ECONOMICS OF REGULATION: CREDIT RATIONING AND EXCESS LIQUIDITY

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Abstract: In examining prudence of collateral, the argument is how a regulator figures out whether commercial banks want to hold excess liquidity for the precautionary aim or expect to cross the redline before debt overhang. Risky behavior in the fixed investment scale (Holmstrom and Tirole, 2013) is representable as inside liquidity in the market. This paper introduces a credit rationing model in uncertainty where the demand deposit-required reserves argument comes from. We also conduct a stylistic analysis of excess liquidity in Jordan and Lebanon from 1993 to 2015. As such, the proposed model exemplifies the combination of credit, liquidity and regulation.

Keywords: credit rationing, inside liquidity, collateral, liquidity shocks, excess liquidity, overnight loan

JEL: D81; E58; L51

1. Introduction

The global imbalance [1] as cross-country differences in saving and investment patterns is pervasive and thought provoking, giving good reasons to advocate reduction of imbalance. To be sure, there have been studies concerned specifically with this problem, but the question has also been raised as to whether domestic and international distortions can be a key cause of imbalance regardless of economic development levels or financial externalities. It is diverse to say specific drivers to position imbalance but liquidity reflecting credit of commercial banks in the economic cycle can react to global imbalance with rational expectation.

[1] Blanchard's account (2007)

The attempt to explain global imbalance which is the macroeconomic broad question on the notion of endogenous liquidity structuring the financial expectation might be further brought into question like killing two birds with one stone. At the outset, what I try to do in this paper is to offer plausible explanations as to why outside liquidity (excess liquidity) can cause inside liquidity [2](surplus liquidity) which is intimately linked with credit rationing [3]. Commercial banks should decide the composition of liquid assets with outside liquidity-currency, reserves, money base. The decision of liquidity might be on whether assets can be melted to make more liquidity in the risky situation or liquid assets as liability is excessively equipped. The concept of excess holds particularly true for reflecting rational expectation in liquidity. Otherwise, excess liquidity without rational expectation should be reduced. Hence, credit rationing to recognize the inside liquidity in open market operations makes reasonable to measure the appropriate outside liquidity to be hold.
Specifically, this study establishes the contour of arguments about financial institutional reasons (appropriate level of holding liquidity) and incentive considerations (outcome uncertainty is endogenous). The meaning of required reserves and net lending in this paper closely parallels the notion of inside liquidity and outside liquidity[4] introduced by Holmstrom and Tirole (2013).
From outside liquidity to inside liquidity, within this context, the classification (Brunnermeier-Pedersen, 2008) of an asset's market liquidity (i.e., the ease with which is traded) and traders' funding liquidity (i.e., the ease with which they can obtain funding) is grounded in those certain rules drawing on financial regulation. When it comes to the funding gap (Cressy, 2000), homogenous funding gap is merely defined as expenditure caused by the gap between alleged debt and equity

[2]Ostensibly, there are three sources of outside liquidity defined by Holmstrom and Tirole (2013): (1) consumers, who can securitize their assets, notably the houses they own; (2) the government, which can issue claims backed by its exclusive right to tax consumers and producers; and (3) international financial markets, which can offer liquidity in the form of claims on international goods and services.

[3]Holmstrom and Tirole, 2013

[4]The explanatory power of the model by Holmstrom and Tirole (2013) has been convincingly structured from the notion of inside and outside money introduced by Gurley and Shaw (1960). For example, Blanchard and Fischer (1989: ch.4) state:
Any money that is on net an asset of the private economy is outside money. Under the gold standard, gold coins were outside money; in modern fiat money systems currency and bank reserves, high-powered money, and the money base constitute outside money. However, most money in modern economics is inside money, which is simultaneously an asset and a liability of the private sector.
Namely, Holmstrom and Tirole (2013) define inside and outside liquidity depending on the source of the pledgeable income. When the pledgeable income is generated by the corporate sector, the claims on it constitute inside liquidity. All claims on goods and services outside the corporate sector constitute outside liquidity.

gaps in national economies within a framework of a balance sheet. Beyond the scale of a balance sheet, heterogeneous funding gap is defined by positive funding gap at an equilibrium, that is, the volume of lending is below the criteria of a competitive capital market perfectly operated by costless and complete contracts and no private information and rational expectations is following. Otherwise, normative funding gap can be from a market failure so the policy responds to which is an increase in the volume of lending.

The normative funding gap might throw light on new intuition escaped from double-booking which should be always balanced in banks' on-balancesheet in imbalance modeling. If a market fails to balance, evidently, rational decision makers try to search for the maximized solution to increase possibility of potential outcome for the future. Much of the decision framework upon the rational expectation is beyond the arrangement of outcomes expected from initial state. To say the least, the aim of this study about excess liquidity is to provide an overview of the financial regulation with rational expectation in economic imbalanced situation.

Expected payoff in investment changes as time goes by because of (1) wealth transfer, (2) rationing by the riskless interst rate and (3) absense of borrowing constraints. It is generally agreed. Firstly, if the investment contract consistently contains complete information without a regulator, same allocation of resources is possible between two agents. Because of non-negativity constraint on the consumption of an agent (Townsend, 1979) which both agents can count on, the present scheme can generate a (random) allocation of resources. There is a significant disparity between transfered wealth and randomized wealth because two parties of wealth have different probabilities for actual realizations on wealth.

Secondly, the riskless interest rates, as Geanakoplos states (2014), depends on the impatience of the agents in the economy and on the expectation of future growth. Differently from the theory of asset pricing which starts on the expected rate given by market, as far back as Irvying Fisher have understood that the riskless interest rate influences the price of an asset by changing the expected present value of its dividents or its fundamental value.

Lastly, according to common consensus in Amable-Chatelain-Ralf (2004), Kiyotaki (2012) and Piketty (1997), debt is a prefered means of finance in the absense of borrowing constraints rather than new share issues. Everybody will make the optimum investment such that the current interest rate equals expected marginal product of capital. Credit rationing disappears if the interest rate is sufficiently low because the net returns become sufficiently high to give proper incentives to agents with no collateral.

The consequences of investment are quite complex. Even if we limit our analysis to the *financial regulation in excess liquidity*, it would have at least three important topics that should be taken into account:

1. The investment as loan related to collateral, interest rate and demand deposit,
2. The comparative statics in investment in a case of liquidity shocks,
3. The risk-taking behavior of consolidated commercial banks in incomplete structural representation.

