

A Bubble with Low Inflation: A Model of the Japanese Economy in the Eighties

Kenshiro Ninomiya† and Amal Sanyal‡ *

†Faculty of Economics, Shiga University

‡Commerce Division, Lincoln University

March 2005

Abstract

We argue that financing method that sustained the Japanese bubble of the eighties was simultaneously responsible for a disinflationary tendency in the economy. In a theoretical model we show that procyclical financing of non-produced assets introduces a deflationary tendency to the rest of the economy. It is this contradictory nature of the system that puzzled both observers as well as the authorities in the eighties and early nineties.

JEL Classification: E10; E31; E52

Keywords: The Japanese Economy; Bubble Economy; Business Debt; Disinflation Bias; Monetary Policy

*Corresponding author; PO Box 84, Commerce Division, Lincoln University, Canterbury, NEW ZEALAND. E-mail address: sanyala@lincoln.ac.nz

1 Introduction

Low CPI inflation rate of Japan from 1976 to 1987 when the real economy was growing robustly was a source of surprise and often praised in the literature of the time. It appeared particularly impressive given that the Bank of Japan was not legally autonomous of the government ¹. Later when it became clear that Japan had been passing through a bubble since the early eighties, the surprise grew further. At the same time many wondered if the Bank had been really that wise. It was pointed out that the Bank might have inadvertently fostered the bubble by maintaining an easy money policy almost till the end of the bubble. When finally the official discount rate (ODI) was increased in May, 1989 and then in a quick sequence raised to a peak in August 1990, it was perhaps too late.

Subsequent literature has blamed the financing behaviour of Japanese business for much of the trouble. Our paper shares this point of view and takes a theoretical look. We argue that the financing method that sustained the bubble was at the same time responsible for a disinflationary tendency in the economy. It is this contradictory nature of the system that puzzled both observers as well as the authorities.

We begin by observing that the bubble was a speculative price increase confined to land and property, and was financed by borrowing without much regard for the cost of borrowing or other financial variables. These assets can therefore be thought of as a group separate from assets like plant, equipment and inventory, which are currently produced and whose purchase is influenced by financial variables. While the distinction is not one hundred per cent accurate empirically, it is sufficiently pronounced for us to think that spending on these two asset types can produce very different effects. In what follows, we assume that the assets that are the subject of the bubble, like land and estates, are not currently produced and no current value-added is embodied in them. They are financed by borrowing driven by expectation of capital gains and are not influenced by real interest rate. The other group of assets, like plant, equipment and inventory, embody current value-added. Purchase of them alone will be referred to as gross domestic capital formation or investment, and the decision to invest in them depends on standard variables including the real cost of borrowing. We further observe that during the bubble there was very little profit-taking, and when there was, the capital gains were mostly reinvested in these assets. We use this observation to characterise the

¹For example, Cargill, Hutchison, and Ito (1997) suggested that the Bank of Japan might have had *de facto* independence and had been used it astutely.

environment of our model. We assume that the effects of the bubble do not spill into the rest of the economy except through the increase in real interest rate from borrowings to finance these assets. Net new issue of bonds increases the interest rate and hence affects investment, consumption and the rest of the macroeconomy. There is a further effect of new bond issues arising from the behaviour of bond buyers. Where a majority of wealth-holders are risk-averse, the demand for money increases with bonds, as wealth-holders would like to maintain a desired inflation-adjusted bond-to-money ratio ². From most accounts, the issue of business debts during the bubble grew in expectation of capital gains. We use the current growth rate of the economy as a proxy for expected future price of the bubble assets, and postulate that the growth of new issues is procyclically related to the growth rate. We show that in standard models of growth these assumptions can produce outcomes similar to what Japan was experiencing during the eighties. The model also highlights the policy dilemmas involved.

