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Monetary hyperinflations and money essentiality

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Abstract

This paper aims at drawing new guidelines for investigation of monetary hyperinflation analysis. We propose a MIUF optimizing model and show that monetary hyperinflation can occur as a perfect foresight competitive equilibrium path only when money is essential in the sense of Scheinkman (1980). This result emerges without any ad-hoc assumption implying the inclusion of friction in the adjustment of some nominal variable. It suggests that monetary hyperinflation analysis under perfect foresight requires abandoning the Cagan money demand and adopting a demand for money respecting money essentiality.

JEL classification: E31, E41

Keywords: monetary hyperinflation, seigniorage, inflation tax, money essentiality

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1. Introduction

This paper addresses the issue of the replacement of Cagan money demand for the analysis of monetary hyperinflation. Cagan money demand is the cornerstone of Cagan's (1956) model widely used in the literature to study hyperinflation both theoretically and empirically. It has been designed to explain monetary hyperinflation i.e. speeding up inflation driven by exploding nominal stock of money and government needs for seigniorage. Buiter (1987) seriously challenged the model by showing that under perfect foresight it was unable to produce monetary hyperinflations. Since Kiguel (1989) it is well known in the profession that Cagan model needs to combine rational expectations with a partial adjustment mechanism in the monetary market. However, this is very unsatisfactory because it is hard to justify the persistent presence of maladjustments costly for the agents in a hyperinflationary context.

We propose new guidelines for investigation of monetary hyperinflation² based on a perfect foresight optimizing model with money-in-the-utility-function (henceforth called MIUF model) drawing on Brock (1975) model. We show that modelling monetary hyperinflation with perfect foresight requires that money is essential to the system in the sense of Scheinkman (1980). Cagan model can be considered as a special case of the MIUF model but Cagan money demand doesn't satisfy the money essentiality requirement.

The paper is organized as follows: section 2 presents the MIUF model and shows that monetary dynamics depends on money essentiality; section 3 relates money essentiality to money demand inelasticity and shows that modelling monetary hyperinflation with perfect foresight requires money essentiality; section 4 summarizes the results.

2. Monetary dynamics and money essentiality

The optimizing monetary model considered in this paper assumes a continuous time model where the economy consists of a large number of identical infinitely-lived forward looking households endowed with perfect foresight. Population is constant and its size is normalized to unity for convenience. There is no uncertainty. Each household has a non-produced constant endowment $y > 0$ of the non-storable consumption good per unit of time.

In the money-in-the-utility-function model the role of money as a medium of exchange is assumed to be captured by introducing real money balances into the household utility function. The set up draws on Sidrauski (1967) and Brock (1975).

The representative household faces at time 0 the following optimization problem:

$$\max_{c,m} \int_0^{\infty} [u(c_t) + v(m_t)] e^{-\delta t} dt, \quad (1)$$

subject to

$$c_t + \dot{m}_t = y - \tau_t - \pi_t m_t. \quad (2)$$

² Our point should be distinguished from that of other works as Brock (1975), Obstfeld and Rogoff (1983), Vazquez (1998), Barbosa and da Cunha (2003), Gutierrez and Vazquez (2004) dealing with speculative hyperinflations. Speculative hyperinflation, in the terms of Obstfeld and Rogoff (1983), is a hyperinflation not driven by money growth, but a hyperinflationary price level bubble driven by self-fulfilling expectations.

The instantaneous utility function is additive and separable in c_t , the household's consumption at time t , and $m_t = \frac{M_t}{P_t}$ his holdings of real monetary balances, M is the nominal stock of money, P is the price level. The functions u and v are increasing in their arguments and strictly concave. δ is the rate of time preference, π_t the inflation rate, and τ_t is a lump-sum tax assumed to be constant.

The first-order condition yields the Euler equation:

$$u''(c_t)\dot{c}_t = -v'(m_t) + u'(c_t)(\pi_t + \delta), \quad (3)$$

The optimum solution must also obey the transversality condition:

$$\lim_{t \rightarrow \infty} [u'(c_t) e^{-\delta t} m_t] = 0. \quad (4)$$

The equilibrium condition in the goods market is

$$y = c_t + g, \quad (5)$$

where g is the constant government expenditure. Using (5) the first-order Euler condition can then be written as:

$$\frac{v'(m_t)}{u'(y - g)} = \pi_t + \delta. \quad (6)$$

Condition (6) requires that at each moment the nominal rate of interest i , defined as

$$i \equiv \delta + \pi, \quad (7)$$

be equal to the marginal rate of substitution of consumption for money. The latter Euler equation and the transversality condition (4) can be re-written, after normalizing the constant value of $u'(y - g)$ to unity for convenience, as:

