Central, Traditional and Shadow Banking in the Multiple Deposit Creation Scheme

Byoung-Ki Kim

BOK Working Paper No. 2013-10

THE BANK OF KOREA

Economic Research Institute
The Bank of Korea

Publisher
Choongsoo Kim
(Governor of the Bank of Korea)

Editor
Woon Gyu Choi
(Director General of the Institute)

Requests for copies of publications, or for
addition/changes to the mailing list, should be
sent to:

Economic Research Institute
The Bank of Korea
39 Namdaemunno Jung-Gu
Seoul, 110-794, Korea

E-mail: eso@bok.or.kr

Fax: 82-2-759-5410

This publication available on the BOK
Economic Research Institute website
(<http://imer.bok.or.kr>)

BOK Working Paper is occasionally published
by the Economic Research Institute, the Bank
of Korea. This is circulated in order to stimulate
discussion and comments. Articles include research
achievement by the staff and visiting scholars, and
selected works sponsored by the Institute.

The views expressed in this paper do not necessarily
reflect those of the Bank of Korea or the Economic
Research Institute.

© The Bank of Korea, 2013
All rights reserved.

Reproduction for educational and
non-commercial purposes is permitted provided
that the source is acknowledged.

Central, Traditional and Shadow Banking in the Multiple Deposit Creation Scheme

Byoung-Ki Kim*

The views expressed in this paper are those of the author and may not necessarily reflect the official views of the Bank of Korea.

* Senior Economist, Institute for Economic Research, Bank of Korea, 39 Namdaemun-Ro, Jung-Gu, Seoul, South Korea. Email: bkkim@bok.or.kr.

The author thanks Woon Gyu Choi, Jae-Joon Han, Inseon Hwang, Hyun-Kee Kim, Junhan Kim, Kyungsoo Kim, Dongyeol Lee, Hyun Ho Lee, Sang Woo Lee, Sung Kee Min, Sungju Song, Myung-Soo Yie and seminar participants at the Bank and at Hanyang University (ERICA) for helpful comments and suggestions.

Contents

I. Introduction	1
II. Multiple Deposit Creation with Shadow Banks	5
1. Monetary Aggregates and Credit	6
2. Effects of Reserve Requirements Ratio Change	9
3. Money and Credit in Slightly Different Environments	12
III. Leverages	14
IV. Proprietary Transactions	19
V. Conclusions	21
References	24

Central, Traditional and Shadow Banking in the Multiple Deposit Creation Scheme

This paper studies the effect of shadow banks on monetary aggregates, credit to private agents, and inter-financial institution transactions by incorporating shadow banks into a simple multiple deposit creation scheme. The simple scheme is carefully modified and extended to reflect leverages taken by shadow banks, proprietary transactions by commercial banks and the interest rate-oriented monetary policy operational framework. This paper shows that transactions between commercial and shadow banks can be determined somewhat endogenously although the model is completely deterministic, and as such, interbank transactions can grow enormously while the size of broad money and credit to private agents does not increase much. In this way, shadow banks contribute to the build-up of systemic risk. This paper also discusses policy implications of the findings.

Keywords: shadow banks, leverages, proprietary transactions, monetary aggregates, credit, multiple deposit creation scheme

JEL Classification: E51, E58, G21, G28

I. Introduction

Traditionally, commercial banks raise funds from depositors in the short term, lend to borrowers in the long term, and keep them in their balance sheets. Through the 1970s and 1980s, competition in the banking sector, financial innovation, and financial (de-)regulation led to the emergence of a new banking model: originate-and-distribute whereby commercial banks lend to borrowers and then sell the loans off to shadow banks. Shadow banks, which made the new model actually work in the real world, are specialized financial institutions that conduct maturity, credit and liquidity transformations without direct or explicit access to central bank liquidity.¹⁾ They raise funds not by receiving deposits but by taking investments and leverages. The increased reliance on the new model of banking up until the emergence of U.S. sub-prime mortgage crisis not only diluted commercial banks' incentive to monitor their loans but also generated new risks. For example, commercial and shadow banks became more and more dependent on market liquidity to securitize the loans and sell them. Furthermore, credit risks, while being distributed to much wider investors rather than being concentrated in the commercial banks, were not eliminated.

As such, shadow banks are thought to have contributed to the build-up of financial vulnerabilities that has led to the catastrophic global financial crisis surfaced since 2007. Adrian and Shin (2009) documented strong procyclical leverage of broker-dealers including major Wall Street investment banks. During a financial boom, a rise in security prices would strengthen the balance sheets and lead to upward adjustment of leverages and greater demand for the assets (securities), which in turn raises the asset (securities) price again. During a financial downturn, this mechanism works in reverse. As a consequence, financial cycle could be amplified substantially by the behavior of shadow banks.

Some questions, however, should be answered before trying to solve the problems posed by shadow banks. Does the existence of shadow banks increase the monetary aggregates and/or the commercial banks' credit supply to private agents in

1) For the definition and behavior of shadow banks, see Adrian and Ashcraft (2012), Claessens et al. (2012), Financial Stability Board (2011), Pozsar (2008), and Pozsar et al. (2010).

non-financial sectors?² Do monetary aggregates and credit measured by examining commercial banks' consolidated balance sheets represent their true amounts under the existence of shadow banks? Or how much does the behavior of shadow banks increase the lendings/borrowings between commercial and shadow banks? Answer to these questions would help devise financial and regulatory structures that prevent future crisis from materializing through better understanding the relationship between inter-financial institution transactions and financial institutions' ability to create credit to private agents. With these answers in hands, the central bank and financial supervisory authority may be able to acquire knowledge on where to focus their monitoring: inter-financial institution transactions, or development of (true) monetary aggregates and credit to private agents, or both.

In an attempt to answer the above questions this paper analyzes central, traditional, and shadow banking in a couple of static environments by putting shadow banks into a multiple deposit creation scheme. We carefully modify and enhance the simple scheme to incorporate leverages of shadow banks and proprietary transactions²⁾ by commercial banks, and the interest rate-oriented monetary policy operating framework. In particular, shadow banks can borrow from commercial banks using securities they hold as collateral, and commercial banks can invest in shadow banks through proprietary transactions. Furthermore, some carefulness must be devoted to incorporating the interest rate-oriented monetary policy operational framework into the scheme. A rise in the reserve requirement ratio generates deficiency of liquidity in the reserve market and increases the short term interest rate. The central bank, in response, has to provide extra reserve money through open market operations to keep market interest rates aligned with its policy rate. We will explore the meaning of this kind of open market operations in the context of the multiple deposit creation scheme.

