

Chapter 7

Interest and Equity

In the previous two chapters we have analyzed how money stock is created (supply side) under a fractional reserve banking system and how it is endogenously determined (demand side) by the borrowing behaviors of producers, households and government, and lending attitudes of banks. This chapter analyzes how money stock is affected by the introduction of interest. It is assumed that bank loans, deposits and discount loans are no longer interest-free, and different interest rates are applied to them. As a result, money stocks turn out to be changed due to changes in currency in circulation, money multipliers, etc. More importantly, it is found that equity tends to be distributed in favor of commercial banks and the central bank. This chapter completes our trilogy of Chapters 5, 6 and 7 on money.

7.1 What is Interest?

In the previous two chapters, it is argued that money is created as debts by non-financial sectors such as public (producers and households) and government, and commercial banks under a fractional reserve banking system. If money is created this way to meet the growing demand for economic transactions as a medium of exchange, the banking system becomes essential sector for economic activities.

Debts are, however, not free in our economy. When non-financial sector borrows money from commercial banks, they have to pay interest. In other words, commercial banks charge interest for making loans. What is interest, then? According to a typical macroeconomic textbook, “Interest is the price for the use of money. It is the price that borrowers need to pay lenders for transferring purchasing power to the future (259 page in [54]).

If extra money is sitting idle at hand without a specific plan to be used in the near future, why can’t we let someone who are in need for medium of exchange use it free of charge? As a matter of fact, usury has been historically prohibited. Yet greedy bankers began to charge interest when loans were made. Eventually, to secure more fund for loans from those who have extra money in

non-financial sector, bankers began to attract those extra money at interest. And in a capitalist market economy, as the above quotation of the textbook justifies, no one now doubts that “interest is the price for the use of money.”

Since system dynamics is a method for designing a better system, it’s worth while to consider whether it’s possible to design an economy that is free of interest charge. To examine this question, let us expand our models of money creation in the previous chapter 5 one by one to the models with interest payments.

Analytical Framework

Our analysis of money and interest in this chapter starts along with the framework of flow and stock approaches presented in the previous chapter 5. However, instead of analyzing behaviors of money creation one by one separately as done in the previous chapter. we explore the impact of interest on equity as the accumulated behaviors of money creation on the previous creation process. Specifically, processes of money creation are assumed to take place as integrated phases as follows.

- (0) Gold Standard 0: Base run of the gold standard model in the previous chapter 5 with the initial amount of gold \$200 by default.
- (1) Gold Standard: Our economy starts with the initial amount of gold held by the public public with the introduction of interest rate and prime rate.
- (2) Discount Loans to Banks: \$100 at $t = 6$.
To increase money stock furthermore to meet the increased economic activities and payments, central bank makes discount loans additionally to commercial banks.
- (3) Government Debt: \$100 at $t = 8$.
Government is further forced to issue its securities to meet its budget deficits, or implement Keynesian fiscal policies to stimulate economic activities.
- (4) Open Market Purchase: 50% purchase of existing government securities at $t = 16$.
Central bank exercises open market purchase operation to buy existing government securities in the market in order to increase base money, and money stock.
- (5) Open Market Sale: 50% sale of government securities held by the central bank at $t = 22$. Central bank now tries to reduce money stock in circulation to curb inflation through its open market sale operation that only decrease base money (not money stock directly).

Simulation file names used for these simulations are the same as phase title names. For instance, in the case of (1) Gold Standard, its simulation file names

for flow and stock approaches are Gold Standard (Flow-approach) and Gold Standard (Stock-approach), respectively. In this way, five phases of money creation out of nothing by loans are analyzed under both flow and stock approaches in a unified and integrated fashion.

7.2 Money and Interest under Gold Standard

7.2.1 (1) Flow Approach

Let us start with the interest model of flow approach [Companion model: 1 Money-Interest(Gold).vpm]. In this model two types of interest rates are introduced. When commercial banks receive deposits, they apply an *interest rate* per dollar deposit to non-financial sector. On the other hand, when they make loans to non-financial sector, they charge a higher interest rate called a *prime rate* per dollar loan. The difference is called *spread* here and becomes a major source of income by the commercial banks. In this way, two different prices of interest rates begin to be introduced for commercial banks. Interest rate and prime rate are set here to be 2% and 3%, respectively

The receipts of interest become interest incomes and are treated as inflows to the equity, while its payments become interest expenses and are booked as outflows from the equity. Figure 7.1 reflects these transactions and becomes a revised model of money and interest under gold standard.

Under the introduction of interest, base money is not affected since gold held by the central bank does not change, Currency in circulation drops from \$133 to \$114, and non-financial sector's deposits increases from \$667 to \$788, resulting in the decrease in actual currency ratio from 0.2 to 0.145 at $t=30$. Actual reserve ratio remains at 0.1. Accordingly, money multiplier increases from 4 to 4.67 at $t=30$, but high-powered money decreases slightly from \$200 to \$193. Money stock increases from \$800 to \$902 at $t=30$ as illustrated by line 2 in the left-hand diagram of Figure 7.2.

In this way, an introduction of interest has a positive effect to increase money stock through the decrease in actual currency ratio.

A more drastic change under the introduction of interest is observed in the distribution of equity between non-financial sector and commercial banks. The amount of equity in the non-financial sector, Equity(Public), begins to decline from \$200 to \$16.6 at $t=30$, while that of the commercial banks increases from zero to \$183.4 at $t=30$ as illustrated by lines 2 and 3 in the right-hand diagram of Figure 7.2. Compositions of the equity among the public (line 2) and banks (line 3) become 8.3% and 91.7% at $t=30$.

