Lecture II:

Fiscal and Monetary Theories of Inflation

Fiscal-Monetary Policy Links

Two Polar Regimes

- “Ricardian” Regime: Fiscal policy adjusts to ensure government’s solvency (IBC). Monetary policy sets interest rates and/or money supply consistent with inflation objective.

- Non-Ricardian Regime: Fiscal policy sets g and τ inconsistently with with IBC. The price level adjusts so as to ensure that IBC holds.

  → case of “**fiscal dominance**”: monetary policy typically can only choose between inflation now vs. inflation later.

Fiscal-Monetary Policy Links

Basic government accounting with central bank

Take Eq. (I.16) and add central bank "receipts" (RBC):

$$B_t^T + G_t^P - T_t = R_{t+1}^{-1} B_{t+1}^T + RBC_t$$

$$\therefore G_t^P = R_{t+1}^{-1} B_{t+1}^T - B_t^T + T_t + RBC_t \qquad \text{(I.23)}$$

Central bank transfer to Treasury

Where the subscript "T" accounts for total government bonds.

Fiscal-Monetary Policy Links

Central Bank Accounting:

Typical Central Bank Balance Sheet

Assets	Liabilities
International Reserves ("NFA")	High Powered Money ("H" or "M")
Net Domestic Assets ("NDA")	

Divide by p only if everything is expressed in real terms

$$\underbrace{R_{t+1}^{-1}B_{t+1}^{M} - B_{t}^{M}} + RBC_{t} = \underbrace{(M_{t+1} - M_{t})} / p_{t} \qquad \text{(I.24)}$$

Change in Government bond holdings in the hands of the central bank (central bank financing of Treasury)

Central bank finances its spending with issuance of high powered money

Fiscal-Monetary Policy Links

Government bond holdings in the hands of households is of course total government bond issuance less the stock of government bonds sitting in the central bank balance sheet (under the item"NDA"). Hence:

$$B = B^T - B^M$$

Solving (I.24) for RBC, plugging into (I.23) and using the above, we end up with the **consolidated budget for the government** (i.e. Treasury + Central Bank):

$$B_t + G_t^P - T_t = R_{t+1}{}^{-1} B_{t+1} + (M_{t+1} - M_t)/p_t$$

$$\therefore G_t^P - T_t = R_{t+1}{}^{-1} B_{t+1} - B_t + (M_{t+1} - M_t)/p_t \qquad \text{(I.25)}$$

Fiscal-Monetary Policy Links

Eq. (I.25) says that the ***consolidated*** government's primary deficit can now be financed with either net bond issuance (i.e. discounted of interest payments) to the households plus money issuance – the so-called **"seignorage"** financing.

- Clearly, bond financing can be expensive: the government has to pay interest rate **r** on its bond issuance.
- And we have seen in Figure 4, that **r** can be high!

Fiscal-Monetary Policy Links

- But this doesn't mean (as we will see more shortly) that seignorage financing is not costly!

- To start examining this, re-write (I.25) as:

$$G_t^P - T_t = R_{t+1}^{-1} B_{t+1} - B_t + \frac{p_{t+1}}{p_t} \frac{M_{t+1}}{p_{t+1}} - \frac{M_t}{p_t}$$

$$= R_{t+1}^{-1} B_{t+1} - B_t + R_{t+1}^{m^{-1}} \frac{M_{t+1}}{p_{t+1}} - \frac{M_t}{p_t}$$

Real return on money balances $R_{t+1}^m = \frac{p_t}{p_{t+1}}$

Real money balance

Fiscal-Monetary Policy Links

- Prima-facie, even without taking into account other (allocative) costs of price instability, the above eq. shows that money financing can be costly.

- E.g. if there is deflation (i.e. $p_t > p_{t+1}$), $R^m_{t+1} = \frac{p_t}{p_{t+1}}$ the rate of return paid on money can be high.

- So, money financing is not so trivially on a purely accounting basis!

Money, Deficits and Inflation in General Equilibrium

- This raises the fundamental question of why people hold money.
- And another, no less tricky question, of what is "money".
- In this lecture, we shall confine ourselves to the former question.
- Under complete markets, fiat money can only be a store of value that, in the limit (i.e. $T \to \infty$, imposing the transversality condition), is valueless.