Especially interesting from the point of view is that a regulator shouldn't do a credit rationing but some credit rationing (credit rationed or sufficient funding) done by individuals and commercial banks in the same problem. How we can insert the problem of individuals to one of commercial banks? That will be our start point in this article.

2. Loan for investment: collateral, interest rate and demand deposit

An individual's problem is that if the individual borrows the amount B, and the interest is $\hat{r}$, then we say individual defaults on his loan if the return R plus the collateral C is insufficient to pay back the promised amount,

$$C + R \leq \underbrace{B(1+\hat{r})}_{\text{loan for investment}} \tag{1}$$

For one thing, consumption and investment don't stand in parallel. If the agent consumes more, his utility increases. However, if the agent invests more, the satisfaction is not directly analogous to uncertain return on investment. For that reason, we can puzzle on how we can insert the problem of individuals to one of commercial banks.
Briefly, we can see two groups' problems (Stiglitz-Weiss, 1981). Firstly, the net return to the borrower $\pi(R, \hat{r})$ can be written as

$$\pi(R, \hat{r}) = max(R - (1+\hat{r})B, -C) \tag{2}$$

The return to the bank can be written as

$$\rho(R, \hat{r}) = min(R + C; B(1+\hat{r})) \tag{3}$$

That is, the borrower must pay back either the promised amount or the maximum he can pay back $(R + C)$ about loan for investment B with loan interest rate $\hat{r}$. With one single exception that the collateral C is not charged for repayment of loan if the situation is solvent that everybody desires. This assumption requires the perfect manipulation of loan interest margin $\hat{r}$ as an instrument related to the collateral which cannot be circulated in the financial autarky.
Especially important is that it bears the imprint of aggregation problem. In a sense of funding level, it appears likely to us that the mixture of some credit rationing

represents credit rationed and sufficient funding at the same time. Nash equilibrium is presented in the form of no credit rationing (first-best optimum investment) and low investment (first-best case for everybody) (Piketty, 1997). All the same, some credit rationing (credit rationed or sufficient funding) is done by individuals and commercial banks in the same framework.
The premise which underpins a good deal of my subsequent argument is to take a panoramic view of investment within fixed investment scale:

$$\begin{cases} Z_1 > I > Z_0 > 0, \\ A \geq \bar{A} \equiv I - Z_0 > 0, \\ Z_1 - Z_0 > 0, \end{cases} \tag{4}$$

We assume that agents consider initial investment I satisfies the fixed investment scale $Z_1 > I > Z_0 > 0$. Most investors can have pleageable investment Z_0.
A model considers a risk-neutral agent (entrepreneur in Holmstrom-Tirole, 2013) with an investment opportunity that is worth Z_1 to him. It is not self-financing in case of a positive net present value, $Z_1 > I$, because most investors can get a pledgeable Z_0 so the risk-taking agent should pay shortfall $I - Z_0 > 0$ converting the market value of their other existing assets.
The portfolio can go forward if and only if the pledgeable income exceeds the portfolio's net financing, $I - \bar{A}$, that is when

$$A \geq \bar{A} \equiv I - Z_0 > 0 \tag{5}$$

Let A be the maximum amount of capital that the agent can commit to the project either personally or through the commercial bank. The lower bound $\bar{A}$ on the amount of assets that the commercial bank or the agent needs to have in order to attract external funds. A commercial bank with less capital than $\bar{A}$ will be credit rationed. $A > I$ is in the situation that no external funds are needed. Necessary conditions for credit rationing (Holmstrom-Tirole, 2013) are:

1. a positive rent $Z_1 - Z_0 > 0$. If $Z_1 = Z_0$, then all projects with positive net present value ($Z_1 > I$) are also self-financing ($Z_0 > I$) and hence can move forward.
2. the agent is capital poor in case of $A < (Z_1 - Z_0)$, the agent has enough capital up front to pay for ex post rents earned and therefore all projects with positive net present value can go forward.

Remark that "capital poor" is in case of $A < (Z_1 - Z_0) \equiv$

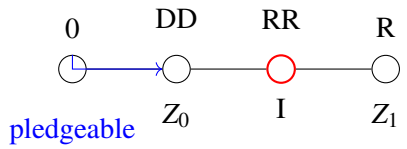
$$1 < \frac{(Z_1 - Z_0)}{A} \tag{6}$$

where A is defined as the maximum in capital in a sense of a portfolio and $(Z_1 - Z_0)$ is a positive rent.
This relation is portrayed in detail of contractual information rent.

$$Z_1 - I \geq (Z_1 - Z_0) - A \tag{7}$$

The left-hand side is the net present value of the project. The right-hand side is the net rent enjoyed by the agent after investing all of his net worth into the project. If the right-hand side is negative, all projects with a positive net present value can proceed.
A capital poor agent will always have projects with a positive net present value that it has to be rejected because the firm does not have enough capital. Both motivations of investment and required reserves bear a striking resemblance to dynamics of comparative statics. Research on investment in comparative statics is still in its early stage, as the brevity of the bibliography attests. It may heighten by filling with two aspects: (1) insured amount and (2) parameterization.
Disputably, the investment is not prominent in satisfaction. As is well known, it is assumed that more consumption is always better for the consumer in the sense of increasing his or her utility. However, it is not a same token for investment. Investors demand high-yielding investments to increase utility. The point is that regulator cannot go to some lengths to establish the utility of investment before revealing the profit. Taking up this issue, insured investment amount can partake of investment in comparative statics. In applying insured investment to move toward the statics, nonpledgeability is closely fetched for being moved of insured investment.
Here by, required reserves have a positive precautionary value but it is not *independent liquidity*. Capital adequacy can require illiquidity more than demand deposit. The shortfall, difference between demand deposit and required reserves, must be secured by deposit insurance to prevent the bank run (or covered by claims on the market value of domestic assets in commercial banks). Such an intuition offers how we can figure a commercial bank's a fixed reserve scale from an individual problem:

Figure 1. Pledgeable Demand Deposit (DD) and a Positive Wedge $Z_1 - Z_0$ (rent).



identification symbols: DD (Demand Deposit), RR (Required Reserves), R (Reserves), Z_0 (opportunity value in positive wedge $Z_1 - Z_0$), Z_1 (positive net present value in positive wedge $Z_1 - Z_0$).