Although the model is quite simple, this paper draws some meaningful answers. To preview the results, the existence of shadow banks generates the following phenomena. (i) Monetary aggregates can decrease or increase depending on their def-

2) Proprietary transactions occur when banks or other financial institutions carry out trades in financial instruments on their own accounts using their own capital and balance sheets for their own profits rather than on behalf of their customers.

initions.³⁾ (ii) Credit supply of commercial banks to private agents increases. The measured credit through the balance sheets of commercial banks, however, cannot capture the true amount accurately. (iii) Nevertheless, shadow banks don't seem to drastically increase monetary aggregates and credit supply to private agents. (iv) Inter-commercial and shadow bank transactions (lendings and borrowings between them) can grow enormously to reach several ten times of the credit supply to private agents. (v) Remarkably, the size of inter-financial institution transactions is determined somewhat endogenously⁴⁾ when leverage taking and proprietary transactions are allowed, although the model is completely deterministic.

The first result is not surprising. As private agents have two ways to put their money, either in commercial bank accounts or in shadow bank accounts, it is natural that commercial banks' liabilities to private agents decrease and commercial and shadow banks' liabilities to private agents increase while the central bank's liability to private agents does not change. The main reason of these results is that the shadow banks are not subject to reserve requirements, which make the financial system as a whole generate more money through multiple deposit creation scheme.

The second result is also conceivable. Commercial banks off-load their loans, that is credit to private agents, by selling them off to shadow banks. This activity brings discrepancy between true credit and measured credit. More specifically, commercial banks' balance sheets do not accurately show the true amount of credit supplied to private agents because commercial banks distribute the originated loans off to shadow banks. As a result, measured credit is less than true credit by the amount of credit sold to shadow banks.

The mechanism behind the first and second results is, however, vulnerable in the following sense and leads to the third result: if there exist different kinds of deposit accounts open at commercial banks not subject to reserve requirements and these accounts are largely substitutable with shadow banks' accounts, then the mere existence of shadow banks cannot increase the monetary aggregate and credit to

3) Two definitions of money are considered. One measure of money is the sum of liabilities of central bank and commercial banks to private agents (narrow money). The other is the sum of liabilities of central bank, commercial banks, and shadow banks to private agents (broad money).

4) Recall that the multiple deposit creation scheme does not involve optimizations of agents, which implies that it cannot pin down the amount of inter-financial institution transactions. The range of the size of the transactions, however, can be derived from the model.

private agents considerably, based on multiple deposit creation scheme. This paper will show that this effect can even be muted out later. Moreover, allowing shadow banks to take leverages does not change the monetary aggregates and true amount of credit to private agents, as will be shown.

The fourth result is noticeable in the sense that transactions between financial intermediaries grow enormously while the size of true credit to private agents does not increase much. This result implies that financial regulations should be more focused on transactions between financial institutions rather than on those between financial institutions and private agents in some circumstances. In this regard, this result is consistent with Hahm et al. (2011) and Shin and Shin (2011), who distinguished between core and non-core liabilities of the banking sector;⁵⁾ and emphasized that the relative size of the non-core liabilities would reflect the stage of the financial cycle and the degree of vulnerability to systemic risks.

Lastly, this paper will show the endogeneity of lendings and borrowings between commercial and shadow banks in the form that the equilibrium quantity of asset-backed securities transactions between them can be determined at the maximum of supply and demand of the asset, not at the minimum. It can be thought that this is one of the abilities that financial institutions have in driving a financial boom. Leverages and proprietary transactions with a little help from the central bank's interest rate-oriented monetary policy operational framework derive the result.⁶⁾ In this way, inter-financial institution transactions can grow enormously and contribute to the build-up of systemic risk.

This paper is organized as follows. Section 2 illustrates a multiple deposit creation scheme which incorporates the existence of shadow banks. The meaning of interest rate-oriented monetary policy operating framework in the context of this scheme will be explored. Each agent's balance sheet and aggregate variables such as money, credit to private agents will be derived and analyzed. Slightly different environments in which commercial banks provide deposit accounts not subject to

5) According to Shin and Shin (2011), core liabilities are held by the ultimate domestic creditors, such as the domestic household sector, while non-core liabilities are held by other financial intermediaries or foreign creditors.

6) Kim et al. (2012) illustrated combination of sophisticated inter-financial institution transactions and interest rate-oriented monetary policy operational framework can foster or accelerate financial procyclicality.

reserve requirements are also examined. Section 3 introduces leverage taking by shadow banks and analyzes its effects on monetary aggregates, and credit to private agents and to shadow banks. Section 4 allows commercial banks to make investment in shadow banks through proprietary transactions and shows that excess supply or demand of asset-backed securities can be all digested through transactions between commercial and shadow banks. Section 5 concludes with a touch of policy implications.

II. Multiple Deposit Creation with Shadow Banks

Money creation in the multiple deposit creation scheme starts conceptually with central bank (CB) lending to the commercial banking sector.⁷⁾ With this outside money from CB given, commercial banks (TBs) make loans to the private agents (PAs): households and firms. PAs then engage in transactions with other PAs in the economy, buying goods and services, and the money changes hands. PAs may hold some cash, too. The receivers in these transactions can deposit their money in bank accounts established at TBs, or they can put some money in the shadow banks' (SBs') accounts as financial investments. At this stage, TBs can sell the loans off to SBs. By issuing asset-backed securities (ABS), TBs remove corresponding quantity of loans to PAs from their balance sheets and as a result, transform one asset (loans to PAs) to another (cash or other securities raised by the sales). In this section, we assume that SBs are not able to make leverages so that the amount of ABS purchased by SBs is the same as that of financial investment PAs put in SBs' accounts.⁸⁾ Reserve requirements are applied to the deposits at TBs but not to the investment accounts at SBs. The amount of reserve requirements is the amount of deposits multiplied by the reserve requirement ratio. TBs can then make another round of loans based on the funds raised from deposits (minus reserve requirements) and sales of ABS. This process iterates itself to create loans, deposits, financial investments, cash holdings and reserves.

7) That is, commercial banks, as a whole, must have outside money before they start to make loans.

8) This restriction will be relaxed in the next section.

