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Financial Structure and Monetary and Fiscal Policies

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Abstract

The subprime loan mortgage crisis has revived scholarly interest in Minsky's financial instability hypothesis. The related mathematical models present two types of Minskian financial structures, which we identify as the lenders' risk type (LR) and the hedge, speculative and Ponzi type (HSP).

We examine the effects of monetary and fiscal policy in macrodynamic models which considers both the LR and HSP financial structures. We demonstrate that the effects depend on the significance of the LR and HSP financial structures. We emphasize the significance of stable financial structures and policy mix of monetary and fiscal policies in order to stabilize the economy. However, we present that the policy mix are not able to remove the fragility of the HSP financial structure completely.

Keywords: Minskian financial structure, financial instability, monetary and fiscal policies, policy mix
JEL classifications: E12, E32, E33,

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1 Introduction

What can be done to prevent from financial crises? Many Keynesians have insisted on the effects of monetary and fiscal policies to stabilize an economy.[1] In constant, neo-and new classical economists insist market- oriented economic reforms are needed[2] and deny the effects of monetary and fiscal polices.[3] However, the financial instability hypothesis proposed by Minsky (1975, 1982, and 1986) has attracted renewed attention since the subprime mortgage loan crisis that occurred in the U.S. in 2007–2008.

A number of post-Keynesian economists have developed the macrodynamics of financial instability, employing two types of financial structures in their models. One of the financial structures was formulated by Taylor and O'Connell (1985). We identify the financial structure as the LR (the lenders' risks) financial structure.

Taylor and O'Connell (1985) suggest that lenders' liquidity preferences intensify with a decrease in the expected profit rate ρ. They hypothesize that an increase in ρ reduces the interest rate i. They also assert that a true Minsky crisis occurs when the value of derivatives i_ρ turns significantly negative.Taylor and O'Connell (1985) formulated that lenders' liquidity preferences intensify with a decrease in the expected profit rate ρ. They hypothesized that an increase in the expected profit rate ρ reduces the interest rate i. They also asserted that a true Minsky crisis occurs when the value of derivatives i_ρ turns significantly negative. Ninomiya and Tokuda (2012) show that Korea's LR financial structure was fragile prior to the Asian monetary crisis of 1998 and stable thereafter. Ninomiya and Tokuda (2017) demonstrate that Japan's LR financial structure has been fragile since the mid-1990s. Ninomiya and Tokuda (2020) examine the LR financial structure in the U.S.

On the other hand, Minsky emphasizes increasing financial fragility, which refers to hedging, speculation and financing via Ponzi schemes. Therefore, related mathematical models interpret growth in a firms' debt burdens as the source of increasing financial fragility.[4] Some studies explicitly consider this latter type of Minskian financial structure. For example, Nishi (2012) proposes a Minskian financial structure and introduce the burden of interest-bearing debt into a Kaleckian model.[5] We identify this financial

[1]See, for example, Asada (1986, 1989). More recently, Murakami (2016, 2022) examined the effects of policies in a Keynesian macrodynamic model. Lavoie (2006) argues that fiscal policies have an effect over the long run using New Consensus Macroeconomics.

[2]See, for example, Ohtake, Kawaguchi, and Tsuru (2013).

[3]See, for example, Barro (1974). However, Barro (1990) presents a growth model that views government expenditures as a productive input and recognizes an effect of fiscal policy. Although Barro (1990) assumes a balanced budget, Futagami, Iwaisako, and Ohdoi (2008) further develop Barro (1990) and examine the effects of fiscal policy by issuing government bonds.

[4]See, for example, Franke and Semmler (1989), Jarsulic (1990), Adachi (1994), Keen (1995), Asada (2004, 2006a, 2006b, 2012), Hein (2007), Charles (2008a, 2008b), Ryoo (2010, 2013), Sasaki and Fujita (2012), Ninomiya and Tokuda (2017), and Ninomiya (2006, 2018).

[5]Foley (2003), Lima and Meirelles (2007), Charles (2008c), and Sasaki and Fujita (2014) also consider Minskian financial structures. However, Nishi(2012) focuses on the long run and assumes

structure as the HSP (hedging, speculative and Ponzi scheme) financial structure.