It bases categories on the juxtaposition of a series of contrasts of exogenous constraints on payouts and another based on endogenous constraints. Here, for example, exogenous liquidity backs up the amount relevant to a precautionary aim as a maximized whole that only the central bank can enjoy, such as the potentiality of lending on a future loan project or increased loan position status. In the second category, compulsive hoarding should be feasible to pay out to projects having profitability. It reduces excess of central banks and the reduced portion is distributed to consumers and producers by commercial banks.
Seen from this point of view, required reserves are tantamount to insured investment as being fixed but also casting itself in the role of nonpledgeability in case of bankruptcy. Consider a commercial bank with precautionary reserves which is bigger than demand deposit can be claimed by depositors in commercial banks. Our starting point for the certain investment scale of a commercial bank is:

$$R > RR > DD > 0 \tag{8}$$

There are various reasons why commercial banks cannot have larger demand deposits than reserves, that is, why there is a *positive wedge* (commercial banks' *precautionary reserves*) $R - DD > 0$. By borrowing the concept of optimal rent, $Z_1 - Z_0 > 0$ which can be interval to sustain the trajectory of investment, we can put explanation into two general categories: one based on *exogenous* constraints on required reserves and another based on endogenous constraints. The prime example of exogenous constraints is an insurance cost on deposits that commercial banks should pay, such as certain amount of demand deposits per household should be secured by insurance. Likewise, accumulation of reserves is potential benefits to deviate from solvency risk by showing the high level of solvency. A related intangible benefit is derived from risk aversion when it comes to continue on-going banking business. As will become obvious from the continued discussion, the uncertain investment scale is:

$$DD > R \tag{9}$$

However, depositors do not value precautionary reserves. It might be in a sense of financial regulation. There is possibility that banks drive risk-taking business, such as asset-liability mismatch that a bank might borrow money by issuing floating interest rate bonds, but lend money with fixed-rate collateral. If interest rates rise, the bank must increase the interest rate paid to its bondholders, even though accrued interest on its collateral has not increased. If source of liquidity in liabilities is riskier than one in assets, evidently, demand deposit is excessive than reserves. For these reasons, this study does attempt to interpret demand deposit as a medium to identify a commercial bank's problem from an individual's problem. Therefore,

viewed in this light, loan for investment is itself a scaled assembly of prudential collateral, risk neutral interest rate margin and demand deposit hedging in uncertainty.
In what follows, the question about meaning of excess reserves ultimately hinges on the shift from risk aversion, $R > RR > DD > 0$ to risk taking, $DD > R$.
By applying this challenging conceptual approach to the subject, Saxegaard (2016) illustrates about holdings of precautionary ($\leftrightarrow$ inflationary potential) reserves in the country having a contraction in the supply of credit by banks because of poorly developed interbank market.
More to the immediate point, excess liquidity (Saxegaard, 2016) is equated to the quantity of reserves deposited with the central bank by commercial banks plus cash in vaults in excess of the required statutory level. Hence, an increase of deposits in the private sector increases commercial banks' holdings of excess liquidity as banks act to insure themselves against shortfalls in liquidity in the case of Sub-Saharan Africa on a quarterly basis of IMF data from 1990:Q1 to 2004:Q4.

$$Excess\,Liquidity(EL) = Excess\,Cash + Excess\,Reserves\,(ER) \tag{10}$$

In the light of above equations, excess liquidity (EL) is holding-loss reserves which should be liquid to maximize satisfactions of consumers and profits of producers. We've assumed monetary status of consolidated commercial banks (except for a central bank) in three assumptions. Firstly, consolidated commercial banks hold excess reserves which are not inserted into required reserves. Secondly, a reserve requirement can be between 1% and 10%. Thirdly, the borrowed money is deposited into a checking account at another bank that is not any of the previous banks. Within precautionary reserves such as Reserves (R) > Demand Deposit (DD), the problem is the fixed-scale of Reserves (R) and Demand Deposit (DD) as below:

$$RR = m \times DD \quad [1\%, 10\%] \tag{11}$$

Considered in this framework, the argument on the investment scale should be newly defined above 10%. Liquidity creation has two sides of a coin about riskiness. It can be argued for liquidity creating riskless and causing the problem in risky asset markets (Gorton and Pennacchi, 1990). Otherwise, borrowing and lending are permitted but constrained (Kehoe and Levine, 2001).
Because of non pledgeability of required reserves (RR) in case of bankruptcy, pledgeable demand deposits (DD) can be marked by $RR - DD > 0$, required reserves (RR) will be required for strict positive net present value in banks. Let A be excess liquidity of capital at the vortex of precautionary aim.

$$A \geq \bar{A} \equiv RR - DD > 0. \tag{12}$$

The lower bound $\bar{A}$ on liabilities and equities of banks invites a reading on several levels of understanding. The negative effect of the lower bound $\bar{A}$ is achieved by increasing of demand deposits (DD) comparably than required reserves (RR), $DD > RR$. Commercial banks need to extend their deposit level paralleled to demand deposits (DD). On the other hand, central banks decide a reserve requirement for commercial banks. Admittedly, the lower bound $\bar{A}$ is *credit-rationed*. That is to say, credit rationing (Jaffee-Modigliani, 1969) is excess demand for commercial loans at the ruling commercial loan rate. Just as certain stability can be indexed by enough reserves, so does a sudden reserve shortage reflect uncertain demand deposits.

	certain outcome	uncertain outcome
DD index	$\frac{DD-R}{R}$	$\frac{DD-R}{DD}$
DD (Demand Deposits)	R (Reserves)	
RR index	$\frac{R-RR}{RR}$	$\frac{R-RR}{R}$
RR (Required Reserves)		

A demand deposit (DD) Index and a required reserve (RR) Index in uncertainty

As above, using two different indices stands to reason that for certain outcome in a demand deposit (DD) index, how far demand deposits are bigger than reserves, for uncertain outcome, within the scale of demand deposits, where reserves are located. Otherwise, for certain outcome in a required reserve (RR) index, how far reserves are bigger than required reserves, for uncertain outcome, within the scale of reserves, where required reserves are located.

