Debt Monetization and Financial Instability in an Oligopolistic Economy*

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1. Introduction

Despite its massive, accumulated debt, the Japanese government has been financing its expenditures by issuing additional government bonds, a situation compounded by declining tax revenues due to prolonged economic stagnation. Typically, debt monetization is avoided because it undermines fiscal discipline and risks triggering high inflation. However, the Bank of Japan has adopted a massive monetary easing policy and purchased a large portion of these bonds, which may be considered de facto debt monetization. Moreover, despite the government's substantial debt burden, all major political parties in Japan have included proposals such as cash handouts, reductions in the consumption tax rate, or even its complete abolition in their platforms for the 2025 Upper House election, framing these measures as a response to persistent inflationary pressure.

After the collapse of the bubble economy, the Japanese government implemented market-oriented structural reforms based on neo- and new classical economics, emphasizing market mechanisms. However, the Japanese economy had been unable to break out of prolonged economic stagnation and deflation. In recent years, although deflation has been overcome, real wages have declined, and the economy remains stagnant. Furthermore, neo- and new classical economics could not avoid the international financial crisis triggered by the sub-prime roan mortgage crisis in the United States (US) in 2007. It was against this backdrop that Modern Monetary Theory (MMT), which seems to be at odds with existing economics, came into the limelight in the US.

MMT states that a country with a floating exchange rate system and its own currency can continue to finance government expenditures in its currency without issuing additional government bonds as long as it does not lead to inflation (e.g., Wray, 2015; Kelton, 2020). It argues that the Japanese economy is a successful example of MMT. In fact, the Japanese economy had not experienced inflation despite the huge accumulation of government debt and massive monetary easing policy. Thus, the MMT debate has attracted considerable attention in Japan.

However, there have been some studies on financing budget deficits with money even before the advent of MMT. Asada (1987) and Sasakura (1994) considered government budget constraints in macrodynamic models.

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Asada (1987) argued that a countercyclical fiscal policy stabilizes the economy. Zhang (1990) demonstrated the existence of a closed orbit in a model similar to that of Asada (1987), whereas Sasakura (1994) proved the existence of a closed orbit in a macrodynamic model that incorporates the government budget constraint.

Recently, Asada (2022) presented a macrodynamic model based on the MMT argument and discussed the effects of active fiscal policy and passive monetary policy. Additionally, Asada (2025) developed Okishio's (1979, 1980) monetarist model to explore the relationship between Keynesian fiscal and monetary stabilization policies, the policy mix, and the ongoing MMT debate.

However, these studies did not consider the financial instability proposed by Minsky (1975, 1982, 1986). Ninomiya (2022c) proposed two types of financial structures in simple macrodynamic models. One is the LR (lenders' risk) financial structure and the other is the HSP (hedge, speculative, Ponzi) financial structure [1)]. The LR financial structure is based on Taylor and O'Connell (1985). Ninomiya (2022c) characterized the financial instability arising from an LR financial structure as a Taylor and O'Connell type (T-O-type) financial instability. Ninomiya (2018) considered the LR financial structure and the effect of the countercyclical fiscal policy. However, he assumed that the price level is constant.

Furthermore, Ninomiya (2022a) argued that, because MMT is based on the theory of endogenous money supply (horizontalist perspective), it does not account for the possibility of T-O-type financial instability. While debt monetization is typically associated with the risk of triggering high inflation, it may also induce financial instability and contribute to overall economic destabilization. However, few studies have systematically examined the relationship between debt monetization and financial instability.

Therefore, this study focuses primarily on the extent of the LR financial structure and discusses debt monetization in an oligopolistic economy. MMT does not appear to emphasize the role of fiscal policy in stabilizing the economy. The main conclusions are as follows: 1) excessive debt monetization destabilizes the dynamic system in an oligopolistic economy, and 2) T-O-type financial instability may occur regardless of debt monetization.