Since no production is assumed in this simple economy of gold standard, its entire equity or net assets is the gold of \$200 dollars held by the non-financial public sector, which remains the same through the process of money creation. The introduction of interest causes the economy's equity to be redistributed between non-financial public sector and commercial banks. In other words, the commercial banks can forcefully exploit non-financial sector's equity as long as

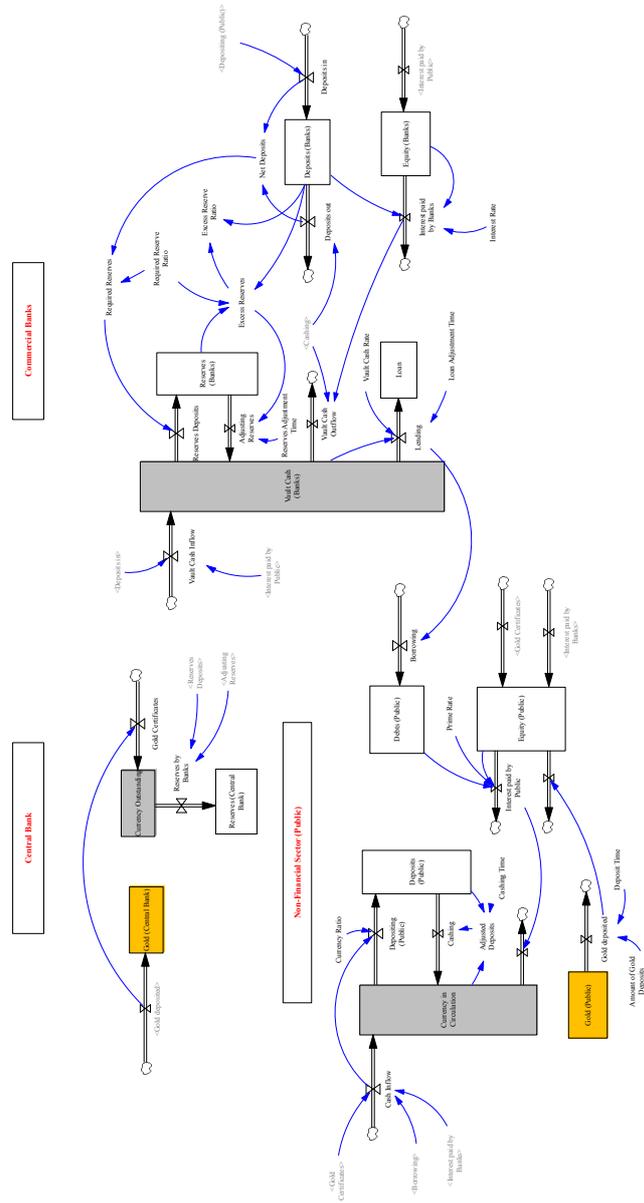


Figure 7.1: Money and Interest under Gold Standard: Flow Approach

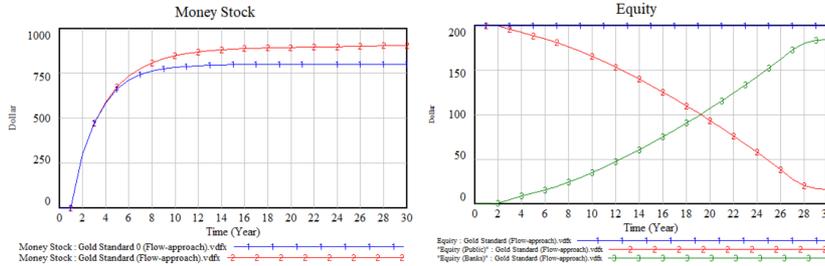


Figure 7.2: Money Stock and Equity under Gold Standard: Flow Approach

the spread value is positive, no matter how positive interest payments (here 2%) please depositors in the non-financial sector. This becomes the essence of the introduction of interest to the monetary economy; that is, a root cause of income inequality under debt money system.

7.2.2 (1) Stock Approach

Stock approach model [Companion model: 1a Money-Interest(Gold-S).vpm] is illustrated in Figure 7.3. This stock approach model slightly differs from the flow approach model in the sense that the amount of money loaned by commercial banks and interests paid by them are now directly transferred to the deposits account of the non-financial public sector. This method of loan payments indicate straightforwardly that banks creates money out of nothing directly into non-financial sector’s deposits account. Interest against this deposits by the public is also paid directly into the public sector’s deposits account. Let us now examine how these changes affect money stock and equity or income distribution.

Under the stock approach, base money is not affected since gold held by the central bank does not change. Currency in circulation drops slightly from \$133 to \$128, and non-financial sector’s deposits decreases from \$667 to \$640, yet this does not change actual currency ratio around 0.2. On the other hand, actual reserve ratio slightly increases from 0.1 to 0.112 at $t = 30$. Accordingly, money multiplier decreases from 4 to 3.84 at $t=30$, but high-powered money remains at \$200. Money stock decreases from \$800 to \$768 at $t= 30$ as illustrated by line 2 in the left-hand diagram of Figure 7.4.

In this way, an introduction of interest has a negative effect to decrease money stock through the increases in actual reserve ratio. This contrasts with the increase in money stock under the flow approach.

The amount of equity, however, in the non-financial sector, Equity(Public), also begins to decline from \$200 to \$58.3 (instead of 16.6 under flow approach) at $t=30$, while that of the commercial banks increases from zero to \$141.7 (instead of 183.4 under flow approach) at $t=30$ as illustrated by lines 2 and 3 in the right-hand diagram of Figure 7.4. Compositions of the equity among the public (line

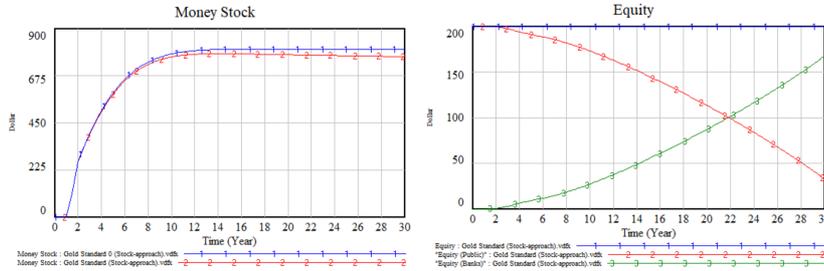


Figure 7.4: Money Stock and Equity under Gold Standard: Stock Approach

2) and banks (line 3) are 29.2% and 70.8% at $t=30$. Hence, equity(public) or income inequality for non-financial sector shows similar trend as the one under the flow approach. That is to say, the introduction of interest to the monetary economy is shown to become a root cause of income inequality irrespective of our analysis under flow approach or stock approach.

