



## Working Paper 2003-01

Payment Systems Group

January, 2003

# Risk Reduction in the Payment System and the Role of the Central Bank: Thailand's Recent Experience

*Prepared by Sayan Parivat and Rungsun Hataiseree\**

## ABSTRACT

This paper assesses the nature of risk involved in the Thai settlement system and the Bank of Thailand's involvement in reducing risk. It also studies the effectiveness of the new design of RTGS under the BAHTNET (Bank of Thailand Automated High-value Transfer Network) system in reducing risk. Empirical evidence seems to suggest that systematic risk (an integral part of credit risk and liquidity risk) as well as FX settlement risk, have been reduced to some certain degree, following the introduction of the BAHTNET system in May 1995 and the newly designed system of BAHTNET on RTGS-DvP in December 2001, as well as the implementation of certain supporting measures by the Bank of Thailand aiming at reducing risk in the Thai payment systems. The paper concludes with references to some related issues of the present payment infrastructure and policy framework that need to be re-designed to gain achievement of further risk reduction in the settlement system under BAHTNET.

**Keywords:** risk in payment systems, RTGS, BAHTNET system, efficiency and safety of the payment system

---

\* The authors are respectively Senior Director and Team Executive of Payment Systems Group, Bank of Thailand. The views expressed in this paper are those of the authors and do not necessarily represent those of the Bank of Thailand or Bank of Thailand policy. Please address all correspondences to Rungsun Hataiseree, Payment Systems Group, Bank of Thailand, 273 Samsen Rd., Pranakon, Bangkok 10200, Thailand. Tel: +66(0) 2283-5102; Fax: +66(0) 2282-7717. E-mail: [rungsunh@bot.or.th](mailto:rungsunh@bot.or.th). For the full version of this paper, see the Bank of Thailand's homepage <http://www.bot.or.th/research> and publications. We are grateful for helpful comments from seminar participants in a Bank of Thailand's workshop on January 28, 2003.

## **Contents**

	<b>Page</b>
<i>Contents</i>	<i>ii</i>
<i>List of Charts</i>	<i>iii</i>
<i>Executive summary</i>	<i>v</i>
<b>1. Introduction</b>	<b>1</b>
<b>2. Trends in Settlements and Background of Changeover to the BAHTNET system</b>	<b>4</b>
<i>2.1 Nature and Salient Features of Settlement Systems in Thailand</i>	
<i>2.2 Trends in Settlement since the Introduction of the RTGS System</i>	
<b>3. Risk in the Payment System and the Contribution of the BAHTNET System in Reducing Risk</b>	<b>13</b>
<i>3.1 Risk reduction in the Payment System and the Bank's major initiatives</i>	
<i>3.2 Continuous Settlements and the Reduction of Credit and Systematic Risks</i>	
<i>3.3 Liquidity Risk Reduction and the Bank's Involvement</i>	
<b>4. Credit Risks in Foreign Exchange Settlement and the Bank's Involvement</b>	<b>31</b>
<i>4.1 Nature of Foreign Exchange Settlement Risk</i>	
<i>4.2 The Bank's Involvement in the Reduction of FX Risk</i>	
<b>5. Conclusion and Implications for Payment System Policy</b>	<b>37</b>
<b>References</b>	<b>41</b>

**Risk Reduction in the Payment System and  
the Role of the Central Bank:  
Thailand's Recent Experience\***

*Sayan Pariwat*

*Rungsun Hataiseree*

*Payment Systems Group*

**1. Introduction**

There have in recent years been a strong international focus on risks in the payments system, as can be seen from a number of recent studies which has highlighted the need for an appropriate design of risk-management measures to contain risks involved in the settlement system (Bank for International Settlement [BIS], 2000). Central banks in most countries have over the past decade developed a framework to address the risks that payment systems present to the nation's central bank, to the banking system, and to other sectors of the economy. Change in the market infrastructure through the establishment of an efficient settlement system for the high-value payments in the inter-bank market has been given high priority in the central bank's agenda due to a relatively sizable impact associated with the high-value funds transfer.

The shift away from a deferred net settlement system (DNS) to a newly designed system of the so-called Real Time Gross Settlement (RTGS) for high-value payment systems is seen as

---

\* *An earlier version of this paper was presented in an academic workshop organized by Payment Systems Group on 28 January, 2003. The authors wish to thank workshop participants, in particular Sibporn Thavornchan, Wantana Hengsakul, Ronasak Ruengvirayu, for their useful comments. Special thanks also go to Bjorn Bakke of the Central Bank of Norway for fruitful discussion during the preparation of the paper. The authors are grateful to Jirawan Leelatanont, Bongkog Isara, for providing part of the data for use in this study, and to On-anong Chulakasyana for excellent research assistance. The views expressed in this paper are those of the authors and do not necessarily represent those of the Bank of Thailand or Bank of Thailand policy. This paper was written when the second author was visiting the Payment Systems Group upon returning to the BOT after having completed his one-year term as a staff member of the present Minister of Finance (Capt. Suchart Jaovisidha).*

the most important change with respect to the design of new payment systems. The shift to these systems also reflects market needs and the concerns of central banks for systemic risk. These new systems have been increasingly used by central banks around the world since 1990 onwards with an approximate 70 central banks currently operating under the RTGS systems.

The Bank of Thailand (BOT), like many other central banks, has given an increasing emphasis over the past many years to develop a new payment system design aimed primarily to address risks on large-baht payment systems. A clear example in this regard is the introduction of the BAHTNET (Bank of Thailand Automated High-value Transfer Network) system in May 1995 and the newly designed system of BAHTNET in December 2001, making RTGS the only mode for the Bank's settlement system for the funds transfer among financial institutions and other organizations in Thailand. The introduction of the BAHTNET system has been seen as a milestone on the part of the BOT to create a new payments system that can be used to help reduce systemic and other risks involved in the payment system, and more importantly, to enhance financial stability.

Although the BAHTNET system has been put in place for more than seven years as the main channel through which funds transfer among financial institutions can be made, there seems to have little empirical study regarding the effectiveness of the new system in reducing systemic risk in the case of Thailand. Earlier attempts are the studies by Tripojanee *et al.* (2002), EMEAP (2002). However, the studies seem to provide little empirical evidence in relation to the contribution of the BAHTNET system for risk reduction. In addition, there seems to be scanty study regarding the degree through which the launching of a series of supporting measures by the BOT can contribute to the risk reduction in the payment system, particularly those measures associated with the changing of market practices in funds transfer under the BAHTNET system as well as the changing of market infrastructure through the establishment of the BAHTNET system.

As RTGS system under the BAHTNET arrangement tends to have many advantages in managing risk and in linking payment flows with securities markets and other payment systems in a timely fashion, it is important, therefore, to understand better the economic incentives and behavior of participants in an RTGS system. The purposes of this study in broad terms are:

(i) to assess the benefits brought by the changing of the settlement system from a standard deferred settlement system into a continuous settlement system of the so-called BAHTNET arrangements;

(ii) to evaluate the extent to which the introduction of the RTGS system under the BAHTNET system can help to reduce the systemic and other risks involved in the payment system, particularly credit risk and liquidity risk;

(iii) to examine the extent to which the launching of certain supporting measures by the Bank can lead to a significant improvement in the market practices, particularly the behavior of market participants in the use of BAHTNET for funds transfer and settlement.

In particular, the study aims to address the following issues:

(1) whether the introduction of the BAHTNET arrangement has contributed to a significant reduction of systemic risk, particularly the degree through which the changeover to the BAHTNET system can lead to an early settlement by banks;

(2) whether and to what extent the shift to the BAHTNET system can lead to shorten the settlement interval for fund transfer;

(3) whether the introduction of *intra-day liquidity facility* (ILF) has exerted an important effect on the settlement process, especially the degree through which the changeover to the BAHTNET system can lead to a sharp reduction of the outstanding amount of the unsettled transactions;

(4) whether the present level of liquidity risk is acceptable;

(5) whether queues have been a problem in the BAHTNET system;

(6) whether and to what extent the shift to the BAHTNET system can help reducing the foreign exchange (FX) settlement risk, particularly the *baht* leg of FX transactions.

To shed some light on the issues mentioned above, the study is organized into 4 sections. *Section 2* provides an overview of the present system of RTGS in the case of Thailand. It also gives a brief discussion of background and aims of changeover to the BAHTNET system, as well as trends in settlement since the introduction to RTGS. *Section 3* provides a more detailed evaluation of the effectiveness of the BAHTNET system in reducing risk, including in particular systemic risk, credit risk and liquidity risk. The evaluation is conducted through, first, identifying important changes that the BAHTNET system has generated and how these changes have reduced

risks, and then analyzing a set of relevant indicators as well as a set of important measures that have recently been implemented by the BOT to help contain liquidity risk and other risks in the payment system, especially intra-day credit policy.

*Section 4* discusses the nature of risk in FX settlement in the Thai payment system, and reviews the current efforts on the part of the BOT to initiate additional policy measures to help reduce FX settlement risk. *Section 5* concludes with some policy implications. It also outlines some of the related issues for the formulation of Thailand's payments system policy in the period ahead. These include in particular the issues of (i) the likely effect associated with the introduction of the BAHTNET system on the conduct of monetary policy (ii) additional measures needed to be put in place in order to make the RTGS under the BAHTNET system safer and more efficient (iii) the likely implications associated with the changing "market infrastructure" through the establishment of the BAHTNET system and the changing "market practices" in BAHTNET on the formulation and implementation of the payment system policy in the future.

