

# On the Liquidation of Government Debt under A Debt-Free Money System – Modeling the American Monetary Act –

Kaoru Yamaguchi \*

Doshisha Business School

Doshisha University

Kyoto 602-8580, Japan

E-mail: kaoyamag@mail.doshisha.ac.jp

## Abstract

Runaway accumulation of government debt in Japan (and many OECD countries) under the recent financial crises seems to deprive the government of its effective policy discretion due to the burdens of debt repayment. This paper first examines that the government debt is structurally built in the current macroeconomic *system of money as debt* which is founded on the Keynesian macroeconomic framework, and it becomes very costly to reduce it, within the scheme, by raising tax or cutting expenditure. Then, it demonstrates how the government debt could be liquidated without cost under an alternative macroeconomic *system of debt-free money* that is proposed by the American Monetary Act. Finally, it is posed that debt-free macroeconomic system is far superior to the debt-burden current macroeconomic system in a sense that it can not only liquidate government debt but also attain higher economic growth.

## 1 Introduction

Since 2004 I have been working on a step-by-step construction of macroeconomic models in [11], [12], [13] and [14] based on the method of accounting system dynamics developed in [10]. This series of macroeconomic modeling was completed in [15] with a follow-up analytical refinement method of price adjustment mechanism in [16].

---

\*This paper was originally presented at the plenary session of the 28th International Conference of the System Dynamics Society, Seoul, Korea, July 26, 2010. With modest revisions, it is reported to the 6th Annual AMI Monetary Reform Conference, Sept. 30 - Oct. 3, 2010 at University Center in Downtown Chicago.

While my macroeconomic modeling was advancing, the current world-wide financial crises were triggered by the bankruptcy of Lehman Brothers in September, 2008, and the US government has been forced to bail out the troubled financial institutions with \$800 billion out of taxpayers' pockets, which in turn caused furious angers among American people.

These financial turmoils gave me, as a system dynamics researcher, a chance to re-think about the effectiveness of current macroeconomic system as a system design, since system dynamics is a methodology to help design a better system as Jay Forrester, founder of system dynamics, emphasized in 1961:

Labor turmoil, bankruptcy, inflation, economic collapse, political unrest, revolution, and war testify that we are not yet expert enough in the design and management of social systems [1, p.1].

## System of Money as Debt

Books such as [2] and [17] enlightened me as being an *expert enough* to understand that the currently dominant macroeconomic system has been founded on the basis of money as debt. In the United States, this monetary framework was instituted by the Federal Reserve Act in 1913, which allows the 100% privately-owned Federal Reserve Board to play a role of the central bank and issue money. Without exception almost all of macroeconomic textbooks such as [4], [5], [6], [3], which have been refereed to my modeling works, justify the current macroeconomic system without mentioning an alternative system, if any.

Specifically, the current macroeconomic system can be defined as a system of money as a debt in which government has no control over the issue of money, except a small amount of metal coinage. Under the system only the central bank has a control to issue money against debt borrowed by the government or commercial banks. See [11] for a detailed process of creating money. Growing economies constantly need to put newly issued money into circulation, yet under the current system it can only be fulfilled by the deficit of government with interest payment out of taxes. In other words, the government is systemically obliged to accumulate debt, as analyzed in [13].

Japanese government owns 55% of the shares of the central bank, that is, the Bank of Japan, yet it has no control over the issue of money. Accordingly, the government has to keep borrowing from the central bank with interest payment, though indirectly through the open market operations. In this sense, the Japanese macroeconomic system can also be said to be a system of money as debt.

What's wrong with this system? Nothing may be wrong if the system provides economic stability, full employment, fair income distribution and environmental sustainability. On the contrary, the system behaves oppositely, as theoretically analyzed in my model in [15], and historically evidenced by the Great Depression in 1929 and the recent financial crises, to pick up some major ones. Accordingly, seven reasons to abolish the system were articulated in [2], which seem convincing and hard to refute by rational economists. Due to the

limitation of space in this paper they are not quoted here, but the reader is encouraged to investigate them in detail. Moreover, voices seem to be surfacing increasingly in the Internet against the current monetary system as a fundamental cause of the recent financial crises, specifically against the privately-owned and controlled central bank, that is, the Fed in the United States<sup>1</sup>.

The current macroeconomic system has been structurally fabricated by the Keynesian economics, in which it is proposed that the additional government expenditure can rescue the troubled economy from recession. Yet, it fails to analyze why this fiscal policy is destined to accumulate government debt as mentioned above. In fact, even though GDP gap is very huge in Japan, yet due to the fear of runaway accumulation of debt, the government is very reluctant to stimulate the economy and, in this sense, it seems to have totally lost the discretion of public policies for the welfare of people even though production capacities and workers have been sitting idle and ready to be called in service. In other words, Keynesian fiscal policy cannot be applied to the troubled Keynesian macroeconomy. Isn't this an irony of the Keynesian theory? Macroeconomic system of money as a debt seems to have fallen into the dead-end trap.

The first objective of this paper is accordingly to reconfirm the fact that the accumulation of the government debt is built in the Keynesian macroeconomic system of money as debt.

## System of Debt-Free Money

As a system dynamics modeler and designer, I have now to pose a question if there exists an alternative macroeconomic system that helps escape from the above dead-end trap of the current system? One of the answers seem to be presented in [17, Chap.24] and [18] as a macroeconomic system of debt-free money. This alternative system can be compactly defined as having the following three features:

- Governmental control over the issue of money
- Abolishment of credit creation
- Constant inflow of money to sustain economic growth and welfare

Accordingly, the second objective of this paper is to construct a macroeconomic model which incorporates the above three features and examine if this alternative system could help liquidate government debt or not. Before moving on, let us take a closer look at these features in detail.

### Governmental control over the issue of money

In macroeconomics, the amount of money to be issued by the central bank is called *monetary base* or *high-powered money*. In order for the government to control the issue of money and monetary base, the American Monetary Act suggests as follows:

---

<sup>1</sup>For instance, <http://www.themoneymasters.com> and <http://www.monetary.org>.

First, the Federal Reserve system becomes incorporated into the U.S. Treasury. This nationalizes the money system, not the banking system. Banking is *not a proper function of government*, but control and oversight of the money system *must be done by government* [18, p.12].

In Japan, the government owns 55% of the shares of the Bank of Japan. Accordingly, its incorporation to the government could be rather smoothly done, though the government, its major shareholder, is currently prohibited from the bank's decision-making process by law. In Europe, two incorporation processes could be possible. First, EU member countries are politically integrated into, say, the United States of Europe, which in turn establishes its own federal European government and incorporate the current European Central Bank into its branch. Or the ECB is once again disintegrated and incorporated into the governments of member countries, respectively.

### **Abolishment of credit creation**

Credit can be created by the lending of commercial banks, and becomes a part of money supply, because it plays a role of means of exchange. See [11] for a detailed analysis of credit creation. The credit creation has been called *money out of nothing* or *money out of thin air* by Keynes. It is made possible because banks are required to hold only a fraction of deposits (with the central bank) and can lend the remaining larger portion. This system is called *a fractional reserve banking system*. Heavily-criticized practice of leveraged investment that led to the recent financial crises is made possible by the credit creation. Under a debt-free money system, this fractional reserve banking system is abolished; that is, a fractional reserve ratio has to be 100%. The American Monetary Act suggests as follows:

Second, the accounting privilege banks now have of creating money through fractional reserve lending of their credit is stopped entirely, once and for all. Banks remain private companies and are encouraged to act as intermediaries between their clients who want a return on their savings and those clients willing to pay for borrowing those savings, but they may no longer create any part of the nation's money supply [18, p.12].

