November 26, 2008
Bank of Japan

"Liquidity" and "Payment and Settlement Systems"

Speech at the Center for Advanced Research in Finance (CARF), The University of Tokyo

Masaaki Shirakawa
Governor of the Bank of Japan

I. Introduction

Today, I am going to speak about "liquidity" and "payment and settlement systems." A good understanding of these subjects is essential, if we wish to probe deeply into the origins of and responses to the profound disturbances and turbulences that, as we know, began with the subprime mortgage crisis in the summer of last year, and are still affecting the global financial market and financial system today. What is more, I believe that in order to understand the recent dislocations, it is necessary to go beyond the basic concepts and take a look at the practical and technical aspects. My feeling is that liquidity and payment and settlement systems are areas that bear out the old saying: "God is in the details." Having said this, I have an impression that issues pertaining to liquidity or payment and settlement systems, important as they are, have not enjoyed the academic attention they deserve. For example, payment and settlement systems are rarely mentioned in macroeconomic or financial theory textbooks. My aim, therefore, for today's speech is to stimulate your interest in these issues and to illustrate the challenges that are involved, referring as much as possible to real-life examples. At the same time, I would be very pleased if my appearance at the Center for Advanced Research in Finance (CARF) contributed to strengthening the dialogue between academia and the Bank of Japan on these subjects.

II. Definition of Liquidity

Let me start my discussion by giving you some examples of the context in which the word "liquidity" is used. Please refer to Chart 1.

The first example is the state of financial markets in the United States after the failure of Lehman Brothers Holdings Inc. Money market mutual funds (MMFs) and hedge funds faced rapidly increasing requests for redemption by investors and, due to the resulting liquidity constraints, became reluctant to invest in CP. As a consequence, CP issuance dropped precipitously and corporate finances came under increasing stress. Moreover, since October, funds have been under strain to secure liquidity, and as a result, they have accelerated the closing of their equity, bond, foreign exchange, and commodities positions, leading to extreme volatility in the respective markets. Liquidity, in the sense that I have just mentioned, essentially refers to the availability of sufficient cash or currency to pay one's counterparty, and is sometimes described as "funding liquidity."

The second example is the state of the market for Japanese government securities (JGSs) since this spring. Chart 2, which illustrates the developments in the Japanese government bond futures market, shows that intraday volatility has increased amid declining turnover. In short, "market liquidity" in the JGS market has declined. Here, "market liquidity" is defined as the "ability of market participants to trade without delay and without impacting the market price." Today, such impairment of market liquidity in the JGS market is manifested, for example, in the unhinging of the usual relations that exist between the cash and futures markets. Consequently, market participants are facing difficulties in properly hedging against interest rate risk, which affects the behavior of financial institutions and eventually all private economic agents. Chart 3 compares the term structure of JGS interest rates, that is, the yield curve, at the beginning of 2007, the day after the failure of Lehman Brothers in the middle of this September, and on Wednesday last week (November 19). While the term structure of interest rates is theoretically said to be the first-order approximation of expectations, current developments in the markets show considerable deviations from the smooth form derived from theory. Actually, such a development is quite relevant in assessing the transmission of monetary policy.

The third example of the way the word "liquidity" is used is in statements such as "the background to the subprime mortgage crisis since the summer of last year is an excess of liquidity." The underlying concept here is related to the funding and market liquidity that I have just mentioned, but at the same time is somewhat vague and encompasses the confidence that supports risk taking.

As the three examples have shown, liquidity is an extremely important concept in our understanding of dynamics in the economy and financial markets.

III. Conceptual Issues regarding Liquidity, and Payment and Settlement Systems

We are now ready to tackle today's topic: "liquidity" and "payment and settlement systems." I will first explain the basic conceptual issues.

A. Central Bank Money

Every day, innumerable economic transactions take place. Many of these transactions are, in the abstract, promises between agents to exchange goods and/or services for money. The discharge of the obligations from these promises through the delivery of the goods or services against money in each of these transactions is called "payment and settlement." Everyday economic activities become possible only if we can have confidence that such payment and settlement activities are safe and sound.

In order to establish such confidence, the quality of the means employed in payment and settlement must be safe and sound. In many economies today, the safest and soundest means is the money issued by the central bank. More specifically, such money consists of banknotes and current account deposits at the central bank that can be exchanged at will for banknotes. These two instruments are called central bank money. They are liabilities of the central bank, which is free of bankruptcy risk and relies on the creditworthiness of the state, vis-à-vis private economic agents. Meanwhile, private financial institutions also provide a means of payment and settlement to firms and households in the form of deposits, and through these offer various payment and settlement services. Any surpluses or shortfalls in funds at financial institutions arising from these payment and settlement services are aggregated with surpluses and shortfalls arising from other activities of these institutions, including deposit taking, disbursement of loans and securities trading, and their aggregate positions are adjusted in the short-term money market such as the call money market. If, in this process, payments and settlements relating to transactions in the money market are disrupted, the disruption will not only impact other financial institutions but also affect firms and households, which depend on payment and settlement among financial institutions for their own payment and settlement. For this reason, to ensure stability, money market transactions as a rule are settled through central bank accounts, guaranteeing payment and settlement security.

