Research Article

Alternative Approaches to Money Multiplier

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Abstract: The recent financial crisis ignited a reexamination of the mechanism of money creation and the determination of money supply. With the perspective of credit creation by banks, we find that prudential regulations constrain money creation capacity of banks, and based on which we can derive formulas of money multiplier. This approach is established on the structure of bank balance sheets, which together with regulatory requirements and environment of banking determine the money supply. To make it more realistic, we propose a stock-flow consistent model, which characterizes the interaction between banks and the non-bank public in terms of monetary flows. The dynamics of the stocks related to money creation are formulated and the steady-state solutions are solved, from which the expression of money multiplier can be obtained. We further make a comparative analysis of these two methods in terms of derivation, precondition, and formula, yielding a reconciliation of both approaches. This comparison not only clarifies the determinants of money supply, but also can help us in designing effective regulatory and monetary policies.

Keywords: money creation, credit capacity, money multiplier, bank regulation, stock-flow consistent model

1. Introduction

The financial crisis erupted in 2008 and the subsequent recession have reignited broad interest and heated debates on the role of banks in macroeconomies. Many reasons have been taken account for this crisis but the main culprit should be the banking system who is prone to underestimate risks and enjoys the privilege of creating credit (Bernanke2010, Gourinchas2012, Mian2011, Stiglitz2009). The crisis was not only a hurricane in the financial circle, but also impaired the real economy (glick2010, Sutherland2012). In order to enhance the stability of the macroeconomy, some countries including the United States and Japan, implemented unconventional monetary policies including quantitative easing, but the growth of money supply was not as much as expected (Disyatatal2011, Goodhart2015). And the aftermath sluggish recovery suggests a call for reassessing the role of banks in money creation and identifying the determinants of the money supply (Werner2014a, Botos2016).

According to the conventional understandings, commercial banks act simply as financial intermediaries who transfer funds from savers to investors in loanable funds markets. Consequently, the ultimate restriction on bank loans is the quantity of pre-existing deposits collected by banks, and the money aggregate can be exogenously controlled by the central bank. Actually, individual banks are able to grant loans without any deposits that already exist. And the same amount of deposits is created as issuing loans simultaneously. This alternative theory about how banks work, named as credit theory of banking, has attracted growing attention after the financial crisis (Borio2011, Werner2014a, Werner2014b, Jakab2015, Abel20161, King2016, Xiong2017). Meanwhile, the theory yields a reformed foundation of analyzing money supply of the banking system (Mcley2014b, Li2017, Xiong2018, Xiong2019).

Money multiplier means that the monetary base can be converted into a multiple money supply. Based on this definition, both the money aggregate and monetary base can be decomposed into several components yielding an explicit formula of money multiplier (Abel2011). As argued by (Keister2009), it's merely a static expression of the monetary structure. That is to say, it does not embody anything related to the mechanism of money
creation. In most of economics textbooks, the explanation of money multiplier comes from fractional reserve theory (FRT) of banking which argues that, given the required reserve ratio, the total amount of loans that commercial banks are allowed to extend is equal to a proportion of the amount of deposits. As a result, the lending capability of banks is restricted by the money base and the required reserve ratio. While the money multiplier is reciprocal of the required reserve ratio. Since the theoretical foundation of central banks' monetary control is assumptions of exogenous money and stable monetary multiplier, the failure of unconventional monetary policy in the aftermath of the crisis has triggered a fierce debate on these assumptions. For instance, the rationale of deriving money multiplier in this way has been criticized as misleading (Carpenter2012, Disyatat2011, Goodhart2010, King2016). All in all, the prevailing derivation methods of money multiplier are not a correct characterization of the working of the banking system as money creators, thus both are lack of explanatory power and disable to account for the recent plummeting of money multiplier. In fact, money supply is the byproduct of credit creation, thus the credit capacity resulted from regulatory requirements constraints the money supply. Consequently, the corresponding money multiplier can be derived for each regulation (Xiong2018). This approach implies that the supply of credit markets dominates the loanable funds. Obviously, this simplification suffers a cost of neglecting the demand side. According to the assumptions in this approach, not only the supply of banks determines the actual credit, but also banks can achieve their credit capacity. In this paper, we firstly present the derivations of money multiplier by assuming the representative bank is under different prudential regulations and with sufficient demand for credit. We then develop a dynamic stock-flow consistent model of banking and obtain an expression of money multiplier at steady state. A comparative analysis of mechanisms of money creation and derivations of money multiplier for these two approaches will help us to understand their respective advantages and limitations. Identifying these factors will facilitate making effective monetary and regulatory policies.