The remainder of this paper is organized as follows: Section 2 addresses the LR financial structure, financial instability, and the theory of endogenous money supply. It explicitly defines the government's budget constraint and discusses debt monetization. Section 3 develops the dynamic system of oligopoly and examines its stability by considering two cases: the balanced budget case and the debt monetization case. Section 4 concludes the paper.

2. Debt Monetization and Financial Instability

2.1 Financial Instability and Endogenous Money Supply Theory

MMT discussions cover a wide range of issues. Ninomiya (2022a, p.8) summarized the characteristics of MMT as follows:

"[1] If a country issues its own currency under a floating exchange rate system, there is no problem in continuing to finance its budget deficit with its own currency as long as there is no inflation.

[2] The post-Keynesian theory of endogenous money supply (horizontalist perspective) is adopted, and the quantity theory of money is rejected.

[3] The inflation rate is adjusted by the GDP gap (Wicksellian price adjustment), and tax policy (fiscal policy) is

important in adjusting the inflation rate (i.e. taxes are increased when the inflation rate rises).

［4］Full employment is to be achieved by a job guarantee program. In principle, the interest rate (monetary policy) is not used to achieve full employment.

［5］Stabilizing the economy through automatic economic stabilizers and other instruments (such as job guarantee program) is preferable to discretionary fiscal policy.

［6］The lender of last resort function of the central bank is emphasized.

［7］Wise investment (government spending) is needed to ensure productive capacity to prevent inflation, such as strengthening infrastructure, expanding educational opportunities, research, and development, etc."

In the context of financial instability, point［2］is particularly important. Endogenous money theory (horizontalist perspective) states that the supply of money, including bank credit, responds passively to demand for money. That is, bank credit increases deposits, which, in turn, increases reserve requirements; however, the central bank passively supplies high-powered money. In other words, the central bank sets the nominal interest rate, and money supply, including bank credit, is passive in relation to the demand for money [2)].

It appears that MMT relies on endogenous money supply theory. Therefore, this study first discusses financial instability and endogenous money supply theory. Following Ninomiya (2016, 2018), this study formulates the money demand function (L) and money supply function (M) as follows:

$$L = k(i)pY, \quad k_i < 0, \tag{1}$$

$$M = \zeta(y, i)H, \quad \zeta_y > 0, \quad \zeta_i > 0, \tag{2}$$

where i: the nominal interest rate, k: the Marshallian k, p: the price level, Y: the income, H: high-powered money, ζ: the money multiplier, and $y(=Y/K)$: income per unit of capital. K is the capital stock. ζ_y indicates the behavior of commercial banks and shows lender's risk. For example, the lender's risk rises dramatically when the risk of default increases during a depression [3)].

Dividing Eqs. (1) and (2) by pK, this study obtains:

$$l\left(=\frac{L}{pK}\right) = k(i)\frac{pY}{pK} = k(i)y, \tag{1}'$$

$$m\left(=\frac{M}{pK}\right) = \frac{\zeta(y, i)H}{pK} = \zeta(y, i)h, \quad h = \frac{M}{pK}. \tag{2}'$$

Therefore, the equilibrium condition of money markets is:

$$\zeta(y, i)h = k(i)y. \tag{3}$$

Solving Eq. (3) with respect to nominal interest rate i, we obtain:

$$
\begin{gathered}
i = i(y, h), \quad i_y \gtreqless 0, \quad i_h < 0, \\
i_y \left(= \frac{di}{dy}\right) = -\frac{m_y}{m_i} \gtreqless 0, \\
m_y = k - \zeta_y h \gtreqless 0, \;\; m_i = k_i y - \zeta_i h < 0, \\
i_h \left(= \frac{di}{dh}\right) = \frac{\zeta}{m_i} < 0,
\end{gathered} \tag{4}
$$

where, m_y indicates a financial factor of an economy. This study obtains $i_y < 0$ when $m_y < 0$ and its absolute value is large. Ninomiya (2022c) called this sign of i_y as the LR financial structure.