Ninomiya (2022b) constructs macrodynamic models of financial instability that consider both the LR and HSP financial structures explicitly, and discusses financial instability and cycles. He shows that the phenomenon of increasing financial fragility, which refers to hedging, speculation, and Ponzi scheme financing, can be observed using numerical simulation, even when financial factors stabilize the economy. Ninomiya (2022a) discusses financial instability in an open economy and emphasizes stable financial structures in the floating exchange rate system. However, these studies did not consider the effects of monetary and fiscal policies. Ninomiya (2016) discusses the Taylor and O'Connell type (T-O type) of financial instability and examine the effect of inflation targeting in a mixed competitive-oligopolistic system that considers the LR financial structure. However, he does not consider the HSP financial structure.

Ninomiya (2006) examines the effect of monetary policy and Ninomiya (2018) examines the effect of fiscal policy in the macrodynamic models that consider both the LR and HSP financial structures. Asada (2012) finds that the appropriate policy mix of fiscal and monetary policies can contribute to stabilizing an unstable economy in higher dimensional Keynesian macrodynamic models. He discusses the types of policy mixes that are appropriate or inappropriate from the point of view of macroeconomic stabilization. Asada, Demetrian, and Zimka (2019) further develop Asada (2012) and investigate the existence of cycles in a six-dimensional model with firms' and governments' debt accumulations. However, they do not consider the LR financial structure or the interest-bearing debt burden.

This study constructs simple macrodynamic models that consider both the LR and HSP financial structures, and examines the effects of monetary and fiscal policies and the mix those policies. We emphasize that the effects of monetary policy, fiscal policy, and the policy mix depends on the LR and HSP financial structures. We also demonstrate that the policy mix of fiscal and monetary policies is more important from the point of view of macroeconomic stabilization. However, we show that the policy mix is not able to eliminate the fragility of the HSP financial structure.

The remainder of the study is organized as follows. Section 2 presents a basic macrodynamic model that considers the LR and HSP financial structures. Section 3 examines the effects of monetary policy, fiscal policy, and the mix of these policies in the macrodynamic model. Section 4 concludes.

2 LR and HSP Financial Structures

We first clarify LR Minskian financial structure based on Ninomiya and Tokuda (2017, 2021), and Ninomiya (2022b). These studies define the money demand function M^d

a constant interest rate; thus, he does not consider an LR financial structure. Charles (2008c) and Sasaki and Fujita (2014) also assume a constant interest rate.

and the money supply function M^s as

$$M^d = L(Y, i), \quad L_Y \equiv \frac{\partial L}{\partial Y} \gtreqless 0, \quad L_i \equiv \frac{\partial L}{\partial i} < 0, \tag{1}$$

$$M^s = \mu(Y, i)H, \quad \mu_Y \equiv \frac{\partial \mu}{\partial Y} > 0, \quad \mu_i \equiv \frac{\partial \mu}{\partial i} > 0, \tag{2}$$

where, μ is a monetary multiplier, H is high powered money, $L_Y < 0$ imply that lenders' liquidity preferences intensify with a decrease in income Y, and $\mu_Y > 0$ implies that money supply increases when a bank lends to an expanding economy. The monetary multiplier μ includes the behavior of commercial banks.[6] These effects are LRs.

Ordering (1) and (2), the interest rate i is determined by equilibrium in the money market as follows:

$$L(Y, i) = \mu(Y, i)H. \tag{3}$$

Solving Equation (3) with respect to i, we obtain

$$i = i(Y, H), \tag{4}$$

$$i_Y \left(\equiv \frac{\partial i}{\partial Y} \right) = -\frac{L_Y - \mu_Y H}{L_i - \mu_i H} \gtreqless 0.$$

$$i_H \left(\equiv \frac{\partial i}{\partial H} \right) = -\frac{\mu}{L_i - \mu_i H} > 0,$$

Equation (4) also shows that the interest rate i is reflected by LRs. This is the lenders' risks type of financial structure. As mentioned, LRs are expressed by L_Y and μ_Y. The sign of i_Y depends on the sign of $L_Y - \mu_Y H$; thus, we obtain $i_Y < 0$ when $L_Y - \mu_Y H < 0$. For example, we obtain $i_Y < 0$ when μ_Y is large. As mentioned above, the monetary multiplier μ includes the behavior of commercial banks.[7] Therefore, i_Y expresses the LR financial structure.

