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國際學碩士學位論文

**The Impact of Monetary Policy and  
Macro-prudential Policy on Banks'  
Lending Conditions: Evidence from the  
Asian Region**

통화정책 및 거시 건전성 정책이 은행 대출에게  
준 영향: 아시아 지역을 대상으로 한 사례연구

2015 年 8 月

서울大學校國際大學院

國際學科國際通商專攻

宋 揚

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A thesis presented

by

**Yang Song**

A dissertation submitted in partial fulfillment  
of the requirements for the degree of Master  
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**Graduate School of International Studies  
Seoul National University  
Seoul, Korea  
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통화정책 및 거시 건전성 정책이 은행대출에게  
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## **Abstract**

# **The Impact of Monetary Policy and Macro-prudential Policy on Banks' Lending Conditions: Evidence from the Asian Region**

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Since the economic expansion began in 2002, lowering monetary policy rates has been one of the policies to boost economic growth. Until the 2008 global financial crisis, the question of how monetary policy affects banks' stability has been a main issue in academic and policy field. Some of scholars criticized that the low monetary policy rate is culprit of 2008 global financial crisis. They deemed that keeping monetary policy rate too low can increase banks' lending and risk-taking by financial institutions.

The main research of this paper is to examine two specific questions related to

transmission mechanism of monetary policy in Asian region during 2005-2012.

First, whether monetary policy affects banking stability by analyzing its impact on commercial banks' lending in Asian region? Second, if monetary policy affects banks' lending, whether macro-prudential policy could affect the impact of monetary policy rate on commercial banks' lending.

The paper found that monetary policy which is short term interest rate reversely affects commercial banks' lending condition in Asian region. The macro-prudential policy reversely impacts the commercial banks' lending condition. The paper also found that monetary policy and macro-prudential policy are connected and influenced each other. Therefore, few suggestions could be proposed in this paper. First, the results of this paper suggest that central banks would need to consider the possibility of bank risk by making monetary policy rate too low. Furthermore, the potential impact of risk-taking by banks also may have implications for longer term macroeconomic outlook including output growth, investment and credit. Second, banking supervisors should strengthened the macro-prudential perspective to financial stability by intensifying their vigilance during periods of protracted low interest rates, particularly if accompanied by other signs of risk-taking, such as rapid credit and asset price increases. Finally, the

authorities of central bank should pay more attention to financial stability issues when they conduct monetary policy. The results of this paper supports that central banks should take more responsibilities on macro-prudential supervision and regulation, in particular the new responsibilities of the Asian regions central bank on macro-prudential policy to monitor systemic risk.

*Key words:* monetary policy, macro-prudential policy, bank stability

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## **1. Introduction**

Since the 2008 global financial crisis, the question of how monetary policy affects banks' stability has been a main issue in academic and policy field. Some of scholars criticized that the low monetary policy rate is culprit of 2008 global financial crisis. They deemed that keeping monetary policy rate too low can increase lending and risk-taking by financial institutions. Before the crisis, many central banks lowered interest rates to boost economic growth. Such as U.S. Federal Reserve Bank, Fed lowered interest rates from 6.5% to 1.0% between January 2001 and June 2003. Taylor pointed out that prior successes in taming higher levels of inflation strengthened the support for a large number of monetary authorities to lower interest rates, keeping them below the levels suggested by historical experience (Taylor, 2009). During the 2002-2005, nominal rates were the lowest in the last decades, below Taylor-rule implied rate, and even real interest rates were negative in several countries (Taylor, 2007). Therefore, a call to query is whether too low monetary policy rate impacts banks' stability in the west academic and policy field.

There are large numbers of studies on how monetary policy effect on banks' stability. The studies based on the theory of monetary policy transmission. The theory suggested that the central bank can change bank reserve scale through monetary policy, from objectively affect the ability of commercial bank to provide loan. It is amplified when banks are subject to reserve requirement on liabilities; a monetary policy contraction drains reserves, hence decreasing bank's ability to lend.

Some recent empirical evidences have shown that keeping monetary policy rate too low can increase banks' appetite for credit and liquidity risk due to banks' moral hazard problems (Jimenez et al. 2012b). Overall the theoretical literature on this topic is inconclusive. In particular, recent theoretical banking micro-based work suggests that changes in the monetary policy rate may affect credit risk-taking by financial institutions. Adrian and Shin (2010a) describe the risk-taking channel of monetary policy and show that expansive monetary policy increases lending and risk-taking by banks when their Value at Risk (VaR) constraint is binding in capital. Angela Maddaloni and Jose-Luis Peydro (2013) find robust evidence that low monetary policy interest rates soften lending conditions unrelated to borrowers' risk in the period prior to the crisis, and some

suggestive evidence of excessive risk-taking due to low interest rates for mortgage loans. Moreover, the impact of low monetary policy rates on the softening of standards is reduced by more stringent prudential policy on either bank capital or loan-to-value ratio.

While western empirical evidences showed negative result of low monetary policy rate on banks' stability, this paper will follow prior study and examine the same questions in Asian region. This paper try to find out answers base on the two main questions, the first one is whether monetary policy affects banks' stability by analyzing its impact on commercial banks' lending conditions in Asian region. The second one is if low monetary policy (interest rates) increases commercial banks' lending, whether macro-prudential measures could affect the impact of low monetary rate on commercial banks' lending?

The remainder of the paper is organized as follow. In section 2 an introduction of monetary policy and macro-prudential policy in Asian region; Section 3 presents data and empirical models used in the paper; Section 4 summarizes the result and relevant findings; lastly Section 5 states the conclusion and limitation of the paper.

## **2. Introduction of Monetary Policy and Macro-prudential Policy in Asian Region**

There are 49 independent countries in Asia, considering data resource acquirable, the paper selects 7 countries in Asian region as representative data which based on the Institute of International Finance. The institute of International Finance deems these 7 countries as leading emerging markets in the Asian region which are China, India, Indonesia, South of Korea, Malaysia, the Philippines and Thailand. In this chapter, the paper will introduce the perspective of monetary policy and macro-prudential policy in these 7 countries.

### **2.1 Monetary Policy Objectives and Frameworks in Asian Region**

In China, monetary authorities stated that the objective of the monetary policy is to maintain the stability of the value of the currency in order to promote economic growth. The People's Bank of China has been conducting monetary policy under a flexible monetary targeting.