The attempt in this paper is not to model an asset bubble, but to model a macroeconomic system where a bubble already exists and is fed through procyclical borrowing. We abstract from the cyclical aspects of debt growth ³ and focus on the long run effects. We also abstract from open economy features, which in our view, added additional complications in the case of Japan, but were not basic to either the disinflation problem or the bubble. The model suggests that this kind of business borrowing that feeds a bubble need not introduce any additional instability in the macroeconomic system. An economy which is stable in terms of the usual Cagan (1956) conditions, remains stable with procyclical financing of non-produced assets. However, this type of financing is likely to introduce a disinflation bias. Inflation rate in general, and the steady state rate in particular, are expected to be lower than what is warranted by the growth rate of money and the real economy.

These contradictory outcomes might explain both the surprisingly low inflation rate during the bubble and the indecision of the monetary authorities. If the authorities found the growing bubble of some concern, the traditional prescription would be a drastic cut in the growth rate of money supply. But that did not look a convincing option given the very low inflation rate. Our paper looks at the other

²The model developed below uses this 'conservative' scenario, but it is possible to conceive a scenario with risk-lover lenders. With a sufficiently large number of risk-lovers or with a high degree of concavity, it is possible that the effect of bonds on money demand is negative, implying reallocation of portfolios to bonds away from money. The resulting inflation-growth trajectory would then be very much different from what is reported in this paper.

³See for example Jarsulic (1990) and the references in that work.

standard options. As we have pointed out, the debt stock grows faster as the real economy grows faster, creating a larger demand for portfolio money. To arrest the disinflationary tendency, then, a money supply policy that allows faster growth of supply when the economy grows more rapidly, may be considered. The model shows that such a policy could be effective in controlling disinflation but it will worsen the bubble. Interestingly, a supply rule that follows growth countercyclically, may succeed. But then the authorities would have to choose an unlikely and unorthodox combination of a very high long run rate of growth of money with a severe anticyclical component. Prospects of an anticyclical inflation targeting are also not very promising. It can curb disinflation with a high long run growth rate of money and a high inflation target, but most likely it will worsen the bubble. In short, speculative borrowing created both the bubble and the disinflationary tendency creating a monetary policy problem whose solution is not well charted out⁴.

The rest of the paper is organised as follows. Section 2 sets up a short run model of the economy. In section 3, a reduced form equation for the short run equilibrium output is used to develop a long run model that transcends the short periods. Section 4 shows that procyclical growth of business debt necessarily generates a disinflation bias, and the bias is exacerbated if the growth rate of money supply exceeds or is close to the growth rate of business debt. Section 5 analyses the policy options in a situation where the bubble coexists with low inflation in the economy. Here we show that a money supply rule that follows growth procyclically can remove the disinflation bias, but would worsen the bubble. Secondly, a supply policy countercyclical to growth might succeed but it has to combine two contradictory aspects: high long run growth of money with a severely anticyclical component. Finally if inflation targeting with a high inflation target is used, we show that most likely the bubble will be worsened. Section 6 concludes the paper with a discussion of the intuition of the model.

2 The Short Run Model

The model has three markets: goods, money and bonds. Markets for goods and money are explicitly modelled while that of bonds is taken to clear when the other two markets are in equilibrium. A period begins with given stocks of bonds and money, B and M respectively, and a given inflation expectation π . The period

⁴For a close analysis of the policy difficulties of the Japanese monetary authorities during the period, see Ito and Mishkin (2004).

ends in an equilibrium that determines real output Y and nominal interest rate i . Net supply of new bonds during the period adds to existing stock and defines B for the next period. Inflation expectation is revised according to the equilibrium outcome of the period. A new period then begins with these values of B and π , and exogenously determined M .