Next, we discuss the HSP financial structure. Real gross profit Π and real wage income H_w are defined as follows:

$$\Pi = \theta Y, \quad 0 < \theta < 1. \tag{5}$$

$$H_w = (1 - \theta)Y, \tag{6}$$

where, θ is the rate of profit sharing. In this study, we assume that θ is constant.[8]

[6]The money supply function is similar to Rose (1969). Lima and Meirelles (2007) and Ryoo (2013) introduced the effect of bank profitability on credit supply.

[7]Kregel (1997) emphasizes that the margins of safety proposed by Minsky are significant for financial instability. When an economic boom reduces LRs, lenders, including commercial banks, promote lending despite an erosion in the margin of safety.

[8]Ninomiya and Takami (2018) introduce the dynamic equation of profit sharing into a macrodynamic model of financial instability that considers the LR financial structure.

An interest payment iD is distributed to lenders. Firms retain their remaining profit as internal reserves V, obtained by

$$V = \Pi - \delta iD = \theta Y - \delta iD, \quad \delta > 0, \tag{7}$$

where D denotes a firms' debt burdens. and δ (an important parameter) expresses one of the effect of the burden of interest-bearing debt (iD) and reflects a risk premium. As δ affects a firm's financial conditions, we call this effect the "financial condition effect.[9]"

The demand for investment I assumed to be financed by new debt if it is not financed via internal reserves. The dynamic equation expressing debt burden D becomes

$$\dot{D} = I - V = I - (\theta Y - \delta iD), \tag{8}$$

It is essensitail to introduce the interest payment iD into a dynamic system in order to examine effects of the HSP financial structure.

We now present a basic dynamic model based on Ninomiya (2017)(2022b). The investment function I is defined as

$$I = g_1 Y - g_2 iD + g_0, \quad g_i > 0, \tag{9}$$

where g_1 represents animal spirits or appropriate investment opportunities. For example, a paucity of appropriate opportunities reduces g_1 even though income Y rises. g_2 implies that a firm curtails investment demand because its debt burden rises. g_2 is another effect of interest-bearing debt burden and expresses the debt effect.[10]

The consumption function C is assumed to be a linear function of H_w as follows:

$$C = cH_w + C_0 = c(1-\theta)Y + C_0, \quad 0 < c < 1, \quad C_0 > 0, \tag{10}$$

where c is the marginal propensity to consume and C_0 is basic consumption. All interest payments are assumed to be saved.

The dynamic equation for income Y is formulated as

$$\dot{Y} = \alpha(C + I + G - Y), \quad \alpha > 0. \tag{11}$$

[9]Nishi (2012) formulates the HSP-type Minskian financial structure as follows:

$$\begin{aligned} &\Pi \geqq \dot{D} + iD, && \text{(hedge finance)} \\ &\Pi \geqq iD, && \text{(speculative finance)} \\ &\Pi < iD, && \text{(Ponzi finance)} \end{aligned}$$

For example, hedge finance means that internal reserves $V(= \Pi - iD)$ exceed the increase in the debt burden D. Ponzi finance means that a firm's gross profit (net operating revenue Π) cannot cover its interest payment iD.

[10]Asada (2012) introduced the dynamic equation of price expectation and formulated that the investment function depends on the real interest rate. We assume that price level is constant in this study.

where, G denotes the government expenditure that is constant in this section. Equation (12) describes the quantity adjustment in the goods market, and α is the speed of adjustment.

Ordering (4), (8), (9), (11) and (12), the following dynamic system (S_a) is obtained:

$$\dot{Y} = \alpha[c(1-\theta)Y + C_0 + g_1 Y - g_2 i(Y)D - g_0 + G - Y] \qquad (S_a.1)$$

$$\dot{D} = g_1 Y - g_2 i(Y)D + g_0 - \theta Y + \delta i(Y)D \qquad (S_a.2)$$

We assume that high-powered money H is constant in this section.

The following relationship is assumed:

$$g_1 - s > 0 \qquad (A.1)$$

Kaldorian's business cycle models employ a similar assumption.[11] Assumption A.1 indicates that the real factor destabilizes the economy.