7.3 Money and Interest under Loans to Banks

7.3.1 (2) Flow Approach

What happens if the central bank makes discount loans of \$100 to commercial banks to increase base money and hopefully money stock? To examine this effect, let us assume that the discount rate charged by the central bank is 0.01 [Companion model: 2 Money-Interest(Loan).vpm]. Comparisons in this subsection are made between gold standard and discount loans to banks under the same flow approach. In this case, money multiplier increases slightly from 4.67 to 4.77 at $t=30$, and high-powered money increases from \$193 to \$266.5. Accordingly, money stock increases from \$902 to \$1,272 as illustrated by lines 2 and 3 in the left-hand diagram of Figure 7.5 (in the previous chapter 5 without interest it was \$1,200).

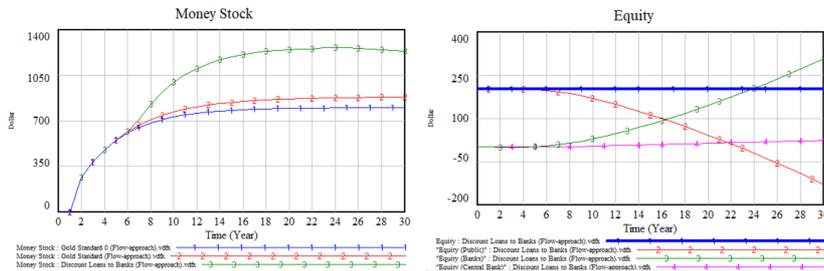


Figure 7.5: Money Stock and Equity under Loans to Banks

The amount of equity in the non-financial sector, Equity(Public), begins to plunge from \$16.6 to \$-130.2 at $t = 30$ (line 2),¹ while that of the commercial banks increases from \$183.4 to \$306.8 (line 3) as illustrated in the right-hand diagram. Moreover, the equity of the central bank increases from zero to \$23.4 (line 4) due to the discount loans to commercial banks. Total equity of the public, banks and central bank remains the same as gold standard; that is, \$200. Whenever central bank makes loans to commercial banks, the total equity is further squeezed to the Equity(Central Bank) so that equity of commercial banks is partly extorted. Compositions of the equity among the public (line 2), banks (line 3) and central bank (line 4) are -65.1%, 153.4% and 11.7% at $t=30$.

7.3.2 (2) Stock Approach

The effects on money stock and equity under stock approach are obtained with [Companion model: 2a Money-Interest(Loan-S).vpm]. Comparisons in this subsection are made between gold standard and loans to banks under the stock approach. In this approach, money multiplier stays almost around 3.83 at $t=30$, and high-powered money increases from \$200 to \$276.6. Accordingly, money stock increases from \$769 to \$1,058 at $t = 30$ as illustrated by lines 2 and 3 in the left-hand diagram of Figure 7.6.

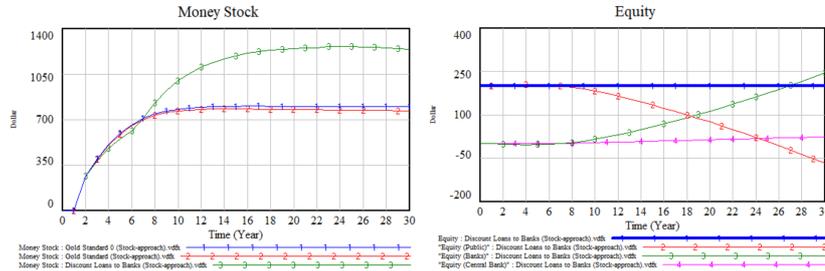


Figure 7.6: Money Stock and Equity under Loans to Banks

The amount of equity in the non-financial sector, Equity (Public), begins to decline from \$58.3 to \$-68.2 at $t = 30$, while that of the commercial banks increases from \$141.7 to \$244.8 as illustrated by lines 2 and 3 in the right-hand diagram. Moreover, the equity of the central bank increases from zero to \$23.4 (line 4) due to the the discount loans to commercial banks. The total equity of the public, banks and central bank remains the same as gold standard; that is, \$200. Whenever central bank makes loans to commercial banks, equity of \$200 is further squeezed to the Equity(Central Bank) so that non-financial sector's equity as well as commercial banks' equity are extorted. Total equity of the

¹In the real economic model, of course, negative values become unacceptable. Accordingly, this negative value has to be filled in by other incomes such as wages for households, and profits by producers. For the sake of equity analysis per se, negative values are tolerated in this model.

public, banks and central bank remains the same under the gold standard; that is, \$200. Compositions of the equity among the public (line 2), banks (line 3) and central bank (line 4) are -34.1%, 122.4% and 11.7% at $t=30$. In the case of discount loans to banks, it is observed that money stock of flow approach increases more than that of stock approach, while equity redistribution of flow approach spreads a little bit wider than that of stock approach. Yet in both cases, equity is redistributed in favor of the banks and central bank. That is, the root causes of inequality remain the same; the introduction of interest.