The aim of this paper is to formulize money multipliers from different perspectives and compare these methods. Firstly, a static approach to money multiplier is introduced in section 2. This section presents the derivations of money multiplier based on credit capacity resulted from each one of several regulations. Section 3 derives at money multiplier with the dynamic stock-flow consistent model. Section 4 compares the two methods and conducts discussions. Section 5 draws the conclusion.

2. Static Approach

2.1 Money Creation of banks

The traditional approach derives at the formula by analyzing the composition of money rather than the process of money creation, so it cannot explain the realization mechanism of money multiplier. In this section, we will introduce an alternative theory of money creation which emphasizes the key role of commercial banks under prudential regulations. We put forward a simplified bank balance sheet, and then analyze the standalone impacts of regulations on money supply by deducing the corresponding maximum money supply when only one regulation is implemented.

Figure 1: An illustration for the mechanism of money creation and destruction.

As shown in Figure 1, money is created through bank lending from commercial banks and destructed through repayment. When a bank grants a loan to a borrower, it deposits the same amount in the borrower's account, so both sides of the bank's balance sheet are expanded. In the reverse operation, when some of the outstanding loans are repaid, they are written off to the debtor's account and the corresponding deposits are wiped out simultaneously (Mcleay2014a, Werner2014a, Werner2014b, Xiong2017). Commercial banks are able to expand their balance sheets at will by making loans. In fact, because of the risks that
commercial banks may face and the defensive buffers they need, they are always constrained in their liquidity and solvency management by their ability of credit creation. However, driven by the desire for more profit, commercial banks tend to make loans without properly estimating these risks and securing their liquidity and equity positions. Therefore, from a macro-perspective of maintaining financial stability and the integrity, efficiency and functioning of the banking systems, prudential regulations are indispensable (Borio2003).

Table 1 shows a simplified balance sheet of a representative bank. On the asset side, we only consider reserves R and loans L, while on the liability side, equity E and deposits D are taken into account. According to the consistency of balance sheet, we have

\[ R + L = D + E. \]  

(1)

Since reserves and equity are assumed to be exogenous variables in our approach, for simplicity, we define the ratio of equity to reserves, which is given by

\[ e = \frac{E}{R}. \]  

(2)

We further assume that this is no cash in this system, so only deposits consist broad money, that is

\[ M = D. \]  

(3)

Based on this balance sheet approach, we analyze the impacts of the reserve requirement and other regulations in the Basel III on money multiplier, including the liquidity coverage ratio (LCR), the net stable funding ratio (NSFR), the risk-based capital adequacy ratio (CAR), and the leverage ratio (LR).

### Table 1: The simplified balance sheet for a representative commercial bank.

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves (R)</td>
<td>Deposits (D)</td>
</tr>
<tr>
<td>Loans (L)</td>
<td>Equity (E)</td>
</tr>
</tbody>
</table>

### 2.2 Capacity of money supply of banks under prudential regulations

#### 2.2.1 The reserve requirement ratio (RR)

Firstly, we consider the constraint of reserve requirement on money creation. Denoting the actual reserve ratio as RR and the required reserve ratio as \( rr \), we have the following inequality

\[ RR = \frac{R}{D} \geq rr. \]  

(4)

Combining the consistency of balance sheet given by Equation 1 and Equations (2-4), we can derive the maximum money supply under reserve requirement and the money multiplier as follows

\[ m_{max}^{RR} = \frac{1}{rr}. \]  

(5)

This derivation is straightforward and simple, nevertheless it is a general procedure for obtaining the expression of money multiplier. Following the same procedure, we will calculate money multipliers under prudential supervisions.

