Risk Management Systems in Clearing and Settlement: Asian and Pacific Equity Markets

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Abstract. *This paper presents an overview of risk management systems in clearing and settlement. In addition, against the recommendations proposed by the Group of Thirty and revised by the International Securities Services Association, current practices of 13 organized stock exchanges in the Asian and Pacific region are presented. Policy issues related to the coexistence of both underlying equity and financial derivatives markets in the region and the increasing volume of cross-border transactions are also discussed.*

Introduction

In the 1990s, equity markets in the Asian and Pacific region witnessed remarkable growth in trading activities, as summarized in Table 1. During the period 1990-1999, trading value rose from $950 billion to $2.75 trillion, recording an annual growth rate of 12.6 percent.[1] The increase in trading value has not always been good news. As the Hong Kong, China market experienced in October 1987, trading activities outstripped the capacity of existing risk control mechanisms built for the clearing and settlement system then and eventually led to the crash in the equity index futures and underlying cash markets (see Hong Kong Securities Review Committee 1988). This experience was not unique to Hong Kong,

[1]These figures exclude Japan. With Japan included, the annual growth rate is adjusted downward to 6.8 percent.

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Table 1: **Equity Market Trading Value in the Asian and Pacific Region, 1990-1999**
(US$ million)

	1990	1992	1994	1996	1998	1999	Annual Growth Rate[a] (percent)
Developing Member Countries							
Newly Industrialized Economies							
Hong Kong, China	34633	78598	147158	166419	205918	244886	24.3
Republic of Korea	75949	116101	286056	177266	137859	733591	28.7
Singapore	20293	14084	81054	42739	50735	97985	19.1
Taipei,China	715005	240667	711346	470193	884698	910016	2.7
People's Republic of China	820[b]	16715	97526	256008	284766	377099	115.2
Southeast Asia							
Indonesia	3992	3903	11801	32142	9709	19903	19.5
Malaysia	10871	21730	126458	173568	28835	48512	18.1
Philippines	1216	3104	13949	25519	9992	19673	36.2
Thailand	22894	72060	80188	44365	20734	41604	6.9
South Asia							
India (Bombay)	21918	20597	21879	26599	64498	122247	21.0
Pakistan (Karachi)	231	980	3198	6054	9102	21057	65.1
Other ADB Member Countries							
Australia	40113	45771	94726	145395	161080	105999	11.4
New Zealand	1933	3168	6785	8882	14505	11980	22.5
Japan	1602388	635261	1121438	1251998	948522	1849228	1.6
Total (including Japan)	2552256	1272739	2803562	2827147	2830953	4603780	6.8
Total (excluding Japan)	949868	637478	1682124	1575149	1882431	2754552	12.6

[a]Growth rate between 1990 and 1999.
[b]1991.
Source: Standard & Poor's (2000).

China. Strains in the clearing and settlement systems were apparent in a number of advanced markets including the United Kingdom and United States during the October 1987 market break (see International Stock Exchange 1987/1988, Brady Commission 1988, and New York Stock Exchange 1990). As a result, increasing attention has been focused on risk management systems in clearing and settlement during the last decade to improve their effectiveness.

In retrospect, two important lessons were learned from the October 1987 market break (Rhee 1995). First, there are two dimensions to securities market efficiency: informational efficiency and operational efficiency. The former implies that securities prices fully reflect all available information relevant to determining their value, while the latter requires the operating system of financial markets to function in an optimal manner. Second, the existence of operational efficiency cannot be assumed. Prior to 1987, modern financial theory had concentrated on the informational efficiency of securities markets, while taking operational efficiency for granted. The Hong Kong, China experience demonstrated that the failure cost in the operating system could be as large as or even larger than the social cost associated with informational inefficiency. The core of operational efficiency comprises clearing and settlement in support of smooth securities transactions. This study reviews the status of clearing and settlement of equity markets in the Asian and Pacific region in an attempt to identify best practices of risk management systems in the securities industry.

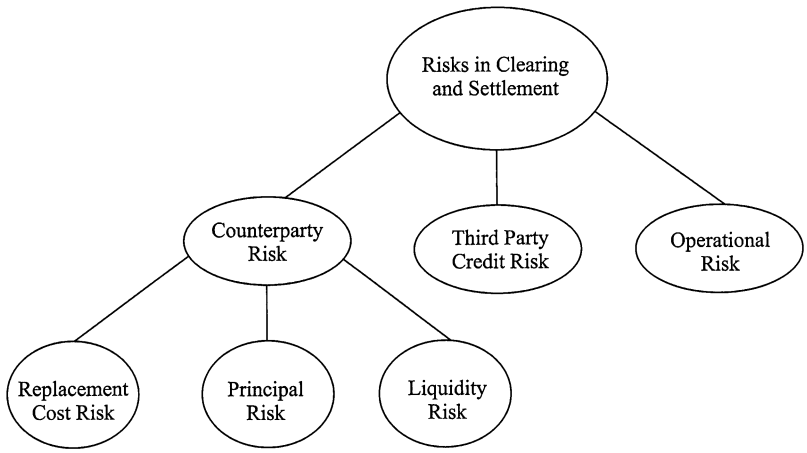
Sources and Types of Risks in Clearing and Settlement