7.4 Money and Interest under Government Debt

7.4.1 (3) Flow Approach

What happens if government borrows by issuing its securities of \$100 at $t=8$ to meet the demand for money stock due to the limitation of money creation with discount loans to banks. Let us run the flow approach model [Companion model: 3 Money-Interest(Flow-approach).vpm]. In the previous chapter 5 it is discussed that government debt merely does not increase money stock (represented by "Government Debt 0" file here). Money stock can be increased only when base money (mainly reserves) or high-powered money increases. With the introduction of interest rate and prime rate as well as security interest rate which is assumed to be the same as the interest rate of 2%, government debt now increases money stock (represented by "Government Debt" file) as follows. Currency in circulation drops from \$200 to \$155.5, which reduces actual currency ratio from 0.2 to 0.144, which in turn increases money multiplier from 4 to 4.586 at $t=30$. Simultaneously, high-powered money decreases from \$300 to \$269.5, and base money decreases from \$300 to \$276.6 at $t=30$. These changes increase money stock slightly from \$1,200 to \$1,236, and money stock(data) from \$1,200 to \$1,243 at $t = 30$. Left-hand diagram of Figure 7.7 illustrate these changes in money stock by lines 1 and 2. Right-hand diagram indicates that government equity further drops from \$-100 to \$-153.5.

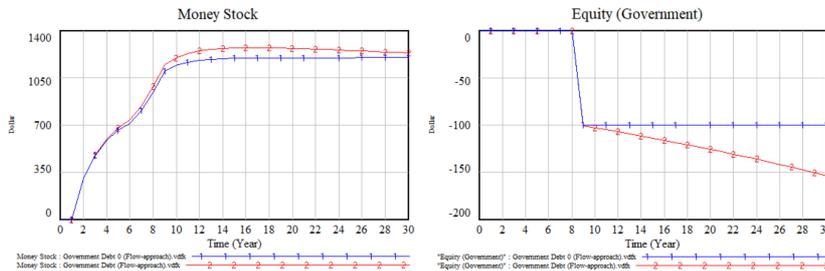


Figure 7.7: Money Stock and Equity under Government Debt Compared

With these preliminary results in mind, let us continue our analysis of the

behaviors of money stock and equity. Comparisons below are made between discount loans to banks (phase 2) and government debt (phase 3) As illustrated in the left-hand diagram of Figure 7.8, money stock becomes \$1,236 (line 4) at $t=30$ as compared with \$1,272 (line 3), meanwhile line 1 and 2 are money stocks under gold standard without interest and with interest; that is, \$800, and \$902.1, respectively. This indicates that government debt does not merely increase money stock by the introduction of interest.

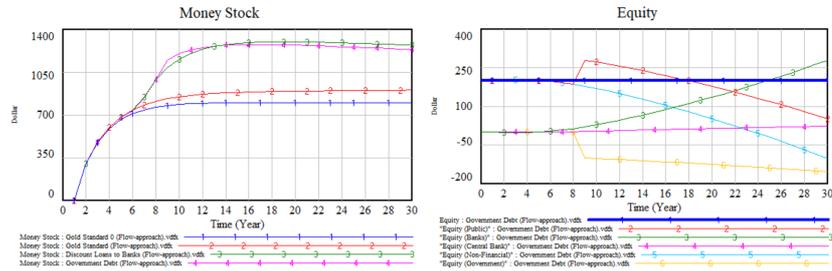


Figure 7.8: Money Stock and Equity under Government Debt

Right-hand diagram shows a new distribution of equity among non-financial sectors (public and government), commercial banks and central bank. Equity (public) increases to the maximum level at $t=9$ (line 2) from the original values of \$200 to \$278,8 (139.4% increase!), following the issues of government securities at $t=8$. This gives us an impression that government debt increases non-financial public sector's equity, thanks to which we the people become rich. Alas, this temporal increase in public equity is made possible by the negative equity of government (line 6); that is, from zero to \$-100 at $t=9$. Eventually, equity(public) begins to decline to \$51.1 and equity (government) to \$-153.5 at $t=30$. Combined non-financial sector's equity by the public and government (line 5) consequently becomes negative; that is, \$-102.4 at $t=30$.

On the other hand, equity of banks go beyond the equity of the economy as a whole (\$200) to \$278.9 (line 3) at $t=30$. Again this extreme inequality of equity in favor of banks is supported by the negative equity value of government. Equity of central bank (line 4) increases from zero to \$23.4%. Total equity at $t=30$ is the same as gold standard; that is, %200. In summary, compositions of the equity among the public (line 2), banks (line 3), central bank (line 4) and government (line 6) becomes 25.5%, 139.5%, 11.7% and -76.7% at $t=30$.

7.4.2 (3) Stock Approach

We now run the stock approach model [Companion model: 3a Money-Interest(Stock-approach).vpm]. In the previous chapter 5 it is pointed out that government debt merely does not increase money stock (represented as "Government Debt 0" file here). However, we have discussed above that government debt increases money stock under flow approach because of the introduction of interest

rate, prime rate and security interest rate.

Let us contend here that this is no longer true under the stock approach (represented as "Government Debt" file). Left-hand diagram of Figure 7.9 illustrate money stock of \$1,200 (line 1) (without interest rates) and money stock of \$1,071 (line 2). This simulation result shows that mere government debt decreases money supply under stock approach with the introduction of interest rates. This result complies with the above analyses of phases (1) and (2) on the money stock under flow and stock approaches.