The Jacobian matrix of the system (S_a) at equilibrium can be expressed as

$$J_a = \begin{pmatrix} \alpha[(g_1 - s) - g_2 i_Y D] & -\alpha g_2 i \\ g_1 - \theta + (\delta - g_2) i_Y D & (\delta - g_2) i \end{pmatrix} \qquad (12)$$

Therefore, we obtain

$$\mathrm{tr} J_a = \alpha\{(g_1 - s) - g_2 i_Y D\} + (\delta - g_2) i, \qquad (13)$$

$$\det J_a == \alpha i[(g_1 - s)\delta + (s - \theta) g_2] > 0, \qquad (14)$$

Since we obtain $\det J_a > 0$, the stability of the system (S_a) depends on the sign of $\mathrm{tr} J_a$ as indicated:

1) $\quad g_1 - s - g_2 i_Y D > 0, \quad \delta - g_2 < 0 \Rightarrow \mathrm{tr} J_a \gtreqless 0$: Cycle 1

2) $\quad g_1 - s - g_2 i_Y D > 0, \quad \delta - g_2 > 0 \Rightarrow \mathrm{tr} J_a > 0$: Unstable

3) $\quad g_1 - s - g_2 i_Y D < 0, \quad \delta - g_2 < 0 \Rightarrow \mathrm{tr} J_a < 0$: Stable

4) $\quad g_1 - s - g_2 i_Y D < 0, \quad \delta - g_2 > 0 \Rightarrow \mathrm{tr} J_a \gtreqless 0$: Cycle 2

Therefore, stability depends on the signs of $\delta - g_2$ and $g_1 - s - g_2 i_Y D$. The inequality $g_1 - s - g_2 i_Y D > 0$ indicates that the goods market destabilizes the economy. This is usually assumed in closed Kaldorian business cycle models. The dynamic system (S_a) is unstable when $\delta - g_2 > 0$. Both δ and g_2 affect the HSP financial structure. The parameter δ (g_2) has a destabilizing (stabilizing) effect on the system.[12] Therefore, the HSP financial structure is stable when $\delta - g_2 < 0$ and fragile (unstable) when $\delta - g_2 > 0$.

[11] See, for example, Asada (1995) and, Ninomiya (2007).

[12] Asada (2006a, 2006b) also examined the debt effect in terms of it destabilizing dynamic systems. He introduced wage and price Phillips curves into the models. A decrease in price induces an increase in real debt burden that restrains investment demand.

There is one parameter value α_{a1} at which Hopf bifurcation occurs, namely when $\delta - g_2 < 0$. There is at least one closed orbit around equilibrium in the dynamic system (S_a), when α is close to α_{a1}. Cycle 1 is similar to the Kaldorian business cycle models. However, the LR financial structure may destabilizes the economy when $g_1 - s - g_2 i_Y D > 0$.[13]

In contrast, $g_1 - s - g_2 i_Y D < 0$ indicates that marginal propensity to invest $(g_1 - g_2 i_Y D)$ is smaller than marginal propensity to save (s). The indirect effect $(g_2 i_Y D)$ is significant and the LR financial structure stabilizes the economy, Therefore, the goods market stabilizes the economy despite the destabilizing effect of the real factor $(g_1 - s > 0)$.

The dynamic system (S_a) is stable when $\delta - g_2 < 0$. There is one parameter value α_{a2} at which Hopf bifurcation occurs when $\delta - g_2 > 0$. There is at least one closed orbit around equilibrium in the system (S_a), when α is close to α_{a2}. The HSP financial structure destabilizes the economy when $\delta - g_2 > 0$.[14] Therefore, Cycle 2 is somewhat different from Cycle 1.

However, using numerical simulations Ninomiya (2022b) shows that increasing financial fragility, referring to hedging, speculation and Ponzi scheme financing, occurs in both Cycle 1 and Cycle 2. The condition $g_1 - s - g_2 i_Y D > 0$ could be satisfied even when $i_Y > 0$. In real economies. it is quite difficult to identify the factors that destabilize an economy when financial fragility increases.

