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Stability and Instability in the "Alternative Monetary Model" (AMM)

John Smithin[1], **Eric Kam**[2]

[1]Aurora Philosophy Institute & York University, Toronto, Canada
[2]Department of Economics, Toronto Metropolitan University, Toronto, Canada
Email: jsmithin@yorku.ca

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Abstract

This note clarifies some of the stability issues that arise in the consideration of alternative interest rate rules for monetary policy. The main finding is that a nominal interest rate peg leads to instability in the inflation rate (which can go in either direction) and general economic instability, whereas a real interest rate rule is conducive to stability.

Keywords

Inflation instability, Nominal policy rate of interest, Real policy rate of interest, ZRPR, ZIRP

1. Introduction

John Smithin (e.g., Smithin, 2020, 2021, 2022, 2023), always a supporter of a real interest rule of some kind (Smithin, 1994), has recently argued that the "near-optimal" setting of the real policy rate of interest (in a closed economy, or in a regime which has either a flexible exchange rate or a "fixed-but-adjustable" exchange rate) is actually zero. As explained by Smithin (Smithin, 2020, 2021) this is known as a "zero real policy rate" or ZRPR. Moreover, that this is preferable to a policy of setting the nominal policy rate at zero, which is usually referred to as a zero interest rate policy or ZIRP[1].

There are two main reasons for preferring a ZRPR to a ZIRP. One of these is that a ZRPR promotes a putatively "fair" distribution of income[2] in a particular

[1]This is policy advocated by the school of "modern money theory" or MMT. See, for example, Kelton (Kelton, 2020) and Wray (Wray, 2012).

[2]The notion of fairness employed in Smithin (Smithin, 2023) has to do with the functional distribution of income between wages, profit, and interest. It is less generous to rentiers than the "fair" rate of interest attributed by Lavoie & Seccareccia (Lavoie & Seccareccia, 2016) and Rochon & Setterfield (Rochon & Setterfield, 2007) to Pasinetti (Pasinetti, 1981), but far more so than Keynes (Keynes, 1936, 376) who canvassed the "euthanasia of the rentier".

sense, whereas a ZIRP is incapable of achieving this result (Smithin, 2023). The second is that a nominal interest rate peg at any level, not just zero, leads to instability in the inflation rate (which can go in either direction) and general economic instability, whereas a ZRPR is conducive to stability. The purpose of this note is to elaborate the argument about stability in the context of a fully specified macroeconomic model, a closed economy version of Smithin's (Smithin, 2013, 2018, 2022) "alternative monetary model" (AMM). This will clarify some of the issues raised in the exchange between Smithin (Smithin, 2020, 2021, 2022), Watts (Watts, 2021), and Watts & Pantelopolous (Watts & Pantelopolous, 2022).

In what follows section 2 sets out the full AMM, and section 3 looks at the inflation equation within the model which is the key to its dynamic properties. Section 4 focuses on the dynamic system, and sections 5 and 6 consider the cases of a ZIPR and a ZRPR respectively. Section 7 offers some brief conclusions on the implications for policy.

2. The Alternative Monetary Model

The closed economy AMM may be written as:

$$y = e_0 + (g - t) + e_1 k, \quad 0 < e_1 < 1, \text{ economic growth} \tag{1}$$

$$k = a - r - w_{-1}, \text{ income distribution} \tag{2}$$

$$p = p_0 - \lambda\left(r_{+1}^O - r^O\right) + w_{-1} - a, \quad 0 < \lambda < 0.5, \text{ inflation} \tag{3}$$

$$w - t = h_0 + h_1 y, \quad 0 < h_1 < 1, \text{ after-tax real wage rate} \tag{4}$$

$$r = m_0 + m_1 r^O - (1 - m_1) p, \quad 0 < m_1 < 1, \text{ real interest rate} \tag{5}$$

