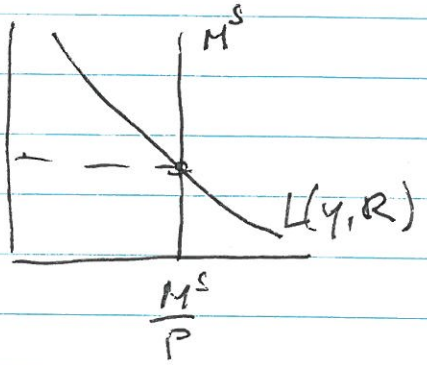
Chapter 18 Fixed Rates

The Money Supply and the Central Bank

We have often written:



but how is M^s set?

(1) $M = C + D$ C = currency ; D = deposits

(2) $H = C + R$ R = bank reserves

This is a broad brush description. There is an active debate about many of the issues associated with "What is money? Does it include one form of deposit or another?" etc.

In this context it is helpful to look at the Central Bank's balance sheet with domestic and foreign assets as a focus.

A	L
FA	DEP by private banks
DA	C currency

$A = L + NW$

DA = govt bonds, loans to banks (depository institutions)

FA = currencies & gold

See handouts for Bank of Canada & Federal Reserve Balance Sheets

Some Mechanics in the Determination of the Money Supply

We defined the stock of money, M, as being equal to the sum of the amount of deposits, D, in our commercial banking system, and the stock of outstanding currency, C, in the hands of the public:

1 $M=C+D$

We normally assume that people want to hold some fraction of their assets in the form of cash and some in the form of deposits at their banks. We assume that the desired amount of currency they wish to hold is proportional to their deposits: $C=\mathbf{c}D$.

The stock of what we called "High-powered" money, H, was defined as equal to the stock of currency, C, plus the reserves, R, held by commercial banks at the Bank of Canada:

2 $H=C+R$

We assume that commercial banks wish to hold some fraction of the deposits made at their institution in the form of reserves held at the Bank of Canada. Consequently we assume that $R=\mathbf{r}D$.

We also <u>assume</u> that there is a relationship between the stock of money and the stock of high-powered money so that:

3 $M=mH$.

To see what small m is, rearrange this so that we have:

3a $m=M/H$

This in turn can be written as (substituting in from 1 and 2):

4 $m=[C+D]/[C+R]$

Then divide both the numerator and the denominator by D, the stock of deposits: .

4a $m=[(C/D)+(D/D)]/[(C/D)+(R/D)]$ and then substituting from the behavioural relationships:

4b $m=[c+1]/[c+r]$.

Return to 3 so that we now have:

5 $M=mH=[(c+1)/(c+r)].H$

It is this latter expression that links the supply of money to the behaviour of the public that determines the amount of cash relative to deposits they wish to hold – probably as a function of their confidence in the banking system and how much they are paid in interest on their deposits; and of the banks which choose how much of their deposits they wish to hold as reserves in case there are people who want to take their money out – probably as a function of how good the investment opportunities are in the economy and how much they have to pay to acquire deposits.[1]

What we can see is that in 5, an increase in H causes the money stock to increase; and increase in **r** causes the money stock to decrease, and an increase in **c** also causes the money stock to decrease.

A numerical example:

To make the latter point clear assume initially that c=.05, r=.05 and H=100. In this case M=[1.05/.10].100=1050

Now let c increase from 0.05 to 0.10. This means that M=[(1.10)/(015)].100=733.

[1] Those of you who are sharp will notice that this looks like an identity since we use the definitions of M and H to define m. But if we assume that r and c are functions of behaviour, then say, they are constants, the relationship is really a theory that predicts how the money stock will change as the exogenous components change. For example, typically, government policy will affect H.