$$v'(m_t) = \pi_t + \delta, \quad (8)$$

$$\lim_{t \rightarrow \infty} e^{-\delta t} m_t = 0. \quad (9)$$

The constant per capita government budget deficit d is financed by issuing high-powered money:

$$d = g - \tau = \frac{\dot{M}_t}{P_t} = \dot{m}_t + \pi_t m_t. \quad (10)$$

Substituting the value of π extracted from Euler equation in the latter expression leads to:

$$\dot{m} = d - (v'(m) - \delta)m. \quad (11)$$

The differential equation (11) provides a complete characterization of real per-capita money balances dynamics which will be studied by using the technique of phase diagram on $[0; +\infty[$. Calculating the limits of \dot{m} at the boundaries provide useful information on the dynamics:

$$\left. \begin{array}{l} \lim_{m \rightarrow +\infty} \dot{m} = +\infty \\ \lim_{m \rightarrow 0_+} \dot{m} = d - \lim_{m \rightarrow 0_+} mv'(m) \end{array} \right\} \quad (12)$$

From (12) we see that monetary dynamics analysis requires the distinction of two cases depending on whether $\lim_{m \rightarrow 0_+} mv'(m)$ is zero or strictly positive. The latter distinction is basically a discussion about money essentiality. Scheinkman (1980) related the condition $\lim_{m \rightarrow 0_+} mv'(m) > 0$ to the essentiality of money i.e. the fact that “money is very necessary to the system”. The definition of money essentiality relates to the evolution of inflation tax collected by government when the rate of inflation explodes. Money is considered as essential if the inflation tax collected by the government does not tend to zero when the rate of inflation explodes. From (10) we see that seigniorage obtained by printing money can be decomposed into two components, the change in the real stock of money and the inflation tax πm which can be written, according to Euler equation (8):

$$\pi m = (v'(m) - \delta)m = mv'(m) - \delta m. \quad (13)$$

Then, when the rate of inflation explodes we have

$$\lim_{m \rightarrow 0_+} \pi m = \lim_{m \rightarrow 0_+} mv'(m). \quad (14)$$

We can conclude that when $\lim_{m \rightarrow 0_+} mv'(m) > 0$ then $\lim_{m \rightarrow 0_+} \pi m > 0$ and money is essential.

3. Money essentiality, money demand inelasticity and monetary hyperinflation

Money essentiality is closely related to the inelasticity of the demand for money with respect to the cost of holding money. Euler equation (8) combined with nominal interest rate definition (7) implicitly define a demand for money as a function of the nominal interest rate i . The strict concavity of v ensures that m and i are related in a negative fashion.

The function $s(m)$ measuring the cost of money services can be defined according to

$$s(m) = mi = m(\delta + \pi) = mv'(m). \quad (15)$$

The first derivative of $s(m)$ is

$$s'(m) = i \left(1 + \frac{m}{i} \frac{\partial i}{\partial m} \right) = i \left(1 - \frac{1}{|\varepsilon|} \right). \quad (16)$$

where ε represents the elasticity of the money demand with respect to the nominal interest rate. If the money demand is interest-rate inelastic, $|\varepsilon| < 1$, then $s'(m) < 0$.

Since $s(m) \geq 0$ and $s'(m) < 0$ when the money demand is inelastic, it follows that $\lim_{m \rightarrow 0_+} s(m) = \lim_{m \rightarrow 0_+} mv'(m) > 0$. Thus, when money demand is interest rate-inelastic, money is essential.

Combining equations (11) and (15) the differential equation describing monetary dynamics becomes

$$\dot{m} = d + \delta m - mv'(m) = d + \delta m - s(m). \quad (17)$$

Proposition 1. *Monetary hyperinflations can be generated only if money is essential and if the maximum value of money services is higher than the real value of government deficit ($\lim_{m \rightarrow 0_+} mv'(m) = \lim_{m \rightarrow 0_+} s(m) > d$).*

Proof: A monetary hyperinflation path is represented in the phase diagram by a path converging to a zero value of real cash balances.

First step: money is essential

When $\lim_{m \rightarrow 0_+} mv'(m) > 0$, limits in (12) become:

$$\lim_{m \rightarrow 0_+} \dot{m} = d - \lim_{m \rightarrow 0_+} s(m) = d - \lim_{m \rightarrow 0_+} mv'(m) \begin{cases} > \\ = 0 \\ < \end{cases} \text{ if } \lim_{m \rightarrow 0_+} s(m) \begin{cases} < \\ = d \\ > \end{cases}. \quad (18)$$

$$\lim_{m \rightarrow +\infty} \dot{m} = +\infty$$

Moreover, the variations of the phase curve are:

$$\frac{\partial \dot{m}}{\partial m} = \delta - s'(m) > 0. \quad (19)$$

Therefore, the phase curve representing the dynamics of (17) in the phase diagram is strictly increasing starting from $\lim_{m \rightarrow 0_+} \dot{m}$ and going to $\lim_{m \rightarrow +\infty} \dot{m} = +\infty$.