3 Monetary, Fiscal Policies and Policy Mix

We now examine the effect of fiscal and monetary policies, and the mix of those policies in a dynamic system that considers both LR and HSP financial structures. First, we

[13]The condition, $i_1 < 0$, means that the LR financial structure is unstable. The mechanism of instability is as follows. We assume that the level of income Y diverges from the equilibrium point to an upper level as a result of a disturbance. If the lenders' risks decline sharply with the rise in income, the supply of loanable funds increases. As a result, the interest rate i will fall in spite of the rise in income. The decrease in interest rate will stimulate investment demand and income will also increase.

$$Y \uparrow \Rightarrow i \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

[14]The condition, $\delta - g_2 > 0$, means that the HSP financial structure is fragile. The mechanism of instability is as follows. We assume that the level of income Y diverges from the equilibrium point to an upper level as a result of a disturbance. The investment demand I is stimulated by the rise in income and debt burden D also increases. As the financial condition effect $(\delta i D \uparrow)$ is significant, the debt burden D increases more and more.

$$Y \uparrow \Rightarrow I \uparrow \Rightarrow D \uparrow \Rightarrow \delta i D \uparrow (> I \downarrow) \Rightarrow D \uparrow$$

formulate a monetary policy as follows:

$$\dot{H} = \sigma + \beta(i - \bar{\imath}), \quad \beta > 0, \tag{15}$$

where, $\bar{\imath}$ is a target interest rate set by the central bank. If β is sufficiently small, the central bank adopts a policy such that the high-powered money grows by constant rate σ. Ninomiya (2016) calls this policy the "x % rule.[15]" If β is sufficiently large, the central bank adopts an interest rate targeting policy.

We formulate a fiscal policy as follows:

$$G = \gamma(\bar{Y} - Y) + G_0, \quad \gamma > 0, \tag{16}$$

where, $\bar{Y}$ is the target income level set by the government. If γ is sufficiently large, the government adopts the countercyclical fiscal policy. We assume that tax revenue T depends on income as follows:

$$T = (t_w + t_\pi)Y, \quad 0 < t_w < 1, \quad 0 < t_\pi < 1, \tag{17}$$

where, t_w is the tax rate for wage income and t_π is the tax rate for profits. We assume that the government deficit is financed by the high-powered money as follows:

$$\dot{H} = \gamma(\bar{Y} - Y) + G_0 - (t_w + t_\pi)Y. \tag{18}$$

Considering Equations (15) and (18), we obtain

$$\dot{H} = \varepsilon[\mu + \beta(i - \bar{\imath})] + \eta[\gamma(\bar{Y} - Y) - (t_w + t_\pi)Y + G_0], \quad \varepsilon > 0, \quad \eta > 0, \tag{19}$$

where. ε and η are the parameters for monetary and fiscal policies, and the mix of these policies. For example, this means that if ε is large and η is sufficiently small, only the monetary policy is applied. If both ε and η are large, a mix of these policies is used,

Next, we revise the dynamic equation of debt burden and the consumption function as follows:

$$\dot{D} = I - (1 - t_\pi)\theta Y + \delta i D, \tag{8'}$$

$$C = c(1 - \theta)(1 - t_w)Y + C_0, \quad 0 < c < 1, \quad C_0 > 0, \quad 0 < t_w < 1. \tag{10'}$$

Ordering equations (4), (9), (11), (19), (8'), and (10'), we obtain the following dynamic system (S_a):

$$\dot{Y} = \alpha[c(1 - t_w)(1 - \theta)Y + C_0 + g_1 Y - g_2 i(Y, H)D + g_0 + \eta\{\gamma(\bar{Y} - Y) + G_0\} - Y] \tag{S_b.1}$$

$$\dot{D} = g_1 Y - g_2 i(Y, H)D + g_0 - (1 - t_\pi)\theta Y + \delta i(Y, H)D \tag{S_b.2}$$

$$\dot{H} = \varepsilon[\mu + \beta(i(Y, H) - \bar{\imath})] + \eta[\gamma(\bar{Y} - Y) + G_0 - (t_w + t_\pi)Y)] \tag{S_b.3}$$

[15]We note that this policy is differs from k % rule proposed by Friedman. The Bank of Japan adopted an inflation-targeting policy in 2013 and also announced new quantitative and qualitative monetary easing measures, including a doubling of high-powered money.