## **2. Trends in Settlements and Background of Transition to the BAHTNET system**

### **2.1 Nature and Salient Features of Payment and Settlement Systems in Thailand**

The payment system in Thailand, as characterized in Chart 1, can be broadly classified into 2 levels according to the type of service provider: (i) "systems for payment services" (retail-bank system) and (ii) "systems for clearing and settlement of payments between banks" (inter-bank system). The former involves the use and provision of cheques, card services, and cash. The latter are systems for calculating positions and transferring funds between financial institutions in the inter-bank market. The systems include (i) *BAHTNET* which is a payment system supporting the transfer of large-value payment (ii) *ECS* (Electronic Cheque Clearing System) which is a payment system supporting inter-bank cheque payment among the member banks, (iii) *PCS* (Provincial Cheque Clearing System) which is one-day clearing at the provincial and district levels among the member banks, and (iv) *Media Clearing* which is a payment system supporting the transfer of small-value payment. However, the Media Clearing system has been later replaced with SMART (System for Managing Automated Retail Funds Transfer).

Inter-bank payments are usually large value and derived from both bank customers' transactions and banks' own businesses. They are large-value customers' inter-bank payments, payments for the settlement of an inter-bank cheque clearing, payments for the settlement of an ATM clearing arising from the withdrawal of cash from another bank's ATM, the settlement of a credit card clearing for payment with credit card issued by another bank, inter-bank lending and securities investment, foreign exchange trading, and transactions instructed by non-resident investors. For more detailed account of this, see for example EMEAP (2001).

INSERT CHAR 1 HERE

Like many other central banks, the BOT has been particularly concerned with the risk in large-value transfer systems, or systems for clearing and settlement of payments between banks, as are located at the top of the payment system in Chart 1. The concern seems to reflect a substantially high degree of systemic risk involved in the financial transactions in the inter-bank system. As is commonly agreed, disruptions in this segment of the payment system can lead to tremendously adverse consequences, partly through the banks' exposure to each other and partly through the banks' processing of payments to and from their customers—i.e. retail payments.

The establishment of BAHTNET has been a major step on the part of the BOT in the process of developing a modern clearing and settlement system in Thailand. This new design for high-value payment system has many positive features, including in particular: (i) the possibility of continuous settlements through out the day and (ii) the built-in mechanism for releasing a gridlock situation in gross settlement. Apart from these, the establishment of the BAHTNET system has entailed a number of important changes in the settlement processes. These include the requirement for cover in relation to payment settlement through BOT and the establishment of intra-day liquidity information in real time.

Prior to the transition to the RTGS system, almost all of the transactions settled through BOT accounts were processed on a net basis of the so-called a deferred net settlement (DNS) basis. In the conventional designated-time settlement, payment instructions are accumulated until designated settlement times instead of immediate settlement for each instruction. At the designated-time, 1 p.m. in Thailand, the net settlement position of each financial institution is

calculated and its account is credited or debited simultaneously. In designated-time settlement, as is commonly agreed, financial institutions need only the funds equivalent to their net debited positions at the time of settlement. This is seen as an efficient system from a viewpoint of fund management. However, the previous system seems to be vulnerable to a high degree of systemic risk if the failure of a single financial institution in the system in meeting its obligation were to create a series of liquidity shortages or defaults, and thus cause a suspension in the entire payment and settlement systems.

Financial transactions processed through the BOT accounts can be broadly classified into 7 categories: (i) fund transfer for non-resident Baht account, (ii) Baht settlement for FX trading, (iii) inter-bank lending, (iv) securities and equity trading, (v) funds transfer (vi) internal funds transfer, and (vii) others. Of these, as portrayed in Chart 2, fund transfer for non-resident Baht account appears to have gained the largest share, accounting for nearly 36 percent of the total value of the domestic inter-bank fund transfer via BAHTNET.<sup>1</sup> The second important item in this regard is fund transfer in the form of FX transaction, accounting for about 29 percent of the total value of fund transfer. This is followed by the transfer of funds in the form of internal funds transfer, inter-bank borrowing and lending and securities trading with having the respective shares of around 13 percent, 10 percent, and 3 percent. It is worth noting that the total value of the first four-types of domestic fund transfers mentioned above is reasonably high, accounting for an approximate share of 80 percent of the total value of cheque clearing transaction in Bangkok and its vicinities, which is about B300,000 million on a daily average basis.

INSERT CHAR 2 HERE

The establishment of the BAHTNET system in May 1995 has been seen as a milestone on the part of the BOT to create a new payments system that can be used to help reduce risk in the payment system. Under the previous settlement system, financial transactions --particularly fund

---

<sup>1</sup> The percentage shares for each type of financial transactions under the BAHTNET system are calculated using the yearly average data for the years 2000-2002 with the yearly average value of the total volume of BAHTNET transactions being about B64.8 billion.

transfer for non-resident Baht account, Baht settlement for foreign exchange trading, inter-bank borrowing and lending, securities trading-- was largely executed by cheques. The value of domestic inter-bank payments via the use of cheques has long gained a lion share compared with those using the BAHTNET despite the fact that the use of cheques in the fund settlement has subjected to a number of risks: settlement risk, systemic risk, and operational risk.

As shown in Chart 3, cheques usage played an important role as the country's major means of fund transfer during 1997-1999. However, the pattern of cheques usage has changed remarkably since 2000, following the BOT initiative in launching the measure<sup>2</sup> of the so-called "migration of high-value cheque" on 10 March 2000. Since around the second half of the year 2000 onward, however, financial transactions in the inter-bank market through the use of cheque have gained less in importance. By contrast, the large bulk of inter-bank funds transfer has been settled via BAHTNET, accounting for more than 80 percent of the total value of cheque clearing transaction in Bangkok and its vicinities.

INSERT CHAR 3 HERE

In addition to its help in minimizing risks in the payments system, the transition to the BAHTNET system can be of some help in the enhancement of the efficiency in the Thai payment system for various reasons. First, transaction costs involved in the financial transactions via BAHTNET system tend to be much lower compared with those conducted by using cheque. As is commonly agreed, the use of cheque in the funds settlement may give rise to various types of costs, including the issuing cost, the collection cost, the timing cost, the unwind cost<sup>3</sup>, and more

---

<sup>2</sup> According to this measure, commercial banks are requested to settle the afore-mentioned four types of financial transaction via BAHTNET. The measure is basically aimed to help reduce the amount of cheque usage for high value payments and thus mitigate the level of risks involved in the payment system, especially the settlement risk. Furthermore, the introduction of the measure is also aimed to comply with the Core Principles for systemically important payment system initiated by the Bank for International Settlements (BIS).

<sup>3</sup> Unwind is the situation that some financial institutions in the cheque clearing system are facing with the liquidity shortage and unable to cover their net position. This in turn results in the recalculation of the net position of cheque clearing by excluding the doubtful cheque of those financial institutions.

importantly the opportunity cost from holding funds in the system for the next day finality of cheque collection. By contrast, the settlement through the BAHTNET system is real time finality.

Second, the arrangements under the BAHTNET system allow BAHTNET members to access information concerning their cash and securities account at the BOT anytime during the service hours via BAHTNET Web Service. This kind of arrangements can assist BAHTNET members in managing their accounts more efficiently, and thus leading to a more effective liquidity management by BAHTNET members. Third, the use of S.W.I.F.T. network as the main interface under the BAHTNET system has provided an increased degree of flexibility for the integration of future services such as the future cross-border linkages with other foreign payment systems. This may have contributed to a more efficiency enhancement of the Thai economy as a whole.

Fourth, the new design of BAHTNET system, the so-called BAHTNET2, has provided a positive contribution to the enhancement of the operational efficiency. The new system of BAHTNET2 has been modified by using S.W.I.F.T. network as the main interface to enable Straight Through Processing (STP) and to be consistent with international practice. As one can see, STP can support the operational efficiency by facilitating the information inputs and sustaining the large amount of business transactions. This creates the economy of scale. Moreover, the information executed by STP can be used immediately for further process resulting in the reduction of the paper-based operation, operational error and timing, especially in the securities transactions.<sup>4</sup>

## **2.2 Trends in Settlement since the Introduction of the RTGS System**

The shift to the BAHTNET system as mentioned above has caused several important changes with respect to the funds transfer among financial institutions. First, the value of inter-bank transaction settled through the BAHTNET system increased significantly, particularly following the introduction of the enforcement by the Bank since March 10, 2000. As is evident

---

<sup>4</sup> Prior to the BAHTNET implementation on RTGS-DvP basis, the buyers and the sellers of securities are required to settle their obligations over the counter at the BOT. The mentioned obligations refer to the transfer of funds through cheque usage and the transfer of securities.

from Chart 4, the value of cheque payment declined sharply from around B267,390 million in 1999 to B102,980 in 2000, a reduction of more than 61 percent, while the value of fund transfer via the BAHTNET system increased nearly tenfold from an approximate amount of B26,900 million in 1999 to B247,320 million in 2000. A closer look at figures for the years 2001-2002 provides a similar conclusion with respect to the pattern of payment method.

<b>Chart 4</b>							
<b>Daily Average Value of Transactions Settled through BOT Accounts: 1996-2002</b>							
<i>(Billion Baht)</i>							
<b>Payment System</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>
<b>BAHTNET</b>	33.50 (6.22)	58.80 (9.48)	67.50 (17.64)	26.90 (8.96)	247.32 (68.81)	275.26 (79.98)	266.29 (77.38)
<b>ECS</b>	495.00 (91.89)	553.36 (89.18)	309.11 (80.76)	267.39 (89.01)	102.98 (28.65)	61.64 (17.91)	69.33 (20.15)
<b>Provincial Cheque</b>	10.20 (1.89)	8.30 (1.34)	5.90 (1.54)	5.77 (1.92)	8.64 (2.40)	6.52 (1.89)	7.40 (2.15)
<b>Media Clearing</b>	--	0.04 (0.01)	0.24 (0.06)	0.33 (0.11)	0.49 (0.14)	0.74 (0.22)	1.12 (0.33)
<b>Total</b>	538.70 (100.0)	620.50 (100.0)	382.75 (100.0)	300.39 (100.0)	359.43 (100.0)	344.17 (100.0)	344.15 (100.0)

Source: Bank of Thailand

Note: Figures in parentheses are percentage share.