It will be worthwhile to clarify a position of money in an economy. Suppose there exists  $N$  commodities in an economy. Under gold standard or commodity money standard, one of the commodities becomes money against which the remaining  $N-1$  commodities are exchanged. Hence, quantity of money is limited by the production of gold or commodity money. Under a fractional reserve banking system, credit is created and used as *low-powered* money in addition to monetary base or high-powered money. In other words, 2 types of money are being used for the exchange of  $N$  commodities. Finally, under a system of debt-free money, only the government-issued fiat money is used to exchange

for  $N$  commodities. Schematically, positions of money under different monetary system is summarized as follows:

Gold or Commodity Money Standard  
 $(N - 1) + \text{Gold}$

Fiat Money as Debt  
 $N + \text{Currency in Circulation} + \text{Credit(Deposits)}$

Debt-free Fiat Money  
 $N + \text{Money}$

### Constant inflow of money

Growing economy demands for a growing amount of money as a means of exchange if monetary value is to be sustained. This can be easily verified from the following quantity theory of money:

$$MV = PT = kPY \quad (1)$$

where  $M$  is money supply,  $V$  is a velocity of money,  $P$  is a price level,  $T$  is the amount of transaction,  $Y$  is real GDP, and  $k$  is a so-called Marshall's  $k$ .

Assuming that  $V$  and  $k$  are constant, we have

$$\frac{\dot{M}}{M} = \frac{\dot{P}}{P} + \frac{\dot{Y}}{Y} \quad (2)$$

Thus, to sustain a monetary value by avoiding inflation or deflation, we have to attain  $\dot{P}/P = 0$ . This implies that  $\dot{M}/M = \dot{Y}/Y$ ; that is, money has to be issued and put into circulation in accordance with the economic growth.

Under a system of money as debt, the injection of new money into circulation has only been carried out by the privately-controlled central bank at its discretion and for its interest. Under a debt-free money system, two channels for money injection becomes available. First, the government can directly distribute newly issued money into circulation as an additional expenditure according to its public policies supported by voters in the field of infrastructures, education, medical care, green technologies and environment. Second, the central bank, now as a part of government, can make loans to commercial banks, free of interest, according to a guideline set by governmental growth strategies for the interest and welfare of people.

As to the new issue of money, American Monetary Act suggest as follows:

Third, new money is introduced into circulation by government spending it into circulation starting with the \$2.2 trillion the engineers tell us is needed for infrastructure repair and renewal. In addition, health care and education are included as human infrastructure. Everyone supports the infrastructure, but they worry how to pay for it. That becomes possible with the passage of the American Monetary Act [18, p.12].

## Battles to Control the Money System

Human history could be, in a sense, said to be a history of battles to control the issue of money; that is, the battles between a system of money as debt and a system of debt-free money in our terminology here, or between interest-bearing money and interest-free money.

Science of money, according to [17], was founded by Aristotle (384-322BC). He viewed that “Money exists not by nature but by law(nomos)“ . His view has been supported through the church’s condemnation of usury up to the work by the philosopher George Berkeley<sup>2</sup> in his 1735 book of questions “Querest”. Neglecting his work, Adam Smith, father of economics, ended the battle by supporting the Bank of England, founded in 1694, as a system of money as debt in his book *The Wealth of Nations* in 1776.

This battle is summarized as Aristotle’s science of money vs. Adam Smith’s metallic view of money. . . . Whether money should be tangible wealth and thereby be privately controlled to benefit the wealthy (Smith), or be an abstract legal fiat power publicly controlled to promote the general welfare (Aristotle) [18, p.6].

In the United States, this battle was finalized when the Federal Reserve Act was approved and system of money as debt has been introduced [2]. Since then science of money has been lost and economists showed no doubt on the role of money as debt, including Keynes. The lost science has been reflected in many macroeconomics textbooks, including the ones as briefly mentioned above.

The dominance of current macroeconomic system is being challenged again with the introduction of the American Monetary Act under the recent financial crises. As a system dynamics researcher and a professionally trained economist, I’m of the opinion that it is a reclaiming process of *the lost science of money* to construct macroeconomic models which enable us to compare these two systems and evaluate them impartially in terms of economics as a science.

## 2 The Macroeconomic System Revisited

For the comparative analysis of the two macroeconomic systems, the integrated macroeconomic model developed in [13] is revisited in this paper. According to the discussions above, the model is classified as a macroeconomic system of money as debt, in which five macroeconomic sectors are assumed to play interdependent activities simultaneously; that is, producers, consumers, banks, government and the central bank. Figure 1 illustrates the overview of the macroeconomic system in this paper, and shows how these macroeconomic sectors interact with one another and exchange goods and services for money. Foreign sector is excluded from the model.

---

<sup>2</sup>University of California at Berkeley, where I studied mathematical economics in late 70’s and early 80’s, was named after the philosopher Berkeley.

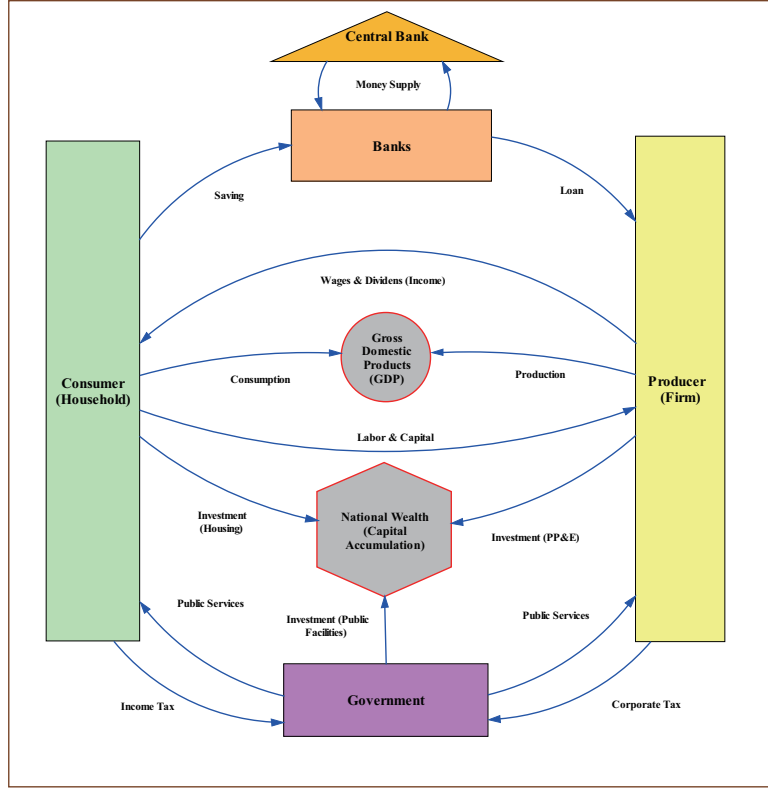


Figure 1: The Macroeconomic System Revisited

## Production Function

To make our analysis simple enough without losing generality, the above integrated model is slightly revised such that labor market is excluded from the model. This is also in accordance with my viewpoint that labor market should be abolished from a market economy as a better economic system, which is proposed as the MuRatopian economy in [9]<sup>3</sup>. Accordingly, the Cobb-Douglas production function needs to be replaced with the following production function

$$Y = \text{Min}(Y_{full}, Y^D), \quad (3)$$

in which full capacity output level  $Y_{full}$  is specified as follows:

$$Y_{full} = e^{\kappa t} \frac{1}{\theta} K, \quad (4)$$

<sup>3</sup>The MuRatopian economy is presented as an alternative system, beyond capitalist market economy and planned socialist economy, suitable for the information age of the 21st century. However, money system is missing in the economy, I admit. While writing this paper, I become convinced that a debt-free money system should be indeed a monetary system of the MuRaopian economy.

where  $\kappa$  is an annual increase rate of technological progress, and  $\theta$  is a capital-output ratio. Furthermore, the amount of desired output  $Y^D$  is defined as a sum of the amount of inventory replacement and aggregate demand forecasting:

$$Y^D = (\text{Desired Inventory} - \text{Inventory}) + \text{AD Forecasting}. \quad (5)$$

The revised production function and the determination process of GDP are illustrated in Figure 2.