Bank of Canada
Balance Sheet
As at 31 December 2010

(Millions of dollars)

UNAUDITED

Assets

Cash and foreign deposits		4.7
Loans and receivables		
Advances to members of the Canadian Payments Association	22.5	
Advances to Governments		
Securities purchased under resale agreements	2,062.4	
Other loans and receivables	2.1	
		2,087.0
Investments		
Treasury bills of Canada	24,906.1	
Other securities issued or guaranteed by Canada:		
maturing within three years	14,211.9	
maturing in over three years but not over five years	5,911.4	
maturing in over five years but not over ten years	5,653.5	
maturing in over ten years	7,773.8	
Other investments	38.0	
		58,494.7
Property and equipment		149.3
Other assets		149.1
		60,884.8

Liabilities and Capital

Bank notes in circulation		57,874.2
Deposits		
Government of Canada	1,869.4	
Members of the Canadian Payments Association	47.5	
Other deposits	639.9	
		2,556.8
Liabilities in foreign currencies		
Government of Canada		
Other		
Other liabilities		
Securities sold under repurchase agreements		
All other liabilities	323.8	
		323.8
		60,754.8

Capital

Share capital and reserves	130.0	
Retained earnings	1.7	
Accumulated other comprehensive income	(1.7)	
		130.0
		60,884.8

I declare that the foregoing return is correct according to the books of the Bank.

Ottawa, 18 January 2011

S. Vokey, Chief Accountant

I declare that the foregoing return is to the best of my knowledge and belief correct, and shows truly and clearly the financial position of the Bank, as required by section twenty-nine of the Bank of Canada Act.