In India, the objectives of monetary policy evolved as maintaining price stability and ensuring adequate flow of credit to the productive sectors of the economy. With progressive liberalization and increasing globalization of the economy, maintaining orderly conditions in the financial markets emerged as an additional policy objective. Thus, monetary policy in India endeavors to maintain a judicious balance between price stability, economic growth and financial stability.

The monetary policy framework in India from the mid-1980s till 1997-98 can be characterized as a monetary targeting framework on the lines recommended by Chakravarty Committee (1985). In the 1990s, the increasing market orientation of the financial system and greater capital inflows imparted instability to the money demand function. Consequently, there was a shift to multiple indicators approach in the late 1990s. Under this approach, interest rates or rates of return in different markets along with movements in currency, credit, fiscal position, trade, capital flows, inflation rate, exchange rate, refinancing and transactions in foreign exchange – available on a high frequency basis – are juxtaposed with output data for drawing policy perspectives.

In Indonesia, monetary authorities stated that the goal of Bank Indonesia is to achieve and maintain the stability of the rupiah. This goal is stipulated in article 7 of Act No. 3 of 2004 concerning Bank Indonesia. To implement monetary policy, Bank Indonesia has opted for a working framework known as the Inflation Targeting Framework (ITF). This framework was formally adopted in July 2005, and replaces the previous monetary policy using base money as the monetary policy target.

In Korea, the Article 1, Clause 1 of the 「Bank of Korea Act」 stipulates that the purpose of this Act is “to contribute to the sound development of the national economy by pursuing price stability through the formulation and implementation of efficient monetary policy”. Accordingly, the Bank of Korea takes price stability as the most important objective of its monetary policy. ... In order for the national economy to achieve stable growth, it should be supported by not only price stability but also financial stability. Regarding this, Article 1, Clause 2 of the 「Bank of Korea Act」 stipulates that “The Bank of Korea needs to pay attention to financial stability in the implementation of monetary policy”. Thus, the Bank of Korea is also making policy efforts to maintain financial stability while pursuing price stability through implementing its monetary policy. The Bank of

Korea has been adapting inflation targeting as its monetary policy framework.

Inflation targeting is a operational framework of monetary policy focusing on the ultimate goal for ‘inflation’ itself and aiming to achieve its goal over the mid-term horizon, instead of setting intermediate targets such as ‘money supply’ or ‘exchange rates’ and influencing them thus to achieve the ultimate goal of price stability.

In Malaysia, monetary authorities stated that Bank Negara Malaysia promotes monetary stability and financial stability conducive to the sustainable growth of the Malaysian economy. The monetary policy framework in Malaysia from 1970 till 1998 can be characterized as a monetary targeting framework. In the 1990s, the increasing market orientation of the financial system and greater capital inflows imparted instability to the money demand function. Consequently, there was a shift to interest rate targeting in the late 1990s until now.

In Philippines, monetary authorities stated that the primary objective of BSP's monetary policy is to promote a low and stable inflation conducive to a balanced and sustainable economic growth. The adoption of inflation targeting framework for monetary policy in January 2002 is aimed at achieving this objective.

In Thailand, monetary authorities stated that although monetary policy objectives were not explicitly stipulated in the Bank of Thailand Act, in practice the Bank has always regarded the maintenance of monetary and financial stability as its primary goal, both of which are necessary in achieving sustainable economic growth over the long run. The Bank of Thailand has been conducting monetary policy under a flexible inflation targeting framework since May 2000 wherein the Bank pays attention not only to inflation but also to economic growth and stability including financial market conditions as well as financial status of households, businesses, and financial institutions.

According to the information of monetary authorities in these 7 countries, most central banks in these 7 countries have chosen to pursue price stability as one of their principal objective of monetary policy. Based on information of the monetary authorities of South Korea, the Philippines, India, Malaysia and Thailand currently aim for price stability as a vital objective. The People's Bank of China and Bank Indonesia stated their goal as maintain the stability of the value of the currency, which could mean to maintain the internal value in terms of goods and services and the external value in term of nominal exchange rate. The awareness of

financial stability and the need for a macro-prudential dimension to financial surveillance and regulation has been heightened since the global financial crisis. Therefore, financial stability has been chosen to an additional policy objective in South Korea, India, Malaysia and Thailand. Achieving the objectives of monetary policy, diverse strategies were adopted by different countries. For instance, Bank Indonesia, The Bank of Korea, Bangko Sentral ng Pilipinas and Bank of Thailand proclaimed that they adapted inflation targeting as their monetary policy framework. Malaysia has shifted to interest rate targeting, China has adapting monetary targeting and India has adapting multi indicator approach- inflation rate is one of indicators-as their monetary policy framework.

## **2.2 Monetary Policy Instruments**

In China, the monetary policy instruments applied by the PBC included reserve requirement ratio, central bank base interest rate, rediscounting, central bank lending, open market operation and other policy instruments specified by the State Council.

In India, the monetary policy instruments applied by the RBI included open

market operation, cash reserve ratio, statutory liquidity ratio, bank rate policy, credit ceiling, credit authorization scheme, moral suasion, repo rate and reverse repo rate.

In Indonesia, on the operational level, these monetary objectives rely on the use of instruments, including open market operations on the rupiah, forex money markets, setting the discount rate, and prescribing a minimum reserve requirement and regulating credit or financing. The policy rate, commonly known as the BI RATE, is adopted in the Board of Governors Meeting at Bank Indonesia. At the operational level, the BI Rate is reflected in movement in the Interbank Overnight (O/N) Rate.

In Korea, the monetary policy instruments applied by the BOK included open market operations, the central bank's lending and deposit facilities and the reserve requirement. Open market operations are the main monetary policy instrument, through which the central bank buys or sells securities with financial institutions in the open markets, thereby influencing the amount of money in circulation and/or interest rates. The Bank of Korea carries out open market operations mainly to steer the overnight call rate — used in the adjustment of temporary surpluses or

shortages of funds by financial institutions — around the 'Base Rate'. Along with this, the Bank can also maintain financial market stability by expanding its supply of liquidity to the markets through open market operations in times of financial turmoil.