## Price Flexibility

Besides the simplification of production function, two minor sophistications are made to the model; that is, a price adjustment mechanism and a consumption function. Based on [16] price adjustment mechanism is revised as follows. First, price is adjusted according to the discrepancies between full capacity output  $Y_{full}$  and desired output  $Y^D$ , which are called GDP gap. Price is also allowed to adjust directly to the discrepancies between inventory  $I_{inv}$  and its desired inventory  $I_{inv}^*$ , which are called inventory gap here.

Hence, the adjusted equation can be described as

$$\frac{dP}{dt} = \Psi(Y^D - Y_{full}, I_{inv}^* - I_{inv}). \quad (6)$$

Let us specify the equation as follows:

$$\frac{dP}{dt} = \frac{P^* - P}{\text{Delay Time}} \quad (7)$$

The desired price  $P^*$  is obtained as

$$P^* = \frac{P}{\left( (1 - \omega) \frac{Y_{full}}{Y^D} + \omega \frac{I_{inv}^*}{I_{inv}} \right)^e} \quad (8)$$

where  $\omega$ ,  $0 \leq \omega \leq 1$ , is a weight between production and inventory ratios, and  $e$  is an elasticity. Figure 3 illustrates the revised adjustment processes of price and interest rate.

## Consumption Function

Consumption, which was assumed to be determined by a constant marginal propensity to consume in the previous integrated model, is now assumed to be dependent on a relative price elasticity of consumption such that

$$c(P) = \frac{c}{\left( \frac{P}{P_0} \right)^e} \quad (9)$$

where  $P_0$  is an initial price level and  $e$  is a price elasticity of consumption. As price level goes up, marginal propensity to consume gets smaller. In this way, consumption is affected by the relative size of prices and its elasticity.



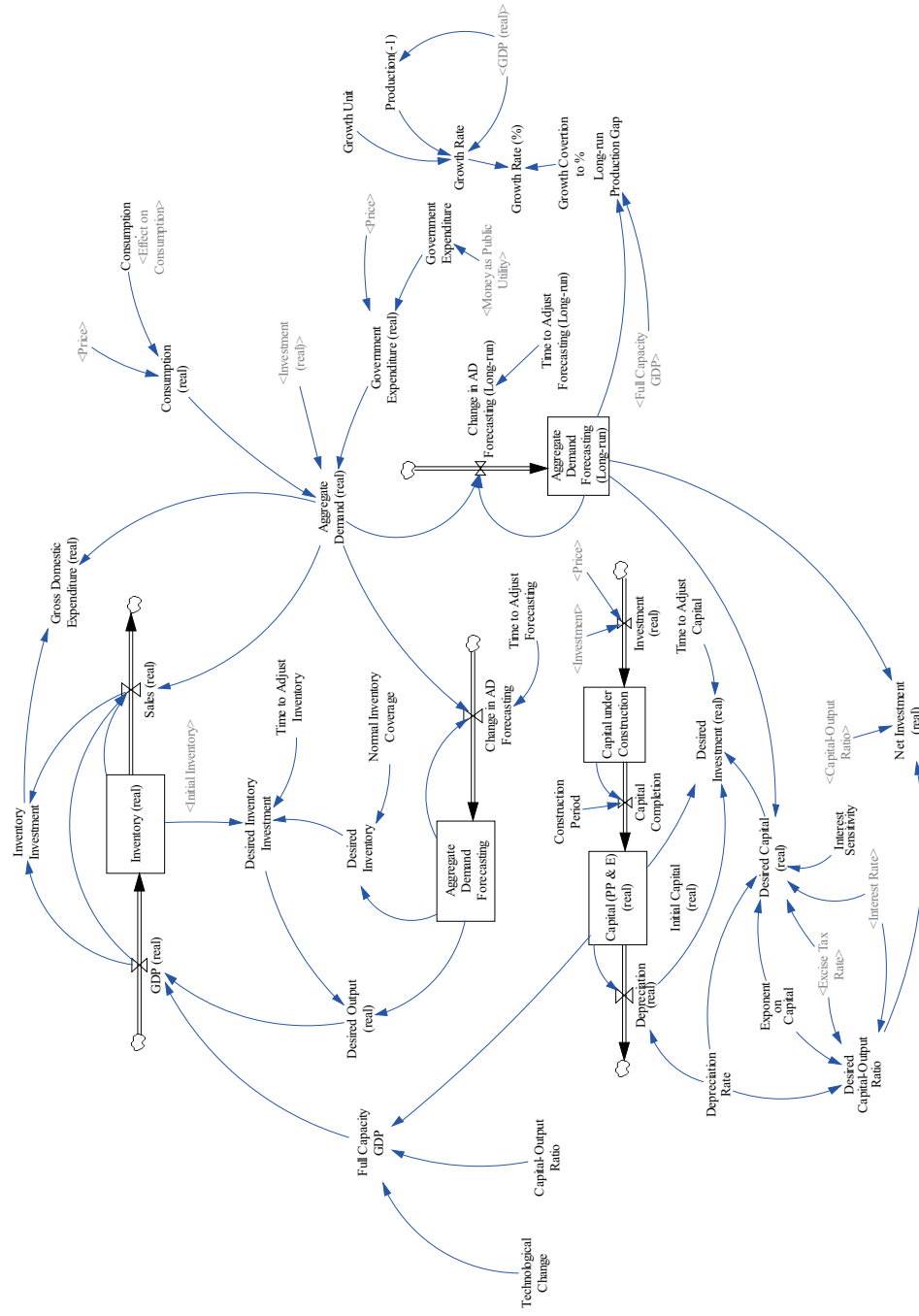


Figure 2: Production Function and the Determination of GDP



Accordingly, the revised consumption function becomes

$$C(P) = C_0 + c(P)Y_d \quad (10)$$

The consumption function thus revised has a feature of a downward-sloping demand function, similar to a demand curve of consumers at a microeconomic level. This minor behavioral change, however, does not significantly affect the system structure of the model.

### 3 Macroeconomic System of Money as Debt

We are now in a position to describe some transactions by producers, consumers, government, banks and the central bank under the current macroeconomic system of money as debt. They are basically the same as already explained in [13], and repeated here for the convenience of the reader.

#### Producers

Major transactions of producers are, as illustrated in Figure 4, summarized as follows.

- Out of the GDP revenues producers pay excise tax, deduct the amount of depreciation, and pay wages to workers (consumers) and interests to the banks. The remaining revenues become profits before tax.
- They pay corporate tax to the government out of the profits before tax.
- The remaining profits after tax are paid to the shareholders (that is, consumers) as dividends.
- Producers are thus constantly in a state of cash flow deficits. To continue new investment, therefore, they have to borrow money from banks and pay interest to the banks.

#### Consumers

Transactions of consumers are illustrated in Figure 5, some of which are summarized as follows.

- Consumers receive income as wages and dividends from producers.
- Financial assets of consumers consist of bank deposits and government securities, against which they receive financial income of interests from banks and government. (No corporate shares are explicitly modeled.)
- In addition to the income such as wages, interests, and dividends, consumers receive cash whenever previous securities are partly redeemed annually by the government.