Figure 1 represents the phase diagram³ corresponding to the case⁴ when $\lim_{m \rightarrow 0_+} s(m) > d$ implying that $\lim_{m \rightarrow 0_+} \dot{m} < 0$. As $s'(m) < 0$, $\lim_{m \rightarrow 0_+} s(m) > d$ states that the maximum value of money services (given by $\lim_{m \rightarrow 0_+} s(m)$) is higher than the real fiscal deficit. Since $\lim_{m \rightarrow +\infty} \dot{m} = +\infty$, the curve \dot{m} is increasing and crossing the horizontal axis only once at the unique steady state m^* . All paths originating at the right of m^* are hyperdeflationary paths that can be ruled out because violating the transversality condition (9). All paths starting to the left of m^* are hyperinflationary paths since the

³ The precise shape of the phase diagram depends on the second derivative of \dot{m} with respect to m . Then, other shapes than that depicted could be possible. However, as we are interested in the qualitative properties of (17) the important point is that the phase curve is a strictly increasing one on $]0; \infty[$.

⁴ The two alternative cases, $\lim_{m \rightarrow 0_+} s(m) < d$ and $\lim_{m \rightarrow 0_+} s(m) = d$, lead to phase curves entirely above the horizontal axis and imply hyperdeflationary paths that can be ruled out because they violate transversality condition (9).

level of per-capita money balances decreases continuously as time goes by, and then, according to (8), the inflation rate explodes. Moreover, these hyperinflationary paths are monetary hyperinflations because along these paths the rate of growth of the money supply explodes. Rewriting government budget constraint (10) as:

$$\frac{\dot{M}}{M} = \frac{d}{m}, \quad (20)$$

we see that along these paths of continuously declining m , given that $d > 0$, the growth rate of money supply increases continuously.

Second step: money is not essential

When $\lim_{m \rightarrow 0_+} mv'(m) = 0$, limits in (12) become:

$$\left. \begin{aligned} \lim_{m \rightarrow 0_+} [\dot{m}] &= d - \lim_{m \rightarrow 0_+} mv'(m) = d > 0 \\ \lim_{m \rightarrow \infty} [\dot{m}] &= +\infty \end{aligned} \right\}. \quad (21)$$

According to these limits, whatever the variations of \dot{m} in $]0; \infty[$, it is obvious that no monetary hyperinflation can be generated since there is no path converging to a zero value of real cash balances. This completes the proof. ■

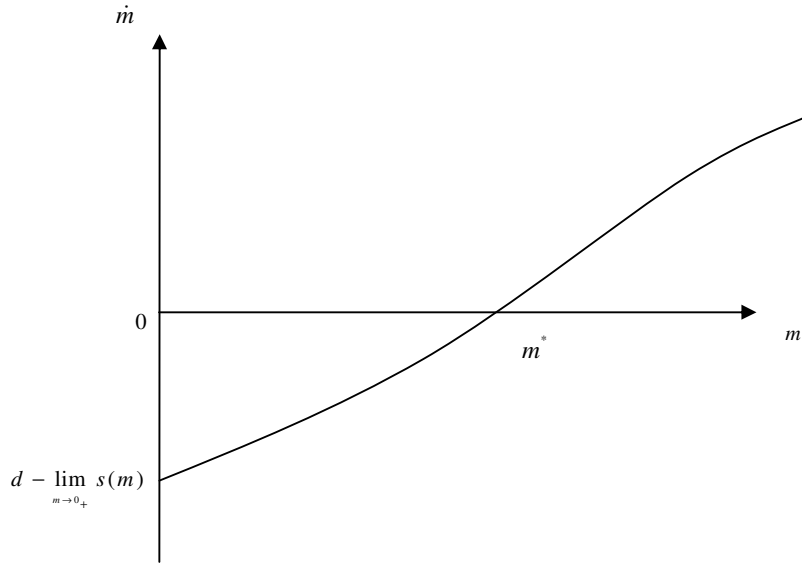


Figure 1: Monetary dynamics when $\lim_{m \rightarrow 0} mv'(m) = \lim_{m \rightarrow 0} s(m) > d$

In the context of speculative hyperinflations issue, Obstfeld and Rogoff (1983) ruled out hyperinflationary paths similar graphically to those originating at the left of the steady state on Figure 1 on grounds that such paths would not be feasible because the real stock of money would eventually become negative. Barbosa and Cunha (2003) contested that approach by arguing that on such hyperinflationary paths when the real quantity of money reaches zero hyperinflation would have wiped out the value of money, the opportunity cost of holding money would have become infinite, and the economy would no longer be a monetary economy. We follow the point made by Barbosa and Cunha (2003) and consider the monetary hyperinflation paths of Proposition 1 as perfect foresight competitive equilibrium paths.