#### 2.2.2 The liquidity coverage ratio (LCR)

The liquidity coverage ratio (LCR) refers to the proportion of highly liquid assets held by financial institutions, to ensure their ability to meet ongoing short-term obligations. And the LCR is calculated by dividing a bank’s high-quality liquid assets (HQLA) by its total net cash outflows (NCOF) over a 30-day stress period, which can be expressed as

\[ \text{LCR} = \frac{\text{HQLA}}{\text{NCOF}}. \]  

(6)

According to the regulatory requirement, we know that LCR \( \geq \text{LCR}_{\min} \). For simplicity, we denote \( \text{LCR}_{\min} \) as \( rr_1 \), so we have

\[ \text{LCR} \geq rr_1. \]  

(7)

The high-quality liquid assets only include those with a high potential to be converted easily and quickly into cash. Since only reserves are high quality liquid assets in our simplified balance sheet, we then have \( \text{HQLA} = R \). In addition, the net cash outflow is defined as

\[ \text{NCOF} = \text{OF} - \min\{IF, 0.75OF\}, \]  

(8)

where IF is the expected net cash inflows and OF is the expected net cash outflows within 30 days. For the sake of simplicity, we set a time unit of 30 days. In Equation 8, IF is computed according to the total amount of repayment (denoted as RP) with a discount of 50% due to the hypothesis of stressed scenario. Usually, RP is proportional to the outstanding loans with a rate of \( \lambda \), then IF can be written as

\[ IF = 0.5\lambda L. \]  

(9)

On the other hand, OF is calculated by multiplying the nominal value of the liability by the run-off rate
during the stress period we are concerned with. The run-off rate of deposits is denoted by \( \mu \), so we have \( OF = \mu D \). (10)

According to the above elaboration, Equation 7 can be rewritten as
\[
LCR = \frac{R}{\mu - \min(0.5\lambda L, 0.75\mu D)} \geq rr_1. \quad (11)
\]

Likewise, after making a set of manipulations, we can get the expression of the extreme value of money multiplier under LCR regulation in two ranges. When \( IF > 0.75OF \), we have
\[
m_{\text{LCR}}^{\text{max}} = \begin{cases} \frac{e}{\lambda(e-1)} & e \geq 1 - \frac{4(\lambda-1.5\mu)}{\lambda \mu r_1}, 1 < e < 1 + \frac{4(\lambda-1.5\mu)}{\lambda \mu r_1}, \lambda < 1.5\mu. \\ \end{cases} \quad (12)
\]

When \( IF < 0.75OF \), the expression is
\[
m_{\text{LCR}}^{\text{max}} = \begin{cases} \frac{2 + \lambda rr_2(e-1)}{1.5\mu - \lambda}, 1 < e < 1 + \frac{4(\lambda-1.5\mu)}{\lambda \mu r_1}, \lambda < 2.5\mu; \\ \frac{1}{\lambda rr_1}, 1 < e < 1 + \frac{4(\lambda-1.5\mu)}{\lambda \mu r_1}, \lambda > 1.5\mu. \\ \end{cases} \quad (13)
\]

### 2.2.3 The net stable funding ratio (NSFR)

The purpose of setting the NSFR is to prevent banks from relying too heavily on wholesale funding during periods of market exuberance and liquidity, and to encourage a more adequate assessment of the liquidity risk of assets on and off balance sheets. In addition, the use of NSFR also helps to cope with the cliff-effect of liquidity coverage rate (LCR). Net stable funding ratio requirement seeks to calculate the proportion of available stable funding (ASF) via the liabilities over required stable funding (RSF) for the assets, which can be written as
\[
NSFR = \frac{ASF}{RSF}. \quad (14)
\]

Banks must comply with
\[
NSFR \geq rr_2, \quad (15)
\]

where \( rr_2 \) denotes NSFR_{\text{min}}.

Sources of available stable funding includes: customer deposits, long-term wholesale funding (from the interbank lending market), and equity. Since there is no long-term wholesale funding in our approach, ASF is composed of equity with a weight of \( \beta \) (\( \beta \in (0,1) \)) which can be expressed as
\[
ASF = E + \beta D. \quad (16)
\]

Sources of required amount of stable funding includes each type of assets with weight of positive risk correlation. We assume that RSF is the sum of reserves weighted 0 and loans weighted \( \varepsilon \) (\( \varepsilon \in (0,1) \)), so we have
\[
RSF = 0 \cdot R + \varepsilon \cdot L = \varepsilon L. \quad (17)
\]

Combined with the above definitions and Equation 15, the requirement on NSFR is then given by
\[
NSFR = \frac{E + \beta D}{\varepsilon L} \geq rr_2. \quad (18)
\]

After manipulations, the money multiplier under the net stable funds ratio requirement is given by
\[
m_{\text{NSFR}}^{\text{max}} = \frac{e - \gamma r_2(e-1)}{\gamma r_2 e - \beta}. \quad (19)
\]

This equation shows that \( m_{\text{NSFR}}^{\text{max}} \) is positively correlated with \( e \) and \( \beta \) while negatively correlated with \( rr_2 \) and \( \varepsilon \).