Ninomiya (2007, 2022c) showed that the economy becomes unstable when $m_y < 0$ and its absolute value is large. Commercial banks promote their lending when the economy is booming ($y \uparrow$) and interest rate i will decline ($i \downarrow$). A decline in interest rate promotes investment I and further heats up the economy. Ninomiya (2022c) called this financial instability T-O-type financial instability (Taylor and O'Connell, 1985).

$$y \uparrow \Rightarrow i \downarrow \Rightarrow I \uparrow \Rightarrow y \uparrow$$

In contrast, the endogenous money supply theory argues that the central bank controls the interest rate while commercial banks fully accommodate this rate. I believe that MMT relies on the endogenous money supply theory (horizontalist perspective) and does not sufficiently consider the occurrence of financial instability [4].

MMT claims to inherit Minsky's financial instability hypothesis, but post-Keynesian arguments vary. MMT's arguments differ from the theoretical models of T-O-type financial instability. MMT, which is based on endogenous money theory (horizontalist perspective), does not consider the possibility that the interest rate is the decreasing function of income, and its theoretical treatment of financial instability is far from adequate. In the following section, this study examines the relationship between this issue and debt monetization within the framework of a post-Keynesian macrodynamic model of an oligopolistic economy.

2.2. Budget Constraint of Government and Debt Monetization

According to MMT, if a country issues its own currency under a floating exchange rate system, there is no problem in continuing to finance its budget deficit with its own currency as long as there is no inflation.

This study next discusses the budget constraint of a consolidated government as follows:

$$
\begin{gathered}
pT + \dot{H} = pG + \mu H, \\
\dot{H} = pG - pT + \mu H,
\end{gathered} \tag{5}
$$

where, G: the government expenditure, T: the tax revenue; Eq. (5) shows that the growth rate of high-powered money is μ if the consolidated government adopts a balanced budget ($pG = pT$). I assume that μ is constant in this study.

Dividing Eq. (5) with pK, this study obtains:

$$
\frac{\dot{H}}{pK} = \frac{G}{K} - \frac{T}{K} + \frac{\mu H}{pK}, \tag{5}'
$$

This study defines government expenditure per unit of capital (G/K) and tax revenue per unit of capital (T/K) as follows:

$$\frac{G}{K} = \beta y, \quad \beta > 0, \tag{6}$$

$$\frac{T}{K} = ty, \quad 0 < t < 1, \tag{7}$$

where, t: tax rate. $\beta(= G/Y)$ is the parameter of government expenditure, which is one of the crucial parameters in this study. Y is net income.

Ordering Eqs. (5'), (6), and (7), this study obtains:

$$\frac{\dot{H}}{pK} = \beta y - ty + \mu h. \tag{8}$$

This study assumes that the tax rate t is constant. Therefore, the parameter β indicates the degree of debt monetization. If the consolidated government keeps the balanced budget ($\beta = t$), this study obtains:

$$\frac{\dot{H}}{pK} = \mu h. \tag{9}$$

In the following section, this study examines the case of balanced budget ($\beta = t$) and case of debt monetization ($\beta > t$).

Asada (2022) presented a macrodynamic model based on the MMT argument, discussing the effects of active fiscal policy and passive monetary policy. Asada (2025) presented the macrodynamic model to explore the relationship between Keynesian fiscal and monetary stabilization policies, the policy mix, and the ongoing MMT debate.

However, MMT asserts that full employment should be achieved by a job guarantee program. Interest rate (monetary policy) is not used to achieve full employment [4]. MMT maintains that stabilizing the economy through automatic economic stabilizers and other instruments (such as the job guarantee program) is preferable to discretionary fiscal policy [5]. Therefore, this study does not consider countercyclical fiscal and monetary policies.