Second, the introduction of the BAHTNET system tends to cause changes in the behavior of the settlement process. As will be discussed and analyzed in more details in Section 3, it is likely that payments tend to enter into the system earlier. This development reflects, as it can be argued, market participants' heightened awareness of the risks and costs associated with settlement. Such a move toward an early settlement by banks can be seen as another positive effect of the transition to the RTGS under the BAHTNET system, particularly from a perspective of credit risk and hence systemic risk reduction.

Third, the establishment of the BAHTNET system has also contributed to a more efficient settlement for government securities market. This is particularly so under the newly designed system<sup>5</sup> of BAHTNET2 that has been developed to replace the previous system of BAHTNET1. The new system has become operative since December 11, 2001. Prior to the implementation of the BAHTNET2 system on RTGS-DVP (Delivery-versus-Payment) basis, settlements in government securities trading have been made by cheque that has the finality one-day after completely delivering the securities to counter party by Thailand Securities Depository Co., Ltd (TSD). Practice of this kind has made the securities'sellers vulnerable to the principal risk and/or credit risk. However, the principal risk tends to have mitigated or eliminated under the new settlement of the BAHTNET2 system on RTGS-DVP, as the delivery of securities occurs if and only if the payment occurs.<sup>6</sup> Despite such potential benefits, the daily average value of securities transfer via the BAHTNET system has been relatively low when compared with other types of financial transactions via BAHTNET, amounting to only 3 percent of the total funds transfer settled through BAHTNET over the years 2000-2002 (Chart 2).

Fourth, branches of foreign banks and Thai commercial banks have dominated the financial transactions in the inter-bank market via BAHTNET. While the former is likely to be more active than the latter in terms of the value of the financial transactions, they tend to be less pronounced in terms of the number of funds transfer instructions. As reported in BOT (2003),

---

<sup>5</sup> The new design of BAHTNET2 contains a number of salient features, including in particular a real time automated DvP system for the Thai government securities trading and an application of S.W.I.F.T. network as the fund transfer message carrier. However, for some participants not being a S.W.I.F.T. member, a web-based service via the BOT Web Portal is provided to gain the access to BAHTNET2. Apart from the usual fund transfer service, participants are entitled to acquire a set of additional services via the BOT Web Portal. These include inquiry of account balance and movement, queue management, message communication, and reports. For non-S.W.I.F.T. BAHTNET participants, Web services will also facilitate funds transfer and DvP transactions.

<sup>6</sup> Under this system, debited institutions will transfer their funds to TSD, which acts as a clearing house in order to transfer those funds consecutively to credited institutions. In the case that both debited and credited institutions are not BAHTNET members, they must directly contact their respective commercial banks which are BAHTNET members to act as their settlement agents. The ownership transfer and funds transfer will be settled simultaneously by the net position at the specified time.

branches of foreign banks have gained the relatively larger share of more than 53 percent of the total value of the financial transactions, compared with 34 percent for a group of domestic commercial banks. However, this is not the case when considering in terms of the number of funds transfer instructions, as Thai commercial banks have gained more important role, accounting for more than 55 percent of the total number of the financial transactions, compared with 31 percent for the case of group of foreign banks.

Fifth, although financial fund transfers via BAHTNET have been increased importance as implied from a continuous rise in the value of transactions, it seems to be much lower compared with some major industrialized countries. The daily average value of financial transactions settled through BOT accounts was on average about B262.7 billion in the years 2000-2002, compared with the mere amount of B26.9 billion in 1999. As shown in Chart 5, the levels of turnover relative to GDP for Thailand are much lower than those found in G10 payment systems.<sup>7</sup> This is not totally surprising, as it may be attributed to differences in a number of factors.

For one thing, it reflects differences in the stage of financial development between G10 countries and emerging countries like Thailand. For another, it is because the large-value payment system via BAHTNET has just gained an increasing popularity by the financial institutions in recent years. This is particularly so in the period after 1999 whereby several important measures have been introduced by the BOT, including in particular the introduction of the “High-value cheque migration” in March 2000, and “ILF” in February 1999 as will be discussed in more details in Section 3.

However, the ratio of the large-value payment relative to GDP for Thailand seems to be much better when compared with some countries in the Southeast-Asian region. This is

---

<sup>7</sup> However, this figure seems to be understated the actual values. As one can see, the figures for Thailand appear to be significantly increased if the calculation period is extended to embrace the years 2001-2002 during which the levels of turnover for Thailand tend to have showed sign of a substantial increase in value in response to a set of supportive measures introduced by the BOT with the aim to help smoothing the funds transfer among market participants in the BAHTNET.

particularly so when compared with Philippines, Malaysia, and Indonesia with having the reported ratio of 0.1, 4, and 5, respectively (Chart 5).

<p style="text-align: center;"><b>Chart 5</b>  <b>Large-value payment systems in relation to GDP:</b>  <b>G10 countries and selected ASIAN countries</b></p>		
<b>Country</b>	<b>System</b>	<b>Annual payments turnover /GDP</b>
Belgium	ELLIPS	83
Canada	LVTS	23
France	TBF and PNS	56
Germany	EAF and ELS	31
Italy	BI-REL	28
Japan	BOJ-NET	70
Netherlands	TOP	42
Sweden	K-RIX	51
Switzerland	SIC	111
United Kingdom	CHAPS Sterling and Euro	75
United States	CHIPS and Fed-wire	69
Singapore	MEPS	60
Indonesia	BI-RTGS	5
Malaysia	RENAS	4
Philippines	MIPS2	0.1
Thailand	BAHTNET	13

*Notes:* (i) Figures for other countries, except Thailand, were calculated using 1999.

(ii) For Thailand, the calculation is based on the year 2000.

*Source:* Figures for G10 countries are from BIS and IFS, while those of Asian countries are authors' own calculation based on the data contained in *Payment Systems in EMEAP Economies (2002)*.

### **3. Risk in the Payment System and the Contribution of BAHTNET in Reducing Risk**

#### **3.1 Risk in the Payment System and the Bank's Involvement**

The BOT, like many central banks, has over the past many years placed an increasing emphasis on the development and design of an appropriate infrastructure for large value funds transfers aimed at reducing and/or eliminating risk in the payment system. As financial transactions via BAHTNET have showed sign of a continuous increase in values over the past many years, this implies that failure of one big bank in fulfilling its obligation could be a source of financial instability. In this respect, it may contribute to spreading liquidity and solvency problem. The problem of this kind tends to have become more pronounced, as it becomes apparent that the values of financial transactions via BAHTNET have increased significantly in recent years. As mentioned in Section 2, the daily average of funds transfers via BAHTNET is reported to be in the range of B247,320 to B275,260 million in the period of 2000-2002 compared with the mere value of B26,900 in 1999.

From a theoretical point of views, as is seen in Chart 6, the risk involved in the payments system can be broadly classified into 6 major categories: (i) credit risk, (ii) liquidity risk, (iii) systemic risk, (iv) FX settlement risk, (v) legal risk, and (vi) operational risk. To save time and space, however, the analysis in this section will be concentrated on the first three types of risks, while FX settlement risk is discussed in more details in Section 4.

INSERT CHAR 6 HERE

*Legal risk* is related to uncertainty about agreements and the distribution of responsibility in the payment system. Experiences in many countries point to the need to put in place a necessary legal framework on Payment Systems, as it can contribute to a reduction or elimination of legal risk. In Australia's case, for example, the Reserve Bank of Australia has found it more comfortable about the legal underpinnings of the payment system, after The Payment Systems and Netting Act came into force in 1998. In the case of Thailand, there is currently no explicit legislation on payment systems to oversee and discipline some policies, such as pricing and electronic funds transfer, of payment services providers and participants. However, the BOT has

considered the introduction and amendments of involving acts, which are Amendment to the Bank of Thailand Act, Payment Systems Act, Financial Institutions Act, Electronic Funds Transfer Act and Royal Decree, Rules and Regulations, derived from Electronic Transaction Act.

*Credit risk* is often referred as the risk of losses due to the failure of another bank to meet obligations on time or at the later point in time. *Liquidity risk*, on the other hand, is tied to the costs involved in liquidate shortfall due to delays in settlement. This may be due, for instance, to insufficient liquidity occurring at one of the banks or the failure of computer systems or telecommunication services.

In addition, there is also *systemic risk* where a settlement failure in any given transaction can spread quickly beyond the original counter parties to affect other parties the interrelation of trade and settlement, ultimately disrupting the nation's entire payment and settlement system. As commonly practiced elsewhere, central banks in many countries have placed a relatively greater emphasis on the containment of systemic risk in the evaluations of risk in the nation's settlement systems. In view of this, possible measures, particularly the BAHTNET arrangements, giving rise to a reduction of systemic and other risks are discussed in greater details in this section.

As mentioned earlier, the introduction of the RTGS system via BAHTNET, was seen as an important step on the part of the BOT to put in place a new design of settlement arrangement that can contribute to the reduction of the systemic risk inherent in the settlement of funds between financial institutions. The introduction of this kind of payment systems has been subsidized in various forms by the BOT: through the gratuity of ILF and through the resort to a queuing mechanism which implicitly provides intra-day liquidity with no cost. Although there is no interest rate charge on intra-day credit under the present system of ILF, banks are required to hold a portion of collateralization of any credit. Although at first glance there appears to be no *actual cost* involved in the use of ILF by financial institutions, a closer look at the detailed arrangements seems to have provided different answer.

As one can see, financial institutions are required to maintain at least 10 percent of high-quality securities relative the total volume of their transactions via BAHTNET at the BOT as eligible collateral for the use of ILF. Although this practice incurs cost of some kind on participants, it has help protected the central bank's balance sheet. The cost of this kind is commonly referred to as the *opportunity cost*, as banks have to hold the assets accepted by the

BOT as collateral rather than those that the bank would freely choose. It is for this reason that intra-day credit may be costly for some banks, particularly those that have continuously retained a relatively high level of unused ILF. Experiences over the past many years suggest that some certain banks of the Thai banking industry have occasionally claimed that the provision of collateral appears to be costly and requested the central bank to minimize its use. Nevertheless, any possible solution for this needs to take into account some related issues, including for instance the positive externality associated with the availability of ILF and the protection of the central bank's balance sheet.

