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High Inflation in Open Economies

One can think of exchange-rate based stabilization policies as a quick, policy driven move between two stable equilibria, one characterized by high inflation and the other by moderate, under 2% monthly, inflation (see the Bruno quote on the web page and his article under stabilization policy "classics'). In his PhD dissertation Cagan (1956) studied seven European hyper-inflations. He defined hyperinflation as inflation rates of over 50% *monthly* , that's about a 12,875% annual inflation rate. By definition then, hyper-inflations never last very long. Chronic high inflation, in the 5-10% monthly range can persist over periods of many years. Outside Argentina and Brazil and perhaps Peru, what Eliana Cardoso calls "mega-inflation"-- above 10% monthly—also rarely persist for more than a few years. Generally however, inflation in developing countries is higher than in OECD countries. Higher inflation my be due in part to pegged exchange rates, and capital controls and even the Balassa-Samuelson effect on non-traded prices. But perhaps the only plausible explanation for chronic high inflation is government's desire to borrow when few are willing to lend. The local currency is then analogous to a government bond that pays zero interest and loses value at the rate of inflation. This particular form of government borrowing is known as seigniorage. It explains why we often observe high inflation during a debt crises or during wars. Cagan's simplified money demand equation is a special case of the standard money demand (LM curve) where money holdings depends negatively on the expected nominal interest rate i and positively on real output, Y

$$M_d/P = L(Y, i_{t+1}) \qquad (1)$$

In a high inflation environment the inflation component, π of the nominal interest rate i = r* + π dominates changes in real interest rates or GDP growth r*. If only the inflation rate influences real money holdings, then we have,

$$\frac{M_t}{P_t} = \left(\frac{P_{t+1}}{P_t}\right)^{-\alpha} = (1+\pi^e)^{-\alpha} \quad \text{or,} \quad m_{d,t} - p_t = \alpha E\{p_{t+1} - p_t\} \qquad (2)$$

where lower case m_t and p_t are logs of money demand and the price level variable and α is the semi-elasticity of money demand with respect to the nominal interest rate. In the Cagan "semi-log" money demand equation, nominal interests are dominated by expected inflation rate π^e. If expected inflation is zero then (2) implies the price level is fixed at $p_t = m_t$. But if the money supply grows at a constant rate, μ, then in the steady state prices rises with the money supply so that π = μ, and

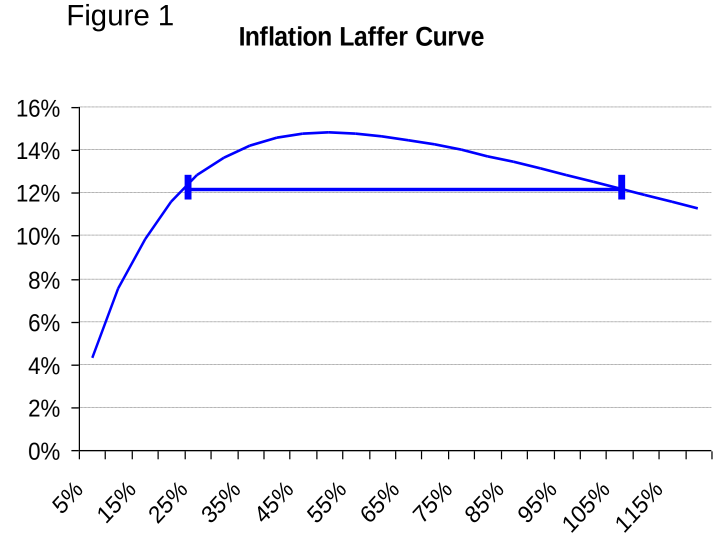
$$p_t = m_t + \alpha \pi \qquad (3)$$

where π is log change or percentage increase in p each period (the inflation rate). When inflation is high we assume the government is trying to use seignorage to finance government spending, where

$$S = \frac{M_t - M_{t-1}}{P_t} = \frac{M_t - M_{t-1}}{M_t} \cdot \frac{M_t}{P_t} = \mu\,(1+\pi)^{-\alpha} \qquad (4)$$