1. Monetary Aggregates and Credit

To portray the above mechanism concretely, we first introduce some symbols. Let A denote the amount of high-powered money CB lends to TBs, c the currency ratio, r the reserve requirement ratio. PAs, after taking out some cash (cA), put proportion s of their money holdings in deposit accounts at TBs ($s(1-c)A$), and invest $1-s$ in investment accounts at SBs ($(1-s)(1-c)A$).⁹⁾ TBs must hold reserves ($rs(1-c)A$) at the CB. We assume that TBs do not hold excess reserves, and that cash is held by private agents outside the banking sector only. TBs use originate-and-distribute strategy by selling their loans in the form of ABS. SBs' demand for ABS is the same as the amount they pull through their investment accounts ($(1-s)(1-c)A$). After all of this process, TBs take $(1-rs)(1-c)A$ for making loans to the next round of deposit creation scheme.¹⁰⁾ In the second round, TBs make loans to PAs of amount $B \equiv (1-rs)(1-c)A$, and the same process repeats. Note that everything else is equal except the amount of loans to PAs changes from A to B . Figure 1 illustrates what is happening at the first and second rounds of deposit creation.

Figure 1: Deposit Creation Scheme

Note: These figures illustrate the first and second rounds of deposit creation scheme. Commercial banks, for example, make loans, take deposits, hold reserves, sell ABS, and move on to the next round.

9) We will provide two variations on this assumption later in this paper.

10) Note that $s(1-c)A - rs(1-c)A + (1-s)(1-c)A = (1-rs)(1-c)A$

The monetary base (A) is composed of private cash holdings (C) and the reserve requirements (R).

$$A = C + R \quad (1)$$

It is straightforward to derive private cash holdings, reserve requirements, TBs' deposits liability (D), TBs' loans to PAs (L), TBs' wholesale funding through sales of ABS (F), and SBs' liability to PAs (E) from the multiple deposit creation scheme explained above.

$$C = cL \quad (2)$$

$$R = rD \quad (3)$$

$$D = s(1 - c)L \quad (4)$$

$$L = \frac{1}{1 - (1 - rs)(1 - c)} A \quad (5)$$

$$F = E = (1 - s)(1 - c)L \quad (6)$$

We can derive the balance sheets of CB, TBs, SBs and PAs, and check that their asset side and liability side match exactly. For CB, asset is loan to TBs, which is base money, and liabilities are cash and reserve as Equation (1) implies. For TBs, assets are composed of reserves, loans to PAs minus ABS sold to SBs while liabilities are deposits and borrowing from CB: $R + L - F = D + A$. For SBs, asset is ABS holdings, liability is PAs' financial investments: $F = E$. For PAs, assets are cash, deposit and financial investments while liabilities are borrowing from TBs: $C + D + E = L$.

Now turn to aggregate economic variables: monetary aggregates and credit to PAs in particular. Narrow money (M_1) is composed of cash and deposits, and broad money (M_2) is composed of narrow one plus SBs' liability to PAs.

$$M_1 = C + D = [c + s(1 - c)]L \quad (7)$$

$$M_2 = M_1 + E = L \quad (8)$$

True amount of credit to PAs (C_t) is the same as the amount of TBs' loans to PAs while measured credit to PAs through TBs' balance sheets is true one minus ABS sold.

$$C_r = L = M_2 \quad (9)$$

$$C_m = C_r - F = [1 - (1 - s)(1 - c)]L = M_1 \quad (10)$$

Differentiation of Equations (7) - (10) with respect to s reveals that narrow money and measured credit to PAs decrease while broad money and true credit to PAs increase, as PAs put more portion of their savings into SBs' investment accounts and TBs off-load their loans to PAs from the balance sheets.

Figure 2 illustrates the results. Note that $s = 1$ corresponds to non-existence of SBs and that $s = 0$ implies PAs do not make deposits in TBs' accounts, instead they put all their money in investment accounts on SBs. When $s = 0$, commercial banks fund their loans to private agents in the wholesale market only by selling off ABS to shadow banks, except in the first round where they borrow from the central bank. As s decreases from one to zero, narrow money decreases and broad money increases. The former result is natural in the sense that the liabilities of TBs declines as PAs put less money in the deposit accounts. When $s = 0$ the narrow money consists of only cash, CB's liability to PAs. The latter is also conceivable because SBs are not subject to reserve requirements, more money can be generated inside the financial sector once we define the liability of SBs as money. Given this and the fact that TBs off-load the loans to SBs to finance another round of loans, true credit to PAs should increase with the decrease of s . Measured credit, however, decreases with the decrease of s . Interestingly, narrow and broad money coincides with measured credit to PAs and true credit to PAs, respectively. But this coincidence breaks once leverages are introduced as will be shown in the next section.

Note that, according to experiences, s can vary over the financial cycle. s tends to be lower during the boom and higher during the bust. This implies that true credit to PAs increases and decreases during financial boom and bust, which may have a potential to create a sort of financial acceleration mechanism. We will come back to this in the next section.

Figure 2: Amount of Narrow Money, Broad Money, Credit and ABS

Note: This figure shows that broad money and true amount of credit increase while narrow money and measured credit decrease, as private agents put more money in investment accounts at shadow banks. Simulation is based on $A = 100$, $c = 0.02$, $r = 0.03$.

2. Effects of Reserve Requirements Ratio Change

Before going further, it would be worthwhile to analyze the effect of changes in reserve requirements ratio. One may think that in multiple deposit creation scheme, monetary policy through changes in reserve requirements ratio would have profound effects on deposits, credit and monetary aggregates. We will show this is not true under current interest rate-oriented monetary policy operational framework. Under current framework, central bank sets the policy rate regularly, once a month for example, and maintains the short term market interest rate¹¹⁾ closely

11) Consider the reserve market and the interest rate therein such as the federal funds rate in the U.S., SONIA in the U.K., EONIA in the euro area, and call rate in Korea, to name a few.

aligned with the policy rate through open market operations and/or through corridor system.¹²⁾

Suppose that CB adjusts the reserve requirements ratio upward from r to r' . Then TBs must increase the reserve from rD to $r'D$. Therefore the reserve deficiency (Y) is determined by the following equation.

$$Y = D(r' - r) = \frac{s(1 - c)}{1 - (1 - rs)(1 - c)} A(r' - r) \quad (11)$$

CB now must make up for this amount of deficiency by supplying additional monetary base through open market operations to prevent the short term market interest rate from deviating from the policy rate. Then cash holdings, reserve requirements, TBs' deposits liability, TBs' loans to private agents, TBs' wholesale funding through sales of ABS, and SBs' liability to PAs can be calculated under the new reserve requirements ratio and new amount of monetary base.

