ECGA 5450 **Fall 2013**

Generations of currency & Financial crises

(culminating in Europe's "no currency" 2011 crisis)

Since the history of capitalism is one of booms and busts, crises are in principle predictable. As Kindleberger and Aliber emphasize in Manias, booms and crashes all booms come to an end: just when and how severe the end turns out to be is of course the question (hard and soft landings). The great appeal of generation I models is that they predict not only when currency crisis occur, but also what caused it. A generation I crisis model is just the standard financial programming or MABP model with chronic fiscal deficit. In fact, both Generation I and II crises originate in the public sector. Generation III models focus more on private sector booms, especially those fueled by banks (see the Generation III handout and Allen et al. 2002 Box 1). Basically Generation III add a private credit and a nontraded sector linked by bank lending (and borrowing, sometimes from banks in other countries). We always thought banks made currency crises much worse—the punishment outweighs the crime, as Chang and Velasco, 1999 put it—that is until we saw how much worse a banking/fiscal crisis can be when an country has no currency of their own.

"Twin crisis" thinking dominates most explanations of the 2008 crisis, including Rheinhart and Rogoff, 2010. Nouriel Roubini predicted the "great moderation" boom would end in a currency crisis, but it did not: the dollar actually strengthened despite a massive expansion in liquidity. It was in Europe however, specifically in some EU members who lacked their own currency that the crisis became severe. Unemployment rose to over 20% in Greece, Spain and Portugal. Ireland, Finland and Italy struggled with high borrowing costs. However, those countries that retained their own currency Poland, Sweden and the UK had less severe recessions. Even Denmark who still has a currency that is pegged to the Euro did better. Many argue that some countries (Greece) will eventually have to replace the Euro with a new national currency, as Argentina did at the end of 2001. The ongoing Euro crisis has elements of all three currency crisis models: high Generation I public sector deficits, self-fulfilling high Generation II interest rates and unemployment rates as well as banks with balance sheet problems (Generation III) . Moreover, this crisis demonstrates the value of having a national currency: it provides an important escape route from both an overvalued exchange rate and an unmanageable debt burden (see . The problem is (as always) that the ongoing Euro crisis is different, it does not fit neatly into any one of currency crisis models including Generation II models inspired by the previous EU crisis in 1993. While Poland and other prospective members are now less likely to adopt the Euro, Greece is unlikely to leave the Euro area, mainly because of potentially strong contagion to other Southern European countries (Spain, Italy, Portugal and Ireland).

The great appeal of so-called **generation I speculative attack models** that they offer a model of both a how and when a fixed exchange rate regime will end. Paul Krugman (1979) applied a speculative attack model developed by Steven Salant and Dale Henderson (1978) to predict attacks on commodity stocks to a country's "stock" of foreign reserves. Like commodity stocks foreign exchange reserves (dollars) serve as a buffer against destabilizing shortages in normal times. But if stocks get too low there can be problems: even before stocks reach zero, currency holders anticipate a fall in the local currency's and buy all the dollars they can. At some date T there is a run on the Central Bank's reserves vanish very quickly, into the hands of speculators who then wait for the price of the home currency collapse. The speculative attack model remains influential promises a date of crisis, more or less, and because of Krugman's focus on public deficit financing seemed to fit the debt crises of the 1980s. The currency crises of the 1990s, however, including the European ERM crises of 1992, Mexico's 1995 crisis and the Asian crises—seem less consistent with these stylized facts (see IMF 1996 ICM Background paper). Mexican interest rates did not rise before their December 1995 devaluation. In the early 1990s, many European countries devalued without running big budget deficits or depleting their reserves. Subsequent currency crisis models attempt to capture new elements of these crises.