3. Dynamic System

This study now constructs a macrodynamic model of an oligopolistic economy by considering the government's budget constraint and debt monetization. This study defines consumption and investment functions as follows:

$$c\left(= \frac{C - T}{K}\right) = a(1 - t)y, \quad 0 < a < 1, \tag{10}$$

$$g\left(= \frac{I}{K}\right) = g(y, r) = g(y, i - \pi^e), \quad g_y > 0, \quad g_r < 0, \tag{11}$$

where, C: the consumption, a: the marginal propensity to consume, I: the investment, $r(= i - \pi^e)$: the real interest rate, and π^e: the expected rate of inflation. g denotes capital accumulation rate.

Considering Eqs. (2), (10), and (11), this study adjusts the goods market using the Keynesian quantity adjustment process in an oligopolistic economy as follows:

$$\dot{y} = \alpha[a(1 - t)y + g(y, i - \pi^e) + \beta y - y], \tag{12}$$

where, α represents the speed of adjustment in the goods market. Quantity adjustment is dominant in the oligopolistic economy. In general, the adjustment speed α is assumed to be sufficiently large in the oligopolistic economy. In contrast, if the adjustment is not dominant, this study supposes that α is assumed to be small. α is an important parameter in this study.

In the oligopolistic economy, the inflation rate is determined by the mark-up principle and expectations-augmented wage Phillips curve [5]. Therefore, this study formulates the inflation rate of the oligopolistic economy as follows:

$$\pi = f(n(0)y\kappa) - \sigma_2, \quad f' > 0, \quad n = \frac{N}{Y}, \tag{13}$$

where, N represents employment and σ_2 denotes the growth rate of n.

κ is defined as follows:

$$\kappa = \frac{K}{N_s e^{\sigma_2 t}}, \tag{14}$$

where, N_s denotes the labor supply. Considering Eq. (14), this study obtains the dynamic equation of κ as follows:

$$\frac{\dot{\kappa}}{\kappa} = g(y, i - \pi^e) - (\sigma_1 + \sigma_2), \tag{15}$$

where, σ_1 represents the growth rate of N_s.

Given that $h(= H/pK)$, it follows that:

$$\frac{\dot{h}}{h} = \frac{\dot{H}}{H} - \frac{\dot{K}}{K} - \pi. \tag{16}$$

Following Asada (1991), this study assumes that the expected inflation rate is consistent with the steady-state inflation rate and is formed under the balanced budget ($pG = pT$). Considering Eqs. (5), (15), and (16), this study obtains the expected inflation rate π^e as follows:

$$\pi^e = \mu - \sigma = \bar{\pi}_e, \tag{17}$$

where, $\sigma = \sigma_1 + \sigma_2$.

Ordering Eqs. (12), (13), (15), (16), and (17), this study obtains a dynamic system (S) as follows:

$$\dot{y} = \alpha[g(y, i(y, h) - \bar{\pi}_e) - (s - \beta)y] = f_1(y, h; \alpha, \beta) \tag{S.1}$$

$$\dot{\kappa} = [g(y, i(y, h) - \bar{\pi}_e) - \sigma]\kappa = f_2(y, h) \tag{S.2}$$

$$\dot{h} = (\beta - t)y - [-\mu + g(y, i(y, h) - \bar{\pi}_e) + f(n(0)y\kappa) - \sigma_2]h = f_3(y, \kappa, h; \beta) \tag{S.3}$$

$$s = 1 - a(1 - t)$$

The Jacobian matrix of the system (S) at the equilibrium point can be expressed as:

$$J = \begin{pmatrix} f_{11} & 0 & f_{13} \\ f_{21} & 0 & f_{23} \\ f_{31} & f_{32} & f_{33} \end{pmatrix}, \tag{18}$$

where,

$$\begin{aligned} f_{11} &= \alpha\left[g_y + g_r i_y - (s-\beta)\right], \\ f_{13} &= \alpha g_r i_h > 0, \\ f_{21} &= \left(g_y + g_r i_y\right)\kappa, \\ f_{23} &= g_r i_h \kappa, \\ f_{31} &= (\beta - t) - \{(g_y + g_r i_y) - f'n(0)\kappa\}h, \\ f_{32} &= -f'n(0)yh, \\ f_{33} &= -g_r i_h h. \end{aligned}$$