As explained in the introduction, we assume that the assets whose prices are the subject of the bubble do not embody any current value-added. They are financed by borrowing, and the supply of new bonds is driven by expectation of capital gains. We use the growth rate of the economy as a proxy for asset price expectation. Writing respectively b and y for the natural logs of B and Y , the growth rate of stock of bonds is written as:

$$\dot{b} = \mu_0 + \mu(y - g); \quad \mu, \mu_0 > 0 \quad (1)$$

In equation (1) g denotes the natural rate of growth. We will also use $\bar{Y}(t)$ to denote the natural rate of output in period t , and \bar{y} for the natural log of \bar{Y} ⁵. Net supply of new bonds is met by an increase in stock held by lenders. The bond market clears by adjustment in the real interest rate; r . Lenders' portfolios contain both money and bonds, so that the demand for each is affected by the stock of the other. We can write lenders' optimal bond to money ratio as $R = R(\pi, r)$, $R_\pi > 0$, $R_r > 0$, and assume that the optimal ratio is attained, given π and r , in any general equilibrium. This would imply three behavioural properties of the model. First, given π and r , a larger equilibrium holding of bonds must accompany a larger equilibrium holding of money. Hence $L_B > 0$, where $L(\cdot)$ denotes the real demand for money. Second, given M and π , r has to increase if the stock of bonds increases, $r_B > 0$. Finally, the desired portfolio ratio may change across periods as r and π change, $\dot{R}/R = \phi(\dot{r}, \dot{\pi})$, $\phi_1 > 0$, $\phi_2 > 0$. If the economy attains a steady state with $\dot{\pi} = 0$, then $\dot{R}/R = \varphi(\dot{r})$, $\varphi' > 0$. Along any equilibrium path, the ratio \dot{R}/R is simply the difference between the rates of growth of bond stock and money supply, i.e. $\dot{b} - \dot{m}$. If the economy attains a steady state where $\dot{b} \neq \dot{m}$, then r will continue to change after the attainment of the steady state.

Using P for the price level and $C(\cdot)$ for the consumption function, the short

⁵The investment function and the new issue of bonds together imply that retained profits and the repayments of debt adjust residually. The fluctuation of retained profits and debt repayment can be analysed as a source of short term cycles. We ignore these cyclical effects as stated in the introduction.

run equilibrium is described by

$$Y = C(Y, r) + I(Y, r, B) \quad C_Y > 0, C_r < 0; I_Y > 0, I_r < 0, I_B < 0 \quad (2)$$

$$\frac{M}{P} = L(Y, i, B) \quad L_Y > 0, L_i < 0, L_B > 0 \quad (3)$$

The investment function incorporates bond stock as an argument, and we assume $I_B < 0$. By this assumption we recognise that B affects I not only via increase of r , but also independently of r . The reason is that a larger stock implies a larger repayment obligation (for any given r) and hence a strain on net cash flow and investment. However the qualitative results of the paper do not change if $I_B = 0$.

Equations (1) and (2) give

$$i = i\left(\frac{M}{P}, B, \pi\right) \quad (4)$$

and

$$Y = Y\left(\frac{M}{P}, B, \pi\right) \quad (5)$$

The short run system is assumed stable, so that $C_Y + I_Y < 1$, $\Delta \equiv L_i(C_Y + I_Y - 1) - (C_r + I_r)L_Y > 0$. Hence we have

$$Y_{(M/P)} = \frac{-(C_r + I_r)}{\Delta} > 0, \quad Y_\pi = \frac{(C_r + I_r)L_i}{\Delta} > 0$$

$$Y_B = \frac{-I_B L_i + (C_r + I_r)L_B}{\Delta} < 0$$

3 The Long Run System and Stability

For analysing the long run dynamics we will use a loglinear form of (5)

$$y = \alpha(m - p) + \beta b + \gamma \pi \quad (6)$$

where m and p respectively denote $\log M$ and $\log P$. The signs of coefficients in (6) are based on the partials of Y established above: $\alpha > 0$, $\beta < 0$, $\gamma > 0$.