where the M_t/P_t from equation (2) above reminds us that a rise in steady state money growth μ has two effects on seigniorage revenue—it raises the tax rate, π, but reduces real money balances—M/P. Using (2) to replace M_t/P_t and noting that $\mu = \pi$ money growth equals inflation the third expression. Differentiating seigniorage revenue S with respect to π yields a seigniorage maximizing inflation rate of $\pi_{max} = 1/\alpha$. For example, if the semi-elasticity of money demand $\alpha = 2$, the revenue-maximizing rate of inflation is 50%. In this particular case, 50% inflation maximizes seigniorage revenues as in the Figure 1. Note, that two inflation rates, 30% and 120% raise the same 12% of GDP seigniorage as revenues can rise or fall with inflation depending which side of the inflation Laffer curve the economy is on. (this discussion follows that of Obstfeld and Rogoff (1998) p. 523 but see also Sachs and Larraine Chapter 23,pp. 740-741).

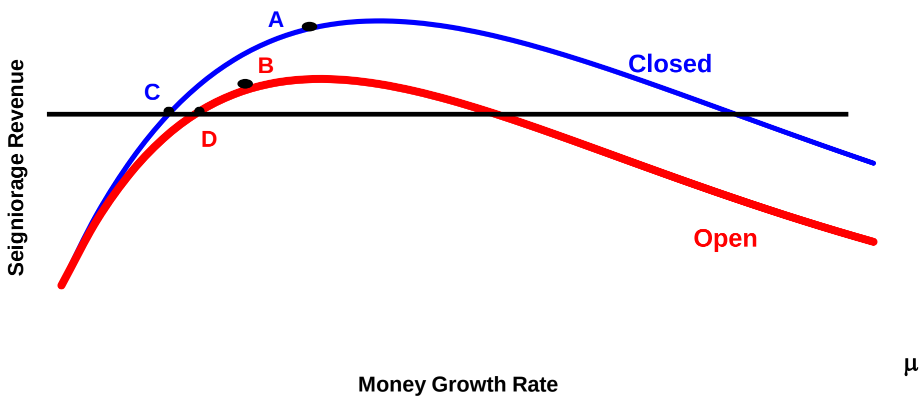
Figure 1



One key determinate of the elasticity of demand is the availability of substitute currencies. Economies with a history of high inflation often become "dollarized" as residents substitute dollars for domestic currency in everyday transactions. There is still demand for local currency as dollar denominated bank accounts and paying taxes and wages in foreign currency may be prohibited by law, but the demand for that currency becomes more elastic if a substitute currency circulates. But dollarization can also discipline the monetary authorities: if can use dollars instead of their own currency, demand becomes more elastic and the "optimal" inflation tax falls.

During the 1990s better communication technologies, a more open capital market in the U.S. and greater capital flows into emerging markets (partly driven by capital account liberalization) made it easier for residents to hold dollars instead of local currency. A higher elasticity of demand for money reduces the optimal inflation rate, as shown in Figure 2 below. Assuming there is some cost of inflation (the Olivera-Tanzi effect for example) then optimal inflation declines from A to B. Dornbusch (1991) and Hamann and Prati (2001) discuss the "disciplining" effect of open capital markets and argue open capital markets make it more likely exchange rate based stabilization programs will succeed. Both of these factors help explain the broad disinflation in emerging market economies observed in the 1990s (see Gruben and McLeod (2002)). However, if the government insists on financing a fiscal deficit equal to some fixed GDP share, represented in Figure 2 as a horizontal line, then inflation rises from C to D. Dollarization and/or capital account liberalization makes easier to avoid a tax on money so the inflation rate necessary to extract the same tax revenue rises from C to D.

Figure 2: Inflation and Capital Account Opening



Maximizing seigniorage with a more realistic Money Demand

The above high inflation demand curve is simple but perhaps not general or simple enough. Take a simple linear money demand function,

$$\mathbf{L^d = a\ PY - b(\pi^e + i^* + \varepsilon)}$$

where L^d is the private demand for domestic credit (as discussed in the MABP handout) and a is analogous to 1/v, except that in case the "real" velocity of money depends on the nominal interest rate which for this small open economy equals the local inflation rate plus the foreign interest rate i* plus some country risk premium.