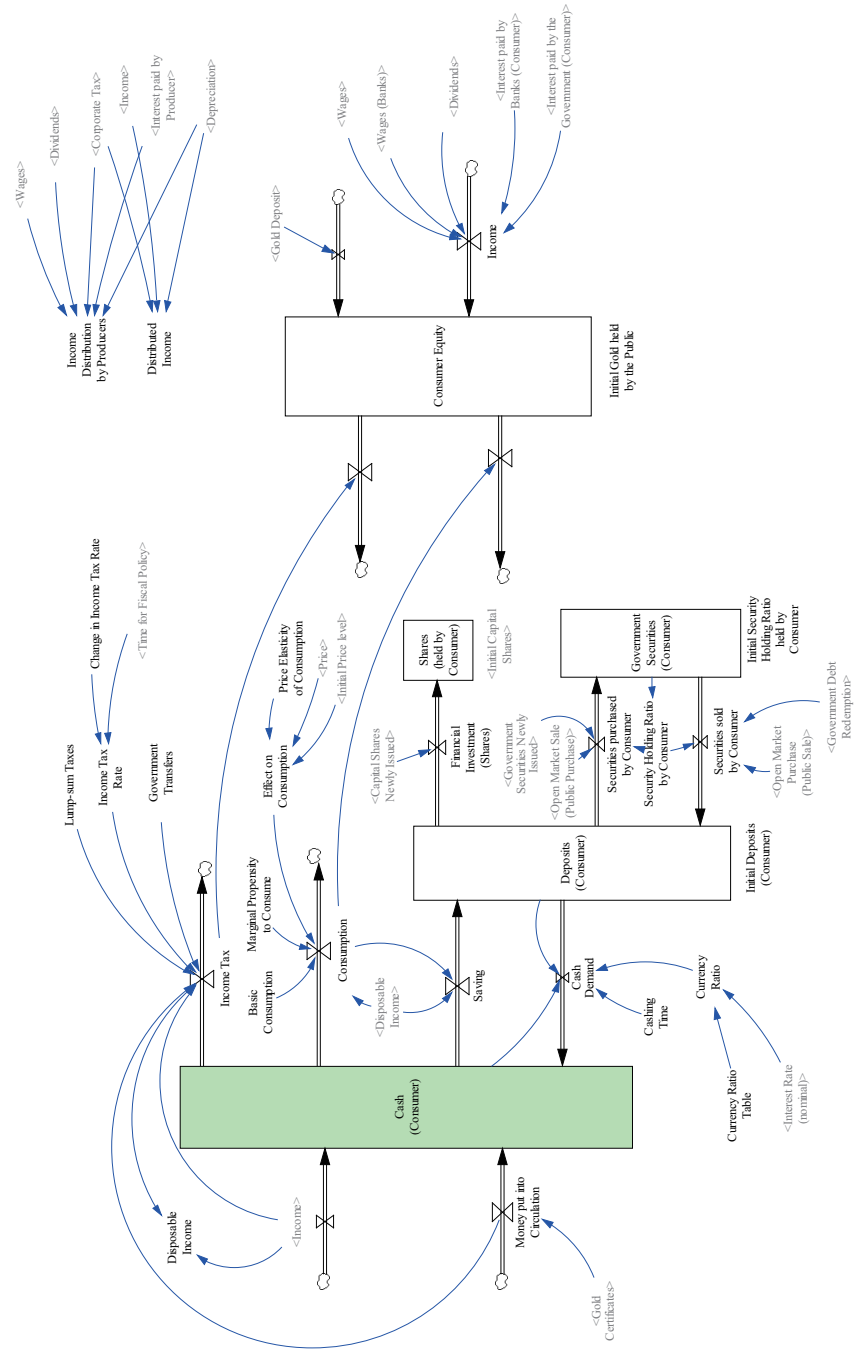


Figure 5: Transactions of Consumer

- Out of these cash income as a whole, consumers pay income taxes, and the remaining income becomes their disposal income.
- Out of their disposal income, they spend on consumption. The remaining amount are either saved or spent to purchase government securities.

## Government

Transactions of the government are illustrated in Figure 6, some of which are summarized as follows.

- Government receives, as tax revenues, income taxes from consumers and corporate taxes from producers as well as excise tax on production.
- Government spending consists of government expenditures and payments to the consumers for its partial debt redemption and interests against its securities.
- Government expenditures are assumed to be endogenously determined by either the growth-dependent expenditures or tax revenue-dependent expenditures.
- If spending exceeds tax revenues, government has to borrow cash from banks and consumers by newly issuing government securities.

## Banks

Transactions of banks are illustrated in Figure 7, some of which are summarized as follows.

- Banks receive deposits from consumers, against which they pay interests.
- They are obliged to deposit a fraction of the deposits as the required reserves with the central bank (which is called a fractional reserve banking system).
- Out of the remaining deposits loans are made to producers and banks receive interests for which a prime rate is applied.
- Their retained earnings thus become interest receipts from producers less interest payment to consumers. Positive earning will be distributed among bank workers as consumers.







## Central Bank

In this revised model, the central bank plays an important role of issuing money or currency. Sources of its assets against which money is issued are simply confined to gold, discount loans and government securities. The central bank can control the amount of money supply through the amount of monetary base consisting of currency outstanding and bank reserves. This monetary control can be carried out through monetary policies such as a manipulation of required reserve ratio and open market operations as well as direct control of lending to the banks.

Transactions of the central bank are illustrated in Figure 8, some of which are summarized as follows.

- The central bank issues money (historically gold certificates) against the gold deposited by the public.
- It can also issue money by accepting government securities through open market operation, specifically by purchasing government securities from the public (consumers) and banks. Moreover, it can issue money by making discount loans to commercial banks. (These activities are sometimes called creation of *money out of nothing*.)
- It can similarly withdraw money by selling government securities to the public (consumers) and banks, and through debt redemption by banks.
- Banks are required by law to reserve a certain fraction of deposits with the central bank. By controlling this required reserve ratio, the central bank can control the monetary base directly.
- The central bank can, thus, control the amount of money supply through monetary policies such as open market operations, reserve ratio and discount rate.
- Another powerful but hidden control method is through its direct influence over the amount of discount loans to banks (known as *window guidance* in Japan.)

## 4 System Behaviors of Money as Debt

### Mostly Equilibria in the Real Sector

The revised model is now complete. It is a generic model, out of which diverse macroeconomic behaviors will be generated. In this paper we only focus on an equilibrium growth path of the macroeconomy. An equilibrium state is called a *full capacity aggregate demand equilibrium* if the following three output and demand levels are met:

$$\text{Full Capacity GDP} = \text{Desired Output} = \text{Aggregate Demand} \quad (11)$$



If the economy is not in the equilibrium state, then actual GDP is determined by

$$\text{GDP} = \text{MIN} (\text{Full Capacity GDP}, \text{Desired Output} ) \quad (12)$$

In other words, if desired output is greater than full capacity GDP, then actual GDP is constrained by the production capacity, meanwhile in the opposite case, GDP is determined by the amount of desired output which producers wish to produce, leaving the capacity idle.

Does the equilibrium state, then, exist in the sense of full capacity aggregate demand GDP? By trial and error, mostly equilibrium states are acquired when a ratio elasticity of the effect on price  $e$  is 1, and a weight of inventory ratio  $\omega$  is 0.1, as illustrated in Figure 9.