Generation II currency crisis models add an optimizing government that may choose to devalue even when it has sufficient reserves to defend a particular exchange rate. This model was applied by Obstfeld (1996) to the collapse of the ERM in 1992-93 which included speculative attacks on the Pound and Swedish Kroner. These crises are particularly vexing because the need not be driven by "fundamentals" (for budget deficits or excess money creation financed by reserves as in Generation I models). Instead governments trapped in an politically difficult situation (high unemployment, deflation, budget cuts, etc.) may the "escape clause" or option to devalue

impossible to resist. Currency speculators and local investors know this and attack the currency. This model also fits Argentina in 2001 (very high unemployment) and more recently Europe (see Paul DeGrauewe, 2010).

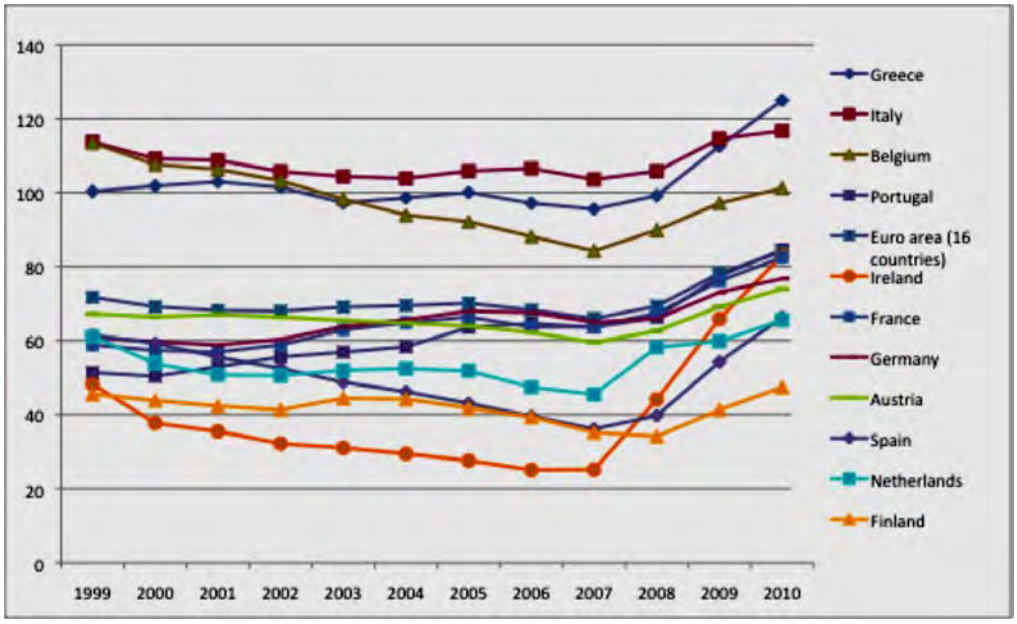
Generation III models add private banks and financial markets that engage in domestic and international lending leading to new channels for contagion effects and adding private sector credit booms and balance sheets to the predictors of crises (as opposed to Generation I monetary or public sector imbalances). Spain and Ireland for example, had modest fiscal deficits until there banks were brought down by the end of the real estate boom in 2007-2008. Rheinhart and Rogoff's 2010 *This Time is Different* makes these "twin crises" models the benchmark, this time is no different model (problems start with a financial liberalization as in the United States 2008 "Lehman Crisis"). However, the asset bubbles in these models may start and end in the private sector, as with the real estate booms observed in Thailand, Hong Kong, Spain, Ireland and in the U.S. Since "bubbles" and real booms sometimes last for long periods, these models generally do not give us much insight into timing and dynamics of crisis… (however, they have formed the basis for a number of attempts to predict crises, see R&R chapter 17). A typical model "balance sheet" model with banks is Chang and Velasco, 1998 (see Generation III lecture notes) where banks raise growth by pooling deposits and investing in higher return projects….