B. Payment and Settlement Systems

Next, let me talk about payment and settlement systems. The term "payment and settlement systems" refers to mechanisms for systematically processing transfers of funds

and/or securities arising from daily business and/or financial transactions on a standardized basis.[1] Of these mechanisms, a system that processes the transfer of funds is a "payment system."[2]

Chart 4 presents a stylized illustration of the current state of payment systems in Japan. Of these systems, the system that handles large-value payments is the Bank of Japan Financial Network System Funds Transfer System (BOJ-NET), owned and operated by the Bank. The BOJ-NET mainly processes payments related to transactions in various financial markets, such as the short-term money market, the foreign exchange market, and the securities markets (JGSs, corporate bonds, and equities). Meanwhile, direct debit and credit transfers between firms and individuals for wages, pensions, utility bills, taxes, business-to-business payments, and so on, are relatively small in value compared with transactions in financial markets, but their aggregate volume is huge. Payment instructions for many of these transactions are processed by the Zengin Data Telecommunication System (Zengin System). The system handles an average daily volume of more than five million instructions, and more than 20 million instructions on peak days, which is quite large compared with other payment systems around the world. Consequently, even though the payments processed by the Zengin System are quite small, any disruption to the smooth settlement of such a large volume of transactions is likely to have a widespread impact on activity in the economy overall, just as any disruption of a large-value system would have. In this sense, both the BOJ-NET and the Zengin System represent essential social infrastructures supporting daily economic activity in Japan.

Looking at the aggregate daily value of instructions processed through payment systems in Japan, the value of daily payments processed through the BOJ-NET, for example, at an average of JPY 120 trillion per day during 2007, was equivalent to about 57 times the value of nominal GDP per day. As can be seen in Chart 5, the aggregate daily value settled by payment systems operated by overseas central banks is also enormous. Accordingly, the

---

1 See Bank of Japan (2006, 2007, 2008).

2 Several entities may be involved in a payment system, with each entity involved in different steps of processing after a deal is struck. These include the following: entities that match and confirm participants' deal flows; entities, called clearing institutions, that aggregate each participant's incoming and outgoing payments and calculate net positions therefrom; and entities that finally settle transactions (and thus make up "settlement systems" in the narrowest sense).

sound and efficient management of payment systems that handle such large amounts of payments has become one of the top priorities of central banks around the world.

IV. Supply and Demand of Funding Liquidity

Keeping in mind the issues I have just outlined, I would next like to elaborate on funding liquidity. One of the fundamental concepts in economic analysis is that of supply and demand, and this is also the case when it comes to funding liquidity.

A. Demand for Funding Liquidity and Methods of Settlement in Payment Systems

I will begin by looking at the demand side. The demand for funding liquidity is dependent on the method of settlement employed by payment and settlement systems. Broadly speaking, there are two methods of settlement in payment and settlement systems: the deferred-net settlement system (DNS system) and the real-time gross settlement system (RTGS system). Please refer to Chart 6. Under a DNS system, payment instructions received from financial institutions are pooled until a pre-specified cutoff time, and then the gross values of incoming and outgoing funds are netted out. Only the net amount is settled. The advantage of DNS is that it uses funding liquidity very efficiently. However, if even one of the participating financial institutions fails to meet its obligations in a particular settlement period, it becomes necessary to halt the settlement of payment instructions of all participating institutions in the system, and then to remove instructions involving the institution that failed to meet its obligations and recalculate the net settlement amount all over again for each participant in the system. This means that the failure of one institution to meet its obligations will affect the settlement of payment instructions of all other institutions, and may, depending on the sums involved, even start a chain reaction where other participants fail to meet their obligations. In other words, DNS can potentially disrupt the entire payment system, that is, it harbors systemic risk.

On the other hand, under an RTGS system, as payment instructions are received, funds are transferred immediately on an instruction-by-instruction (i.e., gross) basis. In such an environment, the immediate impact of a failure of one financial institution to meet its payment obligation will be confined to the counterparty, because instructions are settled individually. Therefore, RTGS contributes considerably to preventing the manifestation of

systemic risk. Consequently, in recent years, many central banks have introduced RTGS. The Bank also moved from DNS to RTGS in 2001. In this regard, one caveat is that under an RTGS system a larger amount of funding liquidity is required for settlement, because payment instructions are settled individually on a gross basis. From the perspective of a financial institution, this makes it necessary for the institution to have a larger cushion of funding liquidity, and/or to make use of available liquidity more efficiently. I will return to this point later on.

B. Supply of Funding Liquidity

Next, I would like to talk about the supply of funding liquidity. The main method of supply of balances held in central bank current accounts is the open market operation conducted by the central bank.