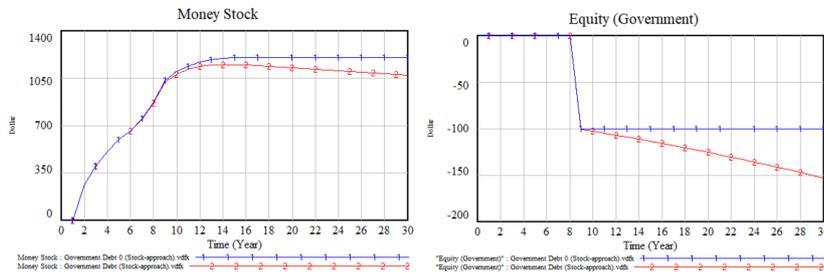


Figure 7.9: Money Stock and Equity Compared (Stock Approach)

Right-hand diagram indicates that government equity further drops from \$-100 (line 1) to \$-153.5 (line 2). This produces the same result of equity distribution under the flow approach.

With these preliminary results in mind, let us continue our analysis of the behaviors for money stock and equity. Comparisons below are made between discount loans to banks (phase (2)) and government debt (phase (3)). As illustrated in the left-hand diagram of Figure 7.10, money stock becomes \$1,071 (line 4) at t=30 as compared with \$1,058 (line 3), meanwhile line 1 and 2 are money stocks under gold standard without interest and with interest; that is, \$800 and \$7689, respectively.

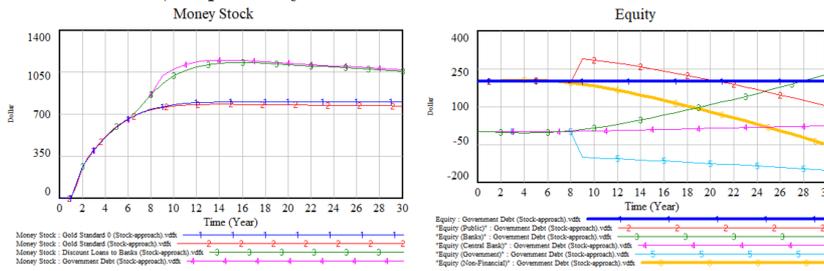


Figure 7.10: Money Stock and Equity under Government Debt: Stock Approach

Right-hand diagram shows a new distribution of equity among non-financial sectors (public and government), commercial banks and central bank. Equity (public) (line 2) increases to its maximum level of \$289.6 at t=9 from the original

values of \$200 (144.8% increase compared with 139.4% under flow approach at $t=9$), following the issues of government securities at $t=8$. Again this gives us an impression that government debt increases non-financial sector's equity as in the flow approach. This temporal increase in public equity is made possible by the negative equity of government (line 6); that is; from zero to \$-100 at $t=9$, which further drops to \$-153.5 at $t=30$. Eventually, equity(public) begins to decline to \$101.5 at $t=30$ (compared with \$51.5 under flow approach). Combined non-financial sector's equity (line 5) sooner or later becomes negative; that is, \$-51.9 at $t=30$.

On the other hand, equity of banks go beyond the equity of the economy as a whole (\$200) to \$228.5 at $t=30$ (compared with \$278.9 under flow approach). Again this extreme inequality of equity in favor of banks is supported by the negative equity value of government. Equity of central bank (line 4) increases from zero to \$23.4 at $t=30$. In summary, compositions of the equity among the public (line 2), banks (line 3), central bank (line 4) and government (line 6) becomes 50.8%, 114.3%, 11.7% and -76.8% at $t=30$.

These simulation results indicate that equity distribution exhibits similar trends as in the flow approach, though equity (public) gets slightly improved from 25.5% to 50.8%.

7.5 Money and Interest under Open Market Operations

7.5.1 Flow Approach: Phases (4) & (5)

Simulations of open market purchase (phase (4)) and open market sale (phase (5)) are jointly performed in this section, running the same model of flow approach used in phase (3). Left-hand diagram of Figure 7.11 indicates that money stock under open market purchase operation (50% at $t=16$) increases from \$1,236 (line 4) to \$1,403 at $t=30$ (line 5), as expected from our discussions above on the creation of money by government debt. In other words, open

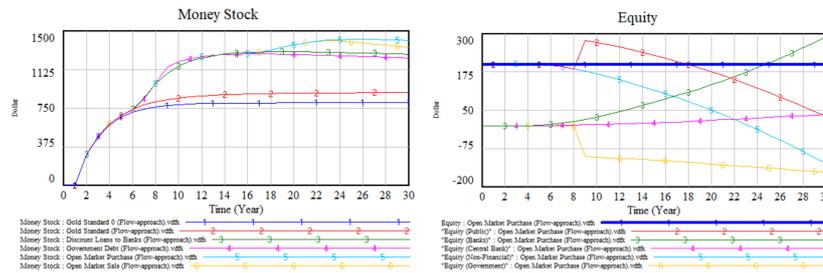


Figure 7.11: Open Market Purchase and Sale Operations: Flow Approach

market purchase operation increases base money from \$276.6 to \$311.1 as well

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as high-powered money from \$269.5 to \$303.7, which in turn increases money stock.

On the other hand, whenever central bank carries out open market sale operation (50% at $t=22$), base money decreases from \$311.1 to \$294.9 as well as high-powered money from \$303.7 to \$289.9 at $t=30$, which in turn decreases money stock from \$1,403 to \$1,339. Right-hand diagram show a distribution of equity.

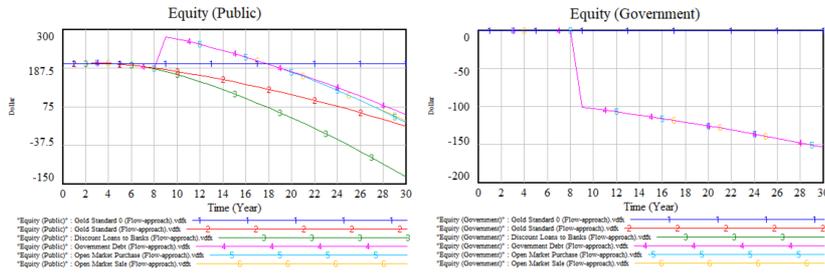


Figure 7.12: Public and Government Equities under Open Market Operations

Let us take a closer look at the equity distribution of non-financial sectors (public and government). Left-hand diagram of Figure 7.12 illustrates the equity of public sector. Lines 4, 5 and 6 are equities of the public under government debt, open market purchase and sale operations, respectively. These values become almost the same. Right-hand diagram illustrates the equity of government. Lines 4, 5 and 6 are equities of the government under government debt, open market purchase and sale operations, respectively. These values become exactly the same; \$-142.9 at $t=30$. This implies that once government debt gets incurred, its equity becomes negative under any situation.