Define

$$x = y - \bar{y} = \alpha(m - p) + \beta b + \gamma \pi - \bar{y} \quad (7)$$

Differentiating (7) gives

$$\dot{x} = \alpha \dot{m} - \alpha \dot{p} + \beta \dot{b} + \gamma \dot{\pi} - g \quad (8)$$

Substituting (1) in (8),

$$\begin{aligned} \dot{x}(1 - \beta\mu) &= \alpha \dot{m} - \alpha \dot{p} + \beta\mu_0 + \gamma \dot{\pi} - g, \quad \text{or} \\ \dot{x} &= \frac{1}{(1 - \beta\mu)}(\alpha \dot{m} - \alpha \dot{p} + \beta\mu_0 + \gamma \dot{\pi} - g) \end{aligned} \quad (9)$$

Since $\beta < 0$ and $\mu > 0$ we have $1/(1 - \beta\mu) < 1$. Equation (9) shows that the effects of increase in real money and inflation expectation on the growth of real output are reduced by a drag factor. If real money and inflation expectation increase, there is a resulting growth in real output. But a unit growth of output generates an increase in borrowing for the speculative assets by μ , which raises real interest rate and reduces output by $\beta\mu$.

We use a Phillips' curve relation to determine the inflation rate \dot{p}

$$\dot{p} = \varepsilon x + \pi, \quad \varepsilon > 0 \quad (10)$$

Expected inflation is assumed to follow the adjustment rule

$$\dot{\pi} = \theta(\dot{p} - \pi), \quad \theta > 0 \quad (11)$$

From (10) and (11) we get

$$\dot{\pi} = \theta \varepsilon x \quad (12)$$

Substituting (10) and (12) in (9) we have

$$\dot{x} = \frac{1}{(1 - \beta\mu)}[\alpha \dot{m} - \alpha(\varepsilon x + \pi) + \beta\mu_0 + \gamma\theta \varepsilon x - g] \quad (13)$$

Equations (12) and (13) define the long run dynamics of (π, x) .

The steady state of the model is characterised by $\dot{x} = \dot{\pi} = 0$, which implies $x = 0$, $\dot{y} = g$, and $\dot{b} = \mu_0$. Steady state value of π is

$$\pi^* = \dot{m} - \frac{g - \beta\mu_0}{\alpha} \quad (14)$$

Let the Jacobian for the system (12) and (13), arranged in that order be

$$J = \begin{vmatrix} f_{11} & f_{12} \\ f_{21} & f_{22} \end{vmatrix}$$

Then

$$f_{11} = \frac{1}{(1-\beta\mu)}(-\alpha\varepsilon + \gamma\theta\varepsilon); \quad f_{12} = \frac{-\alpha}{(1-\beta\mu)} < 0; \quad f_{21} = \theta\varepsilon > 0; \quad f_{22} = 0$$

The characteristic equation is

$$\lambda^2 + \frac{(\alpha\varepsilon - \gamma\theta\varepsilon)}{(1-\beta\mu)}\lambda + \frac{\alpha\theta\varepsilon}{(1-\beta\mu)} = 0$$

Since $\alpha\theta\varepsilon > 0$, both roots of the equation are negative if and only if $(\alpha\varepsilon - \gamma\theta\varepsilon) > 0$. We rewrite this condition as

$$\varepsilon(\gamma\theta - \alpha) < 0 \tag{15}$$

The stability condition (15) is the same as Cagan's condition for stability in standard models without explicit bond markets. In our model a unit output shock raises inflation by ε , inflation expectation by $\varepsilon\theta$ and then output by $\varepsilon\theta\gamma$. At the same time the inflation reduces real money supply by ε , and hence output by $\varepsilon\alpha$. Cagan's condition for stability requires the net result of these two opposing effects to be negative as in (15). Thus the type of bond financing envisaged in (1) does not make the stability condition any different than in standard models.

4 Disinflation Bias

(14) differs from the familiar expression for steady state inflation, $\dot{m} - g$. In standard models $\beta = 0$. Also r and i stabilise in the steady state, so that the steady state ratio $Y/(M/P)$ asymptotically converges to $\partial Y/\partial(M/P)$, giving $\alpha \equiv [\partial Y/\partial(M/P)] \cdot [(M/P)/Y] = 1$. Equation (14) would then reduce to the standard expression $\dot{m} - g$.