Each day, every central bank, including the Bank, projects the demand for current account balances, estimates how autonomous factors such as banknote issue or government treasury funds will impact the level of the current account balances, and adjusts the level of aggregate current account balances by conducting open market operations. The main aim of these activities is to control short-term interest rates. While textbooks on financial theory usually focus on the supply and demand for aggregate current account balances at the end of the business day, in the real world supply and demand will fluctuate constantly during the day. I just mentioned that, under RTGS, given that each payment instruction translates to an outflow of account balances on a gross basis, the demand for account balances will swing considerably during the day, and it is possible that one financial institution will have a shortage in its current account balance, while another has a surplus. While financial institutions do ultimately adjust for such surpluses or shortages of funds in the money market, the market for fine-tuning temporary funding surpluses or shortfalls during the day is not well developed in any country.[3] With this in mind, the Bank started offering an intraday (daylight) overdraft facility in 2001, at the start of RTGS in the BOJ-NET, in order to facilitate payment and settlement during the day. The overdraft

[3] However, in Japan, there has been a market for intraday call money transactions for quite some time, which are conducted mainly through money brokers, and especially since the introduction of RTGS in 2001, such transactions are being used for the intraday adjustment of temporary excesses and shortfalls of funds.

facility automatically supplies intraday funding liquidity up to the level of unencumbered collateral posted in advance at the Bank. As a result, financial institutions can continue executing payment instructions, even very large ones, taking advantage of intraday overdrafts, as long as they have sufficient unencumbered collateral.

Chart 7 provides an illustration of the quantities involved. As can be seen in the chart, the average daily payments processed through the BOJ-NET in 2007/early 2008 amounted to about JPY 120 trillion. On the other hand, funds available for payment, consisting of the aggregate balance of current accounts at the Bank, which was about JPY 9 trillion, and the aggregate value of intraday overdrafts, about JPY 22 trillion, amounted to JPY 31 trillion, meaning that these funds were turned over four times a day.

C. "Gridlock" in Payment Systems

So far, I have talked about the general context of the supply of and demand for funding liquidity. However, it should be noted that the availability of an intraday overdraft facility under RTGS does not necessarily ensure that all payment instructions go through without a hitch from the morning hours. For example, financial institutions that do not have an abundant supply of eligible collateral have limited access to the overdraft facility. Moreover, even if financial institutions can use the overdraft facility, the fact that this involves opportunity costs such as holding eligible capital means that they have an incentive to avoid using it if at all possible. Consequently, each financial institution has an incentive to wait for incoming payments before submitting its own payment instructions (see Chart 8). Then it would not be necessary to use the intraday overdraft facility. While such behavior is rational at the micro level, if it becomes widespread it impedes payment in the system overall, and each institution potentially faces severe delays in receiving funds. This phenomenon is called "gridlock."

In order to resolve such gridlock, the central bank could provide additional funding liquidity to the payment system, or financial institutions could make efforts to bring about a more efficient turnover of funding liquidity by, for example, coordinating the timing of payments among themselves. Please refer to Chart 9. The chart shows the proportion of payment instructions processed during different times of the day in the payment systems operated by

the Japanese and U.S. central banks. In the case of Japan, as you can see in the chart, payments are concentrated in the early morning hours, which implies an effective functioning of the intraday overdraft facility. In the United States, on the other hand, payments are concentrated in the late hours of operation of the payment system, reflecting the tendency of many financial institutions to hold back payment instructions in order to minimize opportunity costs.

There are two reasons for the different patterns in Japan and the United States. One is the difference in market transaction rules. In Japan, borrowers in the call money market are expected to begin repaying any loans falling due from 9:00 a.m. (the time when the BOJ-NET opens) and complete repayment by no later than 10:00 a.m. This is called the "repayment-first" rule. There are other rules as well: lenders are expected to release funds within an hour of agreeing to lend, which is called the "one-hour" rule. The second factor is the conditions for using the intraday overdraft facilities. Many central banks, including the Bank, offer intraday overdraft facilities on a collateralized basis without any fee. This brings to mind the argument put forward by Milton Friedman on the optimal amount of money, and interestingly, the fact that the interest on intraday overdrafts is zero is consistent with his view that a social optimum occurs when the nominal rate is zero.[4] In contrast, the U.S. Federal Reserve provides the facility on an uncollateralized basis with a fee. This likely is one factor contributing to the concentration of payments late in the day.[5] While the U.S. arrangement must be seen in historical context, the concentration of payments late in the day implies an elevated level of stress in the payment system.[6]

To sum up, in order to ensure the safety and efficiency of payment and settlement, it is important to develop transaction rules for financial markets that take account of network externalities. Furthermore, in this context, the way that a central bank supplies funding liquidity, not only through open market operations but also through intraday overdraft

---

4 Friedman (1969).

5 See Armantier, Arnold, and McAndrews (2008).

6 In order to address this issue, there are now plans in the United States to also introduce an intraday overdraft facility on a collateralized, no-fee basis, which are currently under public consultation.

facilities, and the specifics of such facilities, such as fee structures and collateral requirements, play an important role.

V. Funding Liquidity and Market Liquidity

So far I have talked about funding liquidity and payment and settlement systems. I would now like to turn to the relationship between funding liquidity and market liquidity. For this purpose, it is useful to think about situations where there is a shortage of liquidity.