Case study: the 2010-12 Euro Crisis The Euro crisis is an ongoing lesson in the value of monetary policy in coping with crises, and of having the option to print one's currency. Initially, the Euro lowered interest rates and inflation in Southern Europe as promised. But now the region is caught with large public sector debt and depression level unemployment rates. Ireland has made some progress with "internal devaluation" but Greece, Portugal and Italy have not. While Spain, Italy and Greece may need labor market reform, progress has been limited, even under Mario Monti. If Europe's is a Generation I crisis, reducing fiscal deficits and "austerity" should fix it. If it is mainly a Generation II crisis, the key is to reduce high interest rates and increase investment so unemployment will fall at some point. If it is a Generation III crisis, the key is to restore confidence in the banking system (to "recapitalize the banks" in the words of IMF head Christine Lagarde). Greece seems to have suffered a classic Generation I government spending led crisis (see Figure 3 in De Grauewe, 2010, below) but now because it cannot print its own currency even as unemployment (Generation II) soars to incredible levels it still cannot devalue without losing its banking system (Generation II, see Paul De Grauewe, 2011 Managing a Fragile Eurozone). Iceland, Ireland and Spain seem had classic private sector led real estate bubbles and the loses of private banks had to be absorbed by the public sector (this happened in the U.S with the Tarp as well, though the government ended up making money on its banking and insurance loans…). In all cases "balance sheet" or currency mismatch problems are not an issue, so currency depreciation seems less of a threat than a potential solution to these crises. As a loss of confidence, reserves, government policy priorities (credibility) and banks system play a role in almost all currency crises; the three generations of currency crisis models remain complements rather than substitutes, as are the various "approaches" to modeling current account adjustment studied earlier in this course.

The Euro crisis paralyzed Europe's banking system and created sovereign debt problems for a number of countries. In retrospect, and given the 2010-2012 crisis in Southern Europe evidently then ability to print the domestic currency provides and important "escape clause" for countries whose currencies have become overvalued (Generation II) and/or who have large external debt. The alternative to using one's own currency to save the banking system is an even more costly default on sovereign debt which quickly became a banking crisis as well as De Grauewe, 2011 and others suggest. What makes the Euro crisis uniquely difficult is that the old currencies are gone (the Drachma, the Lire and Peseta are gone, but perhaps stored somewhere?). Finally, and again unique to the Euro area, more than one highly indebted country (including Ireland and Portugal) all use the same Euro. Any attempt to replace Euro's with a national currency again (old or new) would trigger a banking panic in all these countries. The fear that some countries would try to replace the Euro create local but contagious "convertibility" risk as ECB head Mario Draghi famously noted. By linking the problem banks and governments would have if private agents began to think a Euro might not be a Euro made the crisis of the ECB, issuer of the Euro, stating famously "Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough." (see his July 2012 remarks) With national central banks powerless to issue the currency used within their borders, the ECB has to become a lender of last resort. By recasting the Euro crisis as a "convertibility" crisis, hence a recasting what had been seen as a sovereign debt crisis of some countries, ECB head Draghi was able to make the problems some countries were having into a problem for the ECB, which could he claimed become effectively a lender of last resort.

However, responding to a twin "banking" and currency crisis by printing a domestic currency has an important bonus that a ECB lender of last resort cannot provide: currency depreciation is convenient to reduce real wages without reducing nominal wages and prices locally (Krugman, 2010 emphasizes this Chapter 10). In his text on monetary unions, De Grauewe argues flexible exchange rates have drawbacks too, but then acknowledges the core of the Mundell's Optimal Currency Area (OCA) arguments remain (see Chapter 2 Page 36 and 53). There are benefits for high inflation countries to join a monetary union, but these benefits come at a cost as "*Relinquishing the possibility of using this instrument for the indefinite future does imply a cost for a nation. This conclusion is enhanced when taking into account the fact that when countries relinquish their national currencies the government debt will have to be issued in a currency that is not under the control of the government. As was argued earlier this makes these governments more vulnerable to being involved in a debt crisis. Thus, it appears that there is a trade-off here. High inflation countries can improve their inflation reputation by entering a monetary union. However, at the same time if their reputation in the budgetary field is not strong, their entry into the union makes them more vulnerable to a sovereign debt crisis. The entry into a monetary union does not create a free lunch." De Grauewe p. 47*