Money, Deficits and Inflation in General Equilibrium

- So, motivating money holdings would require some "friction".
- Here we will review a model in which holding money saves transactions costs – "shopping time"
- The model follows L-S, chapter 24.
- This basic set-up will be used to discuss various fiscal-monetary models of inflation.

Money, Deficits and Inflation in General Equilibrium

- Utility: $$\sum_{t=0}^{\infty} \beta^t u(c_t, l_t)$$

leisure

- Constraints:

$$c_t + \frac{b_{t+1}}{R_t} + \frac{m_{t+1}}{p_t} = y_t - \tau_t + b_t + \frac{m_t}{p_t}$$

$$1 = l_t + \delta_t$$

where δ is shopping time ("s" in L-S but we use little delta to avoid using "s" which we used before for fiscal surplus).

As before: endownment economy with no uncertainty.

Money, Deficits and Inflation in General Equilibrium

- Shopping-time transaction technology:

$$\delta_t = 1 - l_t = H\left(c_t, \frac{m_{t+1}}{p_t}\right) = \frac{c_t}{m_{t+1}/p_t}\varepsilon_t$$

- So, we can now set up the Lagrangian and solve it:

$$\sum_{t=0}^{\infty}\beta^t\left\{u(c_t,l_t)+\lambda_t\left(y_t-\tau_t+b_t+\frac{m_t}{p_t}-c_t-\frac{b_{t+1}}{R_t}-\frac{m_{t+1}}{p_t}\right)+\mu_t\left[1-l_t-H\left(c_t,\frac{m_{t+1}}{p_t}\right)\right]\right\}$$

Money, Deficits and Inflation in General Equilibrium

FOC with respect to $c_t, l_t, b_{t+1}, m_{t+1}$ yield:

$$R_t = \frac{1}{\beta}\frac{u_c(t) - u_l(t)H_c(t)}{u_c(t+1) - u_l(t+1)H_c(t+1)} \qquad \text{(I.26)}$$

$$\frac{R_t - R_{mt}}{R_t}\lambda_t = -\mu_t H_{m/p}(t) \qquad \text{(I.27)}$$

$$\frac{R_t - R_{mt}}{R_t}\left[\frac{u_c(t)}{u_l(t)} - H_c(t)\right] + H_{m/p}(t) = 0 \qquad \text{(1.28)}$$

(Homework: Provide the intuition for all these expressions)

Money, Deficits and Inflation in General Equilibrium

Applying the implicit function theorem to the above yields:

$$\frac{m_{t+1}}{p_t} = F(c_t, R_{m_t} / R_t)$$

Recalling that $R_{m_t} = \frac{p_{t-1}}{p_t}$ and $R_t = \frac{(1+i_t)}{p_t / p_{t-1}}$, it thus follows that:

$$\frac{m_{t+1}}{p_t} = F(c_t, R_{m_t} / R_t) = F(c_t, i_t) \qquad \text{(I.29)}$$

where $F_c > 0, F_i < 0$.

Thus this micro founded model delivers the familiar money demand (“LM” curve) function.

Money, Deficits and Inflation in General Equilibrium

As we did in the discussion of the Ricardian equivalence in our first lecture, now introduce the government. Recall the budget constraint in (I.25):

$$G_t^P{}_t = T_t + R_{t+1}{}^{-1} B_{t+1} - B_t + (M_{t+1} - M_t) / p_t$$

Where M is money supply. Equating M to money demand m in (I.26) and assuming exogenous sequences for government spending and taxation, and initial asset holdings, we can solve the model.

Money, Deficits and Inflation in General Equilibrium

Let's characterize the stationary equilibrium of this economy.

- Let $\{G_t = g_t^P, T_t = \tau_t, B\}$ be set by the government, $\{B_0, M_0\}$ inherited from the past (all small caps denote equilibria).

- Let the resource constraint be $c_t + g_t = y_t$; and let Rß=1.

- The equilibrium is given by a price system so that for $\{c_t, M_t, B_t\}_{t=1}^{\infty}$, the household optimal problem and the government budget constraint are satisfied.
- Equilibrium Rm (1-inflation rate) and po are then pinned-down.

Money, Deficits and Inflation in General Equilibrium

- We seek an equilibrium for which $X_t = X$, where X is any of exogenous or endogenous variables in equilibrium.