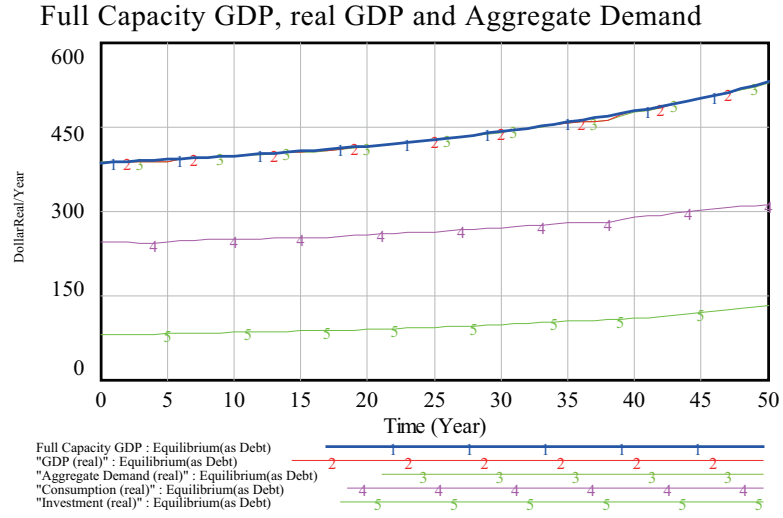


Figure 9: Mostly Equilibrium States

The reader may wonder why this is a state of mostly equilibria, because growth rates and inflation rates are still fluctuating as shown in Figure 10. Specifically, growth rates fluctuates between 1% and - 0.8%, and inflation rates between 0.1% and - 0.2%. Our heart pulse rate, even of a healthy person, fluctuates between 60 and 70 per minute. Yet, this is a normal state. In a similar fashion, it is reasonable to consider these fluctuations as normal equilibrium states.

In the previous paper [13], these equilibrium states are used as a benchmarking state for comparison, and examined various disequilibrium cases such as fix-price disequilibria, business cycles caused by inventory coverage and elastic price fluctuation, and economic recession caused by credit crunch. Then it is analyzed how these disequilibria may be fixed toward equilibria through monetary and fiscal policies. For the purpose of this paper, our analysis is confined only to the case of liquidation of government debt.

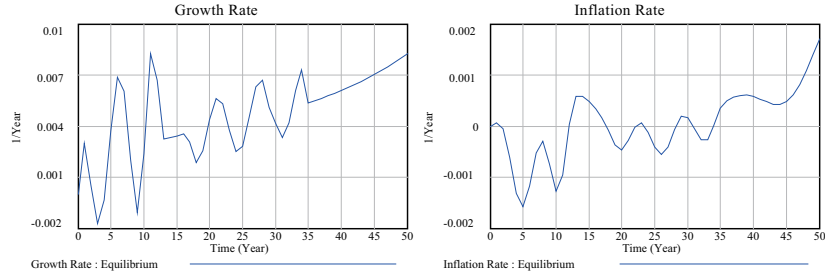


Figure 10: Growth and Inflation Rates of Mostly Equilibrium States

## Money as Debt

For the attainment of mostly equilibria, enough amount of money has to be put into circulation to avoid recessions caused by credit crunch as analyzed in [13]. Demand for money mainly comes from banks and producers. Banks are assumed to make loans to producers as much as desired so long as their vault cash is available. Thus, they are persistently in a state of shortage of cash as well as producers. In the case of producers, they could borrow enough fund from banks. From whom, then, should the banks borrow in case of cash shortage?

In a closed economic system, money has to be issued or created within the system. Under the current financial system of money as debt, only the central bank is endowed with a power to issue money within the system, and make loans to the commercial banks directly and to the government indirectly through the open market operations. Commercial banks then create credits under a fractional reserve banking system by making loans to producers and consumers. These credits constitute a major portion of money supply. In this way, money and credits are only crated when commercial banks and the government as well as producers and consumers come to borrow at interest. If all debts are repaid, money ceases to exit. This is an essence of a system of money as debt. This process of creating money is known as *money out of nothing*.

Figure 11 indicates unconditional amount of annual discount loans and its growth rate by the central bank at the request of desired borrowing by banks. In other words, money has to be incessantly created and put into circulation in order to sustain an economic growth under mostly equilibrium states. Roughly speaking, a growth rate of credit creation by the central bank has to be in average equal to or slightly greater than the economic growth rate as suggested by the right hand diagram of Figure 11.

In this way, the central bank begins to exert an enormous power over the economy through its credit control. What happens if the central bank fails to supply enough currency intentionally or unintentionally? An economic recession by credit crunch as analyzed in [13]. An influential role of the central bank which caused economic bubbles and the following burst in Japan during 90's is completely analyzed by Warner in [7] and [8]. Our macroeconomic model might provide an analytical foundation to support his new findings in the role of the

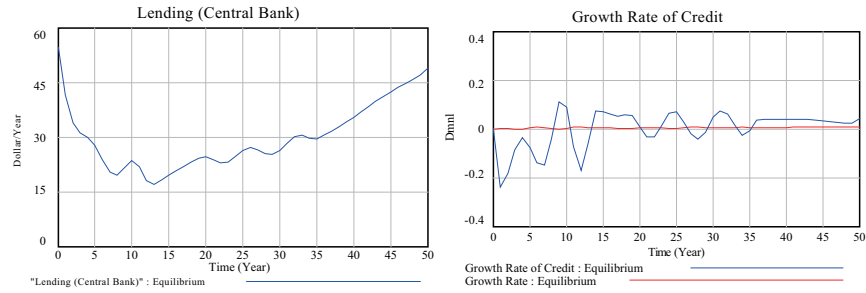


Figure 11: Lending by the Central Bank and its Growth Rate

central bank.

## Government Debt

So long as the mostly equilibria are realized in the economy, through monetary and fiscal policies in the days of recession, no macroeconomic problem seems to exist. This is a positive side of Keynesian macroeconomic theory. Yet behind the full capacity aggregate demand growth path in Figure 9 government debt continues to accumulate as the line 1 in the left diagram of Figure 12 illustrates. This is a negative side of the Keynesian theory. Yet most macroeconomic textbooks neglect or less emphasize this negative side, partly because their macroeconomic frameworks cannot handle this negative side of the system of money as debt.

Primary balance ratio is initially set to be one and balanced budget is assumed here; that is, government expenditure is set to be equal to tax revenues, and no deficit seems to arise. Why, then, does the government continue to accumulate debt? Government deficit is precisely defined as

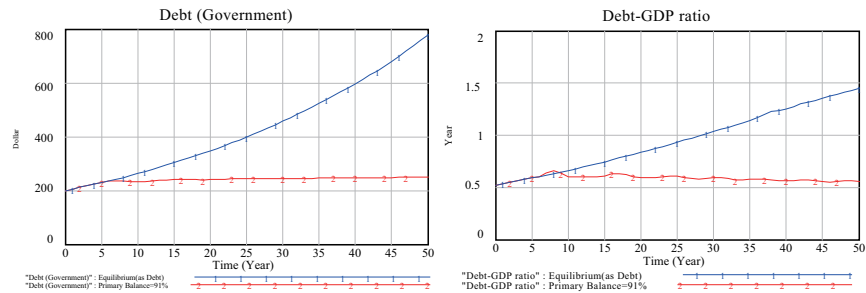


Figure 12: Accumulation of Government Debt and Debt-GDP Ratio

$$\text{Deficit} = \text{Tax Revenues} - \text{Expenditure} - \text{Debt Redemption} - \text{Interest} \quad (13)$$

Therefore, even if balanced budget is maintained, the government still has to

keep paying its debt redemption and interest. This is why it has to keep borrowing and accumulating its debt. Initial GDP in the model is obtained to be 386, while government debt is initially set to be 200. Hence, the initial debt-GDP ratio is around 0.52 year (similar to the current ratios among EU member countries). Yet, the ratio continues to increase to 1.45 year at the year 50 in the model as illustrated by the line 1 in the right diagram of Figure 12. This implies the government debt becomes 1.45 years as high as the annual level of GDP.

Can such a high debt be sustained? Absolutely no. Eventually this runaway accumulation of government debt may cause nominal interest rate to increase, because the government may be forced to keep borrowing by paying higher interests, which may eventually cause hyper-inflation<sup>4</sup>.

Higher interest rates may in turn trigger a sudden drop of government security price, deteriorating values of financial assets owned by banks, producers and consumers. The devaluation of financial assets may force some banks and producers to go bankrupt eventually. In this way, another financial crisis becomes inevitable and government is eventually destined to collapse as well. This is one of the hotly debated scenarios about the consequences of the rapidly accumulating debt in Japan, whose debt-GDP ratio in 2009 was 1.893 years; the highest among OECD countries! Compared with this, debt-GDP ratios in the model seem to be still modest.