Figure 3: Government debt in the Eurozone countries % of GDP, Source: European Commission, AMECO database (see Figure 3 in De Grauewe, 2010)



Generation I Currency Crisis Models:

This presentation follows that of Obsteld and Rogoff, 1995 section 8.4.2.3 We can begin with the same Cagan semi-log high inflation money demand equation used in the discussion of seigniorage except we switch to a continuous time version with $\dot{p}$ representing the inflation rate,

$$m_t - p_t = -\eta \dot{p} \qquad (1)$$

where m and p are logs or where $\dot{p}$ is the inflation rate. But now we return to the open economy money supply definition of the financial programming handout except that domestic credit consists solely of a growing stock of government bonds $L_t = B_t$ issued to finance the government deficit,

$$M_t = L_t + ER_t \qquad (2)$$

where domestic credit is growing at the policy determined rate of deficit growth $\dot{B} = \dot{L} = \mu$. Typically there is no bond market, local banks are forced to hold bonds issued by the government but these in turn just add tobank reserves. Purchasing power parity and uncovered interest rate parity hold in this small open economy so that $p_t = e_t p^*$ where for convenience set exogenous foreign prices $p^* = 1$. These assumptions imply $p_t = e_t$ and $\dot{p} = \dot{e}$. Deficit spending drives a steady increase in domestic credit growth, where $\dot{b} = \mu$. Under a fixed exchange rate this leads to a steady decline in total reserves: $-\dot{R} = \dot{L}$.

Capital flows, inflation and the probability of a Balance of Payments Crises

Foreign borrowing offers an alternative method of financing fiscal deficits potentially leading to less seigniorage and lower inflation. The same budget deficit leads to less inflation with higher net capital inflows. This argument applies mainly to long term capital inflows as will become apparent below. Starting with the consolidated government budget constraint,

$$e_f \dot{F} - e_f \dot{R} + \mu = \dot{b} - z(\pi) \qquad (1)$$

where F is foreign capital inflows, R is fx reserves – both converted into domestic currency at the fixed nominal exchange rate e_f and μ is the change in money supply and $\dot{b}$ is the government deficit less the inflation tax component of seigniorage z. If capital flows are zero $\Delta F = 0$, and if $M^d = L(y,p.i)$ (money demand) $p = e\, p^*$. This is the law of one price, which overlooks non-traded goods, not realistic, but makes the model much simpler. Finally we assume an open capital account which implies $i = i^* + \Delta e + \varepsilon$ where ε is a risk premium we can ignore for now. Finally if $M^s = M^d$ then then and there is not foreign borrowing (the change in F is zero) then,