- As shown in L-S (eq. 24.2.22), this equilibrium delivers the following expression linking the fiscal position and the rate of inflation, p_{t+1}/p_t in stationary equilibrium:

$$\underbrace{g_t^P - \tau_t + B_t \frac{(R-1)}{R}}_{\text{Overall Government Deficit}} = \underbrace{f(R_m)(1-R_m)}_{\text{Seignorage financing}} \qquad \text{(I.30)}$$

Money, Deficits and Inflation in General Equilibrium

- Note that $f(R_m) = \dfrac{m_{t+1}}{p_t}$ and that $1 - R_m = \dfrac{p_{t+1} - p_t}{p_{t+1}}$.
- We can thus decompose total seignorage financing as the product of the inflation tax base component and the inflation rate component.
- Important: note from above that the inflation tax base is dependent on the inflation rate: rising inflation lowers money demand m_{t+1}!
- Hence, there is potential for multiple equilibria!

Money, Deficits and Inflation in General Equilibrium

Illustration of the relationship between deficit and inflation, the **seignorage Laffer curve** (L-S, 24.2.7):

i) Put functional forms in u and H to compute $f(Rm)=F(c,Rm/R)$

ii) Set β to pin-down $R=1/\beta$.

iii) Set c to pin down $l=1-c$.

iv) Set coefficient of risk aversion σ and the (inverse of) the leisure elasticity coefficient (α).

v) Then plot Rm=1-(gross)inflation rate against the deficit.

Homework: do it for various σ. Then, fix $\sigma=2$ and change $\beta=0.9$

Money, Deficits and Inflation in General Equilibrium

Using this model's stationary equilibrium solution we can now

- Effects of an increase in Mo

To see this, consider the solution at t=0:

$$\frac{M_0}{p_0} = f(R_m) - (g^P - \tau_0 + B_0) + B/R$$

where $f(R_m) = m_{t+1} / p_t$

Money, Deficits and Inflation in General Equilibrium

Using this model's stationary equilibrium solution we can now study the effect of various policy experiments

- Effects of an increase in Mo, all else constant

To see this, consider the solution at t=0:

$$\frac{M_0}{p_0} = f(R_m) - (g_t^P - \tau_t + B_0 \frac{(R-1)}{R}) \qquad \text{(I.31)}$$

where $f(R_m) = m_{t+1} / p_t$

Money, Deficits and Inflation in General Equilibrium

Since $\left(g_t^P - \tau_t + B_0 \frac{(R-1)}{R}\right)$ will not change, from (I.30) it must also be that R_m will not change.

Hence, Mo/Po will not change → ΔMo=ΔPo.

So, there is concomitant jump in the price level as M increases

Money, Deficits and Inflation in General Equilibrium

Using this model's stationary equilibrium solution we can now study the effect of various policy experiments

- Effects of a persistent fiscal deficit

From (I.30) and the seignorage Laffer curve, it is clear that a permanent increase in the fiscal deficit will increase (1-Rm), i.e. the steady-state inflation rate, ***if one is on the right side of the Laffer curve***.

However, there may be an equilibrium that the tax base increases, so the bigger deficit is financed with higher M/P.

Money, Deficits and Inflation in General Equilibrium

- Fiscal Requirement for Price Stability

Setting $1\text{-}R_m=0$ in (I.30), clearly requires the overall **(not the primary!**) fiscal deficit to be zero.

With R given, this of course has implications for the required primary deficit too:

$$g_t^P - \tau_t + B_t \frac{(R-1)}{R} = 0$$

$$.:(\tau - g) = \frac{R-1}{R} B = \frac{r}{(1+r)} B$$

Money, Deficits and Inflation in General Equilibrium

- Limits to what Monetary Policy Can Do ("Unpleasant Monetarist Arithmetics")

Suppose that $g_t^P - \tau_t$ rises. Then from (I.30) permanent inflation 1-Rm will rise.

The central bank then tries to mitigate the impact on Po, engaging into open market operations: buy high-powered money (reducing M in t=1) and selling bonds (increasing B).

$$\frac{M_0}{p_0} = \frac{M_1}{p_0} - (g^P - \tau_0 + B_0) + B / R$$

Effect is ambiguous: at best lower po but higher B (due to interest payments on debt) increases 1-Rm

Money, Deficits and Inflation in General Equilibrium

- Optimum Quantity of Money ("Friedman rule")

The idea is that reducing shopping time increases welfare. Hence monetary policy should satiate households with money.