In our model $\beta < 0$; also r , and hence i , continue to change after the steady state is attained if $\dot{b} = \mu_0 \neq \dot{m}$. Therefore in general, $Y/(M/P) \neq \partial Y/\partial(M/P)$, and $\alpha \neq 1$. These two factors alter the steady state inflation from the standard expression $\dot{m} - g$.

Compared to $\dot{m} - g$, (14) is necessarily smaller if $\alpha < 1$ or even mildly larger than 1. Thus for the same profile of money supply and natural growth rate, our economy has a disinflation bias. The bias has two separate contributory factors. The part $\beta\mu_0/\alpha < 0$ arises from speculative borrowing for the assets of the bubble, and tends to reduce the inflation rate irrespective of monetary policy. The

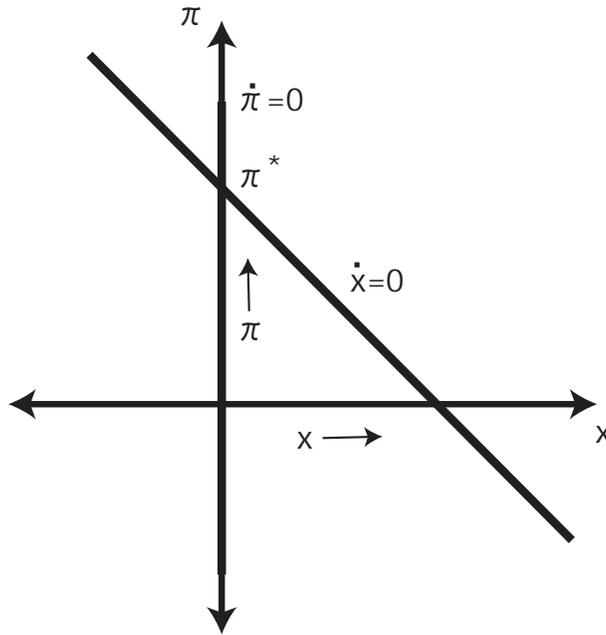


Figure 1:

second factor is related to monetary policy, and may contribute to a disinflationary tendency only if $\alpha < 1$. This is likely to happen if $\dot{m} > \mu_0$. In that event, the steady state is characterised by $\dot{R}/R = \dot{b} - \dot{m} = \mu_0 - \dot{m} < 0$, so that $\dot{r} < 0$. Given that $\dot{\pi} = 0$, it would imply $\dot{i} < 0$, so that $Y/(M/P) > \partial Y/\partial(M/P)$, and $\alpha < 1$ ⁶. Finally, in view of the above argument, α is expected to fall as \dot{m} increases. Hence in this economy one per cent increase in the growth rate of money is expected to produce less than one per cent increase in steady state inflation rate.

We should conclude this discussion with the summary observation that procyclical growth of business debt introduces a tendency for lower inflation rate, and if money supply growth exceeds or is close to the rate of growth of debts, the

⁶Note however that even if $\alpha > 1$ but small, a disinflationary bias would exist.

tendency is further aggravated.

The phase diagram for the system, assuming it is stable, is presented in figure 1. The steady state equilibrium is at $(0, \pi^*)$. Depending on \dot{m} , π^* could be positive or negative, while for any given natural growth rate and money supply rate, π^* is smaller than in a comparable model without business borrowing for non-produced assets. In the area below the line $\dot{x} = 0$, $\dot{b} > \mu_0$ and the bubble continues to grow.

5 Monetary Policy

In this section we assume that $\dot{x} > 0$, so that $\dot{b} > \mu_0$, and the economy is experiencing a bubble. We then analyse the effects of monetary policy options on the inflation rate and the growth of the bubble. We consider two standard policies.