In Malaysia, the monetary policy instruments applied by the Bank Negara Malaysia included direct borrowing & Lending, issuance of BNM bills and notes, open market operations, statutory reserve requirement and public sector deposits. The central bank of Malaysia seeks to stabilize the exchange rate, to date having given more weight to the bilateral exchange rate and chose a short-term interest rate serving as an operating target, with liquidity-draining operations the modal means to hit the target.

In Philippines, Bangko Sentral ng Pilipinas(BSP) usesvarious instruments to achieve the desired level of money supply. These include (a) raising/reducing the BSP's policy interest rates; (b) increasing/decreasing the reserve requirement; (c) encouraging/discouraging deposits in the special deposit account (SDA) facility by banks and trust entities of BSP-supervised financial institutions; (d) increasing/decreasing its rediscount rate on loans extended to banking institutions

on a short-term basis against eligible collaterals of banks' borrowers; and (e) outright sales/purchases of the BSP's holdings of government securities. The BSP's primary monetary policy instruments are the overnight reverse repurchase (borrowing) rate and the overnight repurchase (lending) rate.

In Thailand, the BOT's operational framework consists of a set of instruments which can be classified into three categories: Reserve Requirements, Open Market Operations(OMO) and Standing Facilities. OMOs are the primary instrument used to maintain the policy rate, while at the same time ensuring that there is sufficient liquidity in the banking system to satisfy banks' demand for required reserves and settlement balances. The BOT employs four main types of open market operations:1) Bilateral Repurchase Operations (BRP); 2) Issuance of Bank of Thailand bills/bonds ; 3) Foreign Exchange Swap; 4) Outright Purchase/Sale of Debt Securities.

With respect to policy instruments based on the above information from each country's monetary authority's websites, open market operations, lending and deposit facilities and reserve requirement are the major policy instruments for the most of central banks. Meanwhile, the majority of the institutions implemented

their policy by means of targeting a short-term interest rate. Exception like the People's Bank of China, it has adopted growth rates of monetary aggregates as intermediate targets and carries out several instruments in the implementation of its monetary policy, such as central bank base interest rate, rediscounting, and central bank lending.

### **2.3 Monetary Policy Transmission Mechanism**

Regard to each country's monetary authority's website, each central bank's adjustment of its policy rate influences the aggregate economy through various channels. The channels can be sorted as follow: interest rate channel, asset price channel, credit channel, exchange rate channel and expectations channel.

In interest rate channel, monetary authority can adjust its policy rate to affect the levels of bank deposit rates, lending rates, short-term or long-term rate. If the economy is in a downturn, central banks may launch an expansionary monetary policy by lowering interest rates to promote economic activity. Conversely, if there is mounting inflationary pressure, central banks will respond by increasing the policy rate to slow the excessive pace of economic activity and in so doing ease

inflationary pressure. For instance, The Bank of Korea adjusts its Base Rate to affect interest rates in the financial markets as a whole, including short-term and long-term interest rates, and deposit and lending rates. Bank Indonesia changes the BI Rate affect the levels of bank deposit rates and lending rates. The People's Bank of China changes its central bank base interest rate to affect the levels of bank deposit rate and lending rate. The Bank Negara Malaysia, Bangko Sentral ng Pilipinas, The Bank of Thailand and Reserve Bank of India adjust their policy rate to affect their deposit and lending rate levels.

In asset price channel, changes in the policy rate also influences prices of assets including stocks, bonds, real estate and equity. When the central bank decides to decrease the policy rate, adjustments in short-term money market rates occur. People then reallocate their savings towards non-interest bearing assets such as real estate and equity. A rise in demand for these assets results in higher prices. As a result, wealth increases and higher consumption follows. Moreover, higher equity prices also increase market value of firms, thus making it more worthwhile to invest. Ultimately, an expansion in domestic demand would lead to higher economic growth.

In credit channel, an adjustment of the policy rate also influences banks' lending behavior. For example, if there is a Base Rate hike, banks may become even more prudent than before in lending, concerned about the redemption capacity of borrowers. This curtails both investment by businesses raising funds through bank loans and credit-based consumption by households.

In exchange rate channel, a change in the policy rate affects the foreign exchange rate as well. For instance, the case of Korea, if the Base Rate rises in Korea while rates in other countries remain unchanged, returns on Korean won-denominated assets will increase relatively, which will attract foreign capital. As the number of persons hoping to purchase Korean won-denominated assets grows, the won will appreciate. Its appreciation will bring down prices of imported goods and services and demand for them will accordingly grow. This will in turn push up prices of export goods denominated in foreign currency, which will lead to a decline in overseas demand for Korean goods and services.

The case of Thailand, when the central bank decides to decrease the policy rate, adjustments in short-term money market rates occur. Returns on domestic investment decline relative to those from foreign investments, thus causing

outflows of capital. As a result, the baht depreciates, benefiting exports, employment and income. This would in turn stimulate consumption. At the same time, depreciation in the baht causes imports to be lower. Thus, net exports increase and lead to higher economic growth.

The case of Indonesia, a rise in the BI Rate will increases the differential between interest rates in Indonesia and other countries. The widening of the interest rate differential will encourage foreign investors to place their capital in financial instruments in Indonesia, such as Bank Indonesia Certificates or SBIs, in order to profit from higher returns. These capital inflows will in turn lead to appreciation in the rupiah. As a result of the rupiah appreciation, imports become cheaper and our exports become more expensive, or less competitive, thus encouraging higher imports while reducing exports. This decline in net exports will then have downward impact on economic growth and activity in the economy.

In expectations Channel, changes in monetary policy rate affect expectations of the public concerning inflation, employment, growth, future income and profits/losses. Such changes in expectations in turn determine private economic activities. However, the impact of monetary policy through this channel is the

most uncertain of all channels, as it depends on the public's interpretation of such changes in monetary policy stance. For example, the public may view a decrease in the policy rate as a signal that the economy is going to expand higher in the future, boosting their confidence to consume and invest. On the other hand, they may believe that the economy is weaker than previously expected, lowering their confidence and ultimately consumption and investment.