2.1. Overnight loan investment

For example, demand deposits of commercial banks contain loans, excess reserves and required reserves. excess reserves can pay demand deposits incurred by loans. The composition of excess reserves and loans can be arranged. All in all, central banks have commercial bank reserves as liabilities. In some specific cases, required reserve rate is the percentage of deposit in demand deposits. At all events, the amount of reserves should cover demand deposits according to credit rationing. A commercial bank is an *overnight interbank interest player* in a case of

$$A < R - DD. \tag{13}$$

Why would a commercial bank hold excess reserves at the central bank? The motivation to hold excess reserves has relevance to make more networks between small banks and a big bank. For example, a small bank Tiny has lent more money than they intended so some of expected incoming funds did not arrive timely. A small bank *Tiny* faces the problematic situation of liquidity shortage to meet a reserve requirement which are supposed to be sent to the central bank. On the other hand, a big bank *Too Big Too Fail* has excess cash. A big bank *Too Big Too Fail* is supposed to lend to a small bank *Tiny*. An announcement "I lend you" by a big bank *Too Big Too Fail* executes an overnight wire so a small bank *Tiny* can meet reserve requirement at the end of day. Indeed, this overnight wire isn't a wire of cash between banks. It is a wire of cash reserved in a central bank paralleled to loans of a small bank *Tiny*. Consequently, commercial banks' excess reserves are involved in reserves of central banks. Generally speaking, bank size is maintained. For a small bank *Tiny*, a change of excess reserves in the composition of a balance sheet is less risky when it is involved in reserves of central banks.

In spite of rearrangement of on-balance sheet factors, excess liquidity has a positive value than the low bound $\bar{A}$ because excess liquidity contains cash vaults and ATMs beyond excess reserves.

$$R - RR \geq R - RR - A, \tag{14}$$

In spite of easy deduction with excess liquidity A, being able to transfer cash payoffs does not imply that utility is transferable: wealthy and poor players may derive a different utility from the same amount of money. If capital is credit rationed at the low bound $\bar{A}$, the utility payoff U of banks shows satisfaction about funding value to hold excess liquidity A depending upon utility jumps at $A = \bar{A}$.

$$U = \begin{cases} A + R - RR, & \text{if } A \geq \bar{A}\,, \\ A, & \text{if } A < \bar{A}\,. \end{cases} \tag{15}$$

To put it differently, the difference between excess liquidity A and the low bound $\bar{A}$ implies the tolerance level of excess cash. The candidate to achieve the low bound $\bar{A}$ (=$RR-DD$) can be proper amount of cash holdings. Because required reserves are various, I am puzzling on the important scale between *precautionary reserves* and the decision to hold excess funds for hedging liquidity confronting risky situation like wars and terrors which is different at each country. In case of only A left in the payoff utility if $A < \bar{A}$, that is $DD - RR > 0$, banks want to bet more on *hazardous liquidity A*. Simultaneously, the risk-averse bank turns into the risk-taking investment plan.

The moral hazard problem occurs when the poor status of borrowing banks is negliged by lending banks. Let $A \equiv DD - RR > 0$ be the scale of the *hazardous*

liquidity, let ρ_0 be the total expected return of pledgeable $DD-R$, and ρ_1 the return of excess $R-RR$, both measured per unit invested.

Figure 3. Excess Demand Deposits (DD) and a Negative Wedge $Z_1 - Z_0$ (rent)

$$0 \longrightarrow RR \xrightarrow{\rho_1} R(Z_1) \xrightarrow{\rho_0} DD(Z_0)$$

identification symbols: RR (Required Reserves), R (Reserves), DD (Demand Deposits)

Thus, A results in a total payoff $(\rho_0 + \rho_1) \times A$ of which ρ_0 can be pledged to outside investors. The residual $\rho_0 \times A$ is the minimum rent of overnight investment plan to the bank.

$$\begin{cases} \rho_1 & = p_H \times R, \\ \rho_0 & = p_H \times (R - \dfrac{B}{\rho_0}), \end{cases} \tag{16}$$

where p_H is denoted as the probability of success, B as the return of a bad plan and R as return.

The rational bank expects the return from overnight investment plan. Hence, we get:

$$0 < \rho_1 < 1 < \rho_0. \tag{17}$$

Consequently, the bank has the minimum illiquidity ratio:

$$1 - \rho_1, \tag{18}$$

Maximum betting level for excess liquidity investment plan is:

$$\frac{A \equiv DD - RR}{1 - \rho_1}. \tag{19}$$

and gross payoff is:

$$U^g = \frac{(\rho_0 - \rho_1) \times A}{1 - \rho_1} = \mu A, \tag{20}$$

where

$$\mu \equiv \frac{\rho_0 - \rho_1}{1 - \rho_1} \tag{21}$$

2.2. Liquidity shocks

Assumed that required reserves are monotonically increasing. Merit discussion focuses on similar monotonic increasing nonlinear line of endogenous variables. A further point needs to be made with fixed scaled shocks impacting on the trend line of guided criteria. We shall check whether endoegenous variables are comparably statics following the guided trendline with shocks or not. I begin with two properties:

$$\begin{cases} counter\text{-}monotonicity : 1 <\mid \rho \mid \\ comparability : \rho < \rho_1 \end{cases} \tag{22}$$

Let X(= Demand deposits) be partially ordered sets. x is comparably static in partially ordered sets T of parameter t (= shocks) by a function $f : X \times T \to \mathbb{R}$. If for all $x' > x^*$: whenever $f(x', t^*) \geq (>) f(x^*, t^*)$, then

$$f(x', t') \geq (>) f(x^*, t'), \tag{23}$$

for all $t' > t^*$.

Simply put with counter-monotonicity and comparability as below:

$$\overbrace{0 < \rho_1} < \overbrace{1 < \rho_0 <\mid \rho \mid} \tag{24}$$

The order-theoretic single crossing property of Milgrom and Shannon (1994) in the theory of comparative statics is useful for verifying when the required level in regulation is monotonically increasing. Hereby, endoegenous variables are demand deposits and an exogenous parameter is shock as below:

DEFINITION (single crossing property) Let endogenous X (demand deposits) and parameter T (shock) be partially ordered sets. A function $f : X \times T \to \mathbb{R}$ is said to satisfy the single crossing property in $(x; t)$ if for all $x' > x^*$: whenever $f(x', t^*) \geq (>) f(x^*, t^*)$, then $f(x', t') \geq (>) f(x^*, t')$ for all $t' > t^*$.