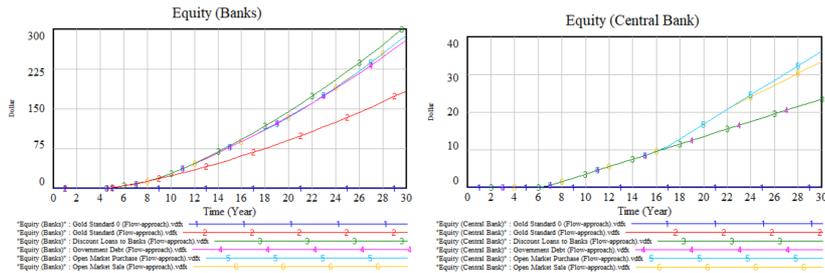


Figure 7.13: Banks and Central Bank Equities under Open Market Operations

Left-hand diagram of Figure 7.13 illustrates the equity of banks. Their equities become \$280.6 under open market purchase at $t=30$ (line 5), and \$283.8 under open market sale (line 6). In other words, their equities exceed the total equity of the economy; that is, \$200. This extreme distribution in favor of banks

are made possible by negative value of government equity of \$-142.9 at $t=30$. Right-hand diagram of Figure 7.13 illustrates the equity of central bank. Its equity becomes \$34.3 (line 5) and \$31.9 (line 6) at $t=30$ under open market purchase and sale operations, respectively.

Consolidated equity of the public and government, called non-financial equity, becomes \$-114.9 and \$-115.7 under open market purchase and sale operations, respectively. Figure 7.14 illustrates its case of open market purchase operation by line 3. On the other hand, consolidated equity of commercial banks and central bank, called financial equity, becomes \$314.9 and \$315.7 under open market purchase and sale operations, respectively. Its case of open market sale is illustrated by line 6 in the Figure. By definition, the sum of non-financial and financial equities should be equal to the total equity of the economy; that is \$200. This is confirmed by our simulation results.

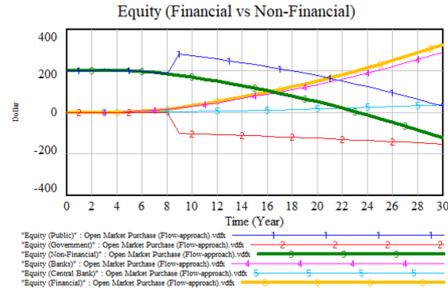


Figure 7.14: Non-Fin. vs Fin. Equity

Our analysis here demonstrates that whenever government borrows by issuing its securities, it inevitably spreads the total equity of the economy in favor of financial sectors such as banks and central bank, which in our models exceeds the total equity of the economy. In this way, by creating money stock out of nothing financial sectors exploit equity non-violently from non-financial sectors such as households, producers and government. Consequently, the introduction of interest rate under debt money system become a root cause of income inequality between financial and non-financial sectors; that is, the so-called inequality between 1% vs 99%.

7.5.2 Stock Approach: Phases (4) & (5)

Using stock approach simulation results as a representative model, let us summarize what we have analyzed in this chapter so far in terms of base money, money stock and money multiplier. Left-hand diagram of Figure 7.15 indicates base money under 6 phases of money creation process, including gold standard without interest as line 1. Right-hand diagram indicates corresponding money stock to base money under 6 phases. Though values of money stock are slightly different from the flow approach, their behaviors indicates similar trends.

Left-hand diagram of Figure 7.16 indicates distribution of equity(public) under 6 phases. Right-hand diagram of Figure 7.16 indicates the equity between non-financial sector (line 3) and financial sector (line 6). These behaviors also demonstrate similar trends as those of the flow approach.

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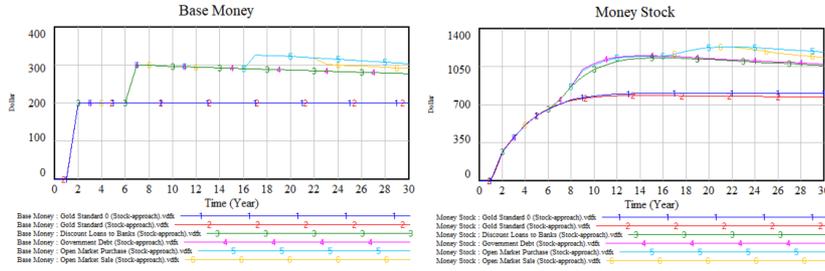


Figure 7.15: Base Money and Money Stock under 6 Phases: Stock Approach

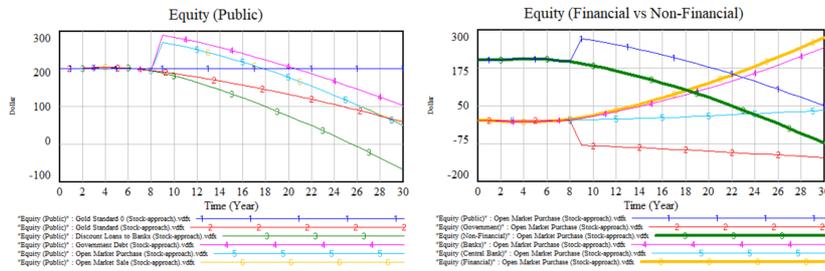


Figure 7.16: Equity Distribution of the Public, and Fin. vs Non-Fin.