$$-\dot{R} = \dot{L} \qquad (2)$$

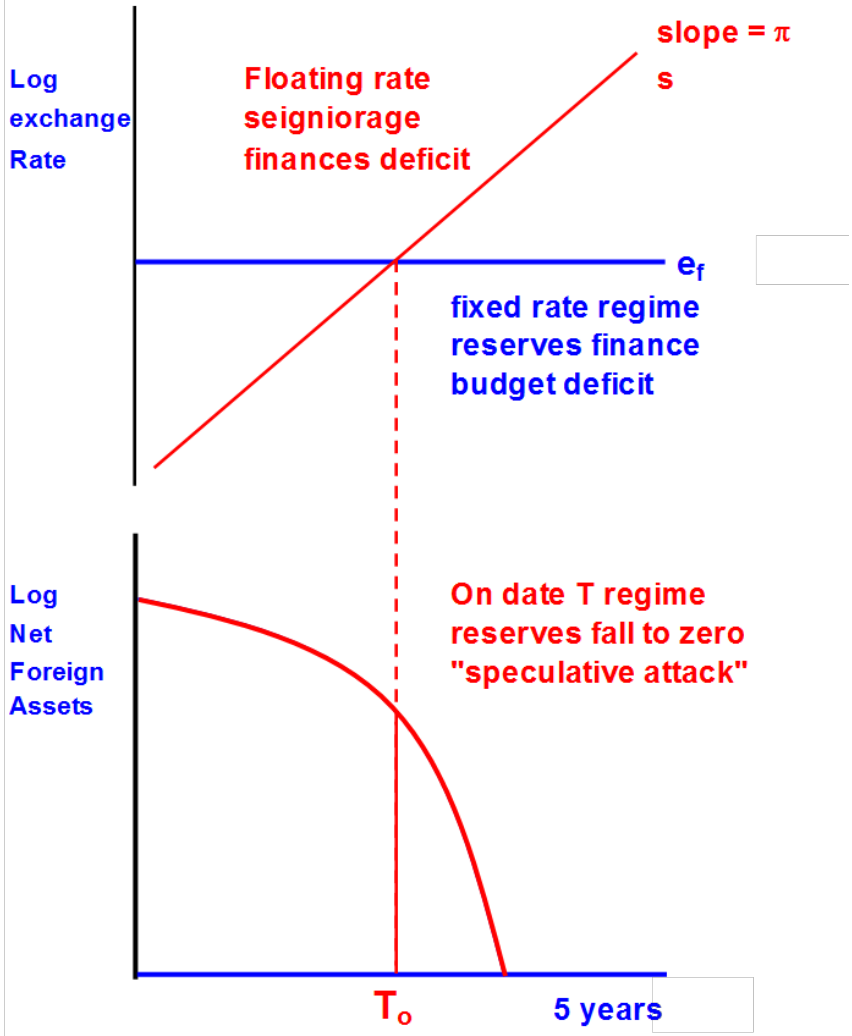
as the fiscal deficit steadily depletes foreign reserves with a fixed exchange rate. With flexible rates the deficit can instead be financed by an the inflation tax as $\Delta M = Z(\pi) = \theta$.

In the steady state $\mu = \pi = \theta = \Delta e$, meaning that the law of one price holds after the crisis as well (again nontraded goods are ignored). Figure 1 shows the transition between the two regimes where is the shadow exchange rate. Under floating rates $\Delta s = \Delta e = \pi$ and reserves stop falling but under a fixed rate regime $e = e_f$ In a perfect foresight world, investors know the date T when $s = e_f$ so at T the convert all there local currency into dollars. By augmenting or creating claims on foreign reserves, capital inflows can accelerate or delay date T since as Obstfeld and Rogof (1999) show under perfect foresight the date of collapse is,

$$T = \frac{e_f - R_0 - \eta\mu}{\mu} \qquad (3)$$

where as before μ is rate of money growth and $\eta$is Cagan semi-elasticity of demand for money.