Clearly, the slope which has the flow and following the trendline of guided amount is not moving upward entirely:

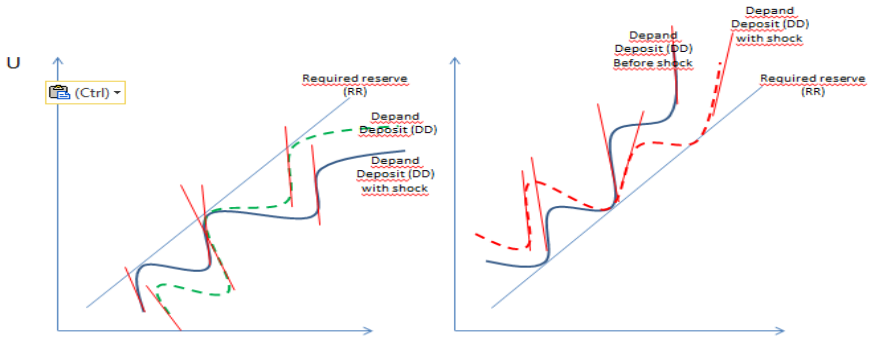


Figure 4. Comparative statics in investment

Comparative statics in investment is the comparison of two different pledgeable portpolios, before and after a change of an exogenous shock within fixed scale by credit rationing in a sense of liquidity and illiquidity:

$$\underbrace{1+\rho}_{\textit{illiquidity to support}\,\rho_1} < \rho_1, \tag{25}$$

Here by, credit rationing is specified in the gap between insured amount and parameterized amount: pledgeable demand deposits and required reserves. Excess liquidity composed by excess reserves is a kind of a shock. The exogenous shock is measured by demand deposit index and required reserve index obtained by credit rationing.

To reach an easier understanding of credit rationing, assume that required reserves (RR) of a bank is monotonically increasing. Certainly, the aim of soft regulation is to check comparatively statics to sufficiently follow the trend of guideline. not a limitation of specific guideline about an amount. The credit scale contains the counter-monotonic part restricted by redlining between Reserves (R) and Demand Deposits (DD).

$$\begin{cases} 0 \to \rho_1 \to \rho_0 \\ 0 \to Z_0 \to Z_1 \\ \underbrace{RR \xrightarrow{\text{moving point}} R \xrightarrow{\textit{redlining}} DD}_{\textbf{credit scale}} \end{cases} \tag{26}$$

Therefore, when we check the change when the slope is increasing, the change before shock and one with shock increase. However, the change is not beyond the required reserve line. Change is comparably statics but it shows increasing is

vigorously continuous along monotonic increasing of criteria for regulation. There remains a range of problems to be tackled because shocks in investment have comparatively statics so it can be nonlinear motions but the lending contract has the fixed term which can be seen in the linear approximation.

2.3. When beliefs are formed enough to effect on decision procedures

Remark that each borrower (it can be a country) has the incomplete structural representation:

$$U = \begin{cases} A + R - RR, & \text{if } A \geq \bar{A}\,, \\ A, & \text{if } A < \bar{A}\,. \end{cases} \tag{27}$$

The preference structure becomes the choice structure when a loaner can answer "Yes" or "no" for the loan request of each borrower. My puzzle is moving on a measure of a consequence of different borrowers having different probabilities of repaying their loan. Apparently, preferences can only depend on the consequences $(c_1, c_2, ..., c_n)$. Degenerated lotteries are also equivalent. Compound Lotteries $(L_1, ..., L_k; a_1, ..., a_k)$ (MWG, session 6B) is the risk alternative that yields the simple lottery l_k with probability a_k for $k = 1, ..., K$, given K simple lotteries $l_k = (p_1^k, ...p_N^k)$, $k = 1, ..., K$ and probabilities $a_k \geq 0$ with $\sum_k a_k = 1$. Here by, summation of equivalent lotteries $\sum_k a_k$ should be 1.

It might be useful to explore on methodology part about utility function in incomplete structural representation. For example, in a model of multi-valued prediction (Jovanovic, 1989, discrete form game) u is latent variable, θ is a parameter in the payoff matrix, S is the set of (pure) strategies, and $G(u \mid \theta)$ is the set of Nash equilibrium (pure) strategy profiles for given u and θ. Then, this issue can be enlarged to question about solutions for multiple equilibria: sub-correspondence, rationalizability, samples converge (ergodicity) or classical central limit theorems. Still, a crescendo of this methodological puzzling is why θ is given at the beginning.

For the issue of utility function in incomplete structural representation, initially I begin with decisions when the number of possible outcomes or "states" is finite. A regulator (decision maker) then indicates the choice structure θ to each state. Let L_θ be the consequence in complete structure θ. Also, let $1_\theta(L)$ be the indicator that the individual assigns to this complete structure θ:

$$\begin{cases} \exists\, l_\theta(L) \to \theta, \text{ where } 1_\theta : L \to \{0, 1\} \text{ as} \\ 1_\theta(L) := 1, \quad \text{if } L \in \theta \\ \qquad\quad = 0, \quad \text{if } L \notin \theta. \end{cases} \tag{28}$$

Then the uncertain outcome or "prospect" is the $2 \times \theta$ vector:

$$(L_\theta; 1_\theta(L)) = ((L_1, ..., L_\theta); (1_\theta(L), ..., 1_\theta(L)). \tag{29}$$

Under the axiom of choice (if you have one side of a pair of shoes, your choice on another side of a pair is obvious in the binary choice) on two uncertain outcomes, there exists a continuous utility function $U(L_\theta; 1_\theta(L))$ over prospects.
Given a structural parameter $\theta \in \Theta$ and the realization $u \in U$ of an unobservable random variable, the model predicts a nonsingleton set, denoted $G(u \mid \theta)$, of values for the outcome variable, that is $G(u \mid \theta)$ is a subset of the (finite) outcome space S. The question (Epstein-Kaido-Seo, 2016) is on how the realized outcome s is selected from $G(u \mid \theta)$. Obviously, the object of interest is θ. Considering the set of all lotteries or prospects over the fixed outcome levels $L_1 < L_2 < L_3$, which can be represented by the set of all choice structure triples of the form $\Theta = (\theta_1, \theta_2, \theta_3)$, we can represent these lotteries by the points in the unit triangle in the (θ_1, θ_3) plane. Since upward movements in the triangle increase θ_3, the risky movements are all northwest movements. For $\theta_3 > 1$, it's possible but we assume there is limit of cognition as of $0 < \theta_3 \leq 1$ by a regulator. The value is revealed when preference structure u is corresponding θ-parametric choice structure Θ:

$$G(u \mid \theta_1 + \theta_3) \in \triangle(S), G(u \mid \theta_2) \nsubseteq \triangle(S). \tag{30}$$

Let's say we assume that we have three points (lotteries, probabilities). If a lottery is utility-representable, a lottery is θ-parametric structural which is complete in the choice structure.

$$\mathcal{P}_\theta = \left\{ P \in \triangle(S^\infty) : P = \int_{U^\infty} P_{u^\infty} dm_\theta^\infty(u^\infty) \right\}, \tag{31}$$