### 2.2.4 The risk-based adequacy coverage ratio (CAR)

The regulation on CAR requires banks to hold adequate capital to guard against solvency risks. CAR is calculated by dividing a bank’s capital by its risk-weighted assets RWA, which can be written as
\[
CAR = \frac{E}{RWA}. \quad (20)
\]

In our model, the only risky asset is loans with an average risk weight of \( \gamma \), then the risk-weighted assets (RWA) can be computed as
\[
RWA = \gamma L. \quad (21)
\]

Suppose that the actual and minimum risk-based capital adequacy ratio is CAR and CAR_{\text{min}} respectively, the bank must comply with CAR requirement where the actual CAR must be greater than or equal to CAR_{\text{min}}. We denote CAR_{\text{min}} as \( rr_3 \) so we have
\[
CAR = \frac{E}{RWA} = \frac{E}{\gamma L} \geq rr_3. \quad (22)
\]

Combining Equations 1, 2 and 22, the maximum money multiplier under CAR requirement can be derived as
\[
m_{\text{CAR}}^{\text{max}} = \left( \frac{1}{\gamma r_3} - 1 \right) e + 1. \quad (23)
\]
From Equation 23 we can draw the conclusion that \( m_{\text{max}} \) is an increasing function of \( e \) while a decreasing function of both \( \gamma \) and \( \text{CAR}_{\min} \). Since \( \text{CAR} \) regulation is mainly imposed on the amount of equity, it is not difficult to understand that a larger equity to reserve ratio requirement reduces the total money supply.

2.2.5 The leverage ratio (LR)

With the similar purpose of \( \text{CAR} \) requirement, LR is a non-risk-based requirement that constraints the scale of total assets. The actual leverage ratio is denoted by \( LR \), which can be computed as

\[
LR = \frac{E}{TA},
\]

(24)

where \( E \) is the amount of equity while \( TA \) is that of total assets. In this case, total assets can be calculated by the summation of loans and reserves, which is given by

\[
TA = L + R.
\]

(25)

According to the requirement of leverage regulation, the actual LR should be no less than the corresponding minimum level \( LR_{\min} \), which is denoted by \( rr_4 \), that is

\[
LR = \frac{E}{L+R} \geq rr_4.
\]

(26)

Following the derivation procedure given above, the corresponding money multiplier under LR regulation can be obtained as follows.

\[
m_{\text{max}}^{LR} = \left( \frac{1}{rr_4} - 1 \right) e.
\]

(27)

From Equation 27, we can see that \( m_{\text{max}}^{LR} \) is a decreasing function of \( rr_4 \). Moreover, LR regulation, similar to \( \text{CAR} \), is also primarily implemented on equity, so a larger LR requirement would also decrease the total money supply.

This alternative approach based on the capacity of money supply of banks shows that the money multiplier is governed by both the reserve requirement and prudential regulations. Specifically, each regulation has a specific formula of money multiplier, whose determinants are the banks’ liquidity and default risk portfolios, as well as the concerned minimum required ratio.

3 Dynamic Approach

3.1 A dynamic stock-flow consistent model of banking

We consider a closed economy that is composed of public, one commercial bank, and the central bank as well as regulatory authorities. The public can deposit and withdraw currency from the bank, make transactions through bank transfers, and apply for loans from the bank and repay them in a due time. The commercial bank facilitates the transactions by providing deposit and loan services to its clients, through which the money creation is realized. In addition, the central bank is in charge of determining the amount of monetary base and with the regulatory authorities together impose regulations over the bank.

Figure 2 shows us all the relevant flows that correspond to changes of stocks including currency, loans and deposits. We will formulize each monetary flow and the dynamics of the three stocks.
According to the definition of broad money, the amount of money is the sum of currency and deposits, that is
\[ M = C + D. \]  
(31)
And the change in money takes the following form
\[ \frac{dM}{dt} = \frac{dc}{dt} + \frac{dD}{dt}. \]  
(32)
We can draw a conclusion immediately that
\[ \frac{dM}{dt} = \frac{dL}{dt}. \]  
(33)
This result tells us that change of money aggregate is the same as that of loans, indicating that only bank lending and repayment will change amount of money while other economic actions just play a part in money circulation.