The characteristic equation of this system is:

$$\lambda^3 + a_1\lambda^2 + \lambda a_2 + a_3 = 0, \tag{19}$$

where,

$$\begin{aligned} a_1 &= -f_{11} - f_{33} \\ &= -\alpha[g_y + g_r i_y - (s-\beta)] + g_r i_h h, \end{aligned} \tag{20}$$

$$\begin{aligned} a_2 &= \begin{vmatrix} f_{11} & 0 \\ f_{21} & 0 \end{vmatrix} + \begin{vmatrix} 0 & f_{23} \\ f_{32} & f_{33} \end{vmatrix} + \begin{vmatrix} f_{11} & f_{13} \\ f_{31} & f_{33} \end{vmatrix} \\ &= \alpha\{(s-\beta)h - (\beta - t) + f'n(0)\kappa\}g_r i_h + g_r i_h \kappa f'n(0)yh, \end{aligned} \tag{21}$$

$$\begin{aligned} a_3 &= \det J = f_{11}f_{23}f_{32} - f_{21}f_{13}f_{32} \\ &= \alpha(1-a)(1-t)g_r i_h \kappa f'n(0)yh > 0. \end{aligned} \tag{22}$$

First, this study examines the case of the balanced budget ($\beta = t$). For a balanced budget, this study has:

$$a_1 = -\alpha\left[g_y + g_r i_y - (1-a)(1-t)\right] + g_r i_h h, \tag{23}$$

$$a_2 = \alpha\{(1-a)(1-t)h + f'n(0)\kappa\}g_r i_h + g_r i_h \kappa f'n(0)yh > 0, \tag{24}$$

$$a_1 a_2 - a_3 = -\alpha^2\left[g_y + g_r i_y - (1-a)(1-t)\right][\{(1-a)(1-t)h + f'n(0)\kappa\}g_r i_h] + \cdots. \tag{25}$$

Therefore, the stability conditions of the dynamic system (S) depend on the sign of $g_y + g_r i_y - (1-a)(1-t)$, which indicates the economic structure. If α is sufficiently large and $g_y + g_r i_y - (1-a)(1-t) > 0$, this study obtains $a_1 < 0$ and $a_1 a_2 - a_3 < 0$. In this case, the Routh-Hurwitz conditions are not satisfied and the dynamic system becomes unstable.

It should be noted that $g_y + g_r i_y - (1-a)(1-t) > 0$ is satisfied when $i_y < 0$ and the absolute value is large. In this situation, T-O-type financial instability occurs. In other words, the T-O-type financial instability occurs in the case of the balanced budget. On the contrary, in the case of $i_y > 0$, $g_y + g_r i_y - (1-a)(1-t) > 0$ is satisfied

when $g_y - (1-a)(1-t) > 0$, which means that a real factor makes the dynamic system unstable. These cases are equivalent to the case of constant high-powered money supply growth examined by Ninomiya (2016).

In other words, the T-O-type financial instability can arise independently of debt monetization. Although MMT claims to build on Minsky's insights, its framework is rooted in the theory of endogenous money supply (horizontalist perspective). Accordingly, it is reasonable to assume that MMT does not fully anticipate the emergence of T-O-type financial instability.

In the oligopolistic economy, quantity adjustment is dominant. Therefore, α is assumed to be sufficiently large. Conversely, when the degree of adjustment is not dominant, α is assumed to be small. In this case, this study has:

$$a_1 = g_r i_h h, \tag{26}$$

$$a_2 = g_r i_h \kappa f' n(0) y h, \tag{27}$$

$$a_1 a_2 - a_3 = (g_r i_h h)(\, g_r i_h \, \kappa f' n(0) y h). \tag{28}$$

Therefore, the dynamic system (S) becomes stable when α is small. This means that the T-O-type financial instability depends primarily on the adjustment speed of goods market α.