If the preference of a lottery is not revealed in the θ-parametric structure, we get certain decision procedure which is not interesting for a rational agent who is affording to get risk-taking outcome:

$$\mathcal{P}_{\theta^c} = 0. \tag{32}$$

$G(u \mid \theta_1 + \theta_3) \in \triangle(S)$, $G(u \mid \theta_2) \nsubseteq \triangle(S)$ in the case of certain second outcome. Again, there is possibility of $G(u \mid \theta_3) \nsubseteq \triangle(S)$ in the extreme case of risky preference on uncertain third outcome.
Compound convergences in this model is assume that u^∞ jointly follows a parametric compound convergence m_θ^∞, the i.i.d. product of the compound convergence

$$m_{\theta_1+\theta_3} \equiv \left\{ \frac{Z_1^1 - Z_0^3}{A^1}, \frac{Z_1^1 - Z_0^3}{A^3} \right\} \in \triangle, \tag{33}$$

defined as "redlining in credit rationing" on U. For sure, an initial clue to this framework is that markets play allocations. The redlined group of borrowers who

cannot obtain credit with a given supply of loanable funds are observed separately. Of special interest is that we can discuss global imbalance in a more convincing way than the financial autarky which is restricted in the scope of balance of savings and investment automatically represented as the supply and demand of loanable funds.
lotteries are degenerated at the same portion in a von Neumann-Morgenstern utility function. Simply from this viewpoint, preferences can only depend on the consequences $(c_1, c_2, ..., c_n)$ and their respective probabilities $(p_1, p_2, ..., p_n)$. A utility function $F(c_1, c_2, ..., c_n; p_1, p_2, ..., p_n)$(by attaching numbers to indifference curves, where a curve corresponding to a higher level of preference gets a bigger number) pictorized in the indifference map as below:

$$EU(L) = p_1 u(c_1) + p_2 u(c_2) + ... + p_n u(c_n) \tag{34}$$

where F(=constant) exists by the indifference map consisted by contours. To facilitate the previous argument, the incomplete structural utility representation is here by:

$$EU(L) = 1_\theta \cdot G(u \mid (\theta_1 + \theta_3) + 1_\theta \cdot G(u \mid \theta_2). \tag{35}$$

My aim is to add a new perspective to a case of continuum project. This framework shows nonmonotonicity of expectation in a framework of an incomplete risk-taking behavior. It provides an overview of convergence of risk-taking behavior than the solution of average riskiness by mean return reverting by loan interest in a sense of mean preserving spreads.

2.4. Selected Liquid Characteristics of Village I and Village II

Having outlined the institutional context dealing with different countries, the discussion now turns to the real economy. The most required question is if there is a certain company, how we can decide either yes or no about the liquidity funding in the financial regulation. In order to provide a framework for more detailed consideration of credit rationing, it will be helpful to compare two villages. There is a marked contrast between a village I holding small reserves (reserve ratio 7%) and a village II holding excess reserves (reserve ratio 30%). To a great extent, within the outside liquidity system, both village I and village II are conceived of excess liquidity (7867, 44800) : ≡ currency issued (5886, 400, current USD, million) + excess reserves (1981, 44400, current USD, million).

(Current USD, million)	Village I	Village II
Outside Liquidity in domestic currency, liabilities		
currency issued	5,886	400
required reserves	2,053	19,200
excess reserves	1,981	44,400
reserve money	9,920	64,000
demand deposits, commercial banks	12,684	3,028
excess liquidity	R < DD	DD < R
Inside Liquidity		
overnight deposit window rate	2.75	2.75
credit rationed A	-10,631	60,972
domestic credit to private sector by banks to GDP (%)	70	99.2
net commercial bank lending and other private credits	250	-43

Table 3. Selected Liquid Characteristics in 2014 [5]

For one thing, excess reserves (64000) and reserve money (44400) in Village II is higher than in Village I (9920, 1981). It can be puzzled how domestic credit to private sector by banks to GDP in Village II (99.2) is higher than Village I (70). It bears the imprint of importance to make an attention on two criteria to understand excess liquidity: R < DD or DD < R. This may in part be due to pledgeability of demand deposits, illiquidity of reserves and more liquidity of demand deposits are emphasized by contrasting two different liquidities. The comparison is partially developed in creditability judged by expectation of investors.

Insofar as credit rationing going to two different lengths is concerned: insured and parametrized in the optimum, an endogenous liquidity model still calls attention to the central problem as to satisfy the goal of investors by insured and parameterized comparative statics of optimal investment values.

The question has been raised in comparative statics as to whether investors increase

[5]source: village I by data in Jordan by Central Bank of Jordan, village II by data in Lebanon by Central Bank of Liban in 2014 and world bank data.

2. complementary economic information about village I and village II, reference: world bank data.

	Village I	Village II
Population (total)	7,416,083	5,612,096
GDP (millions, Current USD)	3,587	4,573
GDP per capita (Current USD)	4,830	8,148
commercial bank branches per 100,000 adults	19. 85	29.84
Domestic credit to private sector (% of GDP)	70	103
Bank nonperforming loans to gross loans (%)	5.6	4
Bank capital to asset (%)	12	8

the amount of investment or not. Our concern is not with the increase of broad investment amount which can be credited but with insured and parametrized amount getting to the optimal value.
A richer analysis of the interdependence between excess liquidity and credit rationing components in the spread between pledgeable and unpleageable amount for different countries can be carried out by considering the government policy rule changing the mix of assets held by the private sector through open market operations (Kiyotaki-Moore, 2008).
For example, a look at functioning of the economy by the central bank's balance sheet, Garreth (2015) argues on impact of central bank collateral choices in Bank of England caused by the Asset Purchase Facility (APF) reaching 375 billion by late 2012.
Additionally, a clue to changes of asset composition is provided by numerous stylized facts about the asset purchases and the freshly created reserves in Hong Kong (long-standing currency peg regime since 2005 by Hong Kong Monetary Authority (HKMA) and Thailand (inflationary targeted (0.5-3.0%) operational strategy to absorb excess liquidity by market.
There can be little doubt that offset in the same composition is always possible in the changeable composition. The change of positioning in the same frame figurative as the change of a composition carries articulation of flows. By the way, this framework requires heavy emphasis on the proof that the value of investment has single-valued because the value can be representable in the balance sheet. The puzzle on offset among different values obtained by credit rationing sets the tone for investment having multi-dimensional valued regardless of on-balancesheet factors and off-balancesheet factors.