5.1 Money Supply Related to Growth Rate

The stock of debts grows with the growth of the economy [equation (1)]. This increases the demand for portfolio money with growth. A possible option is to allow money supply to grow faster when the growth rate is higher. Consider such a procyclic money supply rule:

$$\dot{m} = m_0 + \rho(\dot{y} - g) = m_0 + \rho\dot{x}, \quad \rho > 0 \quad (16)$$

Substituting it in (13) we get

$$\dot{x} = \frac{1}{(1 - \beta\mu - \alpha\rho)} [\alpha m_0 - \alpha(\epsilon x + \pi) + \beta\mu_0 + \gamma\theta\epsilon x - g] \quad (17)$$

It can be easily checked that the stability condition for the system (17) and (12) is the same as (15). The steady state solution for inflation is $m_0 - (g - \beta\mu_0)/\alpha$. It implies that higher steady state inflation can be attained by committing to a higher long run rate of growth of money supply m_0 in rule (16).

What is the effect of the rule on the bubble? Since $\dot{x} > 0$ during the bubble and since $\rho > 0$, \dot{x} along the trajectory (17) is larger than along (13). In view of (1), this should have worsening effect on the bubble.

Interestingly, a supply rule that goes against the growth rate may work if it uses an unorthodox combination of a high long run rate of supply and a severely punishing anticyclical component. To see this, let $\rho < 0$ in (16). The steady state inflation rate is not altered, and is $m_0 - (g - \beta\mu_0)/\alpha$. By increasing m_0 , a desirably

high inflation rate can be supported in the steady state. Now for the effect on the bubble. Since $\rho < 0$, \dot{x} along the trajectory (17) is smaller than along (13). Note that in this course of policy, part of the countercyclical effect ρ on the bubble will be lost by less than unit income elasticity of demand for money, $\alpha < 1$. The policy has a higher chance of denting the bubble, the larger the absolute value of ρ .

The monetary policy rule would thus have to combine two contradictory aspects, high long run growth of money supply with a severe anticyclical component.

5.2 Countercyclical Inflation Targeting

Countercyclical money supply policy generally adds to stability, but as we have seen, stability is not wanting in this model. To tackle the disinflationary tendency, it is not anticyclical supply *per se*, but a higher inflation target is important. However, a target of higher inflation essentially would mean committing to a high long run growth rate of money supply. We illustrate this with a supply rule

$$\dot{m} = m_0 + \rho(\dot{p}_0 - \dot{p}), \quad \rho > 0 \quad (18)$$

To operate (18), the target inflation rate \dot{p}_0 has to coincide with the steady state solution of π , namely $m_0 - (g - \beta\mu_0)/\alpha$ or else the system will be over-determined. Suppose this specification is followed. Then (18) substituted in (13) gives

$$\dot{x} = \frac{1}{(1 - \beta\mu)} [(\alpha m_0 + \alpha\rho\dot{p}_0 + \beta\mu_0 - g) - \alpha(\rho + 1)\pi + \{\gamma\theta\varepsilon - \alpha\varepsilon(\rho + 1)\}x] \quad (19)$$

The system formed with (19) and (12) has a steady state solution $\dot{p}_0 = m_0 - (g - \beta\mu_0)/\alpha$ and $\dot{m} = m_0$. The stability condition is $\varepsilon[\gamma\theta - \alpha(\rho + 1)] < 0$, which necessarily holds if (15) is satisfied.

Now suppose that the supply rule is to be used to tackle the disinflationary tendency with a higher inflation target, say π' . In that case, $\pi' = \dot{p}_0$ and $m_0 = \pi' + (g - \beta\mu_0)/\alpha$.

Recall that the steady state inflation without the countercyclical policy is $\dot{m} = \pi^* + (g - \beta\mu_0)/\alpha$. Hence we have $m_0 - \dot{m} = \pi' - \pi^*$. The higher the inflation target the higher is the long run rate of money supply m_0 compared to the pre-policy rate \dot{m} .