## **2.4 Macro-prudential Policy Objectives**

The financial crisis has highlighted the need to go beyond a purely micro approach to financial surveillance and regulation. In recent years, the number of policy speeches, research papers and conferences that discuss a macro perspective on financial regulation has grown considerably. Brunnermeier et al. (2009) argued that one key purpose of macro-regulation is to act as a countervailing force to the natural decline in measured risks in a boom and the subsequent rise in measured risks in the subsequent bust. Bank of England (2009) noted that in general terms, it should aim at the stable provision of financial intermediation services – payment services, credit intermediation and insurance against risk – to the economy, trying to avoid the type of boom-bust cycles in the supply of credit and liquidity that were

manifested during the recent financial crisis. Macro-prudential policy should instead not be geared to avoiding bubbles and imbalances in general, since – as the dot.com bubble illustrated – these can sometimes not be associated strongly with shifts in (bank) credit supply. Landau (2009) instead argued that avoiding bubbles is a possible mandate for macro-prudential supervision that would be both pragmatic and legitimate. The literature on macro-prudential policy still remains a variance on its objectives. Therefore, broadly speaking, macro-prudential policy is seen as aiming at financial stability and systemic risk. Borio, C. (2011) stated that several aspects of **Basel** reflect a macro-prudential approach to financial regulation. Indeed, the Basel Committee on Banking Supervision acknowledges the systemic significance of financial institutions in the rules text. More concretely, under Basel III banks' capital requirements have been strengthened and new liquidity requirements, a leverage cap and a countercyclical capital buffer have been introduced. Also, the largest and most globally active banks are required to hold more and higher-quality capital, which is consistent with the cross-section approach to systemic risk.

## **2.5 Macro-prudential Instruments**

Shin, H. (2011) and Hanson, S., Kashyap, A. and Stein, J. (2011) proposed several instruments, however, there is no agreement about which one should play the primary role in the implementation of macro-prudential policy. Most of these instruments are aimed to prevent the pro-cyclicality of the financial system on the asset and liability sides, such as: cap on loan-to-value ratio and loan loss provisions and cap on debt-to-income ratio.

The following tools serve the same purpose, but additional specific functions have been attributed to them, as noted below: countercyclical capital requirement - to avoid excessive balance-sheet shrinkage from banks in trouble; cap on leverage (finance) - to limit asset growth by tying banks' assets to their equity (finance); levy on non-core liabilities - to mitigate pricing distortions that cause excessive asset growth; time-varying reserve requirement - as a means to control capital flows with prudential purposes, especially for emerging economies.

To prevent the accumulation of excessive short-term debt: Liquidity coverage ratio, Liquidity risk charges that penalize short-term funding, Capital

requirement surcharges proportional to size of maturity mismatch, Minimum haircut requirements on asset-backed securities.

In most economies, macro-prudential policy frameworks are at an early stage of development. They have been implemented using existing micro-prudential monetary policy and liquidity management mandates and institutions. And, macro-prudential interventions have taken the form of adjustments or add-ons to instruments already used for micro-prudential or liquidity management purposes. To date, macro-prudential instruments have been used mainly to limit the amount of credit supplied to specific sectors seen as prone to excessive credit growth, especially property investment and development. In addition, some emerging market economies have used reserve requirements to prevent the build-up of domestic imbalances arising from volatile cross-border capital flows.

### **3. Literature Review**

There are large numbers of studies on how monetary policy effect on banks' stability. The studies based on the theory of monetary policy transmission. The traditional money view and credit view are two main mechanisms which monetary policy is transmitted to the economy. According to the money view, Friedman and Schwartz(1963) stated that an expansionary monetary policy would lead to a fall in real interest rates, which in turn lowers the cost of capital and causes a rise in investment spending. This leads to an increase in aggregate demand and a rise in output. The theory based on the assumption that there are only two assets in this world, money and bonds. Therefore, the financial intermediaries play no special role; that is in a world of perfect information borrowers can finance their projects directly through lenders with no need for banks. The new theory of monetary transmission mechanism which is credit view based on the assumption that there are three assets in the world: money, publicly issued bonds, and intermediate loans. Under this theory, the bank sector starts play vital role in the financial system and economy by creating money and issuing loans.

Furthermore, the mechanism of balance sheet channel and the bank lending

channel have been suggested to explain the relationship between monetary policy actions and the external finance premium. The balance sheet channel stresses the potential impact of changes in monetary policy on borrowers' balance sheets and income statement. The bank lending channel focuses more narrowly on the effect of monetary policy actions on the supply of loans by banks. The theory is that under the condition of asymmetric information, can make them to those who find it difficult to get money on the open market borrowers with loan service. Therefore, the central bank can change bank reserve scale through monetary policy, from objectively affect the ability of commercial banks to provide loans. It is amplified when banks are subject to reserve requirement on liabilities; a monetary contraction drains reserves, hence decreasing banks' ability to lend. As a result, credit allocated to bank-dependent borrowers may fall, causing these borrowers to reduce their spending.

On the existence of lending channel, the study by Bernanke and Blinder (1992) shows that increases in the Federal Funds Rate (FFR) lead banks to slowly downsize by cutting off loans. Thus, as loans decline, the economy slows. Another study of Bernanke and Blinder (1992) find that a contraction in monetary policy is followed by a decline in the volume of aggregate bank lending. Kashyap, Stein,

and Wilcox (1993) analyzed the relative fluctuations in bank loans and commercial paper issuance by firms as a substitute for loans. They show that at the same time a monetary contraction is reducing bank lending, it is increasing commercial paper volume. Another study for the Greek banking sector also indicates that monetary policy has a significant impact on the supply of bank loans and, through shifts in supply, on aggregate economic activity in Greece (Brissimis et al., 2001). Recently, Angela Maddaloni and Jose-Luis Peydro (2013) find robust evidence that low monetary policy interest rates soften lending conditions unrelated to borrowers' risk in the period prior to the crisis by using Euro area data. Moreover, the impact of low monetary policy rates on the softening of standards is reduced by more stringent prudential policy on either bank capital or loan-to-value ratio.

In sum, based on the above studies, increased the policy rate by central banks will lead banks slowly downsize their loans result in depressing their economic growth, whereas, decreased the policy rate will lead banks increase their loans result in boosting their economic growth.

As we can see that before the global financial crisis, many central banks lowered interest rates to boost economic growth. Prior successes in taming higher levels of inflation strengthened the support for a large number of monetary

authorities to lower interest rates, keeping them below the levels suggested by historical experience (Taylor, 2009). During the 2002-2005, nominal rates were the lowest in the last decades, below Taylor-rule implied rate, and even real rates were negative in several countries (Taylor, 2007). After global financial crisis, many central banks started to recognize that keeping monetary policy rates too low can increase banks' appetite for credit and liquidity risk. Monetary authorities or central banks began to carry out more stringent financial surveillances and regulations and implement more stringent macro-prudential policy to curb the risk. The studies from Euro area showed empirical evidences that more stringent prudential policy is effectively to reduce the potential bank risk taking.