2.5. Composition of Liquidity

At the heart of credit rationing lies the conception of the liquidity composition. In relation to what I have previously said that Village I and Village II are having excess liquidity as far as excess cash and excess reserves concerned. In detail, even though the measurement of excess cash is not easy, Village I are having excess reserves than required reserves (3340 > 694). Likewise, Village II are having excess reserves than required reserves as well as Village I (44400 > 19200). By the way, a closer look at the composition with credit rationing, demand deposits - required reserves (-1764 , 16172) gives a different answer.

Village and Liquidity Composition	Credit Rationing, I : -(DD-R) II: RR-DD	Certainty, excess liquidity I: (R-RR) ÷ R II: (R-RR) ÷ RR	Precautionary Level Index (Lowest 1- Highest 11)	Uncertainty, inside liquidity I: (DD-R) ÷ DD II: (DD-R) ÷ R
Village	Village I, II	Village I, II	Village I, II	Village I , II
currency issued	5886 , 400			
required reserves	694 , 19200			
reserve ratio	7% , 30%			
excess reserves				3340, 44400
reserve money				9920, 64000
demand deposits	12684 , 3028			
credit rationing	-11990 , 16172			
excess reserves				1981 (actu), 44400
(R-RR) ÷ RR		93 % , 233 %		
Level Index			level 11	
(DD-R) ÷ R				22%, -0.0084 %

Table 4. Composition of Village Liquidity in 2014

identification symbols: DD (Demand Deposits), R (Reserves), RR (Required Reserves),

source: village I by data in Jordan by Central Bank of Jordan, village II by data in Lebanon by Central Bank of Liban in 2014 and world bank data.

Seen in the perspective of an asset-liability match, demand deposits exerted a strong influence on reserves. It is not seem to rash to suggest required reserves as a percentage of net demand deposits held in commercial banks by customer. Demand deposits against reserves is total demand deposits less "due from" (Allen, 1956). No single explanation can account for the single driver to describe the change of reserves with credit and demand deposits. However, Several assumptions are worth to be mentioned for the sake of financial regulation.

It is not unreasonable to postulate that credit rationing is differently interpreted as a transaction holding a liability (Henderson, 1960), reserve credit (Allen, 1956) and a monetary instrument (Siegel, 1981). It can be a transaction (Henderson, 1960) for a borrower occupied by the federal funds absorption ratio of a financial liability defined as the amount of federal funds which directly and indirectly support a one-dollar public holding of the liability. As a matter of the fact, a country bank allows a reserve city bank with different reserve requirements by shifting interbank deposits depending upon reserve credit (Allen, 1956) because total reserves is not changed and only distribution among banks by shifts in interbank balances. Additionally, as a monetary instrument, optimal reserve requirement on demand deposits (Siegel, 1981) controls the value of monetary aggregates.

As a closer look at the composition of Village Liquidity in 2014, credit rationing of Village I ($R < DD = 9920 < 12684$) is negative and on the other hand, Village

II ($R > DD = 64000 > 3028$) is positive. It indeed may be said with safety that motivation to hold liabilities excessively is purely surplus reserves in 1930 without any economic purpose caused by lack of good loan opportunities. After crisis 2007, good loan opportunities hinges on a series of remedies in a bad economic situation up to one country and more.
Passively accumulated excess liquidity is not merely explained by the conservative banking system. At the same time, as a meaning of proper loan commitment, it is no less dubious to connect that the bank behavior in the uncertain situation should be viewed with reservation. It is no wonder the motif to hold excess liquidity is good reason to show credit facility to induce good loan opportunities and obtain safer investment return by overnight interest. This motivation requires a quite logical explanation with small sample of reserves in a vulnerable economy.

3. Empirical founding in the case of Jordan and Lebanon during the period 1993-2015

This part takes a systemic and comprehensive approach from excess liquidity to surplus liquidity with the case of Jordan and Lebanon during the period 1993-2015. The MENA (Middle East and North Africa) region has passed political and economic conflicts since the Gulf war in 1990 and 1991 located on Iraq, Kuwait, Saudi Arabia and Israel. It affects Jordan as a small open oil-importing country who is geographically in Southwest Asia, south of Syria, west of Iraq, northwest of Saudi Arabia and east of Israel and the West Bank. As time goes by, conflict areas neighbored with Jordan are seemed to have higher risk in finance. Especially, liquid asset is spotlighted to be sent to a safer country Jordan and Lebanon by residents in conflict areas.
Net lending in conflict areas is higher for restoration from the war. Ostensibly, the confusion among net lending, grant and excess liquidity is bolded than before 1993. In case of Jordan, the holdings rate which is the exchange rate of a currency against the special drawing right (SDR) derived from the currency's representative exchange rate reported by the central bank, is consistently about 1 from 1991 up to 2016, radically decreasing from 2.5 in 1985. In detail, remoted from the impact from the war, for the period (2009 – 2015), basic spread in financial sectors in Jordan: deposit interest rate, lending rate are consistently maintained from 4% to 5% regarding to the bank lending-deposit spread. The deposit interest rate decreases from 4.8% in 2013 to 3.49% in 2015. In addition, the lending interest rate decreases from 9.01% in 2013 to 8.47% in 2015 as well.

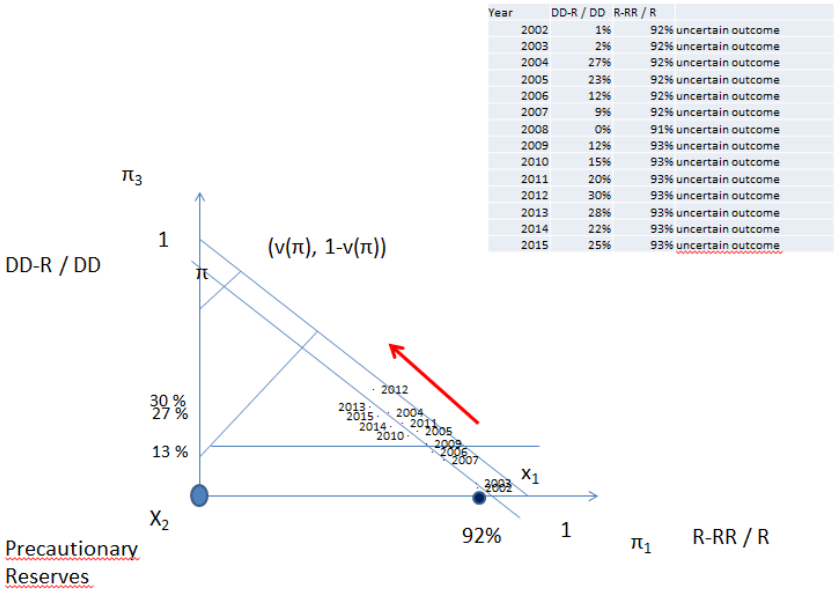


Figure 7. Risky behavior in Jordan during 2002-2015

Real interest rate fluctuates even though there is stability of deposit interest rate, lending rate and interest spread during 2003-2015. For economic financial stability, in all probability, understanding liquidity in financial sector and remittance and transaction in external sector is important than ever to analyze imbalanced part in Jordan. After 2001, the risky behavior has been shown to obtain the uncertain outcome which is up to the northwest direction.