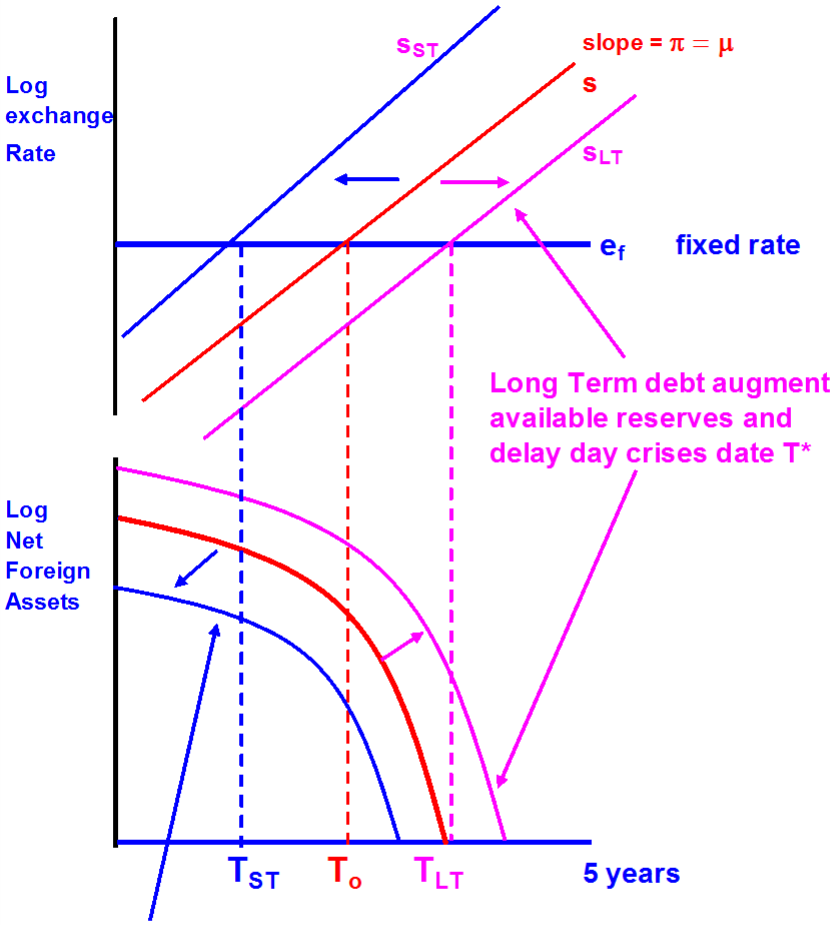
Figure 1: Basic Generation 1 speculative attack



Short-term Capital Inflows (bank liabilities) Reduce net foreign assets and hasten T -date of exchange rate regime switch.

Generation I plus Foreign borrowing:
As shown in Figure 4 below, long term capital inflows augment reserves and delay date T to T_{LT} as reserves increase due to capital inflows. However, as emphasized in 3rd generation models, short-term liabilities (bank to bank credit lines for example) are viewed as claims on reserves – so investors anticipate a potential liquidity crisis as in Korea 1998. The date of collapse moves closer to T_{ST} raising the average rate of inflation observed over any 5 year period. Slope = $\mu = \pi$ the rate of inflation or expansion of monetary supply necessary to generate the seigniorage to finance the government deficit under a floating rate regime.

Figure 4: Term mismatch: short vs. long term capital flows (marrying Generation I and II concerns)



Short-term debt (often bank to bank) reduce available net foreign assets bringing date T closer: the "crisis" date the exchange rate regime switches from fixed to flexible (and all reserves are exhausted).

Generation 1: Krugman (1979) Speculative Attack Model

Generation 3: Chang and Velasco (1999) Liquidity Crisis Model driven by ST Bank to Bank lending

*note long term debt does not prevent balance sheet effects

Generation II Models

Generation II stress a change in expectations rather than fundamentals (budget deficits, falling reserves, foreign borrowing). The derivation of the multiple equilibria model is a bit more complicated (see Obstfeld and Rogoff section 9.5) but the outcome is similar, quoting

"Having adopted a fixed but adjustable exchange rate, the government [may be] *is powerless to enforce its favored low inflation equilibrium at point 1* [in Figure 9.12, at right]. *It may even end up being gamed into a free float, paying the fixed cost c with no benefit from having partially committed to a fixed rate. The root problem is that high expected depreciation in and of itself, by incipiently raising unemployment, creates an incentive for the government to validate expectations ex post by devaluing.*

With multiple equilibria some seemingly unimportant event could trigger an abrupt change in expectations, shifting the equilibrium from one in which only a very bad realization of z forces the government off the fixed rate to one in which even a relatively small z does so. Such an event would look much like the sudden speculative attacks on exchange rates we analyzed using a very different setup in Chapter 8. But here the situation is analogous to a bank run in which withdrawals sparked by depositor fears can themselves cause an otherwise viable bank to fail." (Obstfeld and Rogoff, 1995, page 652)