$$C = \frac{c}{1 - (1 - r's)(1 - c)} (A + Y) = cL \quad (12)$$

$$R = \frac{r's(1 - c)}{1 - (1 - r's)(1 - c)} (A + Y) = r'D \quad (13)$$

$$D = \frac{s(1 - c)}{1 - (1 - r's)(1 - c)} (A + Y) = s(1 - c)L \quad (14)$$

$$L = \frac{1}{1 - (1 - r's)(1 - c)} (A + Y) = \frac{1}{1 - (1 - rs)(1 - c)} A \quad (15)$$

$$F = E = \frac{(1 - s)(1 - c)}{1 - (1 - r's)(1 - c)} (A + Y) = (1 - s)(1 - c)L \quad (16)$$

The comparison between Equations (2) - (6) and Equations (12) - (16) reveals that cash holdings, TBs' deposits liability, TBs' loans to PAs, TBs' wholesale funding through sales of ABS, and SBs' liability to PAs all remain the same, except reserve requirements. Furthermore, one can easily check that monetary aggregates, and true and measured credits do not change either by examining Equations (7) - (10).

¹²⁾ A corridor (or channel) system incorporates lending and deposit facilities. Eligible banks can borrow (deposit) any amount from (at) the central bank at their discretion at a given interest rate, usually the policy rate plus (minus) a pre-determined spread. Lending facilities require collateral as well. For further information, see Kahn (2010).

Summing up, adjustment in reserve requirement ratio has no impact on cash holdings, deposits, loans, monetary aggregates, and true and measured credits to private agents under the interest rate-oriented monetary policy operational framework. This result is common knowledge inside the central banking sector, but it is not generally acknowledged in academia, perhaps due to familiar textbook explanations. Indeed, Goodfriend and Hargraves (1983), Feinman (1993), Hein and Stewart (2003), and Bindseil (2004) acknowledged that reserve requirements had been of little help in accomplishing monetary policy objectives such as containing rapid monetary or credit growth. The major difference between the above result and conventional textbook explanation revolves around whether one takes into account accompanying open market operations. It is easy to note that letting $Y = 0$ corresponds to textbook explanation.

This result, however, should not undermine the importance of reserve requirements. The major role of reserve requirements is to generate sufficient and stable demand for the central bank money (monetary base), which underpins the effectiveness of monetary policy especially under the interest rate-oriented monetary policy operational framework. Reserve requirements also provide liquidity cushion and contribute to stabilizing short term market interest rate.¹³⁾

Before ending this sub-section, we would like to mention about interest on reserves. Major CBs around the world recently started to pay interest on the reserves as they began to adopt unconventional monetary policy measures such as quantity or credit easing. In this situation, TBs have to have excess reserves on their balance sheet because double entry booking system requires that the asset side and liability side of the central bank should match. Therefore, it is necessary for CB to pay interest at a rate in accordance with policy rate on the excess reserve in order to keep the interest rate in the reserve market closely aligned with the policy rate. To be concrete, suppose that the CB buys out securities by increasing monetary base (i.e. printing money). This increased monetary base must be booked in the liability side of the balance sheet of the CB in the form of either currency in circulation or reserves. In normal times, this increased monetary base will ignite multiple deposit creation, and there would be no excess reserves. But under financial distress,

13) See Deutsche Bundesbank (1995), pp. 125-126, and European Central Bank (2008), pp. 59.

multiple deposit creation would not occur in its full scale, and TBs end up with excess reserves. In other words, even if reserve requirements are not binding, like the situation major central banks face nowadays, increasing reserve requirements ratio would have no impact on monetary aggregates, and true and measured credits to PAs due to the existence of excess reserves. If the reserve requirements ratio is increased so high that deficiency of reserve is caused, then the previous case without excess reserves applies. Decreasing reserve requirements ratio in this situation would not have any effect either. It will just increase the amount of excess reserves.

3. Money and Credit in Slightly Different Environments

We slightly change the environment above to incorporate deposits at TBs not subject to reserve requirements and see if there are any changes in results. This can be understood as a robustness check of the result that broad money and credit to PAs increase as shadow banks attract more money from PAs. In particular, SBs' effect on money and credit will be re-examined in two slightly different environments in which TBs provide checking and savings deposit accounts where the former is subject to reserve requirements while the latter is not. In the first slightly different environment, PAs put portion s of their total financial asset in TBs' accounts and $1 - s$ in SBs' accounts. PAs hold portion λ of their total deposits in checking accounts and $1 - \lambda$ in savings accounts. It is easy to derive the monetary aggregates and credit to PAs.

$$M_1 = \frac{c + s(1 - c)}{1 - [1 - rs(1 - \lambda)](1 - c)} A = C_m \quad (17)$$

$$M_2 = \frac{1}{1 - [1 - rs(1 - \lambda)](1 - c)} A = C_r \quad (18)$$

Differentiation of Equations (17) - (18) with respect to s leads to $-\partial M_1 / \partial s < 0$, $-\partial M_2 / \partial s > 0$, $-\partial C_m / \partial s < 0$, and $-\partial C_r / \partial s > 0$. This implies that the original result still holds in this environment.

Now we introduce another slightly different environment in which PAs put portion λ of their total financial assets in checking accounts at TBs and $1 - \lambda$ in savings accounts at TBs and investment accounts at SBs combined. PAs hold portion s in

savings accounts and $1 - s$ in investment accounts. This setup is similar to changing the order of decision making. In the previous environment, PAs first determine the amount to put in TBs and SBs, and then decide the amount in checking and savings accounts. In this environment, PAs first determine the amount to put in checking accounts versus in savings and investments accounts combined, and then decide the amount to put in savings and investment accounts.¹⁴⁾ We can also derive monetary aggregates and credit in this environment easily.

$$M_1 = \frac{c + \lambda(1 - c) + s(1 - \lambda)(1 - c)}{1 - (1 - r\lambda)(1 - c)} A = C_m \quad (19)$$

$$M_2 = \frac{1}{1 - (1 - r\lambda)(1 - c)} A = C_r \quad (20)$$

Again, differentiate the above equations with respect to s to get: $-\partial M_1 / \partial s = -\partial C_m / \partial s < 0$, $-\partial M_2 / \partial s = -\partial C_r / \partial s = 0$. Notice that M_2 and C_r are both independent of s . In other words, broad money and true credit to PAs do not change as SBs attract more portions of financial assets from PAs. This is because the portion PAs put in savings and investment accounts combined is fixed at $1 - \lambda$ and both accounts are not subject to reserve accounts. Indeed, the PAs put, as a result, portion $(1 - \lambda)(1 - s)$ of their financial assets in investment accounts. One can check $-\partial M_2 / \partial \lambda = -\partial C_r / \partial \lambda > 0$. Nevertheless, the partial analysis with respect to s is meaningful in the sense that PAs do not adjust the portion to put in checking accounts much in reality.