*Important Measures for Reducing Risks in large-fund transfers.* As suggested elsewhere, RTGS system usually requires more liquidity than net settlement systems, and participants have to immobilize liquid assets as collateral for intra-day credit. In order to minimize liquidity need in the BAHTNET system and at the same time to help contain liquidity risk in the payment system, the BOT has put in place a number of important measures. First and foremost, the BOT has offered intra-day loans against collateral to financial institutions participating in the BAHTNET arrangements<sup>8</sup>. Second, the BOT has put in place a set of built-in “queuing mechanism” and “anti-gridlock function”. As these two measures are of some particular importance for a successful implementation of the BAHTNET system, they will be discussed in more details in the later part of this section to shed some light on the extent to which the aforementioned measures can be of some help in reducing risks in the Thai payment systems.

The BOT, as portrayed in Chart 7, has also initiated several policy measures aimed to support the smooth functioning of high-value funds transfers via BAHTNET. Of particularly important in this regard are:

- (i) the pricing incentive scheme to encourage an early transfer of funds,
- (ii) the so-called 30:70 percent measure,
- (iii) the high-value cheque migration,
- (iv) the use of credit balance from cheque clearing.

---

<sup>8</sup> As of 31 December 2002, there are 66 financial institutions eligible for the BAHTNET2 members. See more details of this in EMEAP (2002) and the Bank of Thailand Annual Report on Payment System in 2002.

The launching of a series of such measures has been seen as the reflection on the part of the BOT to put in place necessary measures to guide the changes to the *market practices* intended to help reduce risks for all market participants. As is discussed in more details in the subsequent sections, the afore-mentioned policy measures can be of some help in reducing credit risk and/or systemic risk from the payment and settlement process. For example, the introduction of the pricing incentive scheme by charging a relatively lower fee for an early transfer of funds appears to have exerted a considerable impact on the part of commercial banks operating in the BAHTNET market.

#### Chart 7

#### Important Measures Introduced by the BOT to Help Reduce Liquidity Risk

- *Queuing mechanism and gridlock resolution.* These are tools that have been developed to handle the queue of funds transfer instructions that are unable to be settled due to the inadequacy of funds in the sending institution's account. Payment instructions remain queued until the sender has sufficient funds to settle them. When several instructions from various institutions stand in the queue, the system will search for the group of instructions and calculate the net position of each institution. If the net balance of each related institution is a positive amount, the system will then process all the related instructions simultaneously. This would reduce the liquidity needs in the system. These mechanisms were put in place on August 11, 1997 and allow participants to manage their queues by reordering the priority of their transactions.
- *Intra-day liquidity facilities (ILF).* ILF provides participants with access to collateralized overdraft at the BOT. The facility is limited to 30% of the allocated loan window credit line, which must be collateralized by government bonds. Members are charged for using the facility, which was introduced on February 1, 1999. The BOT terminated this cap of 30% of the loan window credit line on March 10, 2000, and currently allows ILF members limited use of the facility without charges during the day, but requiring at least 10 percent of collateralization for any credit with the value of fund transfer exceeding B500 million.

**Chart 7 (continued)**

**Important Measures Introduced by the BOT to Help Reduce Liquidity Risk**

- *High-value cheque migration.* Inter-bank loans, inter-bank foreign exchange, funds transfer for non-residents, and government securities settlement have been settled through BAHTNET since March 10, 2000. Previously, these types of transactions have accounted for over 80% of cheque clearing transactions. This change is an important development to reduce settlement risk.
- *Use of credit balance from cheque clearing.* The BOT has considered allowing member banks to use the credit balance from the normal round of cheque clearing operations to settle any drawn ILF credit line or other funds transfer transactions in BAHTNET. This may reduce short-term interest rate fluctuations in the money market, reduce the cost burden of member banks, and reduce liquidity risk in the system. However, members must have an allocated ILF credit line above 10% of the average funds transfer value in BAHTNET in the past two weeks. Also, the BOT will treat the ILF backed-up bonds as a collateral for the use of the cheque clearing credit balance. Previously, the BOT did not allow for the use of the credit balance from the normal round of cheque clearing and held such credit balance until the return round of cheque clearing returned has been settled the following morning.
- *30-70 percent measure.* The BOT requires participants in BAHTNET to send funds transfer instructions amounting to at least 30% of their daily average funds transfer value prior to 12:00 a.m. and up to at least 70% prior to 15:00 p.m. This condition was imposed in early-2001 and is aimed to ensure the smooth operation of the settlement process and to avoid the heavy congestion of instructions, particularly in the afternoon, and liquidity management problems.

*Source:* Modified from **EMEAP Working Group on Payment and Settlement Systems (2002)**

Apart from these, the BOT has also launched a series of studies aimed at increasing the efficiency and reducing risk for settlement of the Thai government securities. The studies have been carried out with a close collaboration with several organizations both internationally and locally, including for instance Reserve Bank of Australia, World Bank, the Ministry of Finance, the Office of Securities and Exchange Commission, the Stock Exchange of Thailand, Thai Securities Depository Company, and several financial institutions. The major initiatives in this connection are to encourage the greater use of Delivery versus Payment (DvP), set up a legally certain netting arrangements and consider the transferring the operation of the Thai government securities settlement system to private sector.

### **3.2 Continuous Settlements and the Reduction of Credit and Systemic Risks**

Prior to the move toward the RTGS system, the BAHTNET system, domestic inter-bank payment was subjected to high levels of settlement risk—credit and liquidity risks, as most of financial transactions had been executed through cheques with a DNS basis. Under the previous system, banks tended to send payments to the BOT where there was one final settlement daily which is scheduled at 1.00 p.m. This follows that banks' exposure to each other developed through the day and that this exposure can be lasted for a relatively long period. The shift toward the RTGS system via BAHTNET, as it had been argued, has contributed to the reduction of the “size” and the “duration” of banks' exposure to one another. Moreover, as it had been argued, RTGS seems to contribute to more effective risk management since banks may have to decide when transactions should be sent for settlement.

*Policy measures to help lessen risk.* As part of an attempt to help reduce systemic risk, the BOT has launched a number of important measures to encourage the BAHTNET members to send their financial transaction for settlement at the Bank at an early hour of the day. One of such measures is to implement *the so-called 30-70 percent measure* in early 2001. Under this measure, the BOT has requested that all BAHTNET members, who have the daily average value of fund transfer of more than B500 million, to send the funds transfer instructions for the four

types of financial transactions<sup>9</sup> at least 30 percent of the average value of fund transfer via BAHTNET of the same fortnight of last month prior to 12.00 a.m., and up to at least 70 percent prior to 3.00 p.m. The measure is primarily aimed to ensure the smooth operation of the settlement process and to avoid the heavy congestion of instructions, particularly in the afternoon, as well as to lessen the liquidity management problems among market participants.

Another measure is to use *pricing-incentive scheme* in order to motivate an early sending of transfer transactions into the system. Under this scheme, as is shown in Chart 8, market participants are charged with different prices depending on the times at which instructions for fund transfers are sent to the BOT. In an early time zone, covering the period of 8.30 a.m.-12.00 a.m., market participants are subject to the fee of 5 and 8 baht per transaction for instructions sent through S.W.I.F.T. Network and BAHTNET Web Services, respectively.

For the second time zone, covering the period of 12.00 a.m.-4 p.m., payment instructions are charged at 10 and 16 baht per transaction, while securities instructions are charged at the respective amounts of 10 and 13 baht per transaction for S.W.I.F.T. Network and BAHTNET Web Services. In case the market participants sending the instructions after 4.00 p.m., they are required to pay the flat fee of 200 baht per transaction regardless of the types of instructions or the sending channels.

Moreover, the BOT also attempts to encourage the use of S.W.I.F.T. in sending the payment instructions by charging a relatively lower fee for the instructions sent in the S.W.I.F.T. format, as is evident from Chart 8. In the longer term, it is likely that market participants will resort to the use of crediting after settlement for large customer payments at an increasing pace (payments sent in the S.W.I.F.T. format). The potential transition to this would further reduce the remaining credit risk.

In addition, the BOT's initiative to encourage a shift of payment method for high-value payment from cheque to BAHTNET has been seen as a significant progress in settlement risk management, especially in the reduction of settlement risk in the cheque clearing system.<sup>10</sup> As

---

<sup>9</sup> These include (i) fund transfer for non-resident Baht account, (ii) Baht settlement for FX trading, (iii) inter-bank lending, and (iv) securities and equity trading.

<sup>10</sup> In order to facilitate the migration of the transactions, the BOT lifted the charge for the ILF usage and allow BAHTNET members to use their positive daily cheque clearing balance to repay for its ILF used on the

pointed out in Section 2, the value of cheque clearing transaction in Bangkok and its vicinities has shown sign of continuous decline following the implementation of the above-mentioned initiative. Change in the pattern of payment method for high-value payment from cheque to BAHTNET has resulted in the substantial reduction of credit risk among the market participants. It is estimated to be about 80 percent judging from the fact that the total value of the first four-types of domestic fund transfers accounted for an approximate share of 80 percent of the total value of cheque clearing transaction in Bangkok and its vicinities.

<b>Chart 8</b>				
<b>Transaction fees in different time zone</b>				
<i>(Unit: baht)</i>				
<b>Transaction type</b>	<b>Channel</b>	<b>Zone 1</b> (=<12.00 a.m.)	<b>Zone 2</b> (12.00- 16.00 p.m.)	<b>Zone 3</b> (>16.00 p.m.)
1) Funds transfer	S.W.I.F.T.	5	10	200
	EFS	8	16	200
2) Securities transfer	S.W.I.F.T.	5	10	200
	EFS	8	16	200

Source: Bank of Thailand

It is interesting to examine whether the shift to real-time settlement, particularly after the introduction of new design of BAHTNET arrangement (the so-called BAHTNET2) on 11 December, 2001 coupled with the implementation of a series of policy measures, in particular the 30:70 percent measure and the new system of ILF in December 2001, has contributed to a significant reduction of credit and systemic risks. Examination for this issue is carried out

---

particular day, providing that government securities are pledged against the usage. The ceiling of maximum amount of ILF usage was also lifted allowing BAHTNET members to use ILF without any limit as long as the usage is fully collateralized. These measures are aimed to reduce cost and increase liquidity to the members of BAHTNET.

through analyzing the way funds settlement is processed during the course of the day. On a theoretical point of view, systemic risk is said to be reduced if there have been sufficient evidences indicating that settlements for most of the transactions via BOT accounts are completed early in the day.