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

$$J_b = \begin{pmatrix} f_{11} & f_{12} & f_{13} \\ f_{21} & f_{22} & f_{23} \\ f_{31} & 0 & f_{33} \end{pmatrix}, \tag{20}$$

$$\begin{aligned} f_{11} &= \alpha[g_1 - s - \eta\gamma - g_2 i_Y D], \quad f_{12} = -\alpha g_2 i < 0, \quad f_{13} = -\alpha g_2 i_H D > 0, \\ f_{21} &= g_1 - g_2 i_Y D - (1 - \eta t_\pi)\theta + \delta i_Y D, \quad f_{22} = (\delta - g_2)i, \\ f_{23} &= (\delta - g_2) i_H D, \quad f_{31} = \varepsilon\beta i_Y + \eta[-\gamma - (t_w + t_\pi)], \quad f_{33} = \varepsilon\beta i_H, \\ s &= 1 - c(1 - t_w)(1 - \theta) \end{aligned}$$

The characteristic equation of the dynamic system (S_b) is

$$\lambda^3 + a_1\lambda^2 + a_2\lambda + a_3 = 0, \tag{21}$$

where,

$$\begin{aligned} a_1 &= -g_{11} - g_{22} - g_{33} \\ &= -\alpha[g_1 - s - \eta\gamma - g_2 i_Y D] - (\delta - g_2)i - \varepsilon\beta i_H, \end{aligned} \tag{22}$$

$$\begin{aligned} a_2 = {} & \alpha i[(g_1 - s)\delta + \{s - (1 - t_\pi)\theta\}g_2] - \alpha i\eta\gamma(\delta - g_2) \\ & + \alpha g_2 i_H D[\varepsilon\beta i_1 - \eta\{\gamma + (t_w + t_\pi)\}] \\ & + [\alpha[g_1 - s - \eta\gamma - g_2 i_Y D] + (\delta - g_2)i]\varepsilon\beta i_H, \end{aligned} \tag{23}$$

$$a_3 = -[\alpha i[(g_1 - s)\delta + \{s - (1 - t_\pi)\theta\}g_2] - \alpha i\eta\gamma(\delta - g_2)]\varepsilon\beta i_H,^{16} \tag{24}$$

The above discussion proves the propositions below.

3.1 Monetary Policy

We first examine the effects of monetary policy. If we suppose that t_w, t_π, and η are sufficiently small, we obtain

$$a_1 = -\alpha[g_1 - s - g_2 i_Y D] - (\delta - g_2)i - \varepsilon\beta i_H \tag{22'}$$

$$a_2 = \alpha i[(g_1 - s)\delta + (s - \theta)g_2] + [\alpha(g_1 - s) + (\delta - g_2)i]\varepsilon\beta i_H \tag{23'}$$

$$a_3 = -\alpha i[(g_1 - s)\delta + (s - \theta)g_2]\varepsilon\beta i_H > 0. \tag{24'}$$

Next, we adopt the following assumption:

$$-\alpha[g_1 - s - g_2 i_Y D] - (\delta - g_2)i < 0 \tag{A.2}$$

This assumption $(A.2)$ means that the dynamic system (S_b) is locally unstable when β is sufficiently small. This means that the economy become unstable when the central bank adopts the x % rule. We assume that the x % rule is inappropriate and examine whether or not an interest targeting policy stabilizes the system.

In this case, we obtain Proposition 1 as follows:

Proposition 1: *Suppose that β is sufficiently large. The dynamic system (S_b) is locally stable when $\alpha(g_1 - s) + (\delta - g_2)i < 0$. In contrast, the dynamic system (S_b) is locally unstable when the $\alpha(g_1 - s) + (\delta - g_2)i > 0$.*

Proof. Suppose that β is sufficiently large. We have $a_1 > 0$ from (22'), and $a_2 > 0$ from (23') if $\alpha(g_1 - s) + (\delta - g_2)i < 0$. With respect to $a_1a_2 - a_3$,

$$a_1a_2 - a_3 = -[\alpha(g_1 - s) + (\delta - g_2)i](\varepsilon i_2)^2\beta^2 + \cdots .$$

Therefore, we have $a_1a_2 - a_3 > 0$ if $\alpha(g_1 - s) + (\delta - g_2)i < 0$. From (24'), we have $a_3 > 0$. Summarizing, we have $a_1 > 0$, $a_2 > 0$, $a_3 > 0$ and $a_1a_2 - a_3 > 0$ if $\alpha(g_1 - s) + (\delta - g_2)i < 0$. Therefore, in this case, Routh-Hurwitz conditions are satisfied.