In order to deduce the steady state solutions of the dynamic equations, we need to express each variable with some specific parameters. The cash withdrawal is dependent on the total savings, i.e., the deposits in this model. On the other side, cash deposit comes from the stock of cash. So we have
\[ CW = \kappa D; \]  
(34)
\[ CD = \rho C, \]  
(35)
where \( \kappa \) denotes the ratio of cash withdrawal to the total amount of deposits and \( \rho \) represents the proportion of currency that is deposited in the bank.

The dynamic equation for currency, given by Equation 28, can be rewritten as
\[ \frac{dc}{dt} = \kappa D - \rho C. \]  
(36)
From the viewpoint of financial intermediaries, banks grant loans on the base of deposits. Actually, bank lending can be written as a proportion of deposits, that is
\[ BL = b \cdot D, \]  
(37)
where \( b \) is the ratio of bank lending to deposits. Once one regulation constrains banks, the choice of \( b \) depends on the gap between credit capacity and actual outstanding loans. On the other side, repayment is determined by the outstanding loans, which can be written as
\[ RP = \lambda L, \]  
(38)
where \( \lambda \) is related to the maturity term. Thus, we can obtain the dynamic equation of loans
\[ \frac{dL}{dt} = b \cdot D - \lambda L. \]  
(39)

Combining Equations 30, 34, 35, 37, and 38, the dynamic equation for deposits is given by
\[ \frac{dD}{dt} = b \cdot D + \rho C - \kappa D - \lambda L. \]  
(40)

### 3.2 The steady state solution

In order to derive at the money multiplier under the dynamic approach, we need to get the expressions of these stock variables when the economy attains steady states. The steady state solution for currency is obtained when \( \frac{dc}{dt} = 0 \), from Equation 36 we get
\[ C^* = \frac{\kappa}{\rho} \cdot D^*. \]  
(41)
When \( \kappa = 0 \), i.e., the public never withdraws money from banks. We have
\[ C^* = 0. \]  
(42)
So as long as one gets cash, he or she would immediately deposit it in the bank.

The steady state for loans is achieved when \( \frac{dL}{dt} = 0 \).
According to Equation 39, we can obtain
\[ L^* = \frac{b \cdot D^*}{\lambda}. \]  
(43)
Obviously, \( \frac{b}{\lambda} \) is the transformation rate of deposit-to-loan.

The even condition of the balance sheet of the bank is given by
\[ D = R + L. \]  
(44)
So given the volumes of deposits and loans at the steady state, we can get the total reserve held by the bank
\[ R^* = D^* - L^* = \left( 1 - \frac{b}{\lambda} \right) \cdot D^*. \]  
(45)
As the monetary base is defined as follows,
\[ MB = C + R. \]  
(46)
When the economy attains the steady state, it can be expressed as follows.
\[ MB = \frac{\kappa}{\rho} \cdot D^* + \left( 1 - \frac{b}{\lambda} \right) \cdot D^*. \]  
(47)
By substituting Equations 41 and 47 into the definition of money multiplier, we get
All the parameters in this formula refer to ratios of a monetary flow to one certain stock, corresponding to one sort of interactions between the bank and the public. Therefore, it is a general expression of money multiplier. It is worth noting that this general form can degenerate into a specific simple form when we consider some extreme cases. We firstly suppose a no-loan economy where \( b = 0 \), we then have

\[
m = \frac{1 + \frac{\kappa}{\rho}}{1 + \frac{\kappa}{\rho}} \equiv 1.
\] (49)

This indicates that as long as there is no any lending from banks, the aggregate money is always equal to the monetary base. As we have mentioned before, if there is no currency circulating in this economy, that is to say \( \kappa = 0 \), the money multiplier can be simplified as follows

\[
m = \frac{1}{1 - \frac{b}{\lambda}}.
\] (50)

This implies that as the transformation rate gets larger, the money multiplier increases.

In this case, we further suppose that the bank is under a credit constraint of fractional reserve requirement and can reach its maximum credit capacity at steady state. That is to say, the actual reserve ratio is exactly equal to \( r_r \), i.e.,

\[
\frac{R^e}{D^e} = r_r.
\] (51)

By combining Equations 43, 44, and 51, we have

\[
1 - \frac{b}{\lambda} = r_r.
\] (52)

Then we substitute Equation 52 into 50, the expression of money multiplier becomes

\[
m = \frac{1}{r_r}.
\] (53)

Similarly, from the derivations with the alternative static approach presented in Subsection 2.2, we can deduce the corresponding transformation rate of deposit-to-loan for each of other regulatory requirements. Substituting the deposit-to-loan rates into Equation 50 respectively, we can also obtain the corresponding money multiplier for each regulation. It is verified that the results from these two approaches are identical with each other.