Ottawa, 18 January 2011

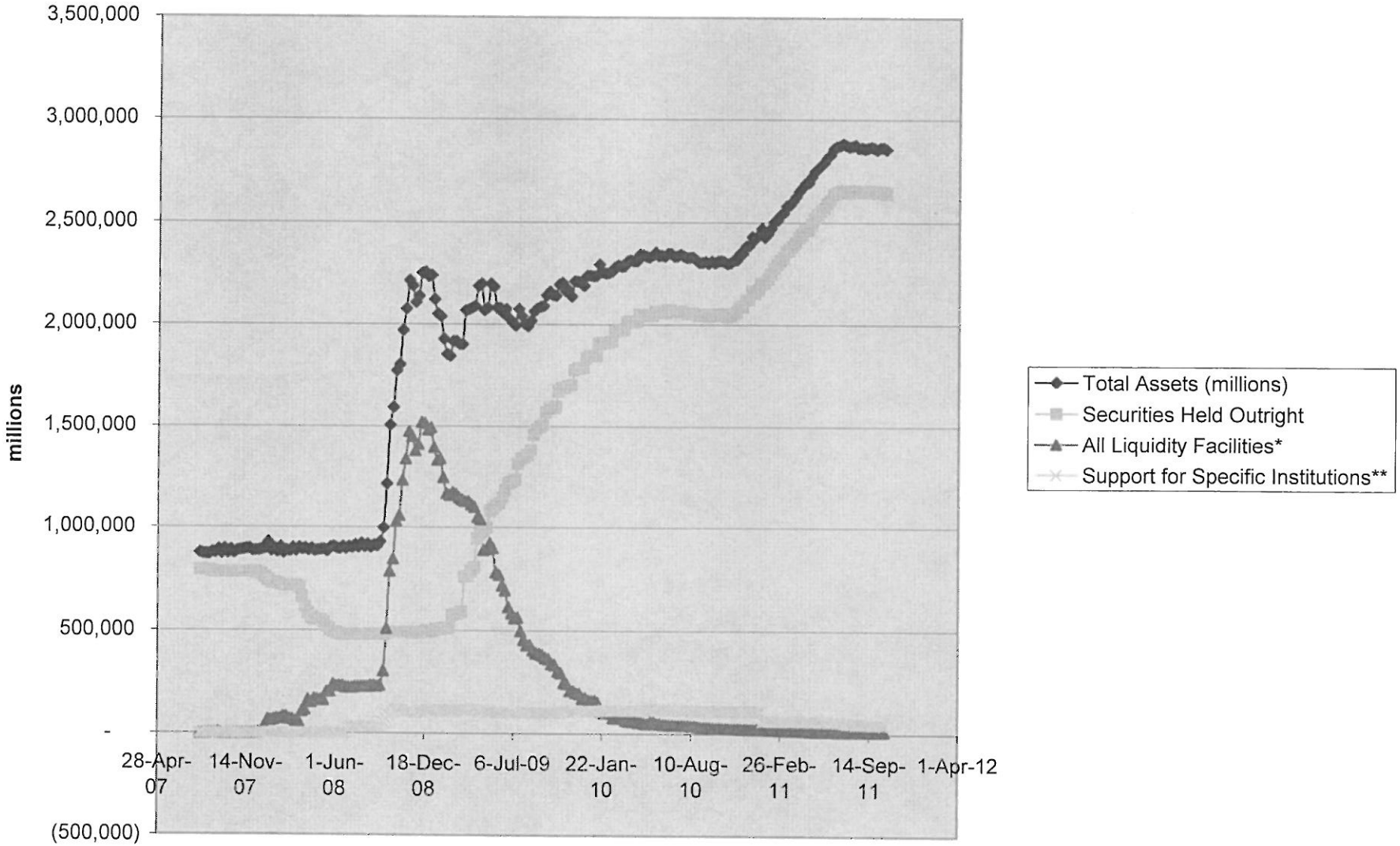
M. Carney, Governor

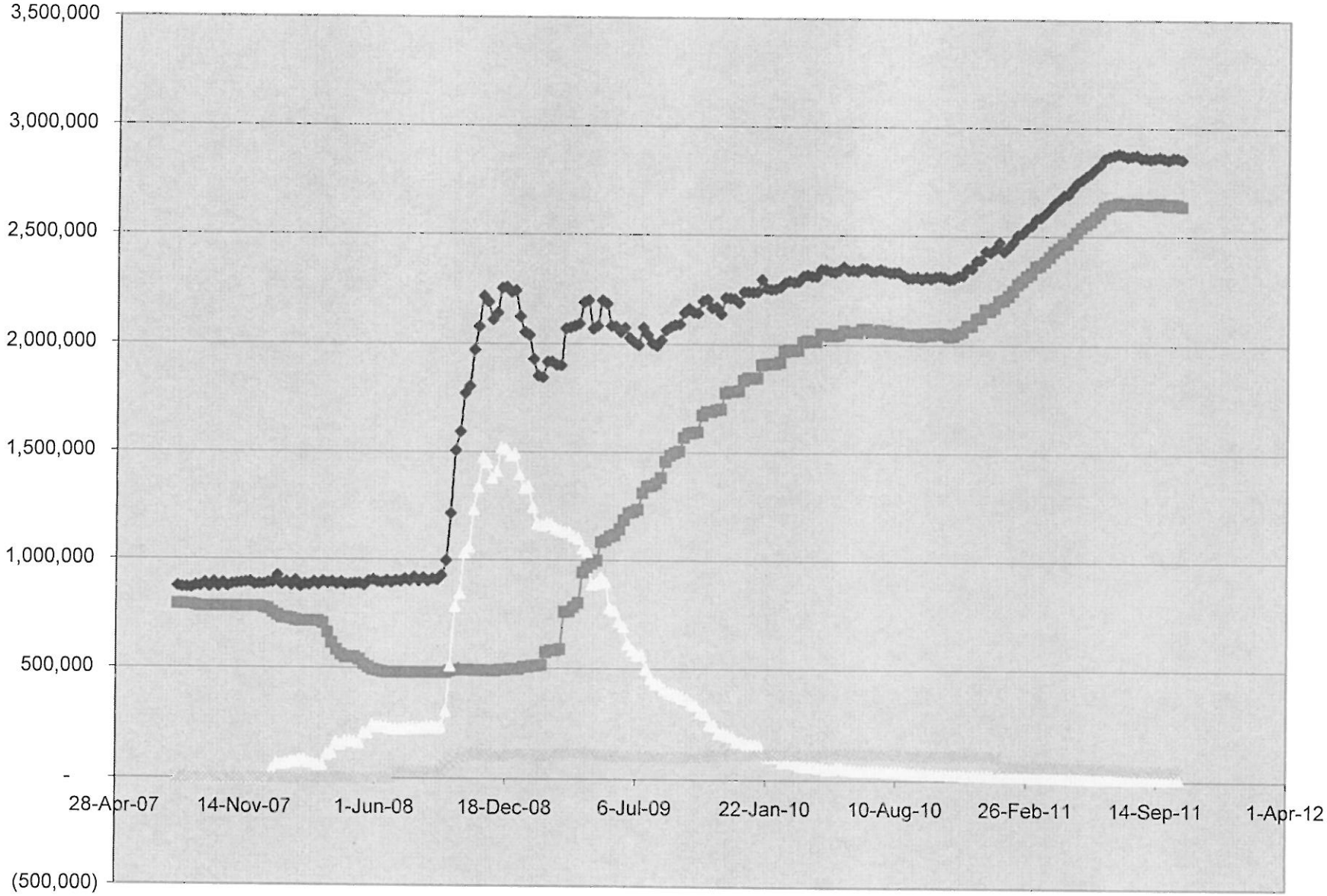
FEDERAL RESERVE BANKS
COMBINED STATEMENTS OF CONDITION
As of December 31, 2010 and December 31, 2009
(in millions)