In contrast, if $\alpha(g_1 - s) + (\delta - g_2)i > 0$ we have $a_2 < 0$. Therefore, the Routh-Hurwitz conditions are not satisfied if $\alpha(g_1 - s) + (\delta - g_2)i > 0$. Q.E.D.

Proposition 1 shows that stability depends on the sign of $\alpha(g_1 - s) + (\delta - g_2)i$. As noted above, $g_1 - s(> 0)$ is the real factor and $\delta - g_2$ is the HSP financial structure. Interest rate targeting stabilizes the economy only when the HSP financial structure is sufficiently stable. Interest rate targeting can eliminate instability of an LR financial structure ($i_Y < 0$); however, it cannot eliminate instability in the real factor ($g_1 - s > 0$). If an LR financial structure is stable ($i_Y > 0$), interest rate targeting could destabilize the economy. It is quite difficult to identify in advance which factors will destabilize an economy; therefore, interest rate targeting may not be appropriate.

3.2 Fiscal Policy

Next, we examine the effect of fiscal policy. If we suppose that ε is sufficiently small, we obtain

$$a_1 = -\alpha[g_1 - s - \eta\gamma - g_2 i_Y D] - (\delta - g_2)i, \tag{22"}$$

$$\begin{aligned} a_2 = {} & \alpha i[(g_1 - s)\delta + \{s - (1 - t_\pi)\theta\}g_2] \\ & - \alpha i\eta\gamma(\delta - g_2) + \alpha g_2 i_H D[-\eta\{\gamma + (t_w + t_\pi)\}], \end{aligned} \tag{23"}$$

$$a_3 = -[\alpha i[(g_1 - s)\delta + \{s - (1 - t_\pi)\theta\}g_2] - \alpha i\eta\gamma(\delta - g_2)](-\varepsilon\beta i_H), \tag{24"}$$

In this case, we obtain Proposition 2 as follows:

Proposition 2: *Suppose that γ is sufficiently large. The dynamic system (S_b) is locally*

unstable when $\delta - g_2 > 0$. *On the other hand, the dynamic system* (S_b) *may be locally stable when the* $\delta - g_2 < 0$.

Proof. Suppose that γ is sufficiently large. Regarding $a_1a_2 - a_3$,

$$a_1a_2 - a_3 = -\alpha^2[i(\delta - g_2) - g_2 i_H D]\eta^2\gamma^2 + \cdots .$$

Therefore, we have $a_1a_2 - a_3 < 0$ if $\delta - g_2 > 0$. Routh-Hurwitz conditions are not satisfied in this case.

On the other hand, if $\delta - g_2 < 0$ we have $a_1 > 0$ from (22"), and $a_2 > 0$ from (23"), and $a_3 > 0$ from (24") . We may also have $a_1a_2 - a_3 > 0$ when $\delta - g_2 < 0$. If $a_1a_2 - a_3 > 0$, we have $a_1 > 0$, $a_2 > 0$, $a_3 > 0$ and $a_1a_2 - a_3 > 0$. Therefore, Routh-Hurwitz conditions are satisfied in this case. Q.E.D.

Proposition 2 shows that the effect of fiscal policy depends on the HSP financial structure (the sign of $\delta - g_2$). Fiscal policy also stabilizes the economy when the HSP financial structure is sufficiently stable. Fiscal policy can eliminate instability from the LR financial structure ($i_Y < 0$) and the real factor ($g_1 - s > 0$). However, fiscal policy cannot eliminate the fragility (instability) of HSP financial structure.

3.3 Policy Mix

We now assume that both ε and η are large and examine the impact of a mix of monetary and fiscal policies. Here, we obtain Proposition 3 as follows:

Proposition 3: *Suppose that both* β *and* γ *is sufficiently large. The dynamic system* (S_b) *is locally stable when* $\delta - g_2 < 0$. *On the other hand, the dynamic system* (S_b) *may be locally unstable when the* $\delta - g > 0$.