The paper will follow the existing studies by analyzing on how monetary policy and macro-prudential policy impact on commercial banks' lending in Asian region and whether the implement of macro-prudential policies works in Asian region.

## **4. Research Methodology**

Main research purpose of the paper is to find out the impact of monetary policy and macro-prudential policy on commercial bank lending in Asian region. The objective of the study is to examine two specific questions related to transmission mechanism of monetary policy in Asian region during 2005-2012. First, whether monetary policy affects banking stability by analyzing its impact on commercial banks' lending in Asian region? Second, if monetary policy interest rate affects commercial banks' lending conditions, whether macro-prudential measures could affect the impact of monetary policy rate on commercial banks' lending.

### **4.1 Data**

The estimation sample consists of quarterly panel data for the 7 Asia economies which are China, India, Indonesia, Malaysia, South Korea, Philippines and Thailand from 2005 Q1 to 2012 Q4. Data of commercial banks' lending volume over GDP, the short term interest rate, long term interest, total capital ratio, reserve requirement, GDP growth and inflation are taken from each country's

central banks, bank regulation institution, Institute of International Finance, IFS and IMF.

## **4.2 Variables**

This paper follows the previous study and examines the same questions in Asian region. On basis of the paper “Monetary Policy, Macro-prudential Policy, and Banking Stability: Evidence from the Euro Area” by Angela Maddaloni and Jose-Luis Peydro (2013), the paper selected short term rates which is monetary policy rate, long term rate which is government bond, current account balance over GDP, inflation, total bank capital ratio and etc as its paper’s macro and financial variables to examine its research questions. The paper’s main data is from the Bank Lending Survey from the euro area on the ECB’s web site. Since there is no such survey in Asia region, this paper uses total bank lending volume over GDP as a proxy of lending condition of each country and the majority of the institutions implemented their policy by means of targeting a short-term interest rate, therefore, it was selected to proxy for monetary policy variable. On basis of studies and 7 countries’ central banks, time-varying reserve requirement - as a means to control capital flows with prudential purposes, especially for emerging economies, is the

macro-prudential instrument used by most of these 7 countries. Thus, this paper uses reserve requirement as the macro-prudential measure variable. And a productive variable which is reserve requirement multiply short term interest rate to examine the effectiveness of the macro-prudential measure variable on bank lending activities. The financial variables are the long term interest rate and total bank capital ratio. According to the standard view of the monetary transmission mechanism, the long term interest rate appears to provide an overly simplistic view of the policy process. Therefore, it was selected to proxy for financial variables. The total bank capital ratio is an important ratio to measure banks' capital position. Therefore, it was selected to proxy for financial variables. The GDP growth and inflation were selected to proxy for economic variables. The main descriptive statistics for the data are shown in Table 1. The definition and the way to calculate each variable is explained by Table 2.

### **4.3 Equation**

In terms of methodology, the paper estimates a series of panel regressions of the form:

$$\begin{aligned} \text{LCi,t} = & \beta_0 + \beta_1 \text{ST} + \beta_2 \text{LT} + \beta_3 \text{TCR} + \beta_4 \text{GDPgrowth} + \beta_5 \text{Inflation} \\ & + \beta_6 \text{RR} + \beta_7 \text{ST} \times \text{RR} \end{aligned}$$

where  $\text{LCi,t}$  are the measures of lending conditions at time  $t$  for country  $i$  and  $\beta_1 \text{ST}$  proxy for monetary policy variable ;  $\beta_2 \text{LT}$  and  $\beta_3 \text{TCR}$  proxy for financial variables;  $\beta_4 \text{GDPgrowth}$  and  $\beta_5 \text{Inflation}$  proxy for economic variables;  $\beta_6 \text{RR}$  proxy for macro-prudential measure variable;  $\beta_7 \text{ST} \times \text{RR}$  proxy for interaction between monetary policy and macro-prudential tool. The result expects that the  $\beta_1 \text{ST}$  proxy for monetary policy variable and  $\beta_6 \text{RR}$  proxy for macro-prudential measure variable have negative coefficient relationship with explained variable. All estimations are carried out using robust standard errors.

**Table1.The Main Descriptive Statistics of Data**

	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>TLV/GDP</b>	2.241161	2.3570481	0.142773	8.983489
<b>ST</b>	4.386401	2.1515375	0.867	10.39
<b>LT</b>	8.22196	3.1049919	3.488	16.3367
<b>TCR</b>	13.83623	2.5221897	8.68	22.72
<b>GDP Growth</b>	5.965977	3.6890991	-8.88049	19.13164
<b>Inflation</b>	4.376179	3.2216692	-12.1	17.78
<b>RR</b>	10.7777	7.7533304	2	30
<b>STRR</b>	46.89553	40.014011	3.99866	169.2411

**Table2. Definitions of Variables in the Regression**

Variables	Definition	Source	Sample	Measurement
Total Lending Volume/GDP	Proxy for lending condition of each country	IMF and central bank	2005Q1 -2012Q4	Quarterly average of monthly index of total bank lending volume over GDP as a proxy of lending condition of each country
Short-Term Rates	The majority of the institutions implemented their policy by means of targeting a short-term interest rate, therefore, it was selected to proxy for monetary policy variable.	IMF	2005Q1 -2012Q4	Quarterly average of daily short interest rates
Total Capital Ratio	This is an important ratio to measure banks' capital position, therefore, it was selected to proxy for financial variables.	Each country central bank	2005Q1 -2012Q4	Quarterly average of monthly index
Long-Term Rates	According to the standard view of the monetary transmission mechanism, it appears to provide an overly simplistic view of the policy process, therefore, it was selected to proxy for financial variables.	IMF	2005Q1 -2012Q4	Quarterly average of monthly index
GDP Growth	Proxy for economic variables	Each country central bank	2005Q1 -2012Q4	Quarterly average of growth of real GDP
Inflation	Proxy for economic variables	Each country central bank	2005Q1 -2012Q4	Quarterly average of monthly inflation rates