Figure 3 depicts the changes in money and credit in all the aforementioned three environments covered so far. Dashed lines correspond to the original environment, thin solid line to the first slightly different environment, and thick solid line to the second slightly different environment. Notice that with introduction of checking accounts in the first slightly different environment, the slope of broad money is flatter than the case of the original environment. In the second slightly different environment, the slope of narrow money becomes linear and the broad money does not change according to the change in proportion PAs put in the investment

14) One way to see the difference between the environments is to consider similarity and substitutability across checking, savings and investment accounts. Private agents in this environment may think that savings and investment accounts are more similar and substitutable while those in the previous environment may think checking and savings accounts are more so.

accounts versus savings accounts. The bottom line is that SBs might not directly or drastically increase the credit to PAs. Indeed, this argument is strengthened in the next section by the result that leverage taking by SBs, at a given s , does not affect the true amount of credit supply to PAs.

Figure 3: Monetary Aggregates and Credit in Different Environments

Note: This figure shows that, in a different environment, broad money and true amount of credit stay at the same level, not responding to changes in the portion private agent put their money in shadow banks (s). Simulation is based on $A = 100$, $c = 0.02$, $r = 0.03$, $\lambda = 0.5$.

III. Leverages

In this section, we go back to the original environment and allow SBs to take leverages. Let δ denote hair-cut so that leverage is $1/\delta$.¹⁵⁾ Further, we assume that TBs

¹⁵⁾ The leverage ratio is the reciprocal of the hair-cut or the margin. See Geanakoplos (2010).

want to retain ϕ of their loans in their own balance sheets. That is, the supply of ABS is given at $(1 - \phi)L$. To make the analysis interesting and consistent with the previous section, we assume that $1 - \phi \geq (1 - s)(1 - c)$. The last assumption implies that the amount of ABS sold by TBs is at least the amount of PAs' financial investments put in SBs' accounts at each round of the deposit creation scheme so that TBs carry all of the funds raised by SBs' investment accounts to the next round for making loans.

Consider the situation right after the first deposit creation but before the start of second deposit creation. SBs have raised $(1 - s)(1 - c)A$ unit of investments from PAs and have bought the same amount of ABS from TBs. Up until now nothing seems new, but the magic of leverage starts here. Using the purchased ABS as collateral, SBs effectively borrow $(1 - \delta)(1 - s)(1 - c)A$ unit of money from TBs. In particular, SBs issue asset-backed commercial papers (ABCP) and sell them to TBs to finance the purchase of ABS. TBs are transforming their loans to PAs, to cash and short term ABCP holdings. SBs fund in the short term by issuing ABCP¹⁶⁾ and invest in the long term by purchasing ABS. Therefore, maturity transformations take place. In addition, since ABCP are more liquid than ABS, liquidity transformations also take place. Importantly, these maturity and liquidity transformations are shifted out of the TBs' balance sheets to the shadow banking sector. In reality, a lot of things are going on in originate-and-distribute process such as loan warehousing, ABS issuance, ABS warehousing, ABS CDO issuance, ABS intermediation, etc (Pozsar et al., 2010). But, conceptually, our model captures the essence of the transactions between TBs and SBs. Indeed, TBs still play a pivotal role, behind the scene, in shadow banking by sponsoring and financing SBs.¹⁷⁾

Now we go on with the process of off-loading loans to PAs from TBs' balance sheets. SBs at this moment have $(1 - \delta)(1 - s)(1 - c)A$ unit of money financed from ABCP issuance. SBs buy the same amount of ABS again from TBs. This process of taking leverage repeats again and again. Money flows in this entire process, from

16) ABCP mature typically between 90 and 180 days.

17) Cetorelli et al. (2012) wrote that 75% of the outstanding value of ABCP, which peaked around 1.2 trillion U.S. dollars before the global financial crisis, were backed up by commercial banks. In other words, commercial banks guaranteed stream of payments of ABCP issued by shadow banks. Further, the change of banking model from originate-and-hold to originate-and-distribute has a profound impact on the organization of banks. Commercial banks reacted to the change of banking environment by integrating shadow banks to form bank holding companies.

the perspective of TBs, boil down to $(1-s)(1-c)A$.¹⁸⁾ In other words, TBs and SBs don't need extra money in this inter-financial institution leverage process, except the original amount of high-powered money A . TBs' wholesale funding through the sales of ABS can be simplified to $(1-s)(1-c)A/\delta$.¹⁹⁾ Similarly, TBs' purchase of ABCP from SBs (effectively SBs' borrowing from TBs) can be represented by $(1-\delta)(1-s)(1-c)A/\delta$.²⁰⁾ Therefore, SBs use ABS worth $(1-s)(1-c)A/\delta$ in book value as collateral to issue ABCP of face value $(1-\delta)(1-s)(1-c)A/\delta$ as anticipated by the hair-cut.²¹⁾ Note that available loans for sales by TBs (i.e. supply of ABS) is $(1-\phi)A$ since total loans to PAs right after the first round of deposit creation is A . Demand for ABS generated by SBs is $(1-s)(1-c)A/\delta$. Equilibrium condition is, in turn, $1-\phi = (1-s)(1-c)/\delta$. This equilibrium condition repeats itself at every round of deposit creation.

We just finished the first round with leverage taking incorporated. TBs carry funds raised from deposits (minus reserve requirements), and sales of ABS (minus purchase of ABCP) to the next round to make new loans to PAs. Therefore, commercial banks' loans to private agents in the second round is, in equilibrium, $(1-rs)(1-c)A$.²²⁾ It is straight forward to repeat this process in the following rounds to derive the amount of private cash holdings, deposits, loans to PAs, ABS, ABCP(G), and financial investments of PAs in SBs' accounts.

$$C = cL \quad (21)$$

$$R = rD \quad (22)$$

$$D = s(1-c)L \quad (23)$$

$$L = \frac{1}{1 - (1-rs)(1-c)} A \quad (24)$$

18) Money inflows and outflows in TBs' perspective can be represented by: $(1-s)(1-c)A - (1-\delta)(1-s)(1-c)A + (1-\delta)(1-s)(1-c)A - (1-\delta)^2(1-s)(1-c)A + (1-\delta)^2(1-s)(1-c)A - \dots = (1-s)(1-c)A$.