The endogenous variables are y, the economic growth rate, p the inflation rate, k the natural logarithm of the "aggregate mark-up factor", w the natural logarithm of the average real wage rate, and r the real rate of interest. The latter is the inflation-adjusted or ex-post real rate of interest, the nominal interest rate less the currently observed inflation rate. The exogenous variables are g, government expenditure on goods and services as a percentage of GDP, t the average tax rate, and a the natural logarithm of average labour productivity. The model is completed by the given parameters, e_0, e_1, p_0, h_0, h_1, m_0, m_1 and λ. The term r^O is the real policy rate of interest set by the central bank. Whether this is, or is not, an exogenous variable will depend on which of the interest rate rules is being employed.

Details of how the equations are derived are to be found in earlier work by Smithin (e.g., Smithin, 2013, 2018, 2022). Equation (1) is the growth rate of effective demand, (2) is the functional distribution of income, (4) is the wage function, and (5) is the so-called "Mundell-Tobin Effect" (Kam, 2000, 2005) which implies a negative relationship between the inflation rate and the real rate of in-

[2]If m_0 is the mark-up between commercial bank lending and deposit rates, and m_1 is the pass-through coefficient in the monetary policy "transmissions mechanism" (both of which are empirically based), this relationship can be derived quite simply from the definition of the real rate of interest.

terest[3]. For the purposes of the present exercise we will need to explain the inflation equation (3) in more detail. This will be done in the next section.

3. Derivation of the Inflation Equation

The model of inflation expresses the endogenous supply of money as a multiple of the lagged nominal wage bill and the "voluntary" demand for money as a fraction of nominal GDP:

$$Ms = \phi W_{-1} N_{-1}, \quad \phi > 1, \tag{6}$$

$$Md = \psi PY, \quad 0 < \psi < 1. \tag{7}$$

The symbol M stands for the total of the broad money supply in the current period, consisting primarily of commercial bank deposits of one kind or another, and $W_{-1}N_{-1}$ is the aggregate nominal wage bill of the previous period. For the industrial system to be viable (able to generate positive monetary profits overall) the coefficient ϕ must be greater than one. It thus represents all other types of borrowing over and above that needed to finance the wage bill. There is a uniform one-period production lag in the model, whereby the expression $Y = AN_{-1}$ maps lagged labour input into the current level of GDP. The equilibrium condition for the money market is therefore that the voluntary demand for money in the current period (the willingness of agents to hold deposits created in the previous period) should be equal to the money supply currently in existence:

$$Md = Ms \tag{8}$$

The value of the aggregate price level, P, must therefore satisfy:

$$P = (\phi/\psi)(W_{-1}/A) \tag{9}$$

The expression for P thus includes the ratio of the two terms ϕ and ψ, from the supply-side and demand-side of the money market respectively. Dividing through by the lagged price level P_{-1} and taking natural logarithms, we see that the inflation rate itself (lower-case p) must satisfy:

$$p = \ln(\phi/\psi) + w_{-1} - a. \tag{10}$$

We next propose a specification for the behaviour of the ratio (ϕ/ψ) as follows:

$$\phi/\psi = P_0 e^{-\lambda\left(r_{+1}^{O} - r^{O}\right)}, \quad 0 < \lambda < 1. \tag{11}$$

This includes two versions of Keynes's theory of liquidity preference (LP) from the Treatise on Money (Keynes, 1930) and the General Theory (Keynes, 1936). Taking natural logarithms of (11) it is then possible to derive the expression for inflation in (3). The term p_0 in (3) is an inverse measure of Keynes's notions of "bearishness" and "bullishness" from the Treatise. An increase in p_0 therefore means a reduction in LP (an increase in "bullishness") and a reduction in p_0 means an increase in bearishness. The second term on the right-hand side (RHS) of (11) represents the so-called "speculative" demand for money from the General Theory. Note that with endogenous money there must also be a speculative supply of money arising from bank loans. What the speculators are speculating about is the future stance of monetary policy, i.e., the future value of the real policy rate of interest. The term λ thus has the connotation of the interest elasticity of money demand. When making economic decisions in the current period the various economic agents and the central bank itself are presumed to share short-term expectations of all the economic variables one period forward, based on information generally available[4].