Remarks: if this scenario of financial breakdown due to the runaway accumulation of debt fails to be observed in the near future, still there exist some legitimate reasons to stop the accumulating debt. First, it continues to create unfair income distribution in favor of bankers and financial elite, causing inefficient allocation of resources and economic performances, and eventually social turmoils by the poor. Second, forced payment of interest forces the indebted producers to continue incessant economic growth to the limit of environmental carrying capacity, which eventually leads to the collapse of environment. In short, system of money as debt is unsustainable as an economic system.

## Liquidation of Government Debt

Let us now consider how to avoid such a financial crisis and collapse. At the face of the financial crisis as discussed above, suppose that the government is forced to reduce its debt-GDP ratio to less than 0.6 by the year 50, as required to all EU members by the Maastricht treaty. To attain this goal, a primary balance ratio has to be reduced to 0.91 in our economy. In other words, the government has to make a strong commitment to repay its debt annually by the amount of 9 % of its tax revenues. Let us assume that this reduction is put into action at the year 6. Under such a radical financial reform, as illustrated by the line 2 in the right diagram of Figure 12, debt-GDP ratio will be reduced to around 0.56, and the accumulation of debt will be eventually curved (line 2 in the left diagram).

---

<sup>4</sup>This feedback loop from the accumulating debt to the higher interest rate is not yet fully incorporated in the model.

Even so, this radical financial reform becomes very costly to the government and its people as well. At the next year of the implementation of 9 % reduction of a primary balance ratio, growth rate is forced to drop to minus 5 %, and the economy fails to sustain a full capacity aggregate demand equilibrium of line 1 as illustrated by the line 2 in Figure 13. Compared with the mostly equilibrium path of line 1, debt-reducing path of line 2 causes economic recession, followed by business cycles.

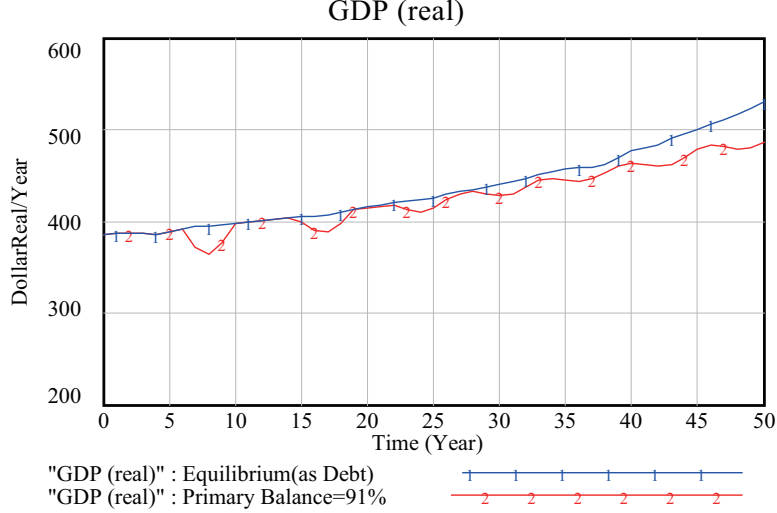


Figure 13: Comparison of GDP paths

## 5 Macroeconomic System of Debt-Free Money

We are now in a position to implement the alternative macroeconomic system discussed in the introduction, as proposed by the American Monetary Act, in which the central bank is incorporated into the government and a fractional reserve banking system is abolished. Let us call this new system a macroeconomic system of debt-free money. Money issued in this new system plays a role of public utility of medium of exchange. Hence the newly incorporated institution may be appropriately called *the Public Money Administration* in this paper.

Under this incorporation, transactions of the government, commercial banks and the public money authority (formally the central bank) need to be revised slightly. Let us start with the description of the revised transactions of the government.

## Government

- Balanced budget is assumed to be maintained; that is, a primary balance ratio is unitary. Yet the government may still incur deficit due to the debt redemption and interest payment.
- Government now has the right to newly issue money whenever its deficit needs to be funded. The newly issued money becomes seigniorage inflow of the government into its equity or retained earnings account.
- The newly issued money is simultaneously deposited with the reserve account of the Public Money Administration. It is also booked to its deposits account of the government assets.
- Government could further issue money to fill in GDP gap.

Revised transaction of the government is illustrated in Figure 14. Green stock box of deposits is newly added to the assets.

## Banks

Revised transactions of banks are summarized as follows.

- Banks are now obliged to fully deposit the amount of deposits they owe as the required reserves with the public money administration. Time deposits are excluded from this obligation.
- When the amount of time deposits is not enough to meet the demand for loans from producers, banks are allowed to borrow from the public money administration free of interest; that is, former discount rate is now zero. Allocation of loans to the banks will be prioritized according to the public policies of the government. (This constitutes a market-oriented issue of new money. Alternatively, the government can also issue new money directly through its public policies to fill in GDP gap as already discussed above.)

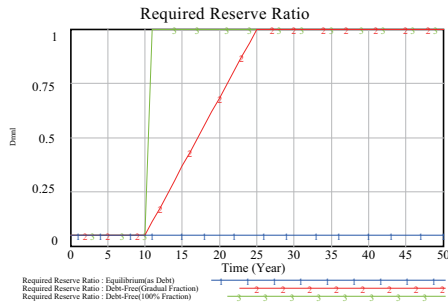


Figure 15: Required Reserve Ratios

Line 1 in Figure 15 illustrates the original required reserve ratio of 5%. We assume two different ways of abolishing a fractional reserve banking system. Line 2 shows that the 100% fraction (full reserves) is gradually attained in 10 years at the year 25, starting from the year 10, meanwhile line 3 indicates that the 100% fraction is attained immediately at the year 10.





## Public Money Administration (Formerly Central Bank)

The central bank now becomes incorporated as one of the governmental organizations which is here called the Public Money Administration (PMA). Its revised transactions become as follows.

- The PMA accepts newly issued money of the government as seigniorage assets and enter the same amount into the government reserve account. Under this transaction, the government needs not print hard currency, instead it only sends digital figures of the new money to the PMA.
- When the government want to withdraw money from their reserve accounts at the PMA, the PMA could issue new money according to the requested amount. In this way, for a time being, former central bank note and government money coexist in the market.
- With the new issue of money the PMA meets the demand for money by commercial banks, free of interest, according to the guideline set by the government public policies.

Under the revised transactions, open market operations of sales and purchases of government securities become ineffective, simply because government debt gradually diminishes to zero. Furthermore, discount loan is replaced with interest-free loan. This lending becomes a sort of open and public *window guidance*, which once led to the rapid economic growth after World War II in Japan [7]. Accordingly, interest incomes from discount loans and government securities are reduced to be zero eventually. Transactions of the public money administration are illustrated in Figure 16. Green stock boxes of seigniorage assets and government reserves are newly added.

## 6 System Behaviors of Debt-Free Money

### Liquidation of Government Debt

Under this alternative macroeconomic system of debt-free money, the accumulated debt of the government gets gradually liquidated as demonstrated in Figure 17, which is the same as Figure 12 except that lines 3 and 4 are added here. Recollect that line 1 was a benchmark debt of the mostly equilibria under the system of money as debt, while line 2 was the decreased debt when debt-ratio is reduced under the same system. Now newly added line 3 indicates that the government debt continues to decline when a gradual fraction ratio is applied, while line 4 shows a reduction of the government debt when 100% fraction (full reserves) is applied at the year 10. Both lines coincide, meaning that the abolishment methods of a fractional level do not affect the liquidation of the government debt, because banks are allowed to fill in the enough amount of cash shortage by borrowing from the PMA in the model.