The assessment in this section is based on the following 3 indicators intended to capture the main characteristics of the contribution of the BAHTNET system to a reduction of systemic and credit risks, namely:

- the reduction in the size of the queues;
- the reduction in the time that average payment is queued;
- the evolution of the final settlement during the day.

*Evidence on an early settlement by banks.* Chart 9 portrays the time at which payments are sent through BAHTNET. To gain support for the mentioned hypothesis, Chart 9 should show that in the period after the move to the present system of BAHTNET2 (BN2), a relatively higher portion of the daily turnover is sent to the system by an early hour<sup>11</sup>. That is, at the same point under BN2, a relatively larger share of the daily turnover should be transmitted to the system, compared with those of BN1. The figures portrayed in Chart 9 seem to have given the firm support for the above-mentioned hypothesis.

As one can see from Chart 9, market participants tend to submit transactions to the system earlier under the relatively new system of BN2. In 2000, transactions were gradually sent to the system until the closing time. The pattern of this kind appears to change considerably in 2001, as a relatively larger portion of transactions was submitted earlier. More importantly, submission time has improved even further following the cutover of BN2.

INSERT CHAR 9 HERE

---

<sup>11</sup> Since it is difficult, though not being impossible, to have the data on entered time in the period before the introduction of the BAHTNET system, the analysis is then carried out by the examination as to whether there is any significant difference in the behavior of market participants regarding the sending of fund transfer instructions under the previous system of BN1 and the present system of BN2.

As can be seen from Chart 10, under the BN1, the traffic of funds transfer instructions reached its peak at 14.00 p.m. and the second high at 11.00 a.m.. However, the incoming traffic pattern has changed remarkably following the introduction of the new design of BAHTNET system of the so-called BN2. As is evident from Chart 11, under the BN2, the payment instructions reached its peak at a relatively early hour of 11.00 a.m. while reaching the second high at 13.00 p.m.

INSERT CHAR 10-11 HERE

Against the evidences mentioned above, it becomes evident that the peak periods in the transmission of payment instructions to the system have been moved up nearly 3 hours from the peak period of 14.00 p.m. under the BN1 to 11.00 a.m. under the BN2. This change in the behavior of the market practice with respect to the sending of payment instructions seems to have been influenced by a number of policy measures put forward by the BOT. Of particularly important measures in this regard are “the 30:70 measure” and “the pricing incentive scheme” which have been introduced to ensure the smooth operation of the settlement process and to avoid the heavy congestion of payment instructions, particularly in the afternoon, and liquidity management problems.

In view of this, it can be argued that change to the market infrastructure through the establishment of the relatively new payment system of BN2, has caused a significant change in the behavior of the market participants, and thus leading to the early submission of financial transactions by market participants. As is evident that from Chart 9-11 that, after the shift to the BN2, the large bulk of funds transfer instructions tends to have been completed early in the day at around 11.00 a.m., moving up about 3 hours compared with those operating under BN1.

It is important to note that, under the DNS, large bulk of transactions were settled at the designated settlement time of 1.00 p.m. However, following the introduction of the BAHTNET system in particular the BN2, a new pattern has emerged where settlement seems to take place at a relatively faster pace starting early in the morning trading session. This development has been in the large part similar to the experiences in many countries. In Japan, for instance, it is found that the average time of settlement has been moved up to around 11.30 a.m., indicating two and a half hours earlier when compared with settlement time found in the previous system (BOJ, 2001).

*Evidence on the size and behavior of queues.* Evidence discussed in the previous section suggest that the move to the new payment and settlement system under BAHTNET can lead to the reduction of the large intra-day exposures between market participants. This is because the large bulk of payment instructions tended to have been sent to the system at the relatively early hours in the day. However, the existence of the non-negligible portion of queues indicates that there may be costs in terms of “*settlement efficiency*”.

As one can see, minute-by-minute, payment flows between banks tends to be asymmetric even if they usually net out over the course of a day. Existing evidence suggests that there is a temptation for some certain banks to delay making *out-payments* until they have received *in-payments*, since the direct cost of a delayed payment falls on the receiving bank, which may not then be able to make a payment itself.<sup>12</sup> If most commercial banks have followed this line of behavior, the result would be a payment gridlock. As mentioned earlier, the BOT has put in place some certain types of supporting measures to alleviate the gridlock problem, including in particular “the so-called 30:70 measure” and “the 10% allocation of ILF credit” whereby the BAHTNET members who have the daily average value of financial transactions in excess of B500 million must have an allocated ILF credit line not less than 10 percent of the average value of funds transfer in the BAHTNET system of the same fortnight of last month.

Evidences from the internal data source also suggest that the average “size” of fund settlement via continuous queuing mechanism relative to the daily average of funds transfer via BAHTNET still maintained at the non-negligible level for certain parts in 2001 and 2002, though showing sign of a declining trend especially in the period after the move to BN2. It is sometimes estimated to be nearly 40 percent of the total amount of funds transfer via BAHTNET. Although the “size” of queues has been on a declining trend, its values tend to be not of the negligible amount, judging from the fact that the Bank has put in place the mechanism to supply additional liquidity to help smooth the settlement of funds transfer via the BAHTNET system through the establishment of ILF.

---

<sup>12</sup> It is likely that if the cost of intra-day borrowing is high (in other words, the marginal private cost of delaying a payment is less than the marginal cost of borrowing), then banks may still have some incentive to delay making payments

It is worth noting in this connection, however, that the reduction in the size of the queues should be also captured by the time of the average payment is queued. It is expected that at 11.00 a.m. the queues were to be larger under the BN2 than the corresponding period of the BN1, as it is likely that the payments are now transmitted to the system earlier (see Chart 9-11). However, the data to be available should indicate that after 12.00 a.m. the situations were to change.<sup>13</sup> It is interesting to see whether the available data would indicate that the queues tend to be much shorter for the period operating under the BN2 than they used to be under the BN1.

*Evidence on the evolution of the final settlement during the day.* Following the introduction of the price-incentive scheme in early 2001 (May 2001), there has been the remarkable change with respect to the behavior of financial institutions in sending funds transfer instructions for settlement via BAHTNET accounts. As one can see from Chart 12 nearly 50 percent of the instructions was sent to the BOT within the first time zone (before 12.00 a.m.), while nearly the same proportion was sent between 12.00 a.m.-16.00 p.m. (second time zone). Only the small portion of the instructions of 2 percent was sent to the BAHTNET system in the third time zone. The earlier timing of settlement has been viewed as an encouraging outcome under the new settlement system. Changing in the pattern of funds settlement of this kind can have a positive impact on the reduction of systemic risk by reducing the amount outstanding of transactions remaining unsettled on the settlement day.

A closer look in the figures suggests that foreign banks as a whole have a tendency to complete the sending of the funds transfer instructions to the BOT at relatively early hours. As is evident from Chart 12, foreign banks tended to complete the sending of the funds transfer instructions to the BOT a relatively higher share of before 12.00 a.m. The amount of which are equivalent to around 54 percent for foreign banks and 41 percent for Thai banks.

It is important to note that branches of foreign banks have long dominated the transactions in the funds transfer through the BAHNET system, as they have been in the FX trading activities in the FX market as will be analyzed in more details in Section 4. As is evident from Chart 12, branches of foreign banks have accounted for more than 55 percent of the total

---

<sup>13</sup> At this stage, the Bank is in the process of collecting the data on the time of the average payment waiting in the queue before it is settled.

financial transactions via BAHTNET in December 2002, while the share of Thai commercial banks is about 40 percent over the same period.

INSERT CHAR 12 HERE

### **3.3 Liquidity Risk Reduction and Bank's Involvement**

As pointed out elsewhere, i.e. BIS (1997), the implementation of RTGS demands a higher degree of liquidity management. This is because settlements under this relatively new system need to be executed on a real time basis, and because banks are now required to have available funds in the central bank's account before settlement can be made. It follows that a settlement may be rejected because a bank lacks cover for its position in the settlement. This may lead to a higher degree of liquidity risk for banks.

This seems to be the case for the present system of payment settlements in Thailand. The introduction of the BAHTNET system implies that banks are now required to have sufficient funds at the BOT account to cover for all of their positions in the payment settlements. As is normally the case, transactions under the BAHTNET system are not netted until they are sent for settlements. This new type of settlement practice may have given rise to a potentially higher liquidity risk, should one or more banks fail to have sufficient funds to cover their obligations. When such a situation occurs, it is often referred to as "gridlock".

Moreover, prior to the introduction of the BAHTNET system, banks are not subject to the risk of rejection of a settlement due to liquidity problem at other banks. In the previous system, liquidity risk facing by banks was solely tied to the BOT rejection of a settlement due to the initiation of insolvency proceedings against a bank. As such, it has often been claimed that banks' liquidity risk tends to have increased following the shift toward the use of gross settlement of the so-called the BAHTNET system.

Actually, there are a number of technical devices open to market participants to lessen the problem and/or the risk of liquidity shortage. These include, for instance, (i) the better planning of payment flows at the individual institution's level, (ii) the setting up of the operating queues at the central bank's level. Although the existing of such devices could be of some help in reducing the demand for intra-day liquidity, experiences of several countries coupled with the very nature of RTGS suggest that there is still a cause for concern regarding the smooth functioning of the settlement process for high-value fund transfers in the inter-bank market. Such

concern makes a strong case for the BOT, like a large number of other central banks, to put in place a system for supplying adequate liquidity on an intra-day basis (See Chart 7 for more detailed account on this).