Proof. Suppose that both β and γ are sufficiently large. We have $a_1 > 0$ from Equation (22) and $a_2 > 0$ from Equation (23). We also have $a_3 > 0$ when $\delta - g_2 < 0$. Regarding $a_1a_2 - a_3$, we have

$$a_1a_2 - a_3 = \alpha^2 i_2\eta^2\varepsilon\beta\gamma^2 + \alpha i_2^2\varepsilon^2\eta\beta^2\gamma + \cdots .$$

Therefore, we obtain $a_1a_2 - a_3 > 0$. If $\delta - g_2 < 0$, we have $a_1 > 0$, $a_2 > 0$, $a_3 > 0$ and $a_1a_2 - a_3 > 0$. Routh-Hurwitz conditions are satisfied in this case. In contrast, when $\delta - g_2 > 0$ we may have $a_3 < 0$. Routh-Hurwitz conditions are not satisfied. Q.E.D.

Proposition 3 indicates that the effect of a mix of monetary and fiscal policies also depends on the HSP financial structure (the sign of $\delta - g_2$). However, a combination of monetary and fiscal policies can be effective in stabilizing an economy. As shown above, monetary policy alone is not able to remove the instability inherent in real factors and may threaten stability in an LR financial structure. On the other hand, fiscal policy can have a stabilizing effect on unstable real factors.

The instability mechanism described in Proposition 3 is as follow. We assume that the economy is in a recession ($Y \downarrow$). The government increases expenditure ($G \uparrow$) and high-powered money also increases ($H \uparrow$). The interest rate i declines by the increase in high-powered money; therefore, the central bank decreases high-powered money and the interest rate i rises. The rise in interest rate restrains investment demand ($I \downarrow$) and increases the burden of interest-bearing debt ($iD \uparrow$). As a result, debt D increases and income Y decreases.

$$Y \downarrow \Rightarrow G \uparrow \Rightarrow H \uparrow \Rightarrow i \downarrow \Rightarrow H \downarrow \Rightarrow i \uparrow \Rightarrow iD \uparrow > I \downarrow \Rightarrow D \uparrow \Rightarrow Y \downarrow$$

A policy or institutional framework is needed to reduce instability when an HSP financial structure makes an economy unstable.

4 Conclusion

This study examines the effect of monetary, fiscal policies, and a mix of both, in a Keynesian macrodynamic model that considers two types of Minskian financial structures—LR and HSP—. In a dynamic system (S_a), Cycle 1 is destabilized by the real factor and Cycle 2 is destabilized by the financial factor. We emphasize that an increase in financial fragility, which refers to hedging, speculation and Ponzi scheme-based financing, occurs in both Cycle 1 and Cycle 2. In the real economy, it is quite difficult to identify factors that destabilize the economy when financial fragility is increasing. The main conclusions of this study are as follows:

In the dynamic system (S_b),

1) The effect of monetary policy depends on the sign of $\alpha(g_1 - s) + (\delta - g_2)i$, where $g_1 - s(> 0)$ is the real factor and $\delta - g_2$ is the HSP financial structure. Monetary policy stabilizes the economy only when an HSP financial structure is sufficiently stable.

2) The effect of fiscal policy depends on the HSP financial structure (the sign of $\delta - g_2$). Fiscal policy may also stabilize the economy when the HSP financial structure is stable. Fiscal policy can eliminate instability in an LR financial structure ($i_Y < 0$) and the instability of the real factor ($g_1 - s > 0$).

3) The effect of a mix of monetary and fiscal policies also depends on the HSP financial structure (the sign of $\delta - g_2$). However, a mix of both types of policies is more effective in stabilizing an LR economy.

These conclusions reflect the fact that we consider the LR and HSP financial structures within dynamic systems. We want to emphasize the significance of a stable HSP financial structure in stabilizing an economy. It is important to examine institutional frameworks when seeking stabilize the HSP financial structure.

Many aspects of this study remain to be developed further. For instance, this analysis is limited to a theoretical exposition. Ninomiya and Tokuda (2012) examine LR financial structure using a Vector Auto Regressive analysis. In a future study we will examine the effect of policies and policy mixes empirically. Furthermore, we need to introduce a dynamic equation of the expected inflation rate and examine the effect of inflation targeting.

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