19) Adding up sales of ABS gives the result: $(1-s)(1-c)A + (1-\delta)(1-s)(1-c)A + (1-\delta)^2(1-s)(1-c)A + \dots = (1-s)(1-c)A/\delta$.

20) Note that $(1-\delta)(1-s)(1-c)A + (1-\delta)^2(1-s)(1-c)A + \dots = (1-\delta)(1-s)(1-c)A/\delta$.

21) In reality, shadow banks need more support to issue ABCP like credit enhancement backed up by commercial banks. See Cetorelli et al. (2012).

22) As one may have already noticed, the assumption that $1-\phi \geq (1-s)(1-c)$ makes it possible for commercial banks to carry all of the funds raised through shadow banks' investment accounts to the next round.

$$F = \frac{(1-s)(1-c)}{\delta} L = (1-\phi)L \quad (25)$$

$$G = \frac{(1-\delta)(1-s)(1-c)}{\delta} L = (1-\delta)(1-\phi)L \quad (25)$$

$$F = E = (1-s)(1-c)L \quad (27)$$

Monetary aggregates and true and measured credit to PAs can also be derived under this environment.

$$M_1 = [c + s(1-c)]L \quad (28)$$

$$M_2 = L = C_r \quad (29)$$

$$C_m = \phi L \quad (30)$$

Some observations are in order. Firstly, SBs cannot increase the true amount of credit supplied to PAs by taking leverages. This is natural since transactions between financial institutions by themselves, without funding from the creditor outside the banking sector, do not increase credit supply to PAs, as pointed out by Shin (2009).

Secondly, after the sales of loans by TBs, the measured amount of loans to PAs on the balance sheets of TBs (ϕL) does not accurately reflect the true amount (L). Moreover, since the liability side of the balance sheets of TBs does not change, the amount of monetary aggregates stays the same. To see this, compare Equations (7) - (10) and (28) - (30). This is so even if we classify TBs as money creating agents and SBs as money holding agents²³⁾ due to the fact that TBs buy ABCP rather than lend to SBs. Effectively, the two methods are the same but in deriving monetary aggregates those are totally different. In the balance sheets of TBs, loans to PAs change to ABCP holdings after the leverage taking process and monetary aggregates do not reflect these inter-financial institution transactions. True credit to PAs still coincides with broad money. Measured credit, however, no longer coincides with narrow money.

23) Monetary aggregates are calculated from the consolidated balance sheet of money creating agents. In particular, monetary aggregate is a certain type of liability of money creating agents (e.g. central and commercial banks) owed to money holding agents (e.g. households and firms). For more information, see Burgess and Janssen (2007).

Thirdly, there is no reason that the parameters have a certain relationship such that $1 - \phi = (1 - s)(1 - c)/\delta$ holds. Well, if $1 - \phi \neq (1 - s)(1 - c)/\delta$, given the assumption that $1 - \phi \geq (1 - s)(1 - c)$, then the equilibrium ABS should be $\min\{(1 - \phi)L, (1 - s)(1 - c)L/\delta\}$. Even if this is the case, the first observation above remains valid with a slight change. In particular, monetary aggregates and true credit are the same as before but measured credit now changes to $[1 - \min\{1 - \phi, (1 - s)(1 - c)L/\delta\}]L$.

Fourthly, the equilibrium tells us, on the one hand, that even if there occur some defaults on loans to PAs, the financial system will not be heavily affected. Total loans to PAs (true amount) act as an upper bound of the amount of ABS and ABCP as illustrated in Equations (25) and (26). Specically, TBs' ABCP holdings are restricted to $\min\{(1 - \delta)(1 - \phi)L, (1 - \delta)(1 - s)(1 - c)L\}$. Since ABCP are backed by ABS, TBs can recover the loss from SBs' ABS holdings too. Consequently, TBs' loss is restricted to the loss arising from non-performing loans to PAs. On the other hand, a financial acceleration mechanism could materialize in this situation. Slight changes in the default rate of loans to PAs can cause deterioration of SBs' balance sheet status due to leverage. If this happens, PAs might try to withdraw their investments from SBs, which would increase s . In turn, total loans to PAs would decrease. Meanwhile, SBs would off-load their ABS in response to losses and withdrawal. Fire sales and further losses for SBs might occur. This process of deleveraging could be painful in some situations like the recent global financial crisis. To sum up, the financial system should be resilient to bad shocks since the leverages taken by SBs would be restricted to a manageable level, although the possibility of financial crisis could not be excluded.

IV. Proprietary Transactions

In this section, we introduce proprietary transactions by allowing TBs to make transactions on their own accounts. In other words, TBs can invest in SBs or borrow/lend each other on their own accounts rather than on behalf of their depositors. As in the previous section, we assume $1 - \phi \geq (1 - s)(1 - c)$ throughout this section. We will show, without loss of generality, that equilibrium amount of ABS can

be determined not by $\min\{(1 - \phi)L, (1 - s)(1 - c)L/\delta\}$, but by $\max\{(1 - \phi)L, (1 - s)(1 - c)L/\delta\}$.²⁴⁾

Figure 4: Potential ABS Demand Times of Total Loans to PAs

Note: This figure plots ABS demand as times of total loans to private agents against hair-cut(δ). Simulation is based on $s = 0.5$, $c = 0.02$, $r = 0.03$, $0.01 \leq \delta \leq 0.1$.

Before digging into that, let's check the potential size of ABS demand: $(1 - s)(1 - c)L/\delta$. Figure 4 depicts the coefficient $(1 - s)(1 - c)/\delta$ under specific s and c . It shows that the demand for ABS can reach more than ten times the total loans to PAs for hair-cut lower than 5%. Therefore, if financial institutions are capable of changing the equilibrium amount of ABS from the minimum to the maximum of supply and demand, it means a lot from a financial stability perspective.