Nevertheless, on the other hand, one has to bear in mind that continuous settlements have, to some certain extent, lead to the potential reduction of banks' positions against each other. This is often related to the virtues of "positive externalities". As an illustration for this, suppose that bank A has to send a payment to bank B, which in turn must send a payment to a third bank. In case where bank A has sufficient reserves and makes its final payment to bank B, the latter needs less liquidity than it would otherwise be without bank A's incoming payment. As holding liquidity exceeding to an optimal level is seen to be costly, bank B has an incentive to wait for bank A to settle its transaction. In the situation like this, if bank A settles, bank B would benefit from a positive externality.

As there is a tendency that the payment settlements under the BAHTNET system may have given rise to a higher degree of liquidity risk problem, it is therefore of natural importance to ask whether the present level of liquidity risk is acceptable. Examination to this issue needs to take into account of the ILF. In particular, it is interesting to see whether the introduction of *intra-day facility* (ILF) on February 1, 1999 has exerted an important effect on the settlement process.

In this regard, it may be of particularly useful to calculate the "degree of efficiency" in using available liquidity for funds settlement via the BAHTNET accounts. As there is no survey data to shed some light on this issue, it can be figured out by looking at the ratio of turnover and available funds at BOT, and then compare it with those figures obtained in other countries. In what follows, the "*efficient ratio*", defined as the ratio of turnover and available funds at BOT, is calculated and then compare the calculated figures to those obtained from other countries with similar stage of financial development.

*Evidence on the ratio of turnover and available funds.* Chart 13 portrays the day-to-day developments in turnover in accounts at the BOT and banks' liquidity measured as available funds at the BOT at the beginning of the day. As one can see, the daily average of the values of fund transfer via BAHTNET vary considerably from around B26,906 million in 1999 to B250,500 million in 2000. The turnover in BAHTNET tended to increase further to around

B281,390 million in 2001. However, it stayed at a more or less similar amount of B272,760 million in 2002. In a similar pattern, the average amount of available ILF at the BOT accounts displayed the sharp increase from around B14,215 million in 1999 to around B44,285 million in 2000. The available ILF continued to increase further to around B53,602 million in 2001 and B54,867 million in 2002. Based on the figures mentioned above, the “*efficient ratio*” has been found to be in the range of “1.9-5.6” over the years 1999-2002, as shown in Chart 13.

<b>Chart 13</b>		
<b>Turnover and available ILF under the BAHTNET</b>		
<b>Period</b>	<b>Daily Turnover in the BAHTNET system (Millions of baht)</b>	<b>Available ILF (Millions of baht)</b>
1999	26,900	14,215
2000	247,320	44,285
2001	275,260	53,602
2002	266,290	54,867

Note: Figures for available ILF are as of end-year.

As one can see, the “*efficient ratio*” has shown sign of significant improvements over the years 1999-2002. Change in the range of the ratio from “1.9” to “5.6” in the years 1999-2002 suggest that the banks were able to handle a large turnover of funds transfer with the relatively similar amount of available funds by using their funds management strategy. In view of this, the significant improvement of the “*efficient ratio*” indicates that the banks have a tendency to use the liquidity in BAHTNET in a more efficient manner, and thus enabling the payment and settlement system become more safety.

Although safety settlement system may have received a higher degree of emphasis for a high-value fund transfer system, it is likely that at some point in the future a trade-off is required. Supplying sufficient liquidity for the smooth operations for fund transfer settled through BAHTNET accounts may in part have resulted in a more safety settlement system. However, this may lead to an unnecessarily excessive level of unused ILF, implying a higher level of

“opportunity cost” for some certain members of the BAHTNET who have continuously maintained a relatively high level of unused ILF.

In an attempt to lessen the potential burden of the BAHTNET members in holding an excessive level of securities and to help increase the efficiency for the entire payment and settlement system, the Bank has set up a plan to redesign the current practices regarding the process of placing and deciding an appropriate amount of eligible securities as the collateral for the use of ILF. Under the newly proposed system that is planned to become operative around the second half of the year 2003, the BAHTNET members are allowed to have more flexibility in deciding the amount of collateralized securities holding deemed to be appropriate for the use of ILF to facilitate their own transaction purposes via BAHTNET. Apart from these, they are also allowed to process the placing of securities holdings by themselves without recourse to BOT, as it has been a common practice under the present system.

In addition, supplying sufficient liquidity to meet the substantially increased demands for intra-day liquidity by banks under an RTGS environment may have *impaired* the effectiveness monetary policy. This is particularly important in the context of tight monetary policy, as the central bank has to ensure that liquidity injection via ILF would not have a “spill-over” effect into overnight and longer liquidity provision, and thereby having monetary consequences. However, such a “spill-over” effect seems to be not a cause for concern, as there is no discernible evidence for the transfer of funds from ILF to overnight balances.

*Evidence on the behavior of the efficient ratio across countries.* With the risk of oversimplification, the calculated ratio of the BAHTNET turnover and available funds for the Thai case appears to be slightly higher than the figures found in some countries such as Norway. As reported in the study by Enge and Bakke (2001), the ratio of turnover and available funds in the case of Norway is found to be in the range of “1-4” in the period of November 1999 and December 2000 with an average value of around 2.3. In relative term, this seems to be significantly lower than the case of Thailand. As is discussed earlier, the average value of the efficient ratio for Thailand, defined as the ratio of the BAHTNET turnover and available ILF, is found to be in the value of 5.0 over the years 1999-2002.

However, it is essential to exercise caution in making this sort of comparison across countries. In particular, one has to bear in mind that efficiency in using available liquidity needs

to be assessed by taking into account additional conditions that are unrelated to the organization of the payment settlements. These include, for instance, (i) the Bank Act's liquidity requirements, (ii) difference in the structure of the banking industry in different countries, (iii) difference in the public regulations in different countries (i.e. the nature of central bank's money market operation, the system of the government liquidity requirement, (iv) difference in the size of the banks in different countries (i.e. large banks tend to handle their liquidity at a relatively more professional manner than smaller banks and hence will need less liquidity holdings), (v) the nature of cooperation among the commercial banks regarding the timing of sending payments (i.e. There has been an agreement in the Norwegian banking industry to send the majority of the financial transactions at the set times.)

Similar to experiences in some countries, liquidity problem associated with the use of gross settlement system under the BAHTNET system has been less in importance than it had earlier been mentioned. It can be argued that such a *positive* outcome with regard to liquidity risk problem can be attributed to many factors. First and foremost, the BOT has set up an intra-day liquidity facility or ILF in order to supply adequate liquidity on an intra-day basis. The provision of this sort of facility has been widely practiced in many countries, including in particular the United State, Switzerland, Norway, Columbia, although there seems to be some differences in the nature and main features in some certain aspects.

Second, the Bank has put in place a built-in an "anti-gridlock function" that automatically offsets banks' positions in the queues against each other. Empirical evidence available so far suggests that this mechanism can be of some help in the reduction of systemic risk in particular the liquidity risk to some degree, judging from the evidence that the proportion of settlement via continuous netting mechanism was around 10 percent of the total value of funds settlement without queues over the period of January-December 2002.

Apart from these, the BOT has initiated a supporting scheme by allowing commercial banks to the "Use of credit balance from Cheque Clearing". Under this scheme, member banks are allowed to use credit balance from cheque clearing normal round in settling the use of ILF credit line and other fund transfer via BAHTNET. This new arrangement is in sharp contrast with the previous one whereby the credit balance from Cheque Clearing Normal Round is held until the Cheque Clearing Normal Round has been completely settled in the next morning.

Nevertheless, some other additional conditions are required for the use of cheque clearing credit balance. First, members must have an allocated ILF credit line not less than 10 percent of the average value of funds transfer via BAHTNET in the same fortnight of the previous month. Second, BOT will treat the ILF backed up bonds as collateral for the use of cheque clearing credit balance.

For the time being, intra-day credits can be drawn around B55,435 million a day as of end-December 2002. Payback needs to be done before 5.30 p.m. For intra-day credits that are not repaid by the end of the day, the BOT charges a penalty that is 150 points above the policy rate (14-day repurchase rate). It is important to note that the actual use of intra-day credits were varied considerably among different types of financial institutions. Although the use of ILF may be necessary to keep the payments mechanism running smoothly and efficiently, it is expected to see a continuous reduction in the volume of intra-day credit at those institutions with a pattern of substantial reliance on such credit.

*Evidence on the use of ILF by financial institutions.* A closer look at the figures on a micro level finds a number of interesting features that may have useful implications for the formulation of ILF policy at some points in the future. First, 5 Thai big banks tends to have actively resorted to the use of ILF, accounting for about 25 percent of the total ILF of the Thai banking industry, while other Thai small banks seem to have played a limited role in the ILF market.

Second, branches of certain foreign banks tend to have played an active role in the use of ILF. It is evident from the internal data that six of the foreign banks have been active in the ILF market, amounting to nearly 30 percent of the total ILF as of January 2003. On most of the occasions, ILF credits extended to each of these foreign banks appears to be far greater than the credits extended to each of the 5 Thai big banks. The significant differences in the use of ILF reflect in part to the difference in the management behavior of these groups of commercial banks. It may also reflect that branches of certain foreign banks appear to be in a better position in the fund and liquidity management by minimizing the cost of liquidity shortage. As is normally the case, intra-day credits supplied by the BOT are free of charge provided that such a borrowing fund has to be paid back to the BOT before the closing of the BAHTNET operations at 5.30 p.m.

However, it may incur some sort of opportunity costs for market participants, as they are required to put some portion of eligible securities as collateral at the BOT.