4. The Dynamic System

As mentioned, the real interest rate concept employed here is the inflation-adjusted or ex-post real interest rate. Therefore, letting the symbol i stand for the nominal interest rate we have:

$$r = i - p \tag{12}$$

Setting all the exogenous variables to zero, the dynamic system may then be written as:

$$y = e_1 k \,,\quad 0 < e_1 < 1, \text{ effective demand} \tag{13}$$

$$k = -r - w_{-1}\,, \text{ income distribution} \tag{14}$$

$$p = -\lambda\left(r_{+1}^{O} - r^{O}\right) + w_{-1}\,,\quad 0 < \lambda < 0.5\,, \text{ inflation} \tag{15}$$

$$w = h_1 y\,,\quad 0 < h_1 < 1, \text{ real wages} \tag{16}$$

$$r = m_1 r^{O} - \left(1 - m_1\right) p\,,\quad 0 < m_1 < 1. \text{ real rate of interest} \tag{17}$$

In sections 5 and 6 below we go on to examine how the choice of interest policy will affect the stability of the system.

5. A Zero Interest Rate Policy (ZIRP)

A ZIRP would simply set the nominal policy rate of interest at zero:

$$i^{O} = 0\,, \tag{18}$$

The real policy rate of interest therefore reduces to:

$$r^{O} = -p\,. \tag{19}$$

The real policy rate thus changes whenever the inflation rate changes giving financial speculators much to speculate about. This is the main reason why a ZIRP (or a nominal interest rate peg at any level) tends to lead to inflation and general economic/financial instability.

Using (18) and (19) in the truncated system (13)-(17), we can then derive the following two difference equations in the economic growth rate and the inflation rate:

$$y = -e_1 h_1 y_{-1} + e_1 p\,, \tag{20}$$

$$p_{+1} = -\left(h_1/\lambda\right) y_{-1} + \left[\left(1+\lambda\right)/\lambda\right] p\,. \tag{21}$$

[4]The important distinction between long-term and short-term expectations is due to Keynes (Keynes, 1936) himself, from the *General Theory*.

A continuous-time approximation to the dynamic system may therefore be written as:

$$\begin{vmatrix} \mathrm{d}(\mathrm{d}y/\mathrm{d}t) \\ \mathrm{d}(\mathrm{d}p/\mathrm{d}t) \end{vmatrix} = \begin{vmatrix} -(1+e_1h_1) & e_1 \\ -(h_1/\lambda) & 1/\lambda \end{vmatrix} \begin{vmatrix} \mathrm{d}y \\ \mathrm{d}p \end{vmatrix} \tag{22}$$

If A is the RHS matrix of coefficients, the global stability of the system requires that the trace ($Tr\,A$) is negative and that the determinant ($Det\,A$) is positive. However, the opposite is true:

$$Tr\,A = -(1+e_1h_1) + (1/\lambda) \; (>0), \tag{23}$$

$$Det\,A = -(1/\lambda), \; (<0). \tag{24}$$

Global stability is ruled out. The negative determinant, moreover, indicates that the equilibrium is a saddle-point. From the mathematical point of view, this means that there is one, and only one, "stable arm" in the phase plane, Starting from most coordinates, however, system is unstable.

What are the implications of this finding? When this awkward situation shows up in the literature an argument is sometimes made that if an additional adjustment mechanism (or transversality condition) exists to reliably place the economy on the single stable arm, then the system eventually will reach equilibrium. Such arguments, however, are often dubious in practice, whatever purely mathematical device is employed[5]. In monetary models with a fixed money supply, for example, appeal is routinely made to a sort of "real balance effect"—with the price level acting as a "jump variable"—to shift the economy onto the stable arm (Smithin, 2013, 195-196). But this solution is definitely ruled out here because the money supply is endogenous. Indeed, it is precisely this circumstance that raises the issue of potential instability in the first place, requiring that we pay close attention to the difference between real and nominal interest rates. It rules out any dynamic equivalent of Pigou's (Pigou, 1943) "classical stationary state" (Smithin, 2013, 48-52).