At the end of September this year, the Basel Committee on Banking Supervision (BCBS) released a paper titled "Principles for Sound Liquidity Risk Management and Supervision."[7] In this paper, the BCBS identifies two types of liquidity risk. The first is "funding liquidity risk," which is "the risk that [a] firm will not be able to meet efficiently both expected and unexpected current and future cash flow and collateral needs without affecting either daily operations or the financial condition of the firm." The other is "market liquidity risk," which is "the risk that a firm cannot easily offset or eliminate a position at the market price because of inadequate market depth or market disruption."

From the perspective of individual financial institutions, if they cannot secure sufficient funding liquidity, shocks may disrupt normal operations. In the worst case, institutions may be threatened by failure. The funding liquidity of an institution depends on several factors, namely its cash on hand, its ability to raise funds from external sources, and its holding of assets that can be sold. Accordingly, it is essential that these avenues are not encumbered in any way and sufficient liquidity is available to withstand any kind of stress that might arise. A financial institution can fail due to a shortage of funding liquidity, even if it is solvent.

Funding liquidity is closely related to market liquidity. If a financial institution cannot secure sufficient funding liquidity through cash on hand or borrowing of external funds and therefore has to sell assets, the degree of market liquidity for such assets becomes an issue. The lower the market liquidity for the assets in question, the more likely it is that the financial institution will have to sell at an unfavorable price. And if not one but many

---

[7] See BCBS (2008).

institutions face such a situation, this will further depress the price of such assets. This, in turn, will also affect institutions that have pledged these assets as collateral for loans or that repo out the assets for funding, as the fall in the prices of collateral assets will result in margin calls. This process, if not stopped, will put additional strains on funding liquidity, which in turn result in a further fall in the prices of the assets and increase price volatility. A vicious cycle could well emerge. Accordingly, market liquidity is an important pillar supporting funding liquidity. Whether an institution can depend on a particular asset as a buffer for funding liquidity depends on the market liquidity of that asset.

This relationship between funding liquidity and market liquidity means that if market liquidity is high, lower levels of funding liquidity are acceptable. On the other hand, the level of funding liquidity also has an impact on market liquidity. A good example is the margining requirement during a falling market, which I noted a few minutes ago. If a market participant cannot meet margin calls, the resulting liquidation of positions depresses prices and further impairs market liquidity. While the determinants of market liquidity are still not sufficiently understood, it is clear that factors other than funding liquidity are also important. For instance, as was seen with subprime mortgage-related securities, when the accuracy of the stated risk profile of financial products is in doubt, market participants will exit the market and market liquidity will fall precipitously. Furthermore, the availability of liquidity at the macro level does not necessarily ensure that surpluses and shortages at the micro level will be righted by the market, as individual institutions manage liquidity conservatively.

While I have spoken in depth about funding and market liquidity, unfortunately, no satisfactory answers have been found yet as to what determines the level of liquidity. However, I would like to point out four aspects that need to be considered when exploring this issue. First, it is obvious that the supply of funding liquidity by the central bank and the level of interest rates have significant effects. Second, not only the aggregate level of funding liquidity but also the distribution of funding liquidity is important. Third, the institutional design regarding the supply of liquidity by the central bank and payment and settlement systems plays an important role. Finally, no analysis of funding and market liquidity is complete without taking expectations into account. Expectations of course are

shaped not only by macroeconomic trends, but also by dynamics that produce herd behavior, such as general euphoria or anxiety.

VI. Recent Initiatives by Central Banks regarding Payment and Settlement Systems

Having spent some time on rather conceptual issues, I would now like to introduce some concrete examples of initiatives by the Bank and other central banks around the world aimed at enhancing the safety and efficiency of payment and settlement systems.

A. Launch of "Next-Generation" RTGS in the BOJ-NET

Starting with developments in Japan, one such initiative is the launch of "next-generation" RTGS in the BOJ-NET. As I have explained, the Bank introduced RTGS in the BOJ-NET in 2001, greatly reducing systemic risk. On the other hand, the burden on participants to secure funding liquidity increased significantly compared with the previous DNS system. If the processing of payment instructions is delayed because of burdens associated with the securing of sufficient funding liquidity, then the advantages of RTGS will not be fully realized. In view of this situation, the Bank in October this year introduced a new settlement method under the "Next Generation RTGS" (RTGS-XG) project in the BOJ-NET. Please refer to Chart 8. In the examples shown in the chart, none of the payment instructions will be processed individually, because there are insufficient funds in each account. The new system aims at mitigating gridlock as effectively as possible while at the same time enabling users to economize on funding liquidity. How the Next Generation RTGS works is shown in Chart 10. Under the Next Generation RTGS, the BOJ-NET now has "queuing" and "offsetting" facilities. Queuing is a mechanism for putting on hold payment instructions that financial institutions send to the BOJ-NET. Offsetting automatically identifies and settles groups of instructions that can be simultaneously settled among the queued instructions. With these facilities, the kind of gridlock in the example shown in Chart 8 is unlikely to occur. In short, the new BOJ-NET, while continuing to mitigate systemic risk, reduces the funding liquidity required for settlement, thereby achieving efficient settlement. Chart 11 shows the results of the introduction of the new system: a large proportion of payment instructions is being settled using the offsetting facility and the amount of funding liquidity needed for settlement has been reduced, and the average time of settlement is now earlier.