Reserve requirement	On basis of studies and 7 countries' central banks, time-varying <a href="#">reserve requirement</a> - as a means to control capital flows with prudential purposes, especially for emerging economies macro-prudential measure variable.	Each country central bank	2005Q1 -2012Q4	Annual index by country
ST*RR	A productive variable which is reserve requirement multiply short term interest rate to examine the effectiveness of the macro-prudential measure variable on bank lending activities	Calculation	2005Q1 -2012Q4	Quarterly data of reserve requirement multiply short term rate

## **5. Results and Findings**

### **5.1 Regression result**

The data of this paper comprises both time series and cross-sectional elements, which is called panel data. For panel data, it cannot be assumed that the observations are independently distributed across time and serial correlation of regression residuals becomes an issue. It must be prepared that unobserved factors, while acting differently on different cross-sectional units, may have a lasting effect upon in the same statistical unit when followed through time. And the other assumption is that the idiosyncratic errors are uncorrelated with the explanatory variables at all times. For considering these features of panel data, several methods are used in this paper to run the regression.

First one is a normal pooled regression with the Panel Least Squares method without any controls, the result was showed as Table 3. The Table 3 shows that monetary policy variable which is short term interest rate is statistically significant, and it has negative coefficient relationship with explained variable. The macro-prudential measure variable which is reserve requirement also has negative

coefficient relationship with explained variable, but it is not statistically significant.

The financial variables which are long term interest rate and total capital ratio are statistically significant. The economic variables which are GDP growth showed statistically significant and inflation is not statistically significant. The productive variable which is reserve requirement multiplies short term interest rate to examine the effectiveness of the macro-prudential measure variable on bank lending activities is statistically significant. But the value of Durbin-Watson statistic is below 1.5 which means the presence of autocorrelation in the residual from a regression analysis.

Then, for estimating a feasible GLS specification correcting for both cross-section heteroskedasticity and contemporaneous correlation, the paper also ran regression with the generalized least squares in cross-section SUR model. The result of table 4 shows that monetary policy variable which is short term interest rate is statistically significant, and it has negative coefficient relationship with explained variable. The macro-prudential measure variable which is reserve requirement has negative coefficient relationship with explained variable, and it is statistically significant. The financial variables are statistically significant. The economic variables which are GDP growth showed statistically significant and

inflation is not statistically significant. The productive variable is statistically significant. The value of Durbin-Watson statistic improved to 0.624746.

**Dependent Variable: Total lending volume over GDP**

Sample: 2005Q1-2012Q4

Periods included: 32

Cross-sections included: 7

Total panel (balanced) observations: 224

Method: Panel Least Squares

**Table3. Result of the 1<sup>st</sup>Regression with Panel Least Squares**

Independent Variable	Coefficient	Prob.
Short term interest rate	-0.503396	0.0020***
Long term interest rate	-0.307542	0.0001 ***
Reserve requirement	-0.048833	0.2055
Total capital ratio	0.371838	0.0000***
GDP growth	-0.119722	0.0011***
Inflation	0.013246	0.7986
STRR	0.023175	0.0105**
R square	0.446119	
Durbin-Watson stat	0.080919	

Significant level: \* 10% , \*\* 5%, \*\*\* 1%

Standard Error of each coefficient is recorded under the coefficient

**Dependent Variable: Total lending volume over GDP**

Sample: 2005Q1-2012Q4

Periods included: 32

Cross-sections included: 7

Total panel (balanced) observations: 224

Method: Panel EGLS (Cross-section SUR)

**Table4. Result1<sup>st</sup>Regression with Panel EGLS (Cross-section SUR)**

Independent Variable	Coefficient	Prob.
Short term interest rate	-0.366178	0.0000***
Long term interest rate	-0.302302	0.0000***
Reserve requirement	-0.062937	0.0000***
Total capital ratio	0.268498	0.0000***
GDP growth	-0.093127	0.0000***
Inflation	-0.014414	0.2891
STRR	0.020532	0.0000***
R square	0.873610	
Durbin-Watson stat	0.624746	

Significant level: \* 10% , \*\* 5%, \*\*\* 1%

Standard Error of each coefficient is recorded under the coefficient

For considering that the financial crisis might impact the results, the paper divided the period to before crisis and after crisis. Then the paper ran regressions with the generalized least squares in cross-section SUR model, the result of before crisis which table 5 shows that monetary policy variable which is short term interest rate is statistically significant, and it has negative coefficient relationship with explained variable. The macro-prudential measure variable which is reserve requirement does not have negative coefficient relationship with explained variable. The financial variables are statistically significant. The economic variables which are GDP growth and inflation are statistically significant. The productive variable is statistically significant.

The result of after crisis which table 6 shows that monetary policy variable which is short term interest rate is statistically significant, and it has negative coefficient relationship with explained variable. The macro-prudential measure variable which is reserve requirement has negative coefficient relationship with explained variable, and it is statistically significant. The financial variables are statistically significant. The economic variables which are GDP growth showed statistically significant and inflation is not statistically significant. The productive variable is statistically significant.

### **Before Crisis**

#### **Dependent Variable: Total lending volume over GDP**

Sample: 2005Q1-2008Q4

Periods included: 16

Cross-sections included: 7

Total panel (balanced) observations: 112

Method: Method: Panel EGLS (Cross-section SUR)

**Table5. Result of the 2<sup>nd</sup>Regression with Cross-section SUR**

Independent Variable	Coefficient	Prob.
Short term interest rate	<b>-0.099111</b>	<b>0.0008***</b>
Long term interest rate	-0.279473	0.0000***
Reserve requirement	<b>0.115601</b>	<b>0.0000</b>
Total capital ratio	0.143950	0.0000***
GDP growth	-0.165787	0.0000***
Inflation	0.046832	0.0000***
STRR	<b>-0.006570</b>	<b>0.0013***</b>
R square	0.582157	
Durbin-Watson stat	1.000794	

Significant level: \* 10%, \*\* 5%, \*\*\* 1%

Standard Error of each coefficient is recorded under the coefficient

## After Crisis

### **Dependent Variable: Total lending volume over GDP**

Sample: 2009Q1-2012Q4

Periods included: 16

Cross-sections included: 7

Total panel (balanced) observations: 112

Method: Method: Panel EGLS (Cross-section SUR)