Year	DD-RR/R	R-RR/RR, Precautionary Reserves	RR/DD, RR index (1-11th)
1993	-35%	567%,certain outcome	23%,3th(below 30%)
1994	-37%	567%,certain outcome	24%,3th(below 30%)
1995	-38%	567%,certain outcome	24%,3th(below 30%)
1996	-36%	567%,certain outcome	24%,3th(below 30%)
1997	-41%	614%,certain outcome	24%,3th(below 30%)
1998	-33%	614%,certain outcome	21%,3th(below 30%)
1999	-38%	614%,certain outcome	23%,3th(below 30%)
2000	-29%	900%,certain outcome	14%,2th(below 20%)
2001	-15%	1150%,certain outcome	9%,1th(below 10%)
2002	1%	92%,uncertain outcome	11th(over 100%)
2003	2%	92%,uncertain outcome	11th(over 100%)
2004	27%	92%,uncertain outcome	11th(over 100%)
2005	23%	92%,uncertain outcome	11th(over 100%)
2006	12%	92%,uncertain outcome	11th(over 100%)
2007	9%	92%,uncertain outcome	11th(over 100%)
2008	0%	91%,certain outcome	1th(below 10%)
2009	12%	93%,uncertain outcome	11th(over 100%)
2010	15%	93%,uncertain outcome	11th(over 100%)
2011	20%	93%,uncertain outcome	11th(over 100%)
2012	30%	93%,uncertain outcome	11th(over 100%)
2013	28%	93%,uncertain outcome	11th(over 100%)
2014	22%	93%,uncertain outcome	11th(over 100%)
2015	25%	93%,uncertain outcome	11th(over 100%)

Table 6. Jordan in an inside liquidity triangle identification symbols: DD (Demand Deposits), RR (Required Reserves), R (Reserves), EL=Excess Liquidity

According to S.Gray (2006), excess reserves are described the position of most developed country central banks: the Bank of England, the US Federal Reserve Bank, the European (System of) Central Banks and the Bank of Japan. In addition, it could be the case that the surplus is represented by excess cash in circulation (supply is greater than demand) rather than by commercial bank balances at the central bank; this is unlikely although it can be observed in a few countries. In case of Jordan, this is the case of excess cash. On the other hand, cash is on deficit as the percentage of GDP Regarding reserve money which contains currency and reserves in central bank of Jordan, issued currency composed the major part of reserve money during the period (2013-2015) and approximated 60% on average. Issued currency increased from 3559 Jordanian million dinars in 2012 to 4336 Jordanian million dinars in 2015 and reserve money as well increased from 5229 Jordanian dinars in 2013 to 7505 Jordanian dinars in 2015. It contrasts with Lebanon which has outstanding required reserve rate as of 30.00 % (Jordan: 8.00 %) as below:

Year	DD-R/R	R-RR/RR, Precautionary Reserves	RR/DD, RR index (1-11th)
1993	-70%	233%,certain outcome	98%,10th(below 100%)
1994	-82%	233%,certain outcome	166,11th
1995	-85%	233%,certain outcome	204,11th
1996	-87%	233%,certain outcome	226,11th
1997	-89%	233%,certain outcome	267,11th
1998	-88%	233%,certain outcome	253,11th
1999	-87%	233%,certain outcome	237,11th
2000	-88%	233%,certain outcome	248,11th
2001	-92%	233%,certain outcome	354,11th
2002	-91%	233%,certain outcome	323,11th
2003	-95%	233%,certain outcome	661,11th
2004	-95%	233%,certain outcome	641,11th
2005	-96%	233%,certain outcome	678,11th
2006	-95%	233%,certain outcome	603,11th
2007	-95%	233%,certain outcome	554,11th
2008	-95%	233%,certain outcome	566,11th
2009	-95%	233%,certain outcome	663,11th
2010	-95%	233%,certain outcome	618,11th
2011	-96%	233%,certain outcome	667,11th
2012	-95%	233%,certain outcome	624,11th
2013	-95%	233%,certain outcome	593,11th
2014	-95%	233%,certain outcome	629,11th
2015	-95%	233%,certain outcome	650,11th

Table 7. Lebanon in an inside liquidity triangle identification symbols: DD (Demand Deposits), RR (Required Reserves), R (Reserves), EL=Excess Liquidity

Middle East and North Africa (MENA) after the Gulf war from 1990 and 1991 can access to get good loan opportunities: debt forgiveness. It is of course not needed to say laziness of conflict countries to be vulnerable by external shocks in their economies. To put it differently, the exact probabilities to indicate the bank behavior in spite of short time series data which cannot be shocked durably and sequentially up to future, better put, the worst situation is happened and should be recovered by net lending, should be noted.

4. Conclusion

Credit rationing is rationing of excess liquidity by risk preference on comparable statics of liquid investment. This study addressed two research questions: First, the key question to be asked is how a subject of excess reserves in excess liquidity after the banking crisis of the early 1930s or 1970 can be re-identified in 2016. And second, needs of new technique about risk preference provides a useful ground to test the cross-sectional data between economics and finance by

applying theories about uncertainty. For one thing, *Excess liquidity* has simply deduced itself from required reserves in banks. By the way, if *Increasing credit rationing* at the precautionary level stand out from the gap of required reserves and pledgeable demand deposits, $RR - DD > 0$. Not the least of these is its mixture of styles, increasing credit rationing at the aim of investment is within fixed reserve scale, Reserves (R) - Demand Deposits (DD). Most obviously, *risk preference* in the triangle distinguishes between risky loving behavior inside of a triangle and risk aversion behavior at the origin. As has been noted earlier, comparative statics in investment is a richly detailed study of the nature of monotonic required regulation criteria. Especially important is hard regulation on increasing the precautionary level is impossible to quibble with increasing every level set above required level. Consequently, the aim of soft regulation is to check comparatively statics to sufficiently follow the trend of guideline, not a limitation of specific guideline about an amount. This technical result of my study points to several promising applications for regulatory issues.

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