B. Establishment of the Continuous Linked Settlement (CLS) System

The second initiative consists of efforts by central banks to reduce the settlement risk associated with foreign exchange transactions. Taking yen-U.S. dollar foreign exchange transactions as an example, the yen and dollar currency legs are respectively settled during daytime in Japan and the United States due to time differences. As a result, the potential losses to parties that pay yen correspond to the principal amount of the contract (i.e., are not limited to the replacement cost). In other words, there is a risk that a party will make a payment on one leg of the foreign exchange transaction but fail to receive payment on the other leg because the counterparty has gone bankrupt in the meantime.

In order to resolve this time zone settlement risk, central banks spent many years holding discussions and encouraging relevant parties to develop a solution to eliminate such risk, and as a result, in 2002 a cross-border multi-currency payment mechanism called Continuous Linked Settlement (CLS) was launched, financed with contributions from private banks around the world. Chart 12 shows a schematic representation of the CLS system. Under the CLS system, settlement of transactions is carried out based on payment-versus-payment (PVP), by simultaneously exchanging two currencies. More specifically, payment to the counterparty in one currency leg is effected only when the payment from the counterparty in the other currency leg is assured. If the counterparty fails to fulfill its obligation in one currency leg as intended, CLS will block the payment to that counterparty within the system. As a result, there will no longer be a situation where one party pays but cannot receive.

In conjunction with these efforts among central banks, the Bank of Japan introduced some changes so that it could accommodate CLS operations: the Bank allowed CLS Bank, located in New York, to directly open a current account with it, and also extended the BOJ-NET operating hours up to 7 p.m. Currently, the CLS system handles 17 currencies, with payments taking place through current accounts at central banks around the world, during overlapping hours in the early evening hours in Japan, which correspond to daylight hours in Europe and early morning hours in the United States.

In order to appreciate the significance of the CLS system, it is useful to look at what happened in the foreign exchange swap market following the emergence of the subprime mortgage problem. Private financial institutions, even those that carry out businesses globally, do not necessarily have a stable base of deposits in markets outside their home country. For this reason, financial institutions from Europe, Japan, and other countries raise U.S. dollar funds in the market. However, the emergence of the subprime mortgage problem made it difficult to raise uncollateralized funds in dollar markets and, as a result, many institutions turned to the swap market for funding in dollars. Chart 13 illustrates these transactions. In the case of dollar-yen swaps, one party sells yen in the cash market for dollars and buys the yen back in the forward market. As a result, the party effectively raises dollar funds against yen collateral, while hedging currency risk. Chart 14 shows that the turnover in the swap market has increased considerably in recent years and now accounts for more than half of the total turnover in the foreign exchange market. In particular, during the recent market turmoil, non-U.S. financial institutions have become increasingly dependent on the swap market as the volume of transactions in the U.S. federal funds market or the Eurodollar market declined. Given that swaps inherently require foreign exchange settlement, if the CLS system did not exist and the settlement of swap transactions were subject to time zone risk, the difficulties faced by non-U.S. financial institutions probably would have been much greater.

C. Provision of Liquidity in Non-Domestic Currencies

The third initiative undertaken by major central banks is the provision of liquidity in non-domestic currencies. One striking element of the current market turmoil is the difficulties faced by European financial institutions in procuring liquidity in U.S. dollars. As I noted a moment ago, when uncollateralized funding markets became increasingly dysfunctional, transactions in the foreign exchange swap market rose significantly. Subsequently, however, after the failure of Lehman Brothers, market liquidity in the swap market also declined as dollar offers became scarcer due to concerns over counterparty risk. The cost of raising dollars in the foreign exchange swap market is depicted in Chart 15, showing a sharp increase after the failure of Lehman Brothers. In response, major central banks around the world entered into swap arrangements with the Federal Reserve and introduced schemes to supply dollar liquidity in major local markets (Chart 16). The Bank

of Japan has also taken part in this cooperative framework and is now conducting dollar-supplying market operations against eligible collateral posted at the Bank.

D. Establishing Central Counterparties for Credit Default Swaps

The fourth initiative by central banks is supporting private-sector efforts to create central counterparties for credit default swap (CDS) transactions. CDSs are a type of derivative contract that obliges the parties to the transaction to pay each other according to fluctuations in the creditworthiness of a particular firm or a set of firms. The seller of a CDS receives a premium from the buyer in exchange for a promise to compensate the buyer for any losses if the reference firm fails. CDSs act as a sort of insurance against credit risk. The market for such contracts in Europe and in the United States has expanded rapidly in recent years, causing concerns that, as a result of the considerable diversity and complexity of these instruments, market participants may not be able to deal with a failure of a major participant in an orderly way. In fact, Chairman Ben S. Bernanke of the Federal Reserve Board has admitted that the concern over the market infrastructure and risk management practices for CDS contracts was one of the major factors that led to the bailout of Bear Stearns.