Since $R_m \in (1, \beta^{-1})$, the Friedman rule implies that the opportunity cost of holding money should be as low as possible.

Here it is therefore bound by the return on (safe) bonds. So,

$$R_m \equiv R.$$

Money, Deficits and Inflation in General Equilibrium

To see what implications this has for nominal interest setting (e.g. the instrument controlled by central banks), recall:

$$R_{m_t} = p_t / p_{t+1}$$

$$R_t = 1 + r_t \equiv 1 + i_t - E_t(1 - R_{m_t}) = i_t + R_{m_t} \qquad \text{(I.32)}$$

with $R_{m_t} \equiv R_t$, this implies that $i_t \equiv 0$.

This is the well-known “Friedman rule”.

- The Fiscal Theory of the Price Level

Recall that in solving the model B (the real value of public debt) is determined by the government and, given g, τ, R, B_o and M_o, inflation (1-Rm) and Po are then determined.

Under the FTPL, B is **endogenous**: while the government can decide on nominal debt, the price ***level*** will adjust to as to make B consistent with the inter-temporal budget constraint.

Again, we can use eqs. (I.30) & (I.31) to see how it works.

Money, Deficits and Inflation in General Equilibrium

- Re-arrange (I.30) to write:

$$\frac{B}{R} = \frac{1}{R-1}[\tau - g^P + f(R_m)(1 - R_m)]$$

$$B = \frac{R}{R-1}[\tau - g^P] + \frac{R}{R-1} f(R_m)(1 - R_m)$$

$$\boxed{B = \sum_{t=0}^{\infty} R^{-t}[\tau_t - g_t^P] + \frac{R}{R-1} f(R_m)(1 - R_m)}$$

- So, given $\{g_t, \tau_t\}_{t=0}^{\infty}, R, R_m$, one can pin down real public debt, B.

Money, Deficits and Inflation in General Equilibrium

- So, the extra requirement here is that policy can determine seignorage ($1-R_m$) or, equivalently, given (I.32), to peg the nominal interest rate i_t.

- Once this is done and, with B_0 and M_0 given, the price level is pinned down by computing p_0 from re-arranging (I.31):

$$\frac{M_0}{p_0} + B_0 = \sum_{t=0}^{\infty} R^{-t}(\tau_t - g_t) + \sum_{t=0}^{\infty} R^{-t} f(R_m)(1 - R_m)$$

Money, Deficits and Inflation in General Equilibrium

- Note also that the path of money supply also gets determined using:

$$\frac{M_1}{p_0} = f(R_m)$$

- Given Mo, then, Mo, M1, … is now determined. So, once the price level is pinned down by the fiscal theory of the price level, the path of money supply is now also endogenously determined.

- A corollary is that one does not need money for the price level to be determined.

Money, Deficits and Inflation in General Equilibrium

- So, we currently have two different fiscal theories of inflation!

- The earlier Sargent and Wallace one shows that the ***inflation rate*** adjusts to the overall fiscal deficit ($g-\tau+rB$) in stationary equilibrium. So, fiscal policy is dominant.

- The price level (p_0, p_1,..) is pinned down by money supply: as we saw, this is the so-called "Ricardian regime".

- Monetary policy can only influence the *timing* of inflation (now vs. future), but not long-run inflation.

- So, no "true" inflation targeting under fiscal dominance.

Money, Deficits and Inflation in General Equilibrium

- New Fiscal Theory of the Price *Level* (Cochrane, Sims, Woodford), the steady-state inflation rate is chosen by policy (e.g. by nominal interest rate pegging); for a given nominal debt, inflation will then increase or reduce real debt.

- Then with inflation and real debt determined, p_0 is pinned-down.

- Under FTPL, the inter-temporal budget constraint holds only at the *equilibrium* value of the price level.

- Under traditional Sargent-Wallace theory, it holds for all P_t.

Money, Deficits and Inflation in General Equilibrium

- Since we only observe equilibrium outcomes, it is virtually impossible to distinguish empirically the two theories.

- One advantage of the new fiscal theory of the price level is to rule out multiple equilibria in the traditional theory arising from the the right hand side of (I.30): f(Rm)(1-Rm).

- The extra restriction that seignorage (or its inverse 1-Rm) is set by policy (i.e. nominal interest peg) takes care of multiplicity: Po, P1, etc. can be uniquely obtained.