Proposition 2: *Cagan money demand does not comply with money essentiality.*

Proof: The Cagan ad-hoc model relying on the Cagan money demand can be considered as a special case of the MIUF model developed here. Similarly as Kingston (1982), one can easily verify that using a utility function for money services $v(m)$ defined as,

$$v(m) = \alpha^{-1} (1 + \gamma + \alpha\delta - \log m) m \quad \text{for all } 0 < m < e^{\gamma + \alpha\delta}, \quad (22)$$

in the Euler equation (8) will found the famous semi-logarithmic Cagan money demand ($\log m = \gamma - \alpha\pi$ where γ is a constant and α a positive constant) and the current MIUF model will resume in the inflationary finance Cagan model. However, such a utility function for money services doesn't comply with money essentiality requirement since for utility function given by (22)

$\lim_{m \rightarrow 0_+} mv'(m) = 0$. Then it won't allow the modelling of monetary hyperinflation as stated in Proposition 1. ■

Modelling monetary hyperinflation under perfect foresight requires assuming money essentiality. This implies abandoning the Cagan money demand for the analysis of monetary hyperinflation in a perfect foresight environment.

4. Conclusion

We consider a MIUF model where money growth relies on the government need for seigniorage revenues. Monetary dynamics depend on money essentiality in the sense of Scheinkman (1980). Money essentiality is closely associated to the inelasticity of money demand with respect to the cost of holding cash balances. The model allows the development of monetary hyperinflations paths only when money is essential and the maximum value of money services is higher than the fiscal deficit. This suggests that modelling monetary hyperinflation under perfect foresight may require firstly money essentiality. This result may give an alternative to the standard Cagan's model failing with perfect foresight. It emerges without any ad-hoc assumption implying the inclusion of some friction in the adjustment of some nominal variable.

Cagan ad-hoc model can be considered as a special case of our model. However, Cagan money demand doesn't comply with money essentiality requirement. This issue has a strong empirical content. As most of the hyperinflation empirical investigations rely on the Cagan model with rational expectations, it could cast doubt on these empirical studies. The results obtained in this paper suggest that monetary hyperinflation analysis with perfect foresight would require abandoning Cagan money demand and adopting a demand for money respecting money essentiality.

References

- Barbosa, F.H. and A.B. Cunha (2003), "Inflation tax and money essentiality", *Economics Letters* 78, 187-195.
- Brock, W. (1975), "A Simple Perfect Foresight Monetary Model", *Journal of Monetary Economics* 1, 133-150.
- Buiter, W. (1987), "A Fiscal Theory of Hyperdeflations? Some Surprising Monetarist Arithmetic", *Oxford Economic Papers* 39, 111-118.
- Cagan, P. (1956), "The Monetary Dynamics of Hyperinflation", in: M. Friedman, ed., *Studies in the Quantity Theory of Money*, Chicago, 25-117.
- Gutierrez, M.J. and J. Vazquez (2004), "Explosive Hyperinflation, Inflation Tax Laffer Curve and Modelling the Use of Money", *Journal of Institutional and Theoretical Economics* 160, 311-338.

- Kiguel, M. (1989), “ Budgets Deficits, Stability and the Monetary Dynamics of Hyperinflation “, *Journal of Money, Credit and Banking* 21, 148-157.
- Kingston, G.H. (1982), “ The Semi-log Portfolio Balance Schedule is Tenuous “, *Journal of Monetary Economics* 9, 389-399.
- Obstfeld, M. and K. Rogoff (1983), “ Speculative Hyperinflations in Maximizing Models: Can We Rule Them Out “, *Journal of Political Economy* 91, 675-687.
- Scheinkman, J. (1980), “ Discussion “, in: Kareken J. and Wallace N., eds., *Models of Monetary Economies*, Minneapolis, Federal Reserve Bank of Minneapolis, 91-96.
- Sidrauski M. (1967), “Rational Choice and Patterns of Growth in a Monetary Economy”, *American Economic Review Papers and Proceedings*, 57, pp. 534-544.
- Vazquez, J. (1998), “ How High Can Inflation Get During Hyperinflation? A Transaction Cost Demand for Money Approach “, *European Journal of Political Economy* 14, 433-451.

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