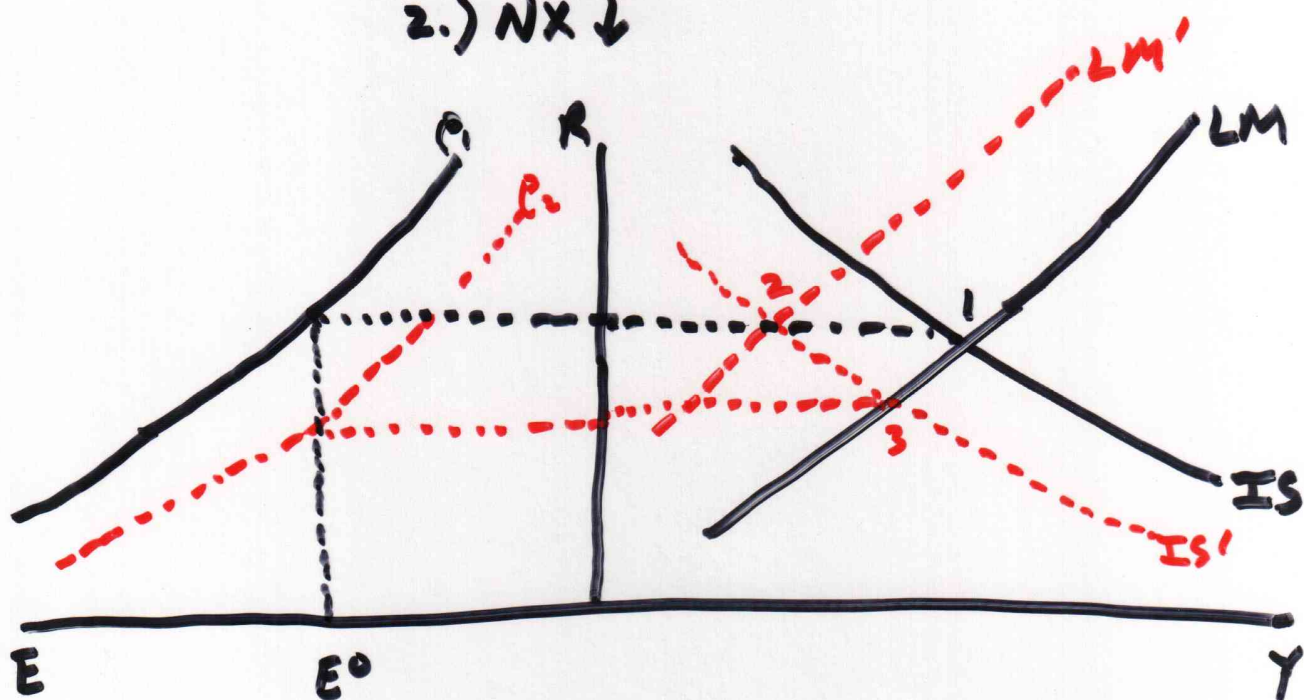Suppose 1.) China wants to maintain a (nearly) stable ex. rate

2.) $NX\uparrow$

Without sterilization, LM shifts out and the economy moves to pt. 2, creating considerable inflation risk.

With sterilization, $A\downarrow$, $(B-A)\uparrow \Rightarrow \rho\uparrow$. Now the economy only moves to pt. 3, reducing the inflation risk.

Are there any costs to this strategy?
Hint: Consider the interest earnings on the CB's port.

Example 2: Mexico 1994

Suppose 1.) Mexico wants a stable ex. rate
        2.) NX↓

Without sterilization, LM shifts left, and the economy moves to pt. 2, creating a serious recession.

With sterilization, A↑, (B·A)↓ ⟹ ρ↓
Now the economy only moves to pt. 3, reducing the severity of the recession.

Are there any potential problems with this strategy?
Hint: What's happening to the CB's stock of fx reserves?
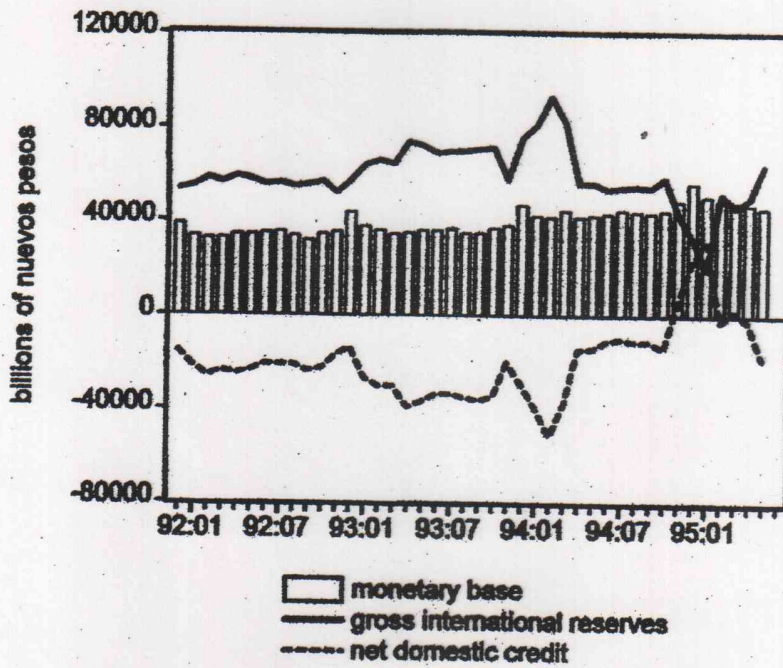
Sterilization in Action

Fig. 6. Base money, foreign reserves, and net domestic credit of the Bank of Mexico.