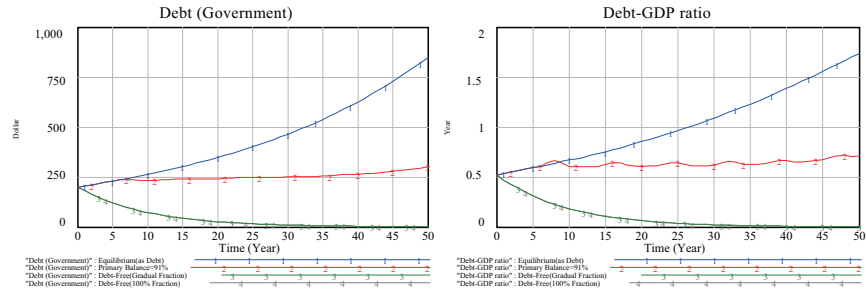


Figure 17: Liquidation of Government Debt and Debt-GDP Ratio

Under the system of debt-free money, a higher GDP is attained, to our surprise, than the one under the system of money as debt as illustrated by lines 3 & 4 in Figure 18. Moreover, it shows that the gradual abolishment of a fractional reserve banking system (line 3) attains a higher GDP than the one by a sudden abolishment of fractional reserves at the year 10 (line 4). In either case, system of debt-free money can be said to be a far better system because of the accomplishment of higher economic growth without inflation.

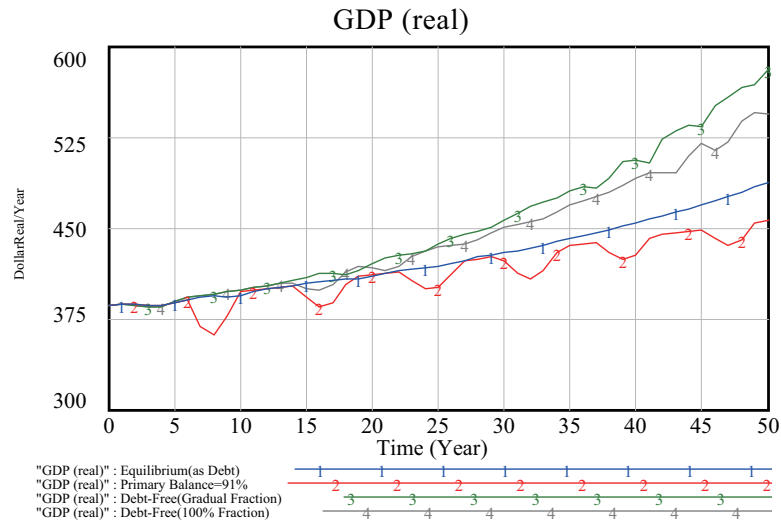


Figure 18: Comparison of GDP paths

In fact, left diagram in Figure 19 illustrates that price of line 3 increases at maximum to 1.6% at the year 17, and inflation rate of line 3 in the right diagram is constantly below 0.3% at maximum.

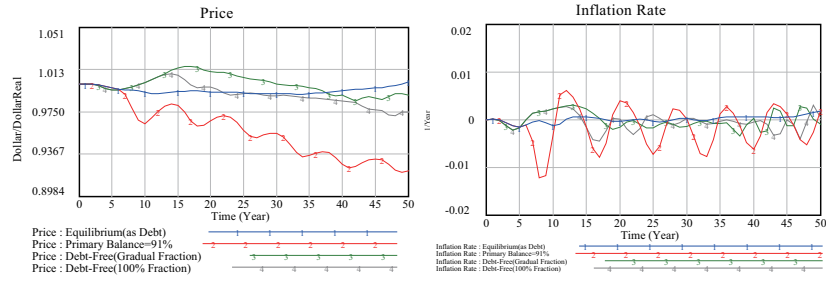


Figure 19: Price Level and Inflation Rate

## Inflation and GDP Gap

Persistent objection to the system of debt-free money has been that government, once a free-hand power of issuing money is being endowed, tends to issue more money than necessary, which tends to bring about inflation eventually, though history shows the opposite [17].

Theoretically, under the existence of GDP gap, increase in the government expenditure by issuing new money would not cause inflation, but stimulate the economic growth instead. To examine this case, let us first create a GDP gap by changing the exponent of capital from 0.4 to 0.43 as illustrated by line 1 in Figure 20, in which the GDP gap is observed between the year 5 and 10. Faced with this recession, money as public utility is being newly issued by the amount of 23 for 10 years starting at the year 6. This corresponds to a continual inflow of money into circulation as proposed in the introduction. As a result equilibrium is attained again as illustrated by line 2 in the left diagram, yet inflation does not seem to appear as line 2 of the right diagram indicates.

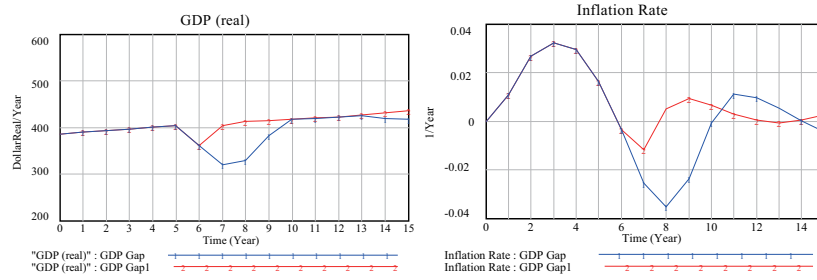


Figure 20: No Inflation under GDP Gap

Inflation could occur only when government mismanages the money supply. To examine this case, let us take a benchmark state attained by the gradual fraction equilibrium, then assume that the government increases its spending by mistakenly issuing new money by the amount of 10 for 3 years, starting at the year 10; that is, the government expenditure continues to increase to 74 from 64 for three years.

As being expected, the increase in the government expenditure under the equilibrium state surely causes inflation, 2% at the year 13, as illustrated by line 2 of the left diagram of Figure 21, followed by the deflation of -2% at the year 17. To be worse, this inflation triggers economic recession of -6.6% at the year 16 as illustrated by line 2 in the right diagram. Figure 22 shows business

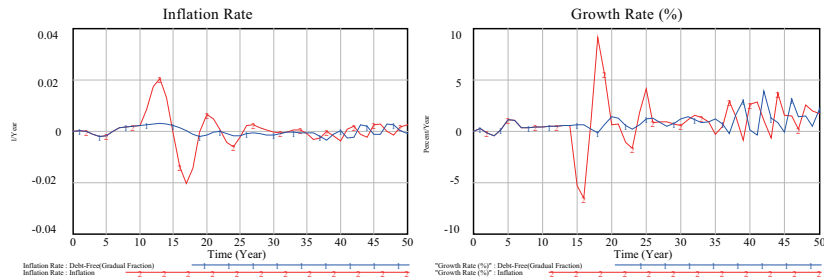


Figure 21: Inflation under No GDP Gap

cycles caused by the mismanagement of the increase in money supply when no GDP gap exists.

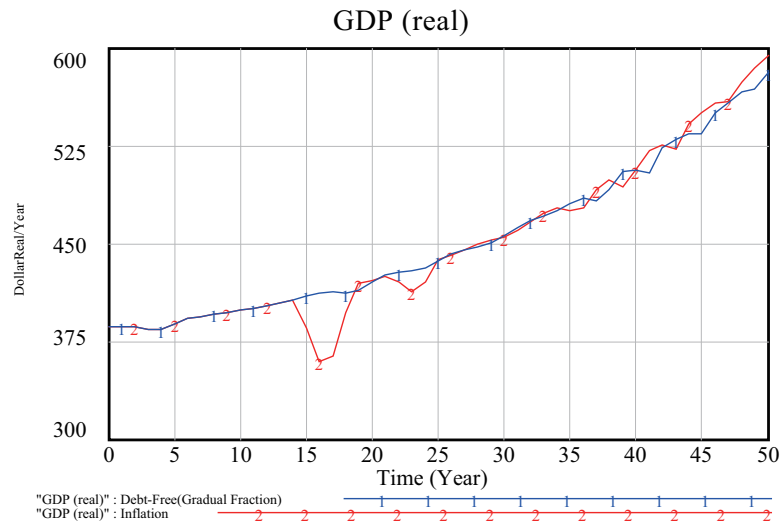


Figure 22: Business Cycles caused by Inflation under No GDP Gap

## Maximum Tolerable Inflation

This could be a serious moral hazard lying under the system of debt-free money, because the incumbent government tries to cling to the power by unnecessarily stimulating the economy in the years of election as history demonstrates.