Cagan's Inflation Model

- Milton Friedman: "Inflation is always and everywhere a monetary phenomenon"

- Historically, high and hyper-inflations have always been associated with rapid growth of base money.

- Cagan (1956) is a classic study of 8 hyperinflations (defined as $\pi > 50\%$ per month) that took place between 1920 and 1946.

- Those hyperinflations were associated with major macro disruptions such as the financing of war expenses.

Cagan's Inflation Model

- As most things in economics, there is considerable controversy on what was the cause/ultimate driving force of those inflationary outbursts.
- Some say seignorage financing (e.g. due to war-related fiscal burdens and disruptions in national tax collection systems).
- Others emphasized the exchange rate (reportedly the view of much contemporary commentators on the German hyper inflation of 1922-23).
- Either way, inflation was highly correlated with money growth.

Cagan's Inflation Model

From Franco, 2013

Casos clássicos (critério 50% ao mês)

Países	Período		Duração (meses)	Taxa de Inflação		
	Início	Fim		Acumulada	Média	Pior Mês
Áustria	Out-21	Ago-22	11	6.878	47	134
Alemanha	Ago-22	Nov-23	16	10.115.776.266	322	32.400
Hungria	Mar-23	Fev-24	10	4.301	46	98
Polônia	Jan-23	Jan-24	11	69.886	81	275
União Soviética	Dez-21	Jan-24	26	12.399.023	57	213
China	Set-45	Mai-49	44	10.434.703.221.306	78	2.565
Grécia	Nov-43	Nov-44	11	2.197.771.119	365	8.500.000
Hungria	Ago-45	Jul-46	12	$3{,}8 \times 10^{27}$	19.800	$4{,}2 \times 10^{15}$

Cagan's Inflation Model

From Franco, 2013

Novas ocorrências – América Latina

Países	Período Início	Período Fim	Duração (meses)	Taxa de Inflação Acumulada	Taxa de Inflação Média	Taxa de Inflação Pior Mês
Argentina	Mai-89	Mar-90	11	15.167	62	197
Bolívia	Abr-84	Set-85	18	97.282	52	183
Brasil[1]	**Dez-89**	**Mar-90**	**4**	**693**	**70**	**81**
Nicarágua	Jun-86	Mar-91	58	11.895.866.143	31	261
Peru	Jan-89	Set-90	21	573.377	51	412
MEMO (critério Stanley Fischer)						
Brasil	**Abr-80**	**Mai-95**	**182**	**20.759.903.275.651**	**16**	**81**
Argentina	**Jul-74**	**Out-91**	**208**	**3.809.187.961.396**	**12**	**197**