Against this backdrop, in the United States, the Federal Reserve Bank of New York has encouraged market participants to upgrade the operational infrastructure supporting CDSs, giving rise to proposals for the establishment of a central counterparty. At present, CDS transactions and settlements are conducted bilaterally by the counterparties. The proposed central counterparty would take on the obligations of the parties of a CDS contract, so that the counterparty risk faced by contracting parties is vis-à-vis the central counterparty instead of the other contracting party. This would make it possible to net obligations and reduce the overall level of counterparty risk for participants. In addition, the introduction of a central counterparty would lead, it is hoped, to some standardization of CDS contracts, which have become excessively diverse. In fact, based on such considerations, details of a proposal to establish a central counterparty are now also being hammered out in Europe.

In this context, it should be noted that it is essential to build a robust framework to safeguard the integrity of any central counterparty, because it will become the single nexus of all counterparty risk. Otherwise, there is a real danger that the central counterparty

itself will become a source of significant systemic risk. As I will discuss in greater detail in a moment, major central banks and national securities regulators have drawn up a document called "Recommendations for Central Counterparties," which explains the core principles for the design and operation of central counterparties, and have conducted oversight based on those principles. Accordingly, the key issue for any prospective CDS central counterparty is to establish a robust framework for risk management consistent with those principles. While the volume of CDS transactions is still relatively limited in Japan, if at some point similar efforts to establish a CDS central counterparty begin to take shape, the Bank will seek to play an active role in the discussions on issues of interest to the central bank, such as the effectiveness of risk management.

VII. The Role of Central Banks in Payment and Settlement

I hope that what I have explained gives you a better idea of what central banks are currently undertaking in the area of payment and settlement systems. Building on these examples, let me now turn to two roles that central banks play in the pursuit of stability and efficiency of payment and settlement systems. The two roles are "banking," which is based on the fact that central banks are banks, and "oversight," which includes monitoring and persuasion to ensure the stable and efficient functioning of payment and settlement systems.

A. Provision of Banking Services

The role of central banks as regards payment and settlement systems performed through the banking services of the central bank can be further broken down into (1) the operation of payment and settlement systems by the central bank itself and (2) adjustments of the amount of funding liquidity necessary for the functioning of payment and settlement systems. One feature of these roles is that they are not founded on laws or administrative regulations. They are carried out by the central bank through the banking services they provide to private financial institutions. Central banks do not pursue profits. Nevertheless, their operations in providing payment and settlement services and funds are analogous to those of private financial institutions: each central bank draws up its own rules for eligibility and decides who may become its counterparty and what conditions it will impose when extending credit. Central banks are described as "the bank for banks" not only because they offer unambiguously secure means of payment and settlement to private

institutions but also because they accomplish their objectives through the provision of banking services.

The banking services provided by the central bank are quite diverse.

First of all, central banks themselves are operators of payment and settlement systems, and they offer payment and settlement services to their current account holders. The thinking on who may open an account with the central bank differs from one country to another. In the case of the Bank, one important criterion is the significance of an institution in Japanese yen payment and/or securities settlement, which resulted in securities dealers opening accounts with the Bank, in addition to banks and *shinkin* banks.[8] These payment and settlement services are closely related with credit extension. Central banks provide credit, which includes lending and intraday overdrafts. In extending credit, central banks take collateral to secure their claims. The eligibility of financial assets for collateral is determined by the credit quality, and so on, of these assets, and an appropriate haircut is applied to each asset. Assets that are purchased in open market operations are subject to similar review processes. What is accepted as collateral is quite important. If relatively less liquid assets are accepted as collateral by central banks, private financial institutions can post less liquid assets in place of more liquid assets, which can be used for funding in the market. As a result, the market liquidity of assets with low market liquidity is increased, thus increasing the funding liquidity buffer of financial institutions. To sum up, banking services provided by central banks are comparable to deposits and loans offered by private financial institutions to firms and households. Central banks, in this process, prudently manage counterparty risks, credit risks, and the price volatility of collateral taken and assets purchased.

A concrete example to illustrate the banking operations conducted by a central bank is the conduct of market operations that simultaneously provide and absorb funds. In normal

---

[8] There are other criteria as well, including the creditworthiness and back-office capabilities of an institution. All criteria are published. Meanwhile, as regards open market operations conducted by the Bank to adjust the amount of funding liquidity, counterparties are selected from among institutions that applied for the opportunity, on the basis of the potential policy impact of market operations in view of an institution's participation in financial activity.

times, as the central bank adjusts the availability of liquidity at the macro level, it could be expected that funding liquidity is appropriately spread around within the call money market by market forces. However, when, as at present, markets are characterized by extreme caution and concerns over counterparty risk are acute, the distribution of funding liquidity may be impeded. In such instances, the central bank may end up taking over the functions normally performed by transactions between financial institutions by at the same time both supplying ample amounts of liquidity to and absorbing funds from financial institutions. In other words, the central bank becomes the intermediary, by offering an opportunity to invest funds to those institutions that have excess liquidity, thus absorbing funds from the market, and simultaneously supplying funds to institutions short of liquidity. Such operations are only possible because the central bank is an agent that poses no counterparty risk. Specifically, during the current market turmoil, central banks around the world, including the Bank, adopted new measures to absorb funds from the market. The Bank, in addition to its longstanding bill sales operations, now pays interest to the holders of current account balances. Looking at overseas central banks, the Federal Reserve has also begun to pay interest on current account balances, while some central banks in Europe, which have already been paying interest on current account balances, have introduced bill sales operations. Regarding the new facility introduced by the Bank of Japan last month, the Complementary Deposit Facility, interest will accrue to funds deposited in current accounts beyond the level mandated by the Reserve Requirement System. From the perspective of the Bank's reserve management operations, the facility is expected to determine the lower bound for market interest rates, because no institution that could take advantage of the facility should have an incentive to invest its funds at rates below that paid to excess reserves.