This study now examines the case of debt monetization, where the parameter β is large ($\beta - t > 0$). In the oligopolistic economy, this study obtains:

$$a_1 = -\alpha\left[g_y + g_r i_y - (s-\beta)\right] + g_r i_h h, \tag{29}$$

$$a_2 = \alpha\{(s-\beta)h - (\beta - t)h + f' n(0)\kappa\} g_r i_h + g_r i_h \kappa f' n(0) y h. \tag{30}$$

Therefore, $a_1 < 0$ when β is sufficiently large. The dynamic system (S) becomes unstable because the Routh-Hurwitz condition is not satisfied, indicating that debt monetization makes the oligopolistic economy unstable.

Eq. (29) also indicates that the T-O-type financial instability occurs in this case. As we mentioned above, MMT's arguments differ from the theoretical models that examine the T-O-type financial instability since MMT is based on the endogenous money theory (horizontalist perspective). Eq. (30) indicates that debt monetization instability occurs due to increased government expenditure and an increase in money supply through increased government expenditure.

In other words, debt monetization can destabilize the economy not only through real channels—such as increased aggregate demand—but also through financial channels, including an expanded money supply. It is important to note that the instability arising from this financial channel is fundamentally different from the T-O-type financial instability. It cannot be ruled out that such instability may trigger the T-O-type financial instability as a consequence of economic overheating.

However, if the adjustment speed of goods market α is assumed to be small, we also have Eqs. (26), (27), and (28). This means that the instability of debt monetization and T-O-type financial instability depend primarily on the adjustment speed of goods market α. This is an important finding of this study. Asada (1991) presented a Keynes-Wichsell model and the adjustment speed α is formulated by the degree of competition. However, I believe it would be premature to assume that a higher degree of competition will avoid the instability of debt monetarization

and T-O-type financial instability.

Furthermore, it is necessary to conduct an econometric analysis to determine whether debt monetization is causing economic instability in Japan. Despite the enormous Japanese government debt, the Japanese economy has continued to experience prolonged economic stagnation. The debt monetization discussed in this study suggests that the dynamic system becomes unstable in terms of both real and financial factors; however, this instability causes overheating rather than economic stagnation.

4. Conclusion

The Japanese government has been financing its expenditures by issuing additional government bonds and has accumulated massive debt. In general, debt monetization is avoided because it undermines fiscal discipline and risks triggering high inflation. However, the Bank of Japan has purchased a large portion of these bonds, which may be considered de facto debt monetization.

MMT argues that a country with a floating exchange rate system and its own currency can continue to finance government expenditures in its currency without issue, as long as it does not lead to inflation. Additionally, it states that tax increases are sufficient to address inflation.

This study focused on the extent of debt monetization and examined how it affects the dynamic system of oligopoly. In an oligopolistic economy, the goods market is adjusted by the output capital ratio y. First, this study reviewed the case of a balanced budget. In an oligopolistic economy, stability conditions depend on the LR financial structure, and T-O-type financial instability may occur. Since MMT relies on the endogenous money supply theory (horizontalist perspective), I believe that the T-O-type financial instability does not occur under MMT.

Additionally, excessive debt monetization destabilizes the dynamic system of an oligopolistic economy, and this outcome does not depend on the economic structure. Generally, debt monetization is criticized for leading to higher inflation. T-O-type financial instability may occur regardless of debt monetization.

As mentioned above, MMT argues that a country with a floating exchange rate system and its own currency can continue to finance government expenditures in its currency without issuing additional government bonds, as long as it does not lead to inflation. However, I believe that this claim by MMT is quite fragile since MMT adopts the endogenous money supply theory (horizontalist perspective).

Although the Japanese economy is said to have emerged from deflation, and stock prices have surpassed levels seen during the bubble economy, real wages have declined, and economic stagnation persists. Structural reforms aimed at market liberalization have led to an increase in non-regular employment, and the resulting widening of income disparities has been commonly observed.