	2010	2009
ASSETS		
Gold certificates	$ 11,037	$ 11,037
Special drawing rights certificates	5,200	5,200
Coin	2,180	2,053
Items in process of collection	374	507
Loans:		
Depository institutions	221	96,618
Term Asset-Backed Securities Loan Facility (measured at fair value)	24,853	48,183
American International Group, Inc., net	20,603	21,250
System Open Market Account:		
Treasury securities, net	1,066,952	805,972
Government-sponsored enterprise debt securities, net	152,972	167,362
Federal agency and government-sponsored enterprise mortgage-backed securities, net	1,004,695	918,927
Foreign currency denominated assets, net	26,049	25,272
Central bank liquidity swaps	75	10,272
Other investments	-	5
Consolidated variable interest entities:		
Investments held by consolidated variable interest entities (of which $68,469 and $71,648 is measured at fair value as of December 31, 2010 and 2009, respectively)	68,666	81,380
Preferred interests	26,385	25,106
Accrued interest receivable	14,231	12,641
Bank premises and equipment, net	2,613	2,624
Other assets	738	638
Total assets	$ 2,427,844	$ 2,235,047
LIABILITIES AND CAPITAL		
Federal Reserve notes outstanding, net	$ 941,561	$ 887,846
System Open Market Account:		
Securities sold under agreements to repurchase	59,703	77,732
Other liabilities	-	601
Consolidated variable interest entities:		
Beneficial interest in consolidated variable interest entities (measured at fair value)	10,051	5,095
Other liabilities (of which $203 and $143 is measured at fair value as of December 31, 2010 and 2009, respectively)	921	1,316
Deposits:		
Depository institutions	968,052	976,988
Treasury, general account	140,773	186,632
Treasury, supplementary financing account	199,964	5,001
Other deposits	16,967	36,228
Funds from American International Group, Inc. asset dispositions, held as agent	26,896	-
Interest payable to depository institutions	113	113
Accrued benefit costs	2,597	2,631
Deferred credit items	1,794	2,103
Accrued interest on Federal Reserve notes	5,124	1,191
Other liabilities	280	290
Total liabilities	2,374,796	2,183,767
Capital paid-in	26,524	25,640
Surplus (including accumulated other comprehensive loss of $3,630 and $3,676 at December 31, 2010 and 2009, respectively)	26,524	25,640
Total capital	53,048	51,280
Total liabilities and capital	$ 2,427,844	$ 2,235,047

The accompanying notes are an integral part of these combined financial statements.