Table 7.1 summarizes money creation figures such as base money (M_0), money stock (M), and money multiplier (m) as well as equity distribution figures such as public (producers and households), non-financial sector (public and government) and financial sector (commercial banks and central bank). From the table

(at $t=30$)	Money Creation			Equity Distribution (= \$200)		
	M_0	M	m	Public	Non-Fin.	Financial
Gold Standard 0	200	800	4	200	200	0
Gold Standard	200	768.7	3.844	58.27	58.27	141.7
Discount Loans	276.6	1,058	3.826	-68.24	-68.24	268.2
Gov. Debt	276.6	1,071	3.873	101.5	-51.98	252.0
OM Purchase	304.2	1,181	3.883	47.93	-74.83	274.8
OM Sale	291.2	1,131	3.884	51.28	-71.48	271.5

Table 7.1: Summary Table of Open Market Purchase: Stock Approach

we can easily recognize the trend that, as money stock increases through loans, equity distribution of non-financial sector (producers, households and government) continues to decrease from the original amount of their equity (\$200) to negative values due to the introduction of interest payments against borrowers, meanwhile equity of financial sector (commercial banks and central bank)

continues to increase beyond the original equity held by the public (\$200). Under the debt money system, money stock can be endogenously increased when producers, households and government come to borrow at interest from commercial banks, as demonstrated in the previous chapter, which forcefully sucks non-financial sector's equity into financial sector's equity, causing inequality of equity (wealth) distribution between non-financial sector and financial sector. This is a design failure of the so-called 1% vs 99% inequality that is built in the current debt money system.

7.6 Equity Distribution under 100% Money

Can we fix this equity inequality, then? In the previous chapter we have shown that under "100% money" monetary instability can be fixed. Running [Companion model: 4a Money-Interest(Stock-Instability).vpm], we can reproduce similar monetary instability under the introduction of interest here. Instead, let us only examine here if "100% money" can fix a system design failure of equity inequality. To run this simulation, let us continue to use same simulation settings of the above stock approach model from phases (1) to (4). To increase the speed of bank lending or borrowing by the public, however, we have assumed here the same bullish lending attitudes of loans adopted in section 6.6 of the previous chapter; that is, Bank Lending Ratio: 0.3→0.6, and Lending Period: 3→1 at t=1.

Under such circumstances, let us abolish a fractional reserve ratio of 10% and introduce full reserve ratio of 100% at t=8. Bold line 5 of Figure 7.17 indicates money stock continues to decrease to \$320.6, which is close to the level of base money; that is, \$304.2 at t=30. To regain this loss of money stock,

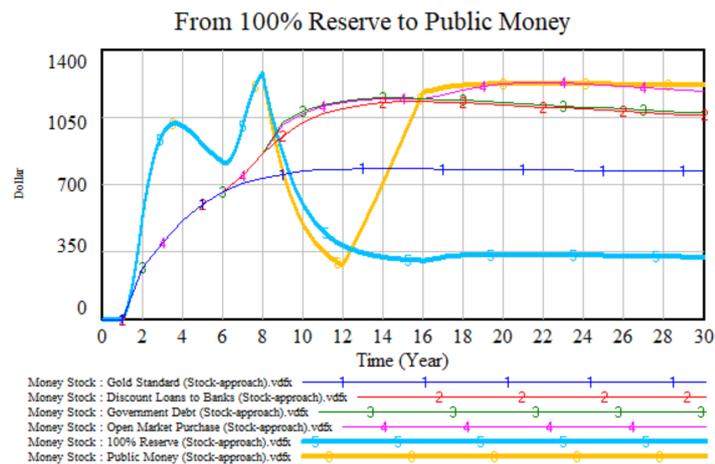


Figure 7.17: Public Equity Compared

public money of 240 dollars is issued for 4 period starting $t=12$; that is, in total \$960. Then, Public Money in circulation increases from the initial amount of \$200 to \$1,160 at $t = 30$ (bold line 6), which becomes almost the same level as money stock under Open Market Purchase; that is, \$1,181 at $t = 30$. In this way, debt money created out of nothing at interest is replaced with public money at interest-free.

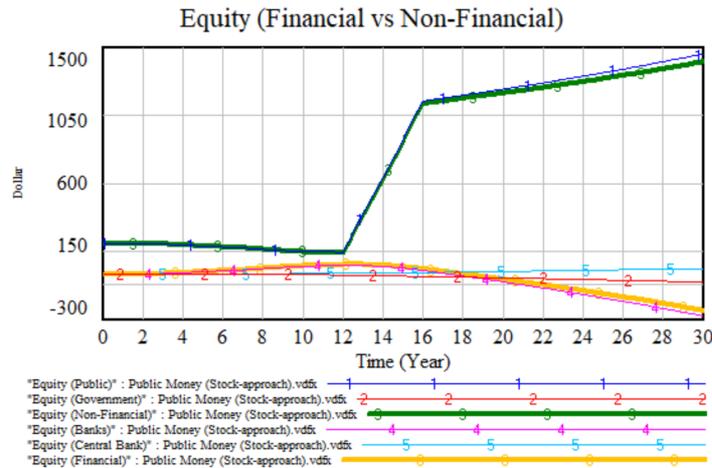


Figure 7.18: Equity Distribution under Public Money: Stock Approach

Figure 7.18 illustrates the equity distribution under 100% public money. Total equity becomes \$1,160; that is, the initial equity of \$200 and newly issued public money of \$960. This indicates that public money issued by the government² directly becomes the equity of the economy as a whole. This contrasts with the government debt of issuing securities which only constitutes its liability but does not increase the total equity at all. Bold line 3 represents non-financial equity (public and government) which becomes \$1,402 at $t=30$. Equity(public) (line 1) becomes \$1,456 at $t=30$. The difference of \$54 is due to the equity (government) of \$-54.³ This implies that by converting from debt money to public money, equity(public) jumps from \$47.93 (Phase (4)) to \$1,402 at $t=30$ (an increase of factor 29!).