Despite its massive balance of outstanding government bonds, the Japanese government is under growing pressure to issue additional deficit-financed bonds to expand public spending. In response to public sentiment, politicians from both ruling and opposition parties have proposed measures such as cash handouts, a reduction in the consumption tax rate, or even its complete abolition. The author views this situation as precarious.

However, debt monetization in this study suggests that the dynamic system becomes unstable due to both real and financial factors, but this instability leads to economic overheating rather than stagnation. It is necessary to conduct an econometric analysis to determine whether debt monetization is causing economic instability in Japan.

It should be noted that the conclusions drawn in this study are derived from a highly simplified post-Keynesian

macroeconomic framework. For example, the instability of debt monetization and T-O-type financial instability do not occur if the adjustment speed of the goods market is sufficiently small. MMT insists that the inflation rate should be adjusted in relation to the GDP gap (Wicksellian price adjustment)[6]. I need to extend the model of this study into the Keynes-Wicksell model.

Furthermore, MMT emphasizes the use of automatic economic stabilizers and other instruments (such as the job guarantee program). Therefore, this study does not consider the effects of countercyclical fiscal policy. However, MMT insists that tax policy (fiscal policy) is important in adjusting the inflation rate. This study does not examine the effect of increasing income tax rates (decreasing government expenditure) when inflation becomes high. Therefore, it is important to consider the effects of countercyclical fiscal and tax policy [7].

I believe that the quality of a fiscal policy is a critical factor in determining its effectiveness. Lavoie (2006) argued that demand, including fiscal policy, affects potential GDP, a phenomenon known as hysteresis [8]. If an increase in government expenditure (demand) enhances potential GDP, the inflation rate may not rise [9]. However, this study does not consider hysteresis. Many aspects of this study could be further developed, aside from the issues of countercyclical fiscal policy and hysteresis. The model of this study is based on a closed economy. Therefore, I must extend the model to an open economy [10]. Additionally, I need to introduce dynamic debt burden equations for firms into the model. Related mathematical models have interpreted the growth in firms' debt burdens as a source of increasing financial fragility. Inflation and deflation will affect the real debt balance and investment demand. Therefore, these aspects should be considered in future studies.

Notes

1) The HSP financial structure is based on the process of financial fragility. The related mathematical models capture the process as a debt burden of firms. This study ignores the debt burden of firms.
2) There is a controversy within the post-Keynesian camp about endogenous money supply theory. The horizontalists believe that the central bank supplies high-powered money entirely passively, while the structuralists believe that there is a limit to this supply.
3) This type of money supply function was formulated by Rose (1969), who discussed credit instability. Taylor and O'Connell (1985) formulated that money demand function as a decreasing function of the expected rate of profit. See Ninomiya (2007, 2022c) for more details.
4) Some Post-Keynesian macrodynamic models based on the endogenous money supply theory assume that the interest rate is constant.
5) The mark-up principle is defined as follows:

$$p = (1 + \tau)Wn,$$

where, p is price level, τ is mark-up ratio, and W is nominal wage rate. The expectations-augmented wage Phillips curve is defined as follows:

$$(\dot{W}/W) = f(E) + \pi^e, \quad f' > 0,$$

where, $E = n(0)y\kappa$ (employment rate). See Asada (1991) and Ninomiya (2016) for more detail.
6) See Taylor (1993) and Romer (2000).
7) Asada et al. (2019) analyzed debt burdens of governments and firms, exploring fiscal and monetary policies and

policy mix. Similarly, Ninomiya (2025) considered the debt burdens of governments and firms and investigated the effect of countercyclical fiscal policy.

8) Miyao (2017) discussed the prolonged recession after 1991 in Japan using the concept of hysteresis.

9) See Ninomiya (2022a) for more detail.

10) Ninomiya (2022b) considered the LR and HSP financial structures in an open economy.

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