Suppose that supply of ABS exceeds demand: $(1 - \phi) > (1 - s)(1 - c)/\delta$. In this case TBs have extra loans to sell. Consider the situation right after the first round of

24) The equilibrium amount of ABS can take any value between $\min\{(1 - \phi)L, (1 - s)(1 - c)L/\delta\}$ and $\max\{(1 - \phi)L, (1 - s)(1 - c)L/\delta\}$, including the endpoints.

deposit creation. Suppose TBs borrow x^l from CB, where the superscript j denotes the j th round. Apparently, the gap between the supply and demand does not disappear if TBs make extra loans to PAs of amount x^l . TBs must invest in SBs to narrow the gap. Then SBs will increase their demand for ABS by x^l/δ . This should clear the gap $(1 - \phi)A - (1 - s)(1 - c)A/\delta$ so that $x^l = [\delta(1 - \phi) - (1 - s)(1 - c)]A$. TBs' sales of ABS amount to x^l/δ while purchases of ABCP sum up to $(1 - \delta)x^l/\delta$. Therefore, after the sales of ABS, TBs can clear up the excess supply of ABS and pay back the borrowing from CB $x^l = x^l/\delta - (1 - \delta)x^l/\delta$ as well. After repeating this process infinite times, we have $\sum_{j=1}^{\infty} x^j = \delta(1 - \phi)L - (1 - s)(1 - c)L$.

Now consider the case in which demand for ABS exceeds supply: $(1 - \phi) < (1 - s)(1 - c)/\delta$. Increasing loans to PAs does not help shrink the gap between demand and supply since a portion of loans to PAs flow back to SBs and further increase demand for ABS. We will show that TBs can create extra loans each other without extra money. Again, focus on the first round and suppose that there are two symmetric TBs. Let TB_1 and TB_2 denote them. TB_1 borrows from CB and make loans of amount $y^l/2$ to TB_2 , where the superscript j denotes the j th round. TB_2 , in turn, make loans of the same amount to TB_1 and TB_1 clears up the borrowing from CB. TBs now have extra assets of amount y^l to sell. This amount y^l should clear the gap between the demand and supply: $y^l = (1 - s)(1 - c)A/\delta - (1 - \phi)A$. Note that TBs can avoid borrowing from CB once they sell off $(1 - s)(1 - c)A$ unit of loans to SBs. Since shadow banks' purchase of ABS is funded through their investment accounts, this fund can be recycled again and again within the banking sector to create loans between commercial banks. Ultimately, after infinite rounds of deposit creation scheme, we obtain $\sum_{j=1}^{\infty} y^j = (1 - s)(1 - c)L/\delta - (1 - \phi)L$. Alternatively, TBs can make loans to SBs before selling off them to other SBs. Suppose that there are two symmetric SBs: SB_1 and SB_2 . In the first round, each SB buys $(1 - s)(1 - c)A/2$ unit of ABS with the funds raised by its financial investment accounts. After this, TBs borrow $(1 - \delta)(1 - s)(1 - c)A$ from CB²⁵⁾ and lend $(1 - \delta)(1 - s)(1 - c)A/2$ to each SB taking the ABS as collateral. Then TBs sell these loans to the other SBs. In particular, SB_1 buys TBs' loan to SB_2 and SB_2 buys TBs' loan to SB_1 . TBs, after the sales of loans, clear the borrowing from CB. In the next process (still in the first round), TBs borrow $(1 - \delta)^2(1 - s)(1 - c)A$ from CB and repeat lending and selling ABS to SBs as in the previous process. This process is repeated until the excess demand for ABS disappears. As this process can increase supply of ABS up to $(1 - s)(1 - c)A/\delta$, there should be a finite number of

process that makes the supply and demand for ABS equal.

We have just shown that the equilibrium amount of ABS can be determined at the maximum of supply and demand. Nevertheless, monetary aggregates and true credit to PAs stay at the same level since deposits and financial investments of PAs do not change. Only measured credit to PAs on the balance sheets of TBs changes to $\phi L = \phi A / [1 - (1 - rs)(1 - c)]$. Leverages, however, really kick in to generate accelerating mechanism a la Adrian and Shin (2009). Suppose SBs maintain leverages around 10 (hair-cut is 0.1). This implies that the loss of SBs is 10 times larger than the decrease of value of the ABS. If the value of ABS declines beyond a threshold point, then SBs will immediately face difficulties in rolling over ABCP and are forced to liquidate their ABS holdings. This, in turn, puts increased pressures on the value of ABS. If ABS value drops by 10%, SBs' capital (in the form of investments from PAs and SBs) will be completely wiped out. SBs will default on huge amount of debt. Now TBs' loss is not restricted to the loss incurred from non-performing loans to PAs but spans over the loss incurred from TBs' investments on SBs or huge amount (close to five times the total loans to PAs according to Figure 4) of debt TBs and SBs crossly own. Should it occur, the process of deleveraging would be much more severe and painful compared to the case without proprietary transactions.

V. Conclusions

The shape of banking industry has remarkably changed since the 1988 Basel Accord. According to Pozsar (2008), the Basel Accord was one of the major driving forces behind the growth of originate-and-distribute banking model. These rules, by enforcing minimum capital requirement and more capital protection against riskier assets, forced commercial banks to off-load riskier loans from their balance sheets through securitization and brought full flourish of shadow banking system gradually over decades.

25) As in the previous illustration, commercial banks can use part of the funds raised from the sales of ABS rather than borrow from the central bank.

This change of the banking model is considered to be one of the major causes of credit boom in the run-up to the recent global financial crisis. However, the effects of shadow banks on the monetary aggregates, credit supply to private agents, and inter-financial institution transactions are not clearly understood until recently. This paper has attempted to fill the gap by incorporating shadow banks into the multiple deposit creation scheme and has derived some meaningful results: inter-financial institution transactions (non-core assets/liabilities) can increase dramatically while broad money and credit to private agents do not increase much. Commercial banks still plays a pivotal role in the financial system by providing credit and investments to shadow banks. In this regard, central banks and financial supervisory authorities need to monitor closely non-core assets as advocated by Hahm et al. (2011) and Shin and Shin (2011). Reserve requirements ratio does not seem to be a promising tool if the central banks aims to tame rapid growth of monetary aggregates or credit to private agents. From the financial stability viewpoint, however, the central bank can increase the reserve requirements ratio in the financial boom and lower it in the financial distress to induce commercial banks to stockpile liquidity in the good times. Commercial banks have to maintain the amount of required reserves on average basis over a maintenance period. In this sense, required reserves are not liquid. But once central bank lowers the reserve requirements ratio, commercial banks can use the freed reserves for their own purpose.