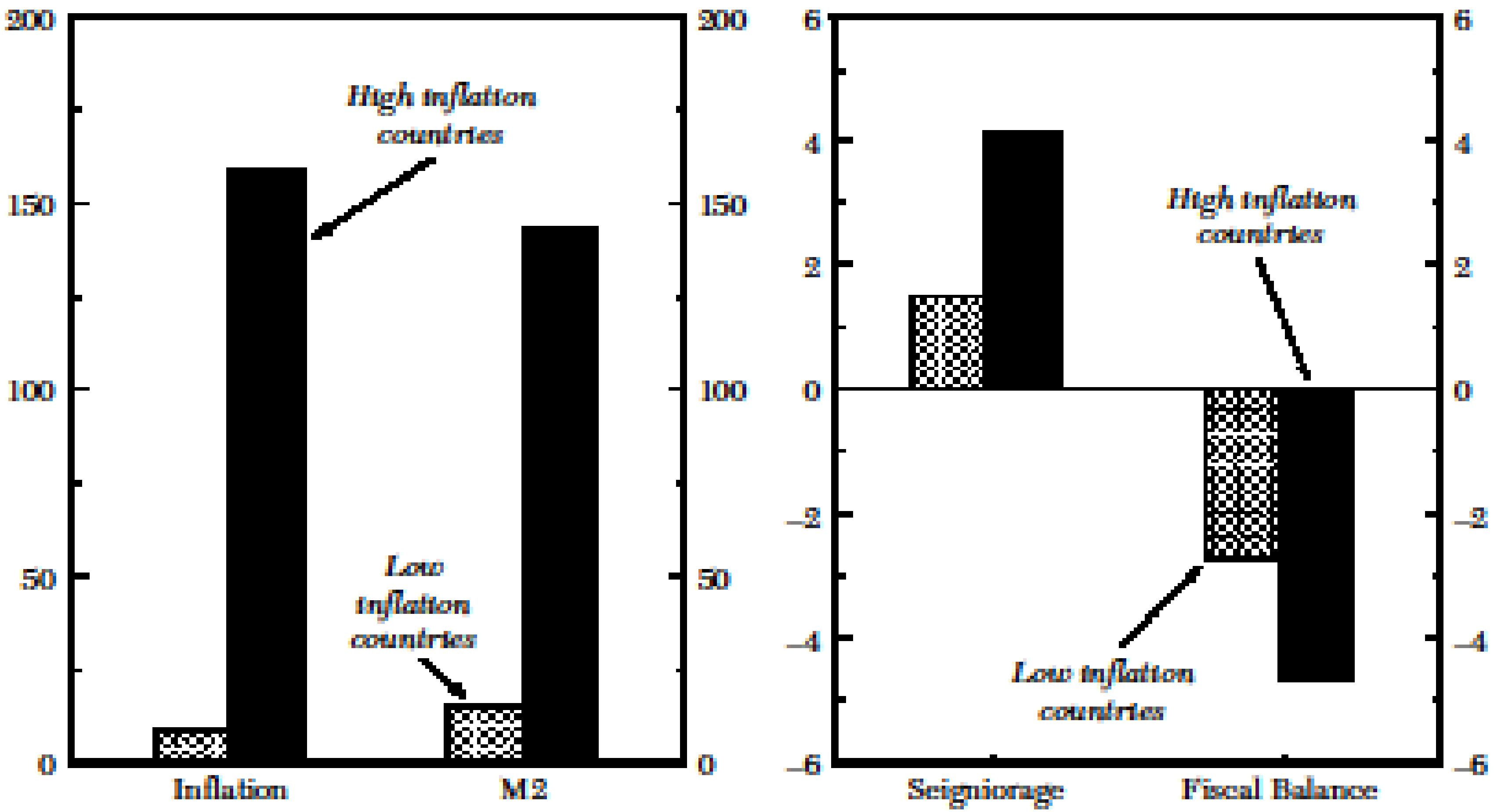
Stanley Fischer "Modern high and hyperinflations" JELit (3) 2002

Cagan’s Inflation Model

- Cagan’s main pioneering contribution was study the role of inflation expectations in the inflationary process.
- As we shall see, he modeled expectations in an adaptative way.
- And concluded that, indeed, money growth was the culprit.
- But again, in fundamental-based models of inflation, at the root of rapid money growth is the existence of non-trivial public deficits.

Cagan's Inflation Model

From Fischer, Sahay, and Végh, 2002



Cagan’s Inflation Model

Let’s now take a look at the Cagan model

[We shall follow closely Wash (2010, section 4.4]

Following Cagan, the setting is in continuous rather than discrete time:

$$g - \tau + rb = \Delta^f = \frac{\dot{H}}{H}\frac{H}{PY} = \theta h \qquad \text{(I.35)}$$

- rate of money growth
- Inflation tax base

Cagan's Inflation Model

Now recall the money demand function in (I.29):

$$\frac{m_{t+1}}{p_t} = F(c_t, R_{m_t} / R_t)$$

where c=y+g in a closed endownment economy (i.e. without output being determined by investment).

Cagan noted that the peculiar nature of high/hiper-inflations is that R and Δy are about stable viz prices. So, the above becomes:

$$\frac{m_{t+1}}{p_t} = F(R_{m_t})$$

Cagan's Inflation Model

Cagan's novelty: demand for base money (H) as a ratio to nominal GDP (=PY) becomes a function of *expected* inflation:

$$h = \exp(-\alpha\pi^{e}) \qquad \text{(I.35)}$$

(I.35) into (I.34):

$$\Delta^{f} = \theta \exp(-\alpha\pi^{e})$$

Cagan's Inflation Model

Stationary Equilibrium

$$dh = 0. : \pi = \theta - \mu \qquad \text{(I.37)}$$

real income growth

and

$$\pi^e = \pi \qquad \text{(I.38)}$$

Hence:

$$\Delta^f = \theta e^{-\alpha(\theta - \mu)} \qquad \text{(I.39)}$$

Cagan's Inflation Model

- Solving for ϴ gives the rate of money growth consistent with raising Δ_f of seignorage revenues.