Third, some certain banks, especially branches of foreign banks that are not actively involved in the foreign exchange business, are not yet entering into the ILF market. Fourth, some major specialized financial institutions (SFIs) have maintained a relatively higher level of outstanding balance for the use of ILF. However, as the experiences have shown, this sort of has been rarely used by certain SFIs. From a liquidity efficient perspective, retaining a relatively high level of unused amount of available ILF tends to have incurred costs for those institutions. The greater the amount of the unused ILF balance, the higher the opportunity cost incurs for them, as market participants in the ILF market are requested to surrender a portion of eligible securities to the BOT as collateral for the use of ILF. However, as mentioned earlier, this sort of potential cost is likely to become less pronounced, especially when the newly designed system regarding the placing and deciding of an appropriate amount of securities holdings become operative around the second half of the year 2003.

Although some intra-day credit (ILF) may be necessary to keep the payments mechanism running smoothly and efficiently, it is equally essential that financial institutions needs to be encouraged to manage their accounts at the Bank efficiently and minimize their use of the Bank's credit via ILF. It is expected to see a reduction in the volume of ILF of the banking sector both in terms of the number of financial institutions and the volume of ILF.

#### **4. Credit Risk in Foreign Exchange Settlement and the Bank's Involvement**

##### **4.1 Nature of Foreign Exchange Settlement Risk**

Similar to the experiences of the payment systems in many other countries, it is important to point out that Thailand's payment system is also vulnerable to a fairly substantial amount of foreign exchange (FX) settlement risk. This risk is taken place because parties involved in the FX trade usually have to send the currency sold long before they know whether the currency they have purchased has been received on time. In other words, risk in FX settlement arises mainly because the *two legs* of the transaction do not settle simultaneously. This type of settlement risk

is often referred to as “Herstatt risk”, following the insolvency of Bankhaus Herstatt, a small Germany bank, in 1974.

Based on the survey data by the BOT in 2000, it is apparent that trading and settlement in FX currency are concentrated on three currencies: US dollar, Thai baht, and Japanese yen. These three currencies accounted for over 90 percent of trading and settlement during the period under review. Of these, the *baht* portion of foreign exchange turnover makes up a significant part of the turnover in the gross settlement system, accounting for an approximate share of 40 percent of the total value of foreign exchange transactions.

In addition, it has become apparent that the daily average value of foreign exchange trading and settlement in *baht* has shown sign of a continuous increase from an approximate amount of \$US4,000 million in 2000 to around \$US4,067 million in 2001 (BOT, 2001). The survey also finds that branches of foreign banks as a whole have played an important role in the trading activities in the Thai FX market. The share of foreign banks in the total trading values in Thai FX market is reported to be about 70 percent compared with around 30 percent for domestic commercial banks in 2001.

*Evidence on the FX settlement risk.* According to the mentioned survey, as shown in Chart 15, the “duration” of FX settlement exposure<sup>14</sup> for a single day’s settlement for Thailand’s case can be varied from “2 hours” to “32 hours”, while the bank’s exposure duration for most currency pairings are found to be in the range of 20-30 hours. Although this duration exposure tends to be in line with the average duration of the exposure of countries in the EMEAP region<sup>15</sup>, it suggests that institutions should be aware of the inter-day nature of the risk and reflects this in their risk management procedures. This is particularly so for some Thai banks which appear to have higher levels of duration exposure when compared with the average level of duration exposure of the Thai banking industry.

---

<sup>14</sup> As practiced widely, the “duration” of FX settlement exposure is calculated covering the time when the “sold” currency can no longer be cancelled unilaterally until the time when the receipt of bought currency is confirmed with finality (or has been identified as fail).

<sup>15</sup> The group comprises of 11 countries, including Australia, China, Hong Kong, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, Singapore, and Thailand.

INSERT CHAR 15 HERE

The BOT survey also indicates that the “size” of FX settlement exposure appears to be reasonably high. Single day exposure is reported to be around US\$3,000 million, while inter-day exposure is around US\$3,500 million. It is important, however, to note that for Thailand’s case the *size* of banks’ exposure in relation to their capital is much small when compared with those in the EMEAP region. Based on figures contained in the report by EMEAP (2001), the *size* of banks’ exposures of many countries in the EMEAP region are found to be larger than their capital, while it is approximately to 0.5 for Thailand’s Banking Industry (BOT, 2001). In some cases, Australia for instance, the potential exposure is estimated to be 2.5 or 3 times of capital.

*Evidence on the FX risk by financial institutions.* It is worth pointing out, however, that the ratio of banks’ exposures to their capital varies remarkably among different groups of banks. For group of foreign banks operating in Thailand, the ratio is found to be of the value of “6.0” which is considered to be much higher than those of “0.3” for the domestic banks’ group and of “0.6” for the hybrid banks’ group (BOT, 2001). Difference of this kind may in part reflect the difference in the behavior between Thai and foreign banks with respect to the trading activities in the FX market. As one can see, branches of foreign banks have long played a more important role in the FX transactions compared to the Thai commercial banks, as is evident from the relatively higher share of the total value of the FX transactions over the past many years. In addition, the difference of this kind may in part reflect the difference in the practices between Thai and foreign banks with respect to the management of trade in FX transactions.

#### **4.2 The Bank’s Involvement in the FX Risk Reduction**

As has been pointed out in the previous sections, the transition to gross settlement system under the BAHTNET arrangements has to some certain degree helped reduce settlement risk, in particular credit risk, in the Thai payment and settlement systems. However, as it has been claimed, the transition to this new system may *not* have removed a substantial portion of what may represent the largest risk in the country’s settlement system of the so-called FX settlement risk. As mentioned above, risk in FX settlement tends to be substantial. This may be attributed to

the significant reliance by Thai banks on correspondent banks, and in part to the time zone difference (EMEAP, 2001).

The introduction of the BAHTNET system tends to have contributed to reducing the FX settlement risk for the Thai *baht leg* of FX transactions, although it is quite early at this stage to clearly locate the degree through which the BAHTNET system has help reduce such risk. More detailed analysis is needed in order to evaluate the extent to which the new design of settlement arrangement via BAHTNET has lead to a potential reduction of the duration of FX settlement exposure.

As commonly agreed, reducing settlement risk primarily requires a reduction in the duration of FX settlement exposure through better management of procedures at every step in the settlement process. In relation to this, as delineated in more details in RBA (1999), there are two channels that a bank, participating in the FX trading and settlement, can opt for in order to reduce the duration of exposure:

*(i) the bank in question can extend the period during which it can cancel the instruction to deliver the sold currency; and/or*

*(ii) the bank in question can reduce the period during which it confirms that the bought currency has been received with finality, or that it did not receive the bought currency from its counter party.*

*Evidence on the Baht reconciliation times.* To analyze the potential benefits associated with the use of BAHTNET for fund transfer and settlement, one has to show that available evidence indicate a better position with respect to the “Thai baht cancellation times” and “Thai baht reconciliation times”. If this is the case, it can be claimed that there are advantages of the benefits of RTGS. At this stage, it can be claimed that the introduction of the BAHTNET system have contributed to reducing the FX settlement risk for the Thai *baht leg* of FX transactions. It is likely that the weighted average reconciliation times for the Thai baht tends to be *shorter* under RTGS compared with those settled under Thailand’s deferred net settlement system (DNS). As

one can see, under the DNS payment, receipt with finality was not achieved until 1.00 p.m. on the morning after value date.<sup>16</sup>

However, this seems to be not the case for payments under RTGS via BAHTNET accounts, as payments become final as they are made. Additional evidence is required to gain better understanding with respect to the behavior of Thai banks in the reconciliation of their baht payments. In this connection, available evidence should indicate that the reconciliation of their baht payments has completed by the close of the Thai payments system. Moreover, it remains to be seen whether local banks in Thailand can take further advantages of the benefits of RTGS by speeding up the process of tracking receipts during the course of the day.

Over the years, the BOT has also explored other ways and means to help further reduction of FX settlement risk. At this stage, as is discussed in more details in a separate paper, the BOT has carried out an internal study to identify FX settlement risk among Thai banks in the same way as has been conducted in G10 countries and EMEAP Group. It also plans to study a possible inclusion of Thai baht as part of eligible currencies in the FX settlement system under CLS Bank.

High in its agenda is the study of the possibility to use *payment-versus-payment* (PvP) system as an additional device to help reduce the FX settlement risk at some point in the future. Of particular interest in this regard is the HK-PvP model that has been initiated by the HKMA and the EMEAP-PvP model. Other possible solutions for the reduction of the FX settlement risk include, for instance, the possible application of the inclusion of the baht in the CLS system.

However, the “cost dimension” for being a member of the CLS system seems to be a central issue for the possible inclusion of the baht currency. This cost involves not only the entry cost of US\$ 5 million, but also the adjustment costs related to the changes of the banking practice in the FX trading process as well as the costs associated with the enhancement of the current systems of computer and telecommunication network.

---

<sup>16</sup> As shown in the BOT survey, hours at risk for currency pairing with the Thai baht leg appear to be much lower when compared with the hours at risk for other currency pairings. They are in the range of 2, 4, 6 and 13 hours.

Apart from these, the volume of the daily FX turnover for Thailand relative to its GDP is relatively much smaller compared with some other prospective members of CLS Bank. As one can see, the ratio is about 3.3 for Thailand, while it is equal to 229.9 for Singapore and 43.5 for Hong Kong (BOT, 2001). In view of this, the *net benefits* of being a prospective member of CLS system for Thailand may be of minimal when compared with some other alternative solutions for use in the possible reduction of FX settlement risk. For instance, Thai banks can participate in CLS through Third Party Service.

From a viewpoint of financial stability, however, it is equally important on the part of commercial banks to develop a framework to equally gain control over FX settlement risk as they do over other types of credit risks. The recent introduction of a CLS Bank reflects a joint effort of major international banks and organizations, i.e. a group of major banks in G10 countries, to put in place a simultaneous FX settlement that can be used as an effective device to reduce FX settlement risk.

Under this sort of settlement, FX transactions are settled simultaneously on a PVP basis. As is widely accepted, settlement arrangements in the form of PVP can be of useful help in eliminating the credit risk connected with transactions in those currencies included in CLS. Despite its potential merit in reducing the credit risk, settlement arrangements under the PVP system has not yet been widely implemented as part of an important measures for risk reduction in the settlement. As pointed in EMEAP (2001) one can see from Chart 16, the PVP has not yet gained an adequate popularity among many central banks, as it has been only used by the HKMA.