Business cycle thus spawned is called *political business cycle*. “There is some evidence that such a political business cycle exists in the United States, and the Federal Reserve under the control of Congress or the president might make the cycle even more pronounced [6, p.353].” Proponents of the central bank take advantage of this cycle as an excuse for establishing the independence of the central bank from the intervention by the government. On the contrary, recent financial crises and runaway accumulation of government debt are caused, indeed, by the independence of the central bank under the system of money as debt.

How can we avoid the political business cycle, then, without resorting to the independence of the central bank? As a system dynamics researcher, I suggest an introduction, by law, of a feedback loop of stabilizing monetary value which forces a resignation of the government in case of higher inflation, or at least the head of the Public Money Administration to step down.

How high inflation, then, can we be tolerant of? The American Monetary Act stipulates the maximum interest rate of 8% per year, including all fees.

Because before 1980/1981, forty nine States had “anti-usury” laws which limited normal interest rates to a maximum of between 6% and 10% p.a. (one state had 12%). The American Monetary Act takes the middle of this range to represent a restoration of the interest limits prevailing across the country prior to 1980/1981 [18, p.27].

From the following relation,

$$\text{Nominal interest rate} = \text{Real interest rate} + \text{Inflation rate} \quad (14)$$

we have, for non-negative real interest rate  $\geq 0$ ,

$$\text{Maximum Nominal interest rate (= 8\%)} \geq \text{Inflation rate} \quad (15)$$

That is to say, the maximum tolerable inflation rate has to be not higher than 8% under the system of debt-free money. The success of the system depends on the legalization of a forced step down of the government or the head of the public money administration in case of the inflation rate higher than 8%.

## Debt-free Monetary Policy

The role of the public money administration under the macroeconomic system of debt-free money is to maintain the monetary value, similar to the role assigned to the central banks under the system of money as debt. Interest rate is no longer controlled by the public money administration, and left to be determined in the market. History shows that bubble and its burst have been caused by the purposive manipulation of the interest rates such as overnight call rate and federal fund rate by the privately-owned central bank for the benefits of financial elite. In this sense, we will be finally freed from the control of the central bank.

Accordingly, the only tool to stabilize the monetary value is through the public management of the amount of money in circulation. This could be carried out through the control of lending money to the banks and through the fiscal policy. Specifically, in case of inflationary state, lending money to the banks may be curbed, or the money in circulation could be sucked back by raising taxes or cutting government spending. In case of deflation, demand for money by the banks would be weak, so that government has to take a strong leadership by spending more than tax revenues with newly issued money. In this way, complicated monetary policies such as the manipulation of required reserve ratio, discount ratio, and open market operations under the system of money as debt are no longer required.

Finally, it would be worth mentioning that system of debt-free money is ecologically friendly to the environment, because forced payment of interest will be replaced with interest-free money, and borrowers of money, mainly producers, need not be driven into forced economic growth at the cost of environmental destruction. System of debt-free money is indeed a system of sustainability.

## 7 Conclusion

This paper investigates how to liquidate runaway government debt under the current financial crises. First, the current system is identified as a macroeconomic system of money as debt, under which the accumulation of government debt is built into the system by the Keynesian theory, and the reduction of debt-GDP ratio becomes, it is demonstrated, very costly, triggering economic recessions and business cycles.

Then the alternative system is suggested as the system of debt-free money, in which only the government can issue money, and the government debt, it is shown, can to be gradually eliminated. Moreover, it turns out that higher economic growth is simultaneously attained.

In this sense, the alternative macroeconomic system, from a viewpoint of system design, seems to be worth being implemented if we wish to avoid accumulating government debt, unfair income distribution, repeated financial crises, war and environmental destruction.

## References

- [1] Jay W. Forrester. *Industrial Dynamics*. Pegasus Communications, Inc., Originally published by MIT Press, Waltham, MA, USA, 1961.
- [2] Edward G. Griffin. *The Creature from Jekyll Island - A Second Look at the Federal Reserve*. American Media, California, USA, 2006.



- [3] E. Robert Hall and B. John Taylor. *Macroeconomics*. W.W. Norton & Company, New York, 5th edition, 1997.
- [4] N. Gregory Mankiw. *Macroeconomics*. Worth Publishers, New York, 5th edition, 2003.
- [5] Campbell R. McConnell and Stanley L. Bruce. *Macroeconomics - Principles, Problems, and Policies*. McGraw-Hill/Irwin, New York, seventeenth edition, 2008.
- [6] Frederic S. Mishkin. *The Economics of Money, Banking, and Financial Markets*. Addison Wesley, New York, 7th edition, 2006.
- [7] Richard A. Werner. *Princes of the Yen: Japan's Central Bankers and the Transformation of the Economy*. M.E. Sharpe, New York, 2003.
- [8] Richard A. Werner. *new paradigm in macroeconomics: solving the riddle of japanese macroeconomic performance*. Palgrave Macmillan, New York, 2005.
- [9] Kaoru Yamaguchi. *Beyond Walras, Keynes and Marx – Synthesis in Economic Theory Toward a New Social Design*. Peter Lang Publishing, Inc., New York, 1988.
- [10] Kaoru Yamaguchi. Principle of accounting system dynamics– modeling corporate financial statements –. In *Proceedings of the 21st International Conference of the System Dynamics Society*, New York, 2003. System Dynamics Society.
- [11] Kaoru Yamaguchi. Money supply and creation of deposits : Sd macroeconomic modeling (1). In *Proceedings of the 22nd International Conference of the System Dynamics Society*, Oxford, England, 2004. The System Dynamics Society.
- [12] Kaoru Yamaguchi. Aggregate demand equilibria and price flexibility : Sd macroeconomic modeling (2). In *Proceedings of the 23rd International Conference of the System Dynamics Society*, Boston, USA, 2005. The System Dynamics Society.
- [13] Kaoru Yamaguchi. Integration of real and monetary sectors with labor market: Sd macroeconomic modeling (3). In *Proceedings of the 24th International Conference of the System Dynamics Society*, Nijmegen, The Netherlands, 2006. The System Dynamics Society.
- [14] Kaoru Yamaguchi. Balance of payments and foreign exchange dynamics: Sd macroeconomic modeling (4). In *Proceedings of the 25th International Conference of the System Dynamics Society*, Boston, USA, 2007. The System Dynamics Society.

- [15] Kaoru Yamaguchi. Open macroeconomies as a closed economic system: Sd macroeconomic modeling completed. In *Proceedings of the 26th International Conference of the System Dynamics Society*, Athens, Greece, 2008. The System Dynamics Society.
- [16] Kaoru Yamaguchi. Logical vs historical time in a price adjustment mechanism. In *Proceedings of the 27th International Conference of the System Dynamics Society*, Albuquerque, New Mexico, 2009. The System Dynamics Society.
- [17] Stephen Zarlenga. *The Lost Science of Money: The Mythology of Money - the Story of Power*. American Monetary Institute, New York, 2002.
- [18] Stephen Zarlenga. *Presenting the American Monetary Act (as of July 18, 2009)*. American Monetary Institute, <http://www.monetary.org/32pageexplanation.pdf>, 2009.