- (I.39) gives the condition for max seignorage revenues:

$$\theta = \frac{1}{\alpha}$$

- For money growth rates above that, the inflation tax base contracts faster with money growth so overall seignorage falls.

Cagan's Inflation Model

Money Supply-Inflation Relationship in Cagan's Model

(taken from Wash, 2010)

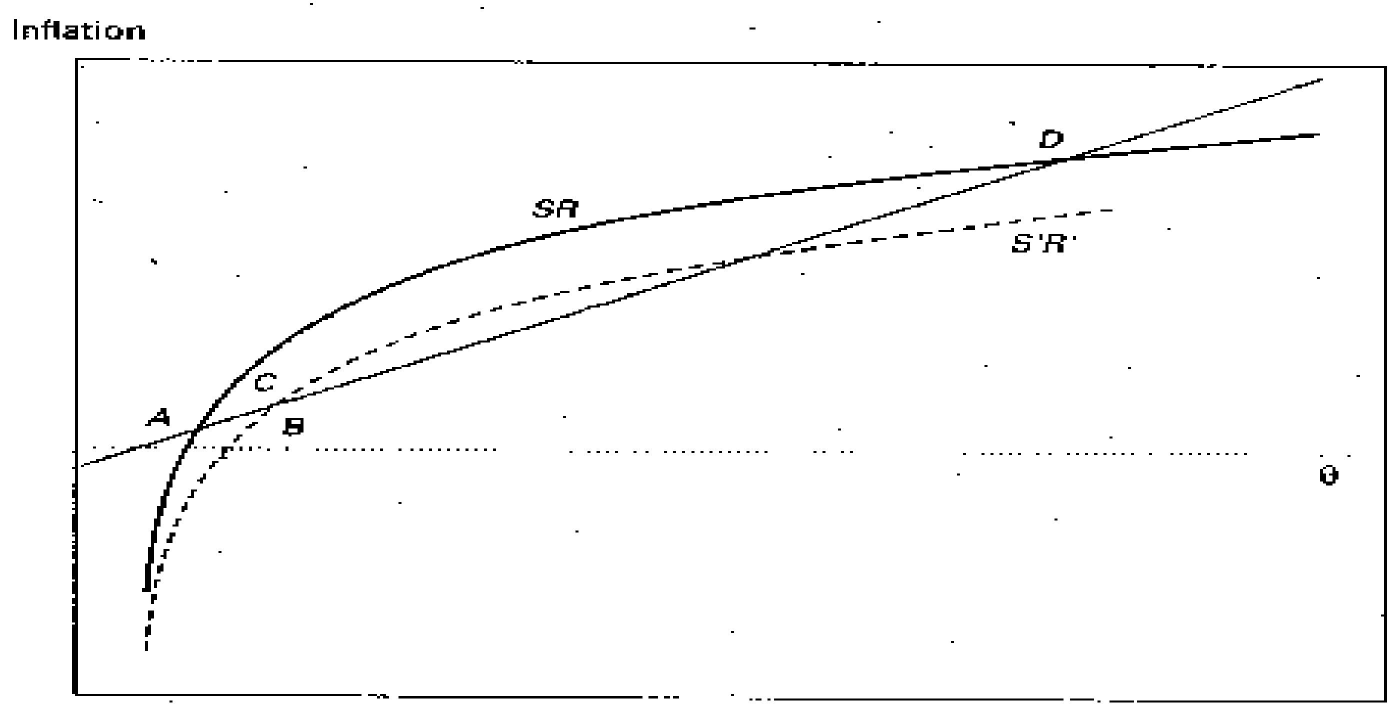


Figure 4.2
Money growth and seigniorage revenue.

Cagan's Inflation Model

- This figure says that with zero money growth, θ=0, there is no seignorage (cf. eq. I.39).

- In this case, inflation is actually negative if $\mu>0$ from I.37.

- Holding μ constant (justifiable in the short run under high inflations, as discussed), then the 45 degree line plots the one to one relationship between money growth and inflation.

- Points A and D are two possible solutions: both are steady state inflation rates consistent with a given deficit.