This paper has shown that conventional measures of monetary aggregates and especially credit to private agents derived from banks' consolidated balance sheets do not adequately represent their true amounts. Monetary aggregates cannot capture and reflect the transactions between commercial and shadow banks since the commercial and shadow banks make use of financial instruments in their transactions even though most of those transactions are effectively lendings and borrowings. Furthermore, once commercial banks off-load their loans to shadow banks, credit to private agents measured by examining commercial banks' balance sheets always understates the true amount. In some cases, the gap between measured and true amount can be huge. Therefore, fundamental improvements are needed to be made to measure the true amount of monetary aggregates and credit in that environment. This result also implies that estimating money or credit demand based on measured monetary aggregates/credit can be misleading unless leverages and proprietary transactions are taken into account.

The static model, of course, has its own limit and weakness, and this paper, at best, explains only a partial part of the subject covered. The focus of this paper, for example, centers around the quantity perspective only. In reality, quantities respond to price variables such as interest rate. This paper, nevertheless, gives some implications for further studies. Subtle changes in model settings have led to different results, as shown in Section 2.3. In dynamic models, this may translate into the importance of timing in decision making process. It is advised to consider the timing of decision making carefully to reflect reality when setting up models. Further, as pointed out by Geanakoplos (2010), interest rates may not contain or represent sufficient statistics for financial status. This paper has shown that proprietary transactions and leverage can possibly circumvent capital and/or liquidity regulations and generate, somewhat endogenously, huge amount of effective lendings and borrowings between commercial and shadow banks. Different levels of inter-financial institution transaction under the same interest rate may suggest different stories about the financial stability.

References

- Adrian, Tobias and Hyun Song Shin (2009), "Liquidity and Leverage," *Staff Reports*, Federal Reserve Bank of New York, No. 328.
- Adrian, Tobias and Adam Ashcraft (2012), "Shadow Banking: a Review of the Literature," *Staff Reports*, Federal Reserve Bank of New York, No. 580.
- Bindseil, Ulrich (2004), "Monetary Policy Implementation: Theory - Past - Present," Oxford University Press.
- Burgess, Stephen and Norbert Janssen (2007), "Proposals to Modify the Measurement of Broad Money in the United Kingdom: A User Consultation," *Quarterly Bulletin*, Bank of England, pp. 402-414.
- Cetorelli, Nicola, Benjamin Mandel and Lindsay Mollineaux (2012), "The Evolution of Banks and Financial Intermediation: Framing the Analysis," *Economic Policy Review*, Federal Reserve Bank of New York, pp. 1 - 12.
- Claessens, Stijn, Zoltan Pozsar, Lev Ratnovski and Manmohan Singh (2012), "Shadow Banking: Economics and Policy," *IMF Staff Discussion Note*, SDN/12/12.
- Deutsche Bundesbank (1995), *The Monetary Policy of the Bundesbank*.
- European Central Bank (2008), *The Implementation of Monetary Policy in the Euro Area*.
- Feinman, Joshua (1993), "Reserve Requirements: History, Current Practice, and Potential Reform," *Federal Reserve Bulletin*, Vol.79, pp. 569-589.
- Financial Stability Board (2011), "Shadow Banking: Scoping the Issues."
- Geanakoplos, John (2010), "The Leverage Cycle," *Cowles Foundation Paper*, No. 1304.
- Goodfriend, Marvin and Monica Hargraves (1983), "A Historical Assessment of the Rationales and Functions of Reserve Requirements," *Economic Review*, Federal Reserve Bank of Richmond, pp. 3-21.
- Hein, Scott and Jonathan Stewart (2002), "Reserve Requirements: A Modern Perspective," *Economic Review*, 87(4), Federal Reserve Bank of Atlanta, pp. 41-52.

- Joon-Ho Hahm, Hyun Song Shin and Kwanho Shin (2011), "Non-Core Bank Liabilities and Financial Vulnerability," paper presented at the Federal Reserve Board and JMCB Conference on "Regulation of Systemic Risk," Washington, DC.
- Kahn, George (2010), "Monetary Policy under a Corridor Operating Framework," *Economic Review*, Federal Reserve Bank of Kansas City, pp. 5-34.
- Kim, Kyungsoo, Byoung-Ki Kim and Hail Park (2012), "Interest Rate-Oriented Monetary Policy Framework and Financial Procyclicality," *Korean Economic Review*, 28(2), pp. 161-188.
- Pozsar, Zoltan (2008), "The Rise and Fall of the Shadow Banking System," *Regional Financial Review*, Moody's Economy.
- Pozsar, Zoltan, Tobias Adrian, Adam Ashcraft and Hayley Boesky (2012), "Shadow Banking," *Staff Reports*, Federal Reserve Bank of New York, No. 458.
- Hyun Song Shin (2009), "Securitisation and Financial Stability," *The Economic Journal*, Princeton University, 119, pp. 309-332.
- Hyun Song Shin and Kwanho Shin (2011), "Procyclicality and Monetary Aggregates," *NBER Working Paper*, No. 16836.

<Abstract in Korean>

김병기*

이 논문은 shadow bank의 존재가 민간신용, 통화량 및 금융기관간 거래에 미치는 영향을 분석한다. 이를 위해 전통적인 예금창출과정을 확장하여 shadow bank의 레버리지 확대, 상업은행의 자기계정 거래, 중앙은행의 금리중심 통화정책 운영체계 등을 모형에 반영하였다. 분석결과 상업은행의 예금에 비하여 shadow bank의 투자계정 예치금이 증대될수록 협의통화량은 감소하나 광의통화량 및 민간신용은 증대되는 것으로 나타났다. 특히 금융기관간 거래는 이론상 민간신용의 수십 배 규모까지 증대될 수 있는데, 이러한 경로를 통하여 shadow banking은 시스템적 리스크를 증대시킬 수 있다. 상업은행이 대출을 유동화하여 shadow bank에 매각함에 따라 상업은행의 대차대조표 분석만으로는 실제 민간신용을 제대로 파악하기 어려워지게 된다. 또한 금융기관간 거래가 주로 대차대조표의 자산항목 변경을 통해 이루어지므로 일부 부채항목을 집계하여 산출하는 통화량을 통해서만 shadow banking의 활성화 정도, 나아가 시스템적 리스크 상황을 제대로 파악하기 어려운 것으로 나타났다.

* 한국은행 경제연구원 금융통화연구실 선임연구원

이 연구내용은 집필자의 개인의견이며 한국은행의 공식견해와 무관합니다. 따라서 본 논문의 내용을 보도하거나 인용할 경우에는 집필자명을 반드시 명시하여 주시기 바랍니다.

THE BANK OF KOREA

m.bok.or.kr