**Table6. Result of the 2<sup>nd</sup>Regression with Cross-section SUR**

Independent Variable	Coefficient	Prob.
Short term interest rate	<b>-0.478937</b>	<b>0.0000***</b>
Long term interest rate	-0.305267	0.0000***
Reserve requirement	<b>-0.049808</b>	<b>0.0010***</b>
Total capital ratio	0.650847	0.0000***
GDP growth	-0.100294	0.0000***
Inflation	0.012598	0.3935
STRR	<b>-0.006570</b>	<b>0.0011***</b>
R square	0.934147	
Durbin-Watson stat	1.059531	

Significant level: \* 10% , \*\* 5%, \*\*\* 1%

Standard Error of each coefficient is recorded under the coefficient

For considering the different size of GDP of these 7 countries, the paper also divided the 7 countries into 2 groups. Group 1 which their total lending volume over GDP is under 100% includes China, India, Indonesia and South Korea. Group 2 which their total lending volume over GDP is over 100% includes Malaysia, Philippines and Thailand. Then the paper ran the regressions with the random effects model and all the control variables with time fixed effects. The result of group 1 which table 7 shows that monetary policy variable which is short term interest rate is statistically significant, and it has negative coefficient relationship with explained variable. The macro-prudential measure variable which is reserve requirement does not have negative coefficient relationship with explained variable. The financial variables are statistically significant. The economic variable which is GDP growth is statistically significant, but inflation is not statistically significant. The productive variable is not statistically significant.

The result of group 2 which table 8 shows that monetary policy variable which is short term interest rate is statistically significant, and it has negative coefficient relationship with explained variable. The macro-prudential measure variable which is reserve requirement has negative coefficient relationship with explained variable, and it is statistically significant. The financial variables are

statistically significant. The economic variables which are GDP growth showed statistically significant and inflation is not statistically significant. The productive variable is statistically significant.

### **Group1.**

#### **Dependent Variable: Total lending volume over GDP**

Sample: 2005Q1-2012Q4

Periods included: 32

Cross-sections included: 4

Total panel (balanced) observations: 128

Method: Method: Panel EGLS (Cross-section weights)

**Table7. Result of the 2<sup>nd</sup>Regression with Panel EGLS Cross-section weights**

Independent Variable	Coefficient	Prob.
Short term interest rate	-0.029248	0.0756*
Long term interest rate	-0.031544	0.0000***
Reserve requirement	0.005452	0.5506
Total capital ratio	-0.014233	0.0094***
GDP growth	-0.028705	0.0000***
Inflation	0.001026	0.7761
STRR	0.001774	0.3889
R square	0.582157	
Durbin-Watson stat	1.000794	

Significant level: \* 10%, \*\* 5%, \*\*\* 1%

Standard Error of each coefficient is recorded under the coefficient

**Group2.****Dependent Variable: Total lending volume over GDP**

Sample: 2005Q1-2012Q4

Periods included: 32

Cross-sections included: 3

Total panel (balanced) observations: 96

Method: Method: Panel Least Squares (Period fixed)

**Table8.Result of the 2<sup>nd</sup>Regression with Panel Least Squares with Period fixed**

Independent Variable	Coefficient	Prob.
Short term interest rate	-2.009662	0.0000***
Long term interest rate	0.884674	0.0000***
Reserve requirement	-0.118729	0.0209**
Total capital ratio	0.542658	0.0002***
GDP growth	-0.121429	0.0240**
Inflation	-0.190376	0.1120
STRR	0.037957	0.0173**
R square	0.876692	
Durbin-Watson stat	0.416250	

Significant level: \* 10% , \*\* 5%, \*\*\* 1%

Standard Error of each coefficient is recorded under the coefficient

## **5.2 Findings**

According to the overall result of estimating the quarterly panel data for the 7 Asia economies which are China, India, Indonesia, Malaysia, South Korea, Philippines and Thailand from 2005 Q1 to 2012 Q4, the paper found that the independent variable which is short term policy rates has negative coefficient relationship with explained variable and it is statistically significant. This result means that when the independent variable which is short term policy rates rises, the dependable variable which is lending condition will decrease. On the contrary, the short term policy rates decreases, the lending condition will rise. The changes of short term policy rate reversely impact the commercial banks' lending condition. The result implies that if the authorities keep lowering the short term policy rate, the financial institutions will increase their lending. The excessive lending may induce unbalance of financial institutions' asset and liabilities which leads to affect the stability of financial institutions. As some scholars concerned that keeping monetary policy rate too low can increase lending and appetites of risk-taking by financial institutions. Secondly, the paper found that the independent variable which is reserve requirement has negative coefficient relationship with explained

variable and it is statistically significant. This result means that when the independent variable which is reserve requirement rises, the dependable variable which is lending condition will decrease. On the contrary, the reserve requirement decreases, the lending condition will rise. The changes of requirement also reversely impact the lending condition. The result implies that if the authorities effectively use the macro-prudential tools, like reserve requirement, the excessive financial lending can be constrained. Thirdly, the paper found that the productive variable which is reserve requirement multiplies short term interest rate to examine the effectiveness of the macro-prudential measure variable on bank lending activities is statistically significant. The result means that the productive variable has interaction with explained variable. This result may imply that if the authorities use more stringent macro-prudential tools, like reserve requirement, can reduce the impact of low monetary policy on lending condition. The using of stringent macro-prudential policy can prevent or buffer the happening of the financial crisis.

According to the result of estimating the quarterly panel data for the 7 Asia economies with the period before crisis and after crisis, the paper found evidences before crisis that low monetary policy interest rates negative impact on bank's lending condition. But macro-prudential measure variable on reserve requirement

does not impact the effect of low monetary rate on commercial banks' lending condition with controls. After crisis, finding evidence that macro-prudential measure variable on reserve requirement does reversely impact the commercial banks' lending condition with controls. This result might reflect that before crisis macro-prudential tool, like reserve requirement was not effectively used. And the result of after crisis might suggest that since central banks cut their policy rates to bail out of crisis, the more stringent macro-prudential policy were used to monitor the further spread of crisis.