6. A Real Interest Rate Rule (for the Central Bank Policy Rate Itself)

Even though endogenous money is the most fundamental premise of the AMM the potential stability problems can nonetheless usually be avoided with a *real* interest rate rule. That is, change in monetary policy. To show this, let the monetary authority commit to a straightforward version of a real rate rule, of the form:

$$i_0 = r_0 + p, \tag{22}$$

where r^O is the target real policy rate of the central bank. (A ZRPR would further

[5]There are exceptions. See, for example, Kam & Smithin (Kam & Smithin, 2004) and Smithin & Tytchino (Smithin & Tytchino, 2023) who work with open economy systems with flexible exchange rates and endogenous money in which there is a plausible economic adjustment mechanism—involving exchange rate expectations—to make sense of the mathematics. However, these example relate to real exchange rate stability not inflation stability.

specify that the real policy rate target should be set at zero, but here we continue to work with the general case). The effect on the inflation equation is simply to remove the specifically "speculative" element—speculation about monetary policy—although shifts in overall attitudes of bearishness or bullishness are still possible. The original inflation equation (3) reduces to:

$$p = p_0 + w_{-1} - a \,. \tag{23}$$

Using (22) and (23) via successive substitution into (13)-(17), the following difference equation in the rate of inflation emerges.

$$p = e_1\left[h_1\left(1-m_1\right)-1\right]p_{-1} - e_1 m_1 h_1 r^O \,. \tag{24}$$

The only exogenous variable left in the system (all others having been set to zero) is the real policy rate target itself. Equation (24) is "convergent with oscillations" as the coefficient $e_1\left[h_1\left(1-m_1\right)-1\right]$ is a negative fraction. The equilibrium rate of inflation in the truncated model is therefore:

$$p = -e_1 m_1 h_1 \Big/ \left\{1-e_1\left[h_1\left(1-m_1\right)-1\right]\right\} r^O \,. \tag{25}$$

Also, there is a parallel first-order difference equation in the real economic growth rate:

$$y = e_1\left[h_1\left(1-m_1\right)-1\right]y_{-1} - e_1 m_1 r^O \tag{26}$$

There is thus a close relationship between inflation instability and real economic instability, but a real interest rate rule ensures convergence in both. The equilibrium growth rate is:

$$y = -e_1 m_1 \Big/ \left\{1-e_1\left[h_1\left(1-m_1\right)-1\right]\right\} r^O \tag{27}$$

There will be three more, similarly convergent, first-order difference equations for the other endogenous variables, k, w, r. The upshot is that with a real interest rate rule, although cyclical behaviour in the economy will continue and there are various permutations of the co-movements of the other economic variables, the dynamic processes are ultimately convergent. There will still be business cycles and movements in the inflation rate. However, in the complete model, there will exist settings of the policy variables, government spending, taxation, etc., not only on the supply side but also on the demand side[6], which can mitigate the fluctuations, and also affect long-term economic prosperity (Smithin, 2022). As for monetary policy, the best advice is to pursue a "park-it" strategy (Rochon & Setterfield, 2007, 2012). Specifically, one that parks the real policy rate of interest at zero.

7. Conclusion

In the AMM, a monetary policy that pegs the nominal policy rate of interest leads to both instability in the inflation rate and general financial and economic instability. To avoid these problems there needs to be a real interest rate rule.

[6]As Keynesians and Post Keynesians have always claimed.

Smithin (e.g., Smithin, 2023) has argued that a zero real policy rate (a ZRPR) is a "near optimal" monetary policy.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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