Having explained how a central bank is involved in payment and settlement systems through the provision of banking services, I should note the growing importance of an international perspective, given the increasing globalization of financial markets. As I described earlier, major central banks around the world are now conducting operations that supply U.S. dollar funds against collateral denominated in the respective domestic currencies. An outstanding medium- to long-term issue is the introduction of what may be called the mirror image of this: a framework for operations that supply domestic currency

funds against foreign currency denominated collateral. Such a framework for "cross-border collateral" may contribute to the efficient mobilization of collateral widely dispersed around the globe, especially in exigencies. While the introduction of cross-border collateral arrangements faces many obstacles, such as ensuring legal certainty across different jurisdictions, the Bank will continue to explore the issue.

B. Oversight of Private Payment and Settlement Systems

Now I will talk about the second function of central banks as regards private-sector payment and settlement systems: the oversight of those systems. Oversight means actions taken by central banks with regard to payment and settlement systems, especially those that are systemically important, to monitor whether the stability of the financial system is threatened because of the design and operation of those systems, and to induce improvements in those systems if necessary.

As I have already mentioned, there is systemic risk associated with DNS payment systems, such as the Zengin System. In addition, securities clearing systems, which I did not discuss today, likewise pose systemic risk. For example, clearing institutions for JGSs and equities also clear transactions through net settlement. Therefore, in these systems, any failure by one participating financial institution to meet its obligations may impact all participating financial institutions. Consequently, strict risk management procedures need to be in place in these systems so as to systematically prevent the transmission of disruptions. Such measures include, for example, eligibility criteria for participants and limits on the maximum intraday settlement exposure for each participant. There are also liquidity provision schemes, under which systems are able to raise funds from pre-designated financial institutions in order to complete settlement even when a participating party fails to meet its obligations. Furthermore, there are measures to cover losses resulting from a failure of a participant by requiring participants to pledge cash or securities as collateral and/or by prescribing loss-sharing rules.

One of the aims of central banks in conducting oversight is to encourage the maintenance and development of these risk reduction measures. In this regard, central banks refer to

established international standards.[9] Those standards are the "Core Principles for Systemically Important Payment Systems,"[10] developed by the Committee on Payment and Settlement Systems (CPSS) meeting at the Bank for International Settlements (BIS), and the "Recommendations for Securities Settlement Systems"[11] and "Recommendations for Central Counterparties,"[12] both developed by the CPSS in cooperation with the International Organization of Securities Commissions (IOSCO). While these are not legally binding documents like treaties or laws, they are internationally accepted standards based on the collective experience and knowledge of central banks and securities commissions. The Bank also has been actively participating in the effort to put together such standards.

That being said, the scope of oversight has been undergoing changes as the value of transactions processed by payment and settlement systems and a clearing institution has grown. For example, at present, each settlement system has lined up predetermined lines of credit from financial institutions under a liquidity provision scheme in order to ensure that the day's settlements are completed even if a participating institution fails. However, as more and more financial institutions participate in several payment systems, it becomes increasingly possible that the failure of a financial institution to meet its obligations would result in a number of systems simultaneously having to draw on committed lines of credit under individual liquidity provision schemes. In such a case, the key issue is whether those financial institutions committed to providing credit to multiple systems can secure sufficient funding liquidity to meet their obligations. Against this background, the Bank monitors the liquidity conditions of each financial institution holding a current account with the Bank on a daily basis. The Bank also conducts on-site examinations of account-holder financial institutions to check the soundness of their management, including the management of funding liquidity risk. In short, the Bank pursues the safety and efficiency of payment and settlement through its oversight of payment and settlement systems and through the monitoring and on-site examinations of individual account-holding institutions.

---

[9] See BIS/CPSS (2005).
[10] See CPSS (2001).
[11] See CPSS-IOSCO (2001).
[12] See CPSS-IOSCO (2004).

Taking one step back to view the whole universe of payment and settlement systems, with advances in information and communications technology, an increasingly visible trend is the interconnectedness of various systems, beginning with trading and dealing systems and extending to matching and confirmation systems as well as clearing institutions and payment and settlement systems. Furthermore, outside Japan, some payment and settlement systems are beginning to be linked across national borders. In such an environment, central bank oversight must take account of such increasing interconnectedness, or "interdependencies," between payment and settlement systems. The growing interdependencies have positive effects such as eliminating duplication in operation and enhancing the efficient use of funding liquidity. On the other hand, in a situation where there is a delay in a financial institution meeting its obligations -- for example, because of a natural disaster -- the impact can quickly spread to a broad range of systems. There are still many issues to be addressed relating to these interdependencies, with one of the more important ones being the enhancement of coordination among central banks and other relevant domestic and overseas parties. One example that comes to mind, taking account of the greater interdependencies, is the conduct of business continuity exercises (e.g., to deal with natural disasters) geared toward involving a wider range of participants taking account of interdependencies.