Cagan's Inflation Model

- Given Δ, whether the economy is in a high- vs. low inflation equilibrium will depend on form of expectations adjustment

- As mentioned, Cagan assumes *adaptative expectations*:

$$\frac{\partial \pi^e}{\partial t} = \dot{\pi}^e = \eta\underbrace{(\pi - \pi^e)}_{\text{Inflation forecast error}} \qquad \text{(I.40)}$$

- The equation that closes the model is obtained by differentiating (I.35):

$$h = \exp(-\alpha\pi^e) = -\alpha\pi^e \exp(-\alpha\pi^e)$$

$$\therefore \frac{\dot{h}}{h} = -\alpha\,\dot{\pi}^e = \theta - \mu - \pi \qquad \text{(I.41)}$$

Cagan's Inflation Model

(I.40) and (I.41) are a differential equation system in $\dot{h}/h$ and $\dot{\pi}^e$

First, use (I.41) to substitute out expected inflation in (I.40) and solve for actual inflation to obtain:

$$\pi = \theta - \mu + \alpha \dot{\pi}^e = \frac{\eta(\theta - \mu - \alpha\eta\pi^e)}{1 - \alpha\eta} \qquad \text{(I.42)}$$

This shows that equilibrium inflation will be a negative function of *expected* inflation for a given real money growth θ-μ.

Intuition: as π^e rises , the inflation tax base shrinks requiring lower π to re-establish the lower inflation equilibrium.

Cagan's Inflation Model

Then solve for changes in expected inflation:

$$\dot{\pi}^e = \frac{\eta(\theta - \mu - \pi^e)}{1 - \alpha\eta} = k\frac{-\eta\pi^e}{1 - \alpha\eta} \qquad \text{(I.43)}$$

This equation delivers the condition for a non-explosive, lower inflation equilibrium: if $\alpha\eta < 1$ the coefficient will be positive (assuming ϴ>μ) implying that *changes* in expected inflation will be dampened as expected inflation gets higher.

If $\alpha\eta > 1$, then the equilibrium is explosive.

Cagan’s Inflation Model

- This explosive equilibrium can occur if money demand is (negatively) too sensitive to expected inflation and/or expected inflation is too sensitive to the gap between actual and expected inflation.

- This is intuitive, if money demand is too elastic to expected inflation, then the inflation tax base is lower. So, for a given fiscal deficit, from equation I.35 one can see that faster money growth will be needed. So, inflation will rise, that will fuel higher inflation expectation, lowering the inflation tax based, thus calling for more inflation, etc.

- This vicious circle is often observed in hyper-inflations.

Cagan’s Inflation Model

- Note, however, that if you are not in this perverse equilibrium, then adaptative expectations allows some “free-riding” in deficit financing.

- This is because expected inflation lags behind actual inflation, so the demand for money will not be as low (i.e. the inflation tax base will be higher), allowing a given deficit to be financed with lower inflation.

- The downside is that reducing inflation takes longer: you can cut the deficit but agents’ expected inflation will converge only gradually to the new wanted inflation rate.

Cagan’s Inflation Model

Limitations and Extensions of the Cagan Model

- In practice, expectations are arguably far more forward-looking: the feedback between expected and actual inflation is closer to zero on average: little scope for fooling agents and systematic “free riding” in deficit financing via seignorage.

- Avoiding the explosive inflation equilibrium can be achieved by credible policies which dampen inflation expectations.

- Still there may be perverse feedbacks between fiscal deficits and money growth.

- E.g. the so-called Keynes-Tanzi effect: real revenue loss due to lags in tax collection (taxi becomes cheaper than bus).

Cagan's Inflation Model

- There is more to this money-fiscal feedback than the Keynes-Tanzi effect.

- For instance, *tax drag*: as inflation rises, if the tax system is not indexed, people move into higher tax brackets, thus raising revenues.

- G can also be corroded by inflation (e.g. delay in paying suppliers).

- So, overall the effect of inflation on public deficits is ambiguous (see C-T, 2005 for a fuller discussion)

Cagan's Inflation Model

Some bottom-line:

- The reverse effects of inflation on the general government balance seem weak.
- Hence it is reasonable to assume that – in economies where the central bank is not institutionally strong – the causality tends to run in the direction of fiscal deficits to inflation, rather than the other way around.
- In this case, money supply is still the fuel, but the ultimate driving force comes from fiscal imbalances.