Selected Federal Reserve Assets: 2007.08-2011.10




3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
-
(500,000)
28-Apr-07
14-Nov-07
1-Jun-08
18-Dec-08
6-Jul-09
22-Jan-10
10-Aug-10
26-Feb-11
14-Sep-11
1-Apr-12

Open Market Operations = purchase or sale of domestic assets
ΔM greater from money multipliers (see handout)

(1) OMO central bank buys assets from public → M^S ↑ directly
(2) if operate by selling ~~as~~ Foreign asset, receives cash ⇒ M^S ↓ (cash ↓)

- FA	CUR -

purchase of a foreign asset increases ~~the~~ CB's liabilities ($)

(3) Sterilization
Foreign ~~currency~~ & domestic in opposite directions
Eg. Sell 100 FA, receive $100 on local private bank reducing M^S.
But if want to offset local M^S effect, buy $100 of gvt bonds from public, which raises assets + liabilities by $100.
∴ There is no change in M^S from the combined operation although the mix between foreign + domestic assets has changed.

(4) BoP (OSB) = surplus when net foreign assets rise ~~relative~~.
B = CA + KA net flow not including gvt transactions to hold currency value

B unsterilized ⇒ M^S ↑

How CB fixes the exchange rate

* CB willing to trade currencies at fixed rate
  buy & sell whatever is necessary.

Implications of success.

First fix at E^0. $\Rightarrow$ $\frac{E^e - E}{E} = 0$ $\frac{E^0 - E^0}{E^0}$

$\Rightarrow$ $R = R^*$

For R to be fixed at R^* $\Rightarrow$ M^s must adjust to maintain interest rate equality.

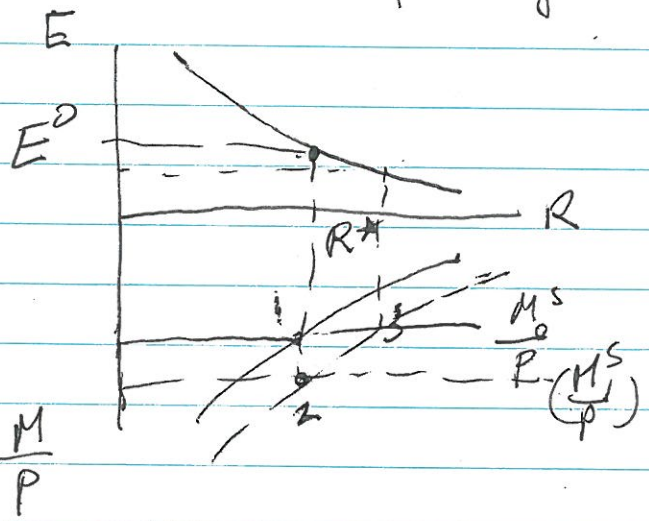


Fig (8.1

(1) Suppose Y ↑ $\Rightarrow$ R "↑", then

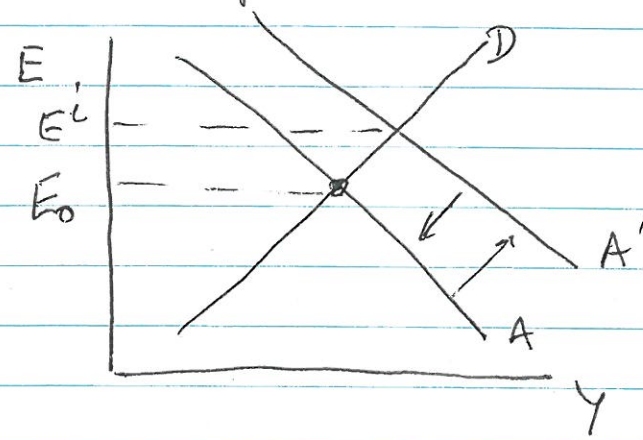
(2) money flow is (FE) which

CB must buy to hold ~~E~~ E

(2) FE ↑ and M^s ↑.