According to the result of estimating the quarterly panel data for the 7 Asia economies with two groups, Group 1 which their total lending volume over GDP is under 100% includes China, India, Indonesia and South Korea. Group 2 which their total lending volume over GDP is over 100% includes Malaysia, Philippines and Thailand. The group 1's macro-prudential measure variable on reserve requirement has negative coefficient relationship with bank's lending condition but lost its significant. Few reasons can be contributed to this result. First, the stimulus policy was implemented during crisis. For example, according to the raw data of reserve requirement in China, China have been effectively used the macro-prudential tool, like reverse requirement during crisis. However, China

injected 4,000 billion Yuan into market to boost economy at the same time. Therefore, the total lending volume was not constrained but increased. Second, other prudential banking regulations were relatively tight, such as NPL, LTV or CAR. For example, instead of using reserve requirement as macro-prudential tool, South Korea has been used other macro-prudential tools, like LTV and CAR. Interesting to notes that the coefficient of total capital ratio is negative and showed significant, this might suggest that the banks entering the crisis with a better capital position may release more money to help the needs of productive sectors. Group 2 which their total lending volume over GDP is above 100%, the short term interest rates and macro-prudential measure variable on reserve requirement have negative coefficient relationship with bank's lending condition and it is significant. This result might imply that these countries keep using tight macro-prudential policy to maintain monetary and financial stability.

## **6. Conclusions**

Since the economic expansion began in 2002, lowering monetary policy rates has been one of the policies to boost economic growth. Until 2008, the financial crisis erupted, the crisis has drawn the attention of researchers and policy makers the link between monetary policy and bank risk-taking. The crisis also has led to a reconsideration of monetary policy and has renewed the focus on financial stability and prudential policy measures aimed at containing systemic risks. Some research papers which based on European banks' data and American banks' data have proved that keeping monetary policy rate too low can increase lending and risk-taking by financial institutions.

This paper followed the existing studies to examine two specific questions related to transmission mechanism of monetary policy in Asian region during 2005-2012. First, whether monetary policy affects banking stability by analyzing its impact on commercial banks' lending in Asian region? Second, if monetary policy interest rate affects commercial banks' lending conditions, whether macro-prudential policy could affect the impact of monetary policy rate on commercial banks' lending. The estimation sample consists of quarterly panel data

for the 7 Asia economies which are China, India, Indonesia, Malaysia, South Korea, Philippines and Thailand from 2005 Q1 to 2012 Q4. The paper found that monetary policy rate affects commercial banks' lending condition in Asian region. The macro-prudential policy impacts the lending condition. The paper also found that monetary policy and macro-prudential policy are connected and influenced each other. Therefore, few suggestions could be proposed in this paper.

First, the results suggest that central banks would need to consider the possibility of bank risk by making monetary policy rate too low. For example, if the authorities keep the monetary policy rate too low for a long time, financial institutions might take risk to finance short-term liabilities for their long-term or illiquid assets. It may induce unbalance of financial institutions' asset and liabilities which leads to affect the stability of financial institutions. Furthermore, the potential impact of risk-taking by banks also may have implications for longer term macroeconomic outlook including output growth, investment and credit.

Second, banking supervisors should strengthened the macro-prudential perspective to financial stability by intensifying their vigilance during periods of protracted low interest rates, particularly if accompanied by other signs of risk-taking, such as rapid credit and asset price increases. For example, the Chinese

authorities used the macro-prudential tool which reserve requirement frequently to constrain the lending condition in order to keep bank stability, before and during the financial crisis. Some other macro-prudential tools, like time-varying and countercyclical LTV values, capital requirements, etc also have been used for keeping financial stability in other Asian region.

However, past experiences have shown that the most potent tool in boosting economic grow this lowering monetary policy rate. Even during the crisis, some banking sectors may need low monetary policy rates to support credit supply for firms and households, especially the banks with weaker balance sheet capacity. But authorities of central bank should pay more attention to financial stability issues when they conduct monetary policy. The results of this paper supports that central banks should take more responsibilities on macro-prudential supervision and regulation, in particular the new responsibilities of the Asian regions central bank on macro-prudential policy to monitor systemic risk.

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## 국문초록

저금리 통화정책은 2002년 경제성장이 시작될 때부터 경제성장을 촉진시킨 정책 중의 하나이다. 2008년 금융 위기 때까지 통화정책이 은행 안정성에 어떤 영향을 미치는지가 학계과 정책분야의 주요 화제였다. 어떤 학자들이 저금리 통화정책이 2008년 금융위기의 주범이라고 주장했다. 그들은 저금리 통화정책을 계속 유지하면 대출이 급증하여 금융기관들의 리스크를 유발시킬 수 있다고 했다.

이 논문은 통화정책의 전송 메카니즘 바탕하여 2005년부터 2012년까지 아시아지역에 관련된 두 가지 주제를 연구했다. 첫째, 아시아 지역에서 상업은행 대출에 미치는 영향에 대한 분석을 통해 통화정책이 은행 안정성에 영향을 미치는지 알아보았다. 둘째, 만일 통화정책이 상업은행 대출에게 준 영향을 미칠 수 있는지 알아보았다.

이 논문은 통화정책이 상업은행 대출에게 반대의 영향을 준다는 것을 찾아냈다. 거시 건전성 정책이 상업은행 대출에게 반대 영향을 미친다는 것을 찾아냈다. 또한 통화정책 및 거시 건전성 정책은 서로

영향을 미친다는 것을 찾아냈다. 따라서, 본논문에서 몇가지 제안들을 제기할수있었다. 첫째, 이 논문은 중앙은행이 저금리 통화정책을 실시 할 때 은행 리스크를 유발시킬 수 있다는 점을 고려할필요가 있다고 제안한다. 더 나아가 은행의 잠재 리스크는 경제성장, 투자, 신용 등 장기적인 거시 경제전망에 영향을 미친다. 둘째, 만일 신용대출 및 자산가격 급등 등의 다른 위험신호가 발생한다면 금융 감독기관은 저금리 통화정책을 실시 기간에 금융 안정성을 확보하기위해 거시경제 건전성을 강화해야 한다. 마지막으로중앙은행은통화정책을 실시할때금융 안정성에보다 더 주의해야 한다. 이 논문의 결과는 아시아 지역의 중앙은행들이 거시 건전성 감독과 규제에 대한 더 많은 책임을 가져야 한다는 것을 지지한다. 특히, 시스템적인 위험을 모니터할 수 있는 거시 건전성 정책에 대한 새로운 책임을 아시아 지역의 중앙은행들이 더 가져야 한다.

키워드: 통화정책, 거시 건전성 정책, 은행안정성

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