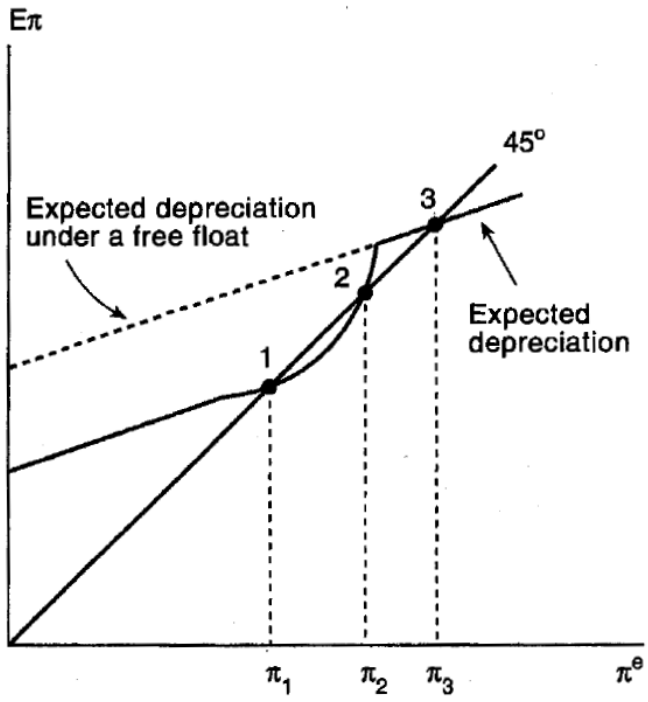


Figure 9.12
Multiple equilibria for expected depreciation

Capital Mobility as a commitment Technology

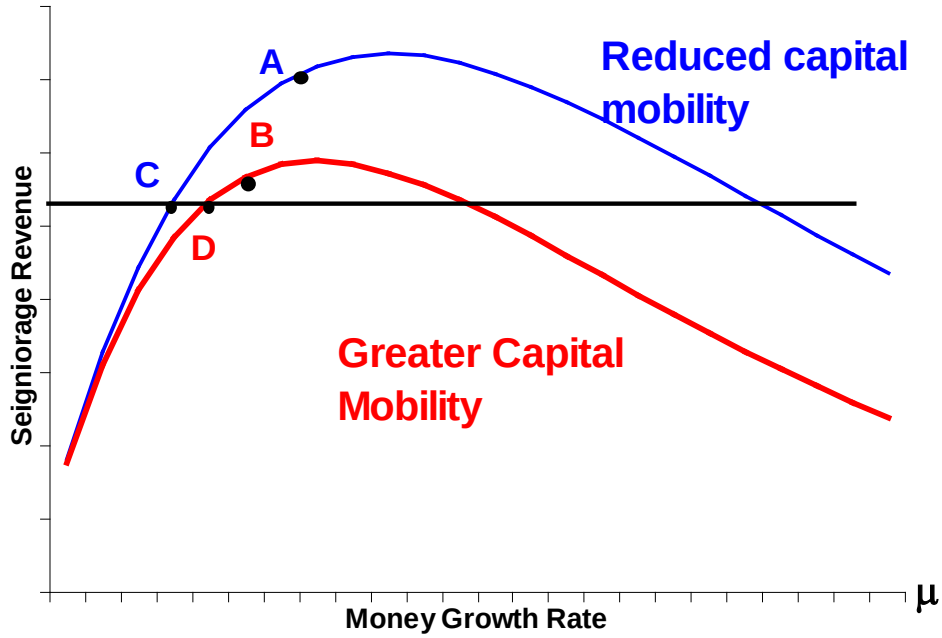
The modern approach to the option to Central Banks with the option to float derives from Barro (1983) rules vs. discretion framework. If government maximizes seigniorage subject to private sector expectations and the costs of inflation. Following Agenor and Montiel's (1996) version of Barro (1983) suppose that the Central Bank/Treasury objective function takes the form