This is a little tricky. We say there is an "incipient" increase in R which brings money into the home country from abroad. It is the money from foreign purchases of domestic assets that provides the + FE purchased by our CB, which expands M^s.

Monetary & Fiscal



$E^e = E^0$

$R = R^*$

(1) M ↑ say by a purchase of domestic assets

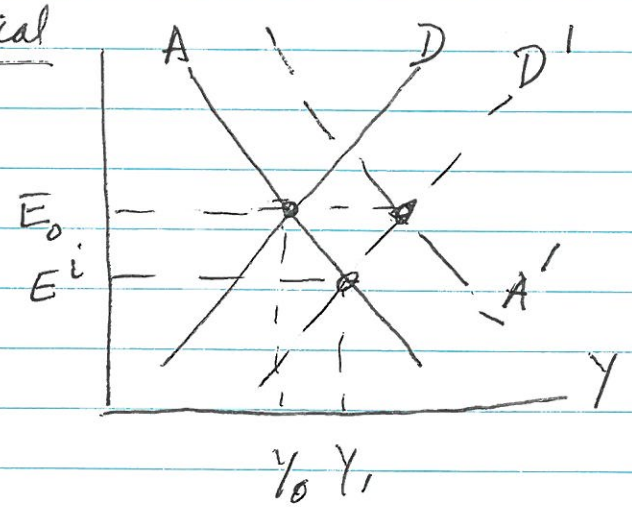
(2) E incipient depreciation, E^1

(2') To prevent this, bank sells foreign assets for domestic money

(3) ∴ M^S ⇓

∴ monetary policy has no lasting effect on M^S!

Fiscal



(1) $D \to D' \Rightarrow E_0 \to E^1$ as Y ↑

(2) M^d ↑ ⇒ R_i ↑ ⇒ inflow of money (or bank buy for. currency so ↑

(3) M^S ↑.

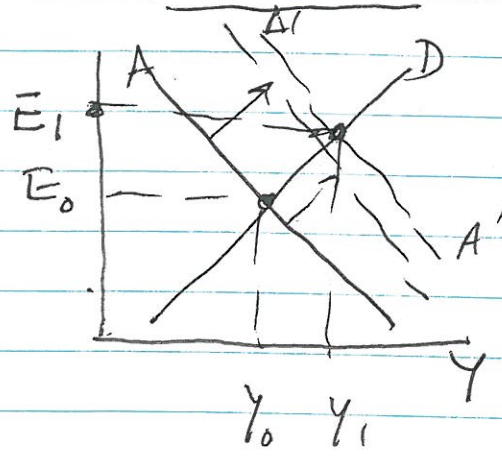
∴ Fiscal policy is 'effective'

ΔE

Devaluation : a new tool

is a ~~↓~~ E↑ against another currency

revaluation : E↓



Because normally occurs infrequently, is the biggest stick in the M/F arsenal

- At E_1 domestic goods cheaper. (P, P^* fixed in SR)
- as $Y \uparrow \rightarrow R_i \uparrow \rightarrow FX \uparrow$
$\Rightarrow MS \uparrow \Rightarrow A'A'$