On the other hand bold line 6 represents financial equity which becomes \$-242.5.⁴ In this way, financial equity drops from \$274.8 (Phase (4)) to \$-242.5

²More precisely, public money is issued by the public money administration under the legislative branch of the government such as Congress, Parliament or Diet as discussed in Part V.

³In this model, government debt of \$100 at $t=8$ is assumed to remain and its interest is also added to the principal debt, so that government debt continues to increase in a compounded fashion, causing negative equity of the government. In this sense, this model is not well designed for the purpose of this section.

⁴In this model, banks are assumed to pay interest to the public for its deposits and central

(a drop of factor 1.9!). The reader can easily confirm that the sum of financial and non-financial equities is equal to the total equity of \$1,160.

Under the public money, equity inequality between non-financial and financial sector seems to be thoroughly eliminated. Public money is shown to completely eradicates the root cause of income inequalities. This is the alternative system design we propose in Part V in place of the current debt money system.

7.7 Interest and Sustainability

The introduction of interest always plays in favor of commercial banks and the central bank in terms of the equity distribution. This is a negative side of debt money creation at interest. Its positive side may be that through a banking system with interest, non-financial sector obtains enough money for productive investment that enables economic growth and eventually an increase in non-financial sector's equity. The model we used here for the analysis of equity distribution does not include production activities. As a result, only the negative side of debt money seems to be revealed.

The fundamental question is whether this increase in the non-financial sector's equity is large enough to compensate the exploitation of its equity by banking system. In system dynamics, this financial (interest) system of deposits and debts can be described by a simple model illustrated in Figure 7.19. That is, this financial system guarantees the infinite inflow of interest to the owner of deposits and lenders.

This is nothing but the example of exponential growth explained in Chapter 1. And the reader can remember its power with a built-in doubling time. In other words, this financial system makes the haves richer and richer. Once we are enslaved with debts, we are forced to work indefinitely to attain endless economic growth for the payments of interest if we want to avoid the decline in our equity values. That is to say, we are not allowed to stop,

instead forced to work and grow our economic activities in a world of limited natural resources. Otherwise, as we have seen above, our equity eventually will be totally exploited by bankers. In other words, considering the power of exponential growth, this financial system of distorted equity distribution does not work consistently. Eventually, its resetting needs to be enforced by financial and economic crises and wars as our economic history indicates.

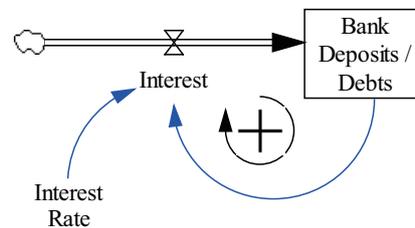


Figure 7.19: Financial (Interest) System of Deposits/ Debts

bank for discount debts of \$100 at $t=6$, while their loans to the public decline due to the issuance of public money, causing negative equity of banks. In this sense, this model is not well designed for the purpose of this section.

This may lead to our ultimate question: Can the resetting together with indefinitely forced economic growth work well for attaining a sustainable economy under a finite world of resources? The answer seems to be negative. Accordingly it is always expedient to think about an option of designing an interest-free economy of public money as a system designer. We'll challenge this option in Part V. Until we arrive there, let us continue to model our capitalist market macroeconomy by focusing on the production side in the chapters to follow.

Conclusion

To create money stock out of a limited base money, fractional reserve banking system plays a crucial role. In this chapter we have examined how the introduction of interest rates affect money stock and equity distribution under the systems of gold standard, discount loans to banks and government debt by setting up a uniform analytical framework of phases (1) thorough (5). In all phases money stocks are shown to be increased.

It is also shown that in the process of money creation equity is always distributed in favor of the commercial banks and the central bank. In other words, non-financial sector's equity will be completely exploited unless economic growth is considered to reverse the trends. Indeed, debt money creation at interest becomes a root cause of equity inequality. Then, it is claimed that this inequality of equity distribution can be completely eradicated under 100% money. Finally, it is posed that interest and sustainability may not be compatible.

Questions for Deeper Understanding

1. Briefly discuss how payments of interest have historically been regarded among world major religions such as Christianity, Islam, Hinduism, Buddhism, Sikhism and Judaism.
2. There are two different calculations of interest; simple and compound interests. Explain how they are different. Then build a simple SD model of these financial systems, and compare the behaviors of these two interests.
3. Left-hand diagram of Figure 1.8 in Chapter 1 introduces a financial system as an example of exponential growth. Discuss the impact of exponential growth on principal or debt. Without exceptions interest system is always introduced as compound financial system in business and economics classes. And interest payments in our real world are based on compound interest system. Discuss why compound interest practice becomes dominant in our economy.
4. In the companion model: 1 Money(Gold).vpm in Chapter 5, money supply is increased to \$800 from the original gold of \$200 as base money. However, in the model: 1 Money-Interest(Gold).vpm in this chapter, money stock is further increased to \$903.7 at $t=30$ due to the introduction of interest rate and prime rate. Discuss why money stock is increased by \$103.7 without a change in base money.
5. Running the Companion model: 4a Money-Interest(Stock-Instability).vpm by changing Currency Ratio Switch from 0 to 1, reproduce monetary instability, similar to the one in the previous chapter, with the introduction of interest rates. Then examine if this monetary instability can be fixed by the introduction of full reserve (100% reserve ratio).
6. Analyze how the introduction of full reserve affects equity distribution between financial and non-financial sectors under the phases of (1) gold standard and (2) discount loans to banks.