What effect will this have on the bubble? It depends on the new target rate in relation to the prevailing inflation rate when the policy is adopted. Let \dot{x}_{19} and \dot{x}_{13}

denote \dot{x} on the trajectories (19) and (13) respectively. Then

$$\begin{aligned}\dot{x}_{19} - \dot{x}_{13} &= \frac{1}{(1 - \beta\mu)} [\alpha m_0 + \alpha \rho \pi' - \alpha \dot{m} - \alpha \rho \pi - \alpha \varepsilon \rho x] \\ &= \frac{\alpha}{(1 - \beta\mu)} [m_0 + \rho \pi' - \dot{m} - \rho(\pi + \varepsilon x)] = \frac{\alpha}{(1 - \beta\mu)} [m_0 + \rho \pi' - \dot{m} - \rho \dot{p}] \\ &= \frac{\alpha}{(1 - \beta\mu)} [m_0 - \dot{m} + \rho(\pi' - \dot{p})]\end{aligned}$$

We have noted that $m_0 > \dot{m}$. If the policy is introduced when the current inflation rate $\dot{p} < \pi'$, then $\dot{x}_{19} - \dot{x}_{13} > 0$ implying that \dot{x} and therefore \dot{b} will be higher than earlier. Thus as the disinflation is combated, the bubble problem worsens.

The bubble could ease in this course of policy only if the prevailing inflation at the time of initiating the policy is sufficiently higher than the targeted inflation to ensure $m_0 + \rho(\pi' - \dot{p}) < \dot{m}$. Given that $m_0 > \dot{m}$, it would require not only $\pi' < \dot{p}$ but also a large ρ . This possibility appears unlikely because the context would generally demand setting $\pi' > \dot{p}$.

Hence if a countercyclical money supply rule is effective in increasing the steady state inflation rate, it is more likely that it will worsen the bubble.

6 Conclusions

The model in this paper is based on a stylised view of the Japanese situation during the bubble period. The most important aspect is the fact that while the bubble grew relying on the robust growth of the economy, the sectors where the bubble was occurring did not generate significant income effect for the real economy. Firstly, the bubble assets did not embody much current value added. Secondly, the capital gains from the bubble were mostly spent on the same assets, thus preventing significant flow of income into the rest of the economy. The contribution of the bubble to the rest of the economy was the higher interest rate resulting from increased borrowing.

The intuition of the model is fairly simple. The bubble continues by creating debt. The growth of debt increases the real demand for money, because lenders would want to maintain a desired ratio between bond and money holding. By creating speculative debt, income growth adds to money demand not only from ordinary income elasticity but also from increasing portfolio demand. Therefore a given growth rate of real money supply will generate an inflation rate lower than itself. To maintain an acceptably high inflation rate, the long run growth rate

of money has to be large. Also it has to be large enough to compensate for extra demand arising from the fall in nominal interest rate, which lowers the debt-money ratio of lenders.

Since the demand for speculative assets grow cyclically, the real demand for money also grows cyclically. Hence a money supply rule that follows the growth rate can combat disinflation. But this would also ease the pressure on the interest rate, stimulate the growth rate of the real economy and thus worsen the bubble. If money supply is countercyclical to growth, it will discourage growth of the economy by firming up the interest rate, and thus have an effect on the bubble. But in this course, the baseline long run money supply has to be large to counter disinflation. The procedure will thus have to combine two usually opposed components of policy.

Targeting a high inflation rate with countercyclical money supply will, no doubt, achieve the target. But the effect on the bubble will depend on the effects of the policy on the growth rate of the economy whether it increases or reduces the interest rate. We have seen that it depends on the relation between the target rate and the prevailing inflation rate at the time of initiating the policy.

References

- [1] Cagan, P. (1956), The Monetary Dynamics of Hyperinflation, in M. Friedman, ed., *Studies in the Quantity Theory of Money*, Chicago, Chicago University Press.
- [2] Cargill, T., M. Hutchison, and T. Ito (1997), *The Political Economy of Japanese Monetary Policy*, Cambridge, MA: MIT Press.
- [3] Jarsulic, M. (1990), Debt and Macro Stability, *Eastern Economic Journal*, Vol. XV, No. 3, July- September.
- [4] Ito, T. and F. S. Mishkin (2004), Two Decades of Japanese Monetary Policy and the Disinflation Problem, Working Paper 10878, NBER Working Paper Series.