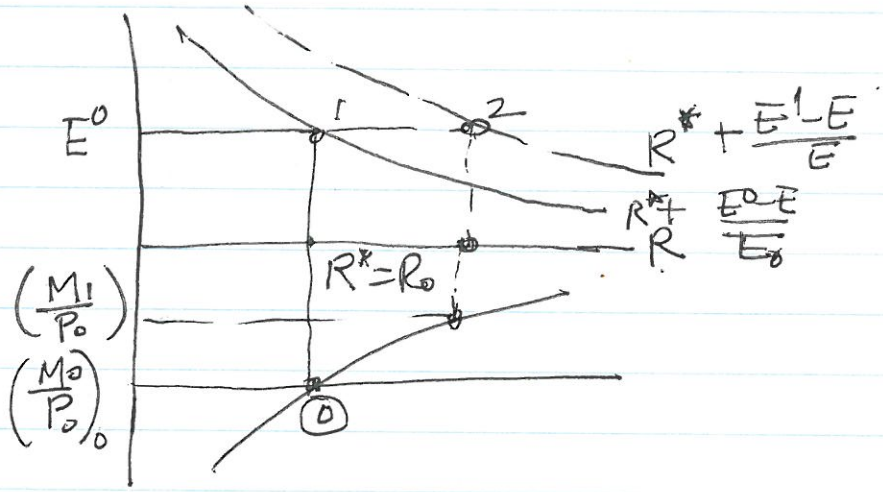
($E^a = E^0 \Rightarrow E^1$ causes AA to shift part way)

(1) Way to stimulate Agg Demand w/out parliamentary stress!
(2) CA > 0 (ML)
(3) Running low on reserves. The classic reason

Long Run : tricky if start from full employment since ΔE is only a "paper change". Thus everything returns to the underlying "real" values albeit with P, E↑ in proportion, but R (real) unchanged.

B of P and Capital Flight

We have assumed $E^e = E^0$, but if the exchange rate is 'under pressure' that causes the market to believe the exchange rate will be devalued, then the beliefs can set-off a b of p crisis and cause a devaluation.



At (0) and E^0 let expectations change to E^1, then there is a right-shift of the domestic return to foreign assets schedule which raises R^* to $R^* + (E^1 - E)/E$ Since $R_0 < R^* + \frac{E^1 - E}{E}$, money flows out as investors respond to the 'incipient' interest rate differential. The CB sells reserves and the $M^S \downarrow$ to M_1.

Often termed "capital flight"

Expectations can lead to a currency flight that is self-fulfilling — one-way bet against the bank. may force 'devaluation'.

Managed Float & Sterilized Intervention

If banks want to let E move a little by selling some reserves, they have to sterilize the outflow by expanding domestic credit.

Perfect Asset Substitutability & Ineffective Sterilization

Equilib when $R = R^*$ ⇒ perfect substitutability

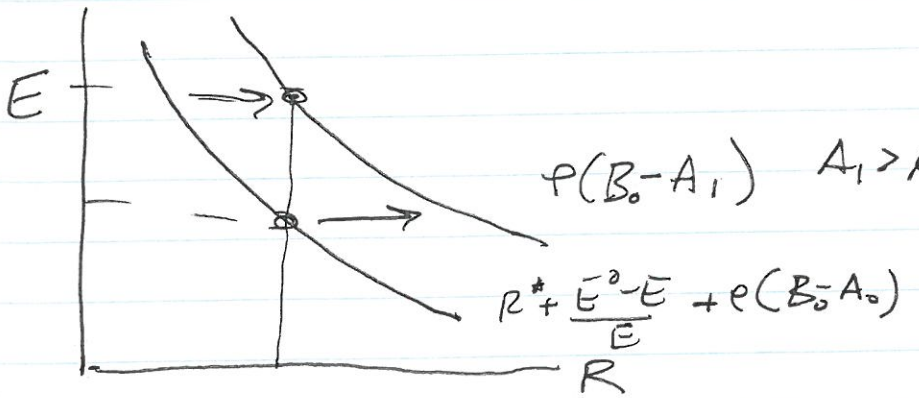
Imperfect $R = R^* + \left(\frac{\bar{E}^e - E}{E}\right) + \rho$

ρ = risk premium

$\rho = \rho(A - B)$ $\quad \rho' > 0$

A = domestic govt bonds held by public

B = " assets of the CB.



Consider a sterilization: purchase foreign assets $+FA$
& sell domestic assets $-DA$ ⇒ $\bar{M}$

Central Bank's domestic assets are lower $B_0 - A_1 < B_0 - A_0$
so domestic residents now hold more risky domestic assets.