### 4 Comparative Analysis

In this section, we compare two derivation methods of money multiplier that we have elaborated above. In order to give a clear demonstration of the mechanism and determinants of money multiplier, we make the comparative analysis from three aspects, including derivation, precondition, and formula. Table 2 shows the differences between the formulas of money multiplier derived for each of the two approaches and intrinsic consistency of them.

As elaborated in proceeding two sections, the derivation process of money multiplier for each approach has its special features. The object of the static method is the balance sheet of a bank, in which each item can be expressed as a ratio to reserves. Assuming that the amounts of reserves and equity are exogenously given, the maximum money supply of the bank can be deduced from the inequality prescribed by the regulatory requirement. The dynamic approach characterizes the monetary flows resulted from the interaction between banks and the public, in terms of deposits, loans and cash correspondingly. The set of dynamic equations of these three stock variables can be formulated respectively by the difference of corresponding inflows and outflows. By solving the steady-state solutions of these three stocks, the money multiplier is then derived.

The precondition for the multiplier expression to be established features each approach in different ways. No matter what state the banking system stays, the money multiplier is always equal to the amount of broad money divided by monetary base. With the static approach, the money multiplier is derived from the balance sheet of a bank under a specific regulation, so the formula of multiplier is correct only if the bank’s regulatory requirement is fully complied and the amount of credit reaches its capacity. As for the dynamic method, since each of stock variables has its inflows and outflows at any time point, the multiplier formula is true only when the whole system reaches a steady state.

The second column of Table 2 presents the expressions of money multiplier corresponding to either method, while the parameter descriptions of all expressions are listed in the third column. In the static approach, the value of the money multiplier is
usually related to the concerned regulation, balance sheet position, and other parameters reflecting the economic conditions involved in a specific regulation. Let’s take leverage ratio as an example, the money multiplier is an increasing function of the ratio of equity to reserves, and it’s a decreasing function of the minimum required leverage ratio. In the dynamic approach, the ratio of bank lending to deposit and the proportion of currency deposited in the bank are positively correlated with money multiplier. The ratio of repayment to outstanding loans and the ratio of cash withdrawal to the amount of deposits outflows are negatively correlated with the money multiplier. Notably, the fourth column indicates that the four approaches to the money multiplier are reconcilable. When currency and excess reserves in the economy are neglected, the money multiplier of the traditional static approach is simplified as the form given by Equation 53.

Table 2: Formulas of money multiplier for different approaches.

<table>
<thead>
<tr>
<th>Approach</th>
<th>The expression of money multiplier</th>
<th>Meaning of parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Static Approach</td>
<td>$m = \frac{1}{1 + \rho}$</td>
<td>- $\rho$: the proportion of currency deposited in the bank</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- $\kappa$: the ratio of cash withdrawals to the amount of deposits outflows.</td>
</tr>
<tr>
<td>Dynamic Approach</td>
<td>$m = \frac{1}{1 - \rho}$</td>
<td>- $\rho$: the proportion of currency deposited in the bank</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- $\kappa$: the ratio of cash withdrawals to the amount of deposits outflows.</td>
</tr>
</tbody>
</table>

although the derived money multipliers take different forms, they share the simple expression given above under some specific conditions. The result for the static approach takes the same form only when banks are regulated by the required reserve ratio. When we assume that people withdraw money exclusively for transfer transactions and regulatory requirement is imposed only on reserves, the dynamic approach then degenerates into the static one.

5 Conclusion

The traditional static approach is always true and the derivation is straightforward from the definition. However, it has nothing to do with the mechanism of money creation. The alternative static approach is based on the bank balance sheet, and derives at the maximum money multiplier for each regulatory requirement by analyzing the inequality prescribed by the corresponding regulation. Each regulation has a specific formula of money multiplier, whose determinants are the banks’ liquidity and default risk portfolios, as well as the concerned minimum required ratio. These expressions of the money multiplier are only valid when the credit reaches the regulation-specific capacity. Since the stock-flow consistent model takes into account the dynamics of key stock variables related to money creation, it has a potential of wide applications. This alternative dynamic approach can help us not only in identifying the determinants of money supply, but also in examining the impacts of regulatory and monetary policies.

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