The benefits brought by the CLS have resulted in an increased interest among many central banks outside a group of original members of CLS Bank to consider the possibilities of having their currencies as an eligible currency under the CLS settlement arrangement. Examples for this include, for instance, Reserve Bank of Australia, the Norges Bank, the Monetary Authorities of Singapore. Although the application for the possible inclusion of baht as an eligible currency under the CLS appears not to be high in its agenda, the BOT has at this stage conducted an internal study to shed some light on the benefits and costs of being a member's currency in the CLS.

Existing evidences seem to have indicated that participating in the CLS system tends to lead to significant reductions in FX settlement risk. However, as it has been claimed, such the

potential benefits may be greater than the real thing. As has been pointed out elsewhere (RBA, 1999), there are a number of uncertain factors associated with the CLS system. For one thing, CLS Bank has just been in actual operation for a relatively short period, starting in September 2002. It is therefore still too early to claim a firm success. For another, not all currencies will be settled by CLS Bank. This follows that there are still risks involved in the FX transactions. In addition, it becomes apparent that not all banks will be able to directly access the services of CLS Bank. This means that some commercial banks will have to use correspondent banks to avail themselves of risk reduction capabilities. This seems to be the case for most of the Thai banks, while branches of foreign banks in Thailand tend to be in a better position as they can resort to the risk management facilities provided by their respective head offices.

INSERT CHAR 16 HERE

## **5. Conclusion and Implications for Thailand's Payment System Policy**

This study has provided an assessment of whether and to what extent the introduction of the RTGS system via BAHTNET can help to reduce the systemic risk, particularly credit risk and liquidity risk, apart from FX settlement risk. In so doing, the paper has first identified important changes that the BAHTNET system has generated and then how these changes have reduced risks. Empirical evidences available so far, as is summarized in Chart 17, seem to lend support of the notion that the establishment of the BAHTNET system coupled with the launching of a series of supporting measures by the BOT can have the positive impact on the reduction of risks involved in the payment and settlement systems of Thailand.

Firstly, there are many indications suggesting that credit risk and hence systemic risks in the Thai payment and settlement systems have been reduced to some certain degree. Continuous settlement has reduced the "size" and "duration" of banks' exposure to each other. As pointed out in the paper, there have been remarkable changes with respect to the behavior of financial institutions in sending payment instructions for settlement via BAHTNET accounts. It has become apparent that commercial banks tended to complete the sending of the large buck of payment instructions to the BOT at the relatively early hours of before 11.00 a.m., moving up about 3 hours compared with those operating under BAHTNET 1, especially in the period after

the launching of the BAHTNET2 and the implementation of price-incentive scheme in December 2001.

The changing pattern of funds settlement of this kind can have the positive impact on the reduction of systemic risk through the reduction of the amount outstanding of transactions remaining unsettled on the settlement day. It is evident that market participants tended to expose to credit risk on a relatively smaller scale, as the large bulk of financial transactions in the inter-bank market was transferred and settled at the early hours on a real time basis. However, further enhancements to the BAHTNET were required to take full advantages of the benefits of RTGS in view of the fact that there has been significant use of queuing mechanism by members of the BAHTNET, although the “size” of queues has shown sign of a declining trend.

**Chart 17**

**Salient Features of the Thai Payment System:**

**Before and After the Introduction of BAHTNET system**

	<b>Before May 1995</b>	<b>Now</b>
● Systemic risk	High	Reduced by over 80 percent
● Credit risk	High	Substantially reduced by about 80 percent
● Liquidity risk	Moderate	Partially reduced (Partially through the significant improvement of efficient ratio)
● FX settlement risk	High	Partially reduced (Partially through the shorter times of Baht reconciliation)
● Timely settlement	Next day	Continuously

Secondly, there seems to have sufficient evidence suggesting that liquidity problem under the BAHTNET system has been less in importance than it had earlier been mentioned. As pointed out in the paper, continuous settlement has reduced banks’ positions against each other through the virtues of “positive externalities”. The virtues of this kind coupled with the gratuity

of ILF by the BOT as well as the establishment of built-in an “anti-gridlock function” have made the Thai payment and settlement system become less vulnerable to the liquidity risk problems as suggested by a number of supporting indicators, including in particular the sharp improvement in “the efficiency ratio”.

However, it is not always the case that the higher efficient ratio is always better than the lower one. On one hand, it is likely that the higher efficient ratio is better than the lower one. With a high efficient ratio, banks tend to need less liquidity to process their payments. This will in turn help reduce the liquidity costs of the banks. On the other hand, with a high efficient ratio, banks seem to be vulnerable to an increased risk of not having sufficient liquidity for fulfilling their obligations in the settlement. This suggests that trade-off is required. In view of this, it appears that both the liquidity costs and the risk that banks will lack liquidity for settlement need to be taken into consideration if one attempts to decide the optimal level of liquidity.<sup>17</sup>

Thirdly, evidence regarding the Baht reconciliation times appears to suggest that changes to the *market infrastructure* through the establishment of the BAHTNET system has contributed to reducing the FX settlement risk for the Thai *baht leg* of FX transactions. Evidence has shown that the weighted average reconciliation times for the Thai baht tends to be *shorter* under RTGS compared with those settled under Thailand’s deferred net settlement system (DNS). This sort of positive result is an encouraging outcome. It also points to the need on the part of private commercial banks and the BOT to closely cooperate to explore ways and means to put in place additional measures necessary for the further reduction of reconciliation times.

Thus, it becomes apparent that the new payment and settlement systems via the BAHTNET have contributed to the reduction of systemic risk and other risks in many aspects. In other words, it can be argued that the new payment and settlement systems via the BAHTNET tend to be more efficient than the previous one in many respects. Despite such positive results, the achievement of further risk reduction in the Thai payment and settlement systems is still called for and indeed is regarded as a central part of the Bank’s financial stability work.<sup>18</sup> To

---

<sup>17</sup> The idea in this paragraph is benefited greatly from the discussion with Bjorn Bakke of the Central Bank of Norway.

<sup>18</sup> One of the Bank’s core purposes is to ensure the overall stability of the payment systems as a whole with high standard.

achieve this end, the BOT will be closely involved in developing and improving the infrastructure, and strengthening the system to help further reduction of risks in the payment and settlement systems.

The BOT finds it indispensable to continue its efforts to enhance the “safety” and “efficiency” of the BAHTNET system under the rapidly changing financial and technological systems where financial globalization is intensifying cross-border linkages with settlement troubles in one country affecting the settlement system in other countries.

First, the Bank therefore finds it increasingly important to work closely with other central banks and the private sector to further improve the payment and settlement system by reviewing the safety standards as necessary from a global perspective, as recently suggested by “The Committee on Payment and Settlement Systems (CPSS)” in Bank for International Settlements (BIS) which has established 10 core principles with which all systemically important settlement systems must comply in order to limit risk in the payment system.

Second, as innovation in information technology is advancing at a fast pace, the specific nature of services required for the fulfillment of an efficient settlement system of the Bank is likely to change. Thus, it is likely that some certain parts of the existing design of ILF need to be modified to gain more efficiency in smoothing out fund settlements via BAHTNET accounts, including in particular the move to the use of book entry system in the registration of collateralized securities for the use of ILF, and the use of “mark to the market” method in the calculation of the value of collateral. In addition, the proposed model for a new design of ILF needs to put in place a mechanism to prevent the liquidity injection via the ILF channel from “spilling over” into overnight and longer liquidity provision and thereby having monetary consequences.

Third, The BOT, at this stage, has placed an increasing emphasis on the use of DvP for securities and funds transfer between financial institutions participating in the Government securities market. The Bank will ensure that all Thai securities are settled with full DvP, thus leading to a major structural reduction in systemic risk.

## References

- Bank of Japan (2001), Real Time Gross Settlement (RTGS) in Japan: AN Evaluation of the First Six Months, **Quarterly Bulletin**, Vol. 9, No. 4, November.
- Bank of Thailand (2001), **Survey of Foreign Exchange Settlement Practices in Thailand**, December.
- Bank of Thailand (2003), **Report on the Financial Transactions via the BAHTNET System**, Payment Systems Group's Monthly Report, various issues.
- BIS (1997), **Real Time Gross Settlement**, Bank for International Settlements, Basel.
- BIS (2000), **The Contribution of Payment Systems to Financial Stability**, Bank for International Settlements, Basel, September.
- EMEAP Working Group on Payment and Settlement Systems (2001), **Foreign Exchange Settlement Risk in the East Asia-Pacific Region**, December.
- EMEAP Working Group on Payment and Settlement Systems (2002), "Payment Systems in Thailand" in **Payment Systems in EMEAP Economies**, July
- Enge, Asbjorn and Bjorn Bakke (2001), "Risk in the Norwegian Settlement System", **Norge Bank Economic Bulletin**, No.1, pp. 20-27.
- Hataiseree, Rungsun. (2001a), "The Capital Account and the Exchange Rate in Monetary Policy Decision- Making: A Thai Perspective", **Bank of Thailand Quarterly Bulletin**, Vol. 41, No. 1, (March), pp. 52-72.
- , (2001b), "On the Use of Regulatory Policies in Dealing with Capital Flow Problems: Emerging Lessons and Prospective Challenge" **Bank of Thailand Monthly Bulletin**, Vol. 41, No. 1, (January), pp. 10-68.
- , (1999), "A Preliminary Analysis of Monetary and Inflation Targeting Framework for Thailand", **Bank of Thailand Quarterly Bulletin**, Vol. 39, No. 1, pp. 28-57.
- Reserve Bank of Australia (1999), **Reducing Foreign Exchange Settlement Risk in Australia: A Progress Report**, September.
- Tripojanee, Saowaluk *et al.* (2002), "The Promotion of BAHTNET on Financial Market Development in Thailand", **Bank of Thailand Quarterly Bulletin**, Vol.42, No.20, pp. 53-59.