But even w/ $\bar{M}$, pressure on E to depreciate

Reserve Currency

(1) US $
(2) Gold Standard

US $ It is the vehicle currency

(1) Countries hold as reserve rather than an even basket of the world's currencies.
(2) Countries fix to the $
    $ can't fix to any more than 1 !
    (N-1) fix to US $
    cross-rates look out for themselves

One interesting feature: If US $M \uparrow$ $R_{xs} \downarrow$ ∴ reserves would tend to leak out. But to fix to the US $, foreign CB's have to be willing to accumulate the reserve currency.

—o—

Reserve currency can push its monetary policy out to the world.

However, if world grows, it will want more reserves ∴ the reserve country must run a B/P deficit!

Gold Standard

Another reserve.
Currencies are fixed to gold (# of troy ounces)
Countries hold gold as a reserve (like foreign assets in CB)

Bank behaviour that causes R↓ would normally cause E to depreciate, but have to ~~fix~~ to gold. Therefore unhappy domestic bond holders sell $ for ~~£~~gold at the CB and then buy bonds abroad.

Gold supply at home falls + increases abroad
This tends to push $M_{\$}$ ↓ and R ↑
Abroad more gold ⇒ $M_{£}$ ↑ R ↓ until equilibrium
Countries share the adjustment; the process is automatic; tends to lead to stable prices – even falling world prices.

Disadvantages

(1) Restricts monetary policy
(2) Supply is "random"
(3) All would want to hold gold. (World deflation)
(4) Russia + SA would have lots of gold!

Other standards
Silver
Bi-metallic
Gold-Exchange – gold + other currencies fixed to gold

Timing and B of P Crises

A crisis arises from a CB's relatively sudden inability to maintain a fixed exchange rate.

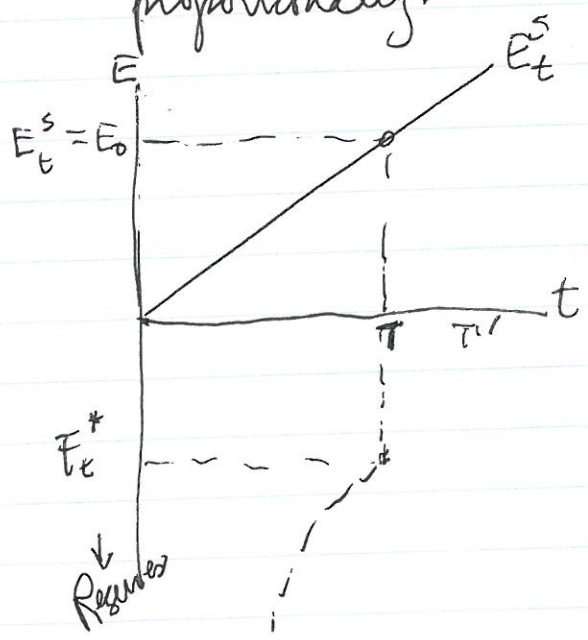
In some cases inconsistent macro policies can help us predict a crisis

Use monetary approach. but $\bar{Y}, \bar{P}^*$
(1) Domestic credit expands steadily. $\bar{D}^*$
(2) E^0 if reserves $F^* > 0$; E floats if $F^* = 0$

Obviously E^0 is inconsistent w/ the monetary policy.
∴ When will reserves run out is the question.

Define the 'shadow floating rate' E_t^S as ER when no change in reserves i.e. a float.

Since domestic credit is growing steadily, E_t^S is growing proportionally.



F_t^* is the reserves at time of the speculative attack.

(1) When $E_t^S < E_0$, never have a speculative attack since "success" would mean an appreciated currency (and a loss for participants who bought for currency)
(2) At $T' > T \Rightarrow E_0 \rightarrow E_{T'}^S$ which gives cap gain ⇒ try to do the same thing earlier.
∴ not an equilibrium.
$\Rightarrow E_t^S = E_0$ is the only equilib