The oversight of payment systems -- although its legal basis may vary from country to country -- is widely accepted as a critical central bank function. This is because oversight of private-sector payment and settlement systems is closely related to central banks' function of providing funding liquidity. The Bank, as the central bank of Japan, will continue to make every effort to contribute to the establishment of safe and efficient payment and settlement systems in Japan, in cooperation with system operators and relevant financial institutions.[13]

As I have sought to explain, central banks, by virtue of the banking services that they provide, are party to payment and settlement systems and as such have their finger on the pulse on liquidity needs arising from payment and settlement in the market as a whole and at individual financial institutions on a day-to-day and intraday basis. Before concluding, I

[13] See CPSS (2008).

would like to stress that such an awareness of the texture of the financial environment enables central banks to respond to various developments in the financial market, and in payment and settlement systems in a timely manner.

VIII. Concluding Remarks

My topic today was "liquidity and payment and settlement systems." As I noted at the beginning, my aim was to stimulate your interest in these issues and to illustrate the challenges that are involved, referring as much as possible to real-life examples. In this regard, instead of a formal conclusion, I will offer two observations to close my remarks.

The first observation concerns the importance of the concept of liquidity in understanding the fluctuations in economic activity. In this regard, much remains to be done in the study of liquidity. Recently, in the field of monetary economics, we have seen many contributions from a new Keynesian approach. While this body of work has enhanced our insights into the conduct of monetary policy, explicit coverage of liquidity issues -- be it with regard to funding or market liquidity issues -- is lacking, notwithstanding the fact that it has become impossible to study macroeconomic developments without sufficiently understanding phenomena such as the sudden excesses or shortages of liquidity. Fortunately, there is now a widespread recognition that studies involving funding liquidity and/or market liquidity have particularly high marginal utility, and there are now many contributions from academia, as illustrated in Chart 17, which shows the results of a search for the term "liquidity" in academic papers. As you can see, reflecting the current turbulent conditions in international financial markets, the area is attracting stronger interest. For example, even if we agree that the direct cause of the current disturbances in international financial markets is the bursting of a global credit bubble, we must still explore what caused the bubble in the first place. Although the causes are complex, one major factor that is frequently highlighted is abundant liquidity. Liquidity here does not necessarily refer to the supply of money at the macroeconomic level as represented by the money stock. In the run-up to the current turmoil, a tightening of various risk spreads and ever higher leverage were observed in international financial markets, and in this environment, market participants acted as if they could secure liquidity at will. The type of liquidity fueled by such an attitude is an example of the third definition of liquidity that I

mentioned earlier today. In this context, the mechanisms that contribute to an increase in liquidity, and their relationship to monetary policy, to capital ratio regulations and risk management methods, to market structures, and so on, are still unclear. To my mind, what is clear, however, is that the fallout of the global credit bubble will lead to a reconsideration of the conduct of monetary policy and the regulation and oversight of financial institutions, and to this end, input from the academic community will be essential.

The second observation I would like to make is that it is necessary to pay even greater attention to the banking activities of central banks and the mechanisms supporting financial markets at large. Regarding the actions of the central bank, interest by both the academic community and the media in monetary policy appears to be quite strong, and as a member of the central bank I welcome this. However, if this reflects a lack of interest in policies and institutional arrangements regarding financial markets, payment and settlement systems, and banking activities, it would be regrettable. Considering the extent of the contribution that the central bank can make with regard to stability and growth, the aspect I personally would highlight is the central bank's banking policy.

I do hope that, in the days ahead, your center will further deepen its involvement in research activities concerning monetary policy and the role of central banks in a broad sense, including the areas that I have discussed today.

References

【Bank for International Settlements (BIS)/Committee on Payment and Settlement Systems (CPSS)】(available at http://www.bis.org/)

CPSS, "Core Principles for Systematically Important Payment Systems," 2001.

--------, "Central Bank Oversight of Payment and Settlement Systems," 2005.

--------, "The Interdependencies of Payment and Settlement Systems," 2008.

CPSS-IOSCO, "Recommendations for Securities Settlement Systems," 2001.

--------, "Recommendations for Central Counterparties," 2004.

【Bank of Japan】(available at http://www.boj.or.jp/en/index.htm)

"Payment and Settlement Systems Report," 2006, 2007, 2008 (full reports available only in Japanese).

【Basel Committee on Banking Supervision (BCBS)】(available at http://www.bis.org/)

"Principles for Sound Liquidity Risk Management and Supervision," 2008.

【Federal Reserve Bank of New York】(available at http://www.newyorkfed.org/)

Armantier, Olivier, Jeffrey Arnold, and James McAndrews, "Changes in the Timing Distribution of Fedwire Funds Transfers," *Economic Policy Review*, 14 (2), 2008, pp. 83-112.

【Other】

Friedman, Milton, "The Optimum Quantity of Money," in *The Optimum Quantity of Money and Other Essays*, Chicago: Aldine, 1969.