$$L = l\, mm^d(p^a) - \exp(k_1 p + k_2 p^a), \qquad (6)$$

where $k_1 p + k_2 p^a$ represent the costs of the actual rate of inflation, π and the expected rate of inflation p^a, m^d money demand, and mm^d revenue from money creation – that is, seigniorage. Given the Cagan money demand function eq. (5) above, the seigniorage revenue is maximized at $\pi = 1/\alpha$ but as shown in figure 2, the inefficiencies caused by inflation hold the "optimal" inflation below the maximum seigniorage rate. Opening the capital market raises α lowering the optimal rate of inflation. Disciplined

by a loss of seigniorage the CB moves from A to B reducing inflation. The undisciplined non-optimizing government, however, may just raise the inflation tax to obtain the same 3% of GDP seigniorage revenue, moving from C to B. Depending on how one views government, capital mobility may increase or decrease inflation….

Figure 2: Inflation and Capital Mobility



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Acronyms:

AER: American Economic Review; BPEA: Brookings Papers on Economic Activity
CPI: Contemporary Policy Issues (became CEP: Contemporary Economic Policy)
F&D: World Bank/IMF Finance and Development
JDE: Journal of Development Economics JEG: Journal of Economic Growth
JEL: Journal of Economic Literature JEP: Journal of Economic Perspectives
JIE: Journal of International Economics JMCB: Journal of Money, Credit and Banking
JME: Journal of Monetary Economics JPE: Journal of Political Economy
PUP: Princeton University Press QJE: Quarterly Journal of Economics
WB ABCDE Annual Bank Conference on Development Economics
WB: World Bank WBER: World Bank Economic Review
WBRO: World Bank Research Observer WD: World Development

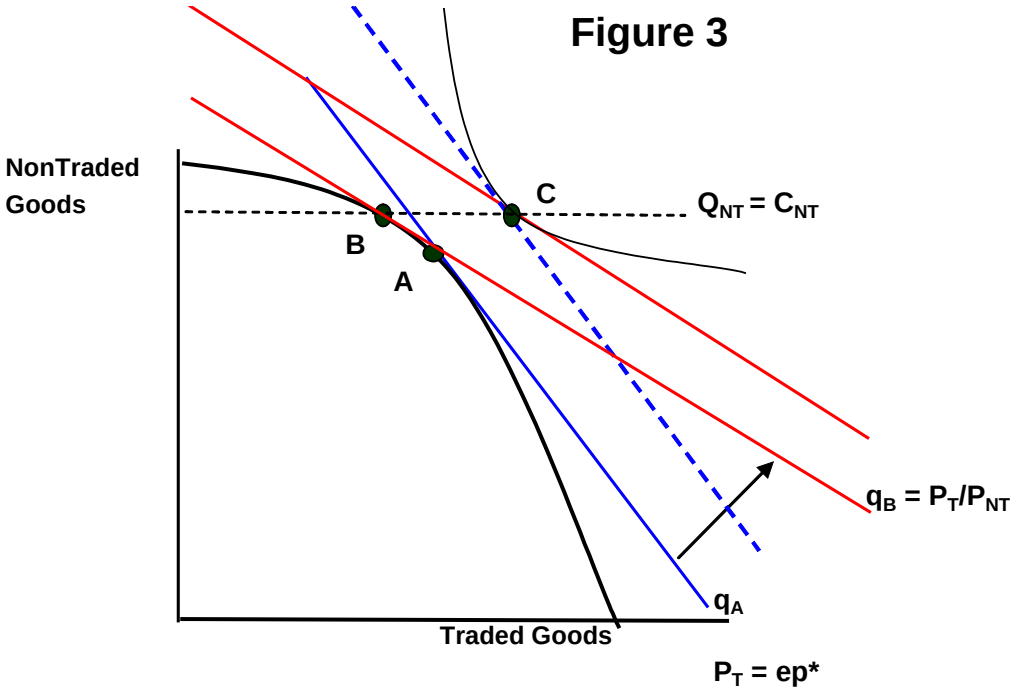

Figure 3: Capital Inflows always cause an appreciation of the real exchange rate, RER or $q = P_T/P_{NT}$ where $P_T = ep^*$.