Risks in clearing and settlement have yet to be clearly defined. Although more than two dozen reports focusing on clearing and settlement systems have appeared since the October 1987 market break, surprisingly, some of these reports did not define the types of risks to be contained under risk management systems. Only a limited number of studies made meaningful efforts in defining clearing and settlement-related risks in general. The most perceptive discussions on the types and sources of risks are found in a Bank for International Settlements (BIS) report (1992) on delivery versus payment (DVP). The overall conceptual framework of this report was adopted by a number of follow-up studies and reports.[2] For the purpose of this paper, the original conceptual framework in the BIS report (1992) is expanded and modified as shown in the Figure to illustrate three categories of risks in clearing and settlement, namely third party credit risk, operational risk, and counterparty risk.

[2]The follow-up studies and reports include Parkinson et al. (1992); IOSCO (1992); FIBV (1996); Stehm (1996); and BIS (1995, 1997).

Market participants in the clearing and settlement system face the risk of failure by a settlement bank or other intermediary. This is called a third party credit risk since it is a function of the credit standing of financial institutions that are involved in clearing and settlement. Parkinson et al. (1992) report that the third party credit risk was much greater prior to the October 1987 market break than at the present time for two reasons. First, responsibilities of banks and clearing organizations were not clearly defined for cases where a clearing member failed to meet its settlement obligations due to insufficient funds. Second, conditions under which payments were made from a settlement bank to the clearing entity were ambiguous.

Figure: **Risks in Clearing and Settlement**



Settlement Failure	Yes	Yes	Yes
Degree of Failure	Partial	Whole	Partial
Nature of Failure	Permanent	Permanent	Temporary
Source of Failure	Price Volatility	Unsynchronized Payment and Delivery	Illiquidity

Market participants also face operational risk, defined as the risk of breakdowns in the clearing and settlement operational system. This may be caused by human error, management failure, or the failure of the hardware, software, and communications network. It may also be caused by power failure or natural disaster such as earthquake or flood.

Of the three categories, counterparty risk is what risk management systems are designed to contain, since settlement failure by individual participants in clearing and settlement may cause a chain reaction of failures, raising the possibility of creating risks of systemic proportions. Therefore, market regulators are concerned about this type of breakdown in view of the potential of systemic risks for the entire financial system (OECD 1991, Rhee 1992). Hence, this paper's focus is limited to counterparty risk. Three sources of counterparty risk are price volatility, unsynchronized payment and delivery, and illiquidity. Given the three sources of risk, counterparty risk can be further classified into replacement cost risk, principal risk, and liquidity risk. Replacement cost risk[3] is generated by price volatility, principal risk stems from unsynchronized payment and delivery, and liquidity risk is attributed to illiquidity.

If no settlement occurs, then a buyer loses as the market price moves up after the trade and a seller loses as the market price moves down. As the price moves away from the original contract price, the replacement of the original trade may become costly and this cost must be borne by one of the counterparties. Thus, one of the counterparties faces replacement cost risk with price volatility between the date of transaction and the date of settlement.

With payment and delivery unsynchronized, there is the risk that a seller of a security may deliver without receiving a corresponding payment or that a buyer may make payment without receiving a corresponding delivery. In this situation, the full principal value of the security can be at risk. Thus, one of the counterparties faces principal risk.[4]

If the buyer fails to make payment, the seller may have to borrow funds or liquidate assets to make up the shortfall and, if the seller fails to make delivery, the buyer may have to borrow the security from a third party. However, the cost of borrowing funds or securities is subject to market liquidity. Thus, one of the counterparties always faces liquidity risk. For example, one counterparty may face heightened liquidity risk toward the end of a business day due to lower market liquidity prior to the close of business. All three types of risk are conditioned upon settlement failure. However, this failure is permanent in the case of both replacement cost risk and principal risk, but is temporary in the case of liquidity risk. The degree of failure also varies from one component of risk to another. Principal risk may cause the loss of the entire transaction value, whereas a partial loss only may be incurred under replacement cost risk and liquidity risk.

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[3] Replacement cost risk is also referred to as market risk. See OECD (1991).
[4] Principal risk is also referred to as capital risk. See OECD (1991).

An Overview of Risk Management Systems

The major objective of a risk management system in clearing and settlement is to minimize counterparty risks. To achieve this objective, a number of safeguards are employed. They may be classified into four major categories: (i) membership standards and monitoring program of financial performance, (ii) financial safeguards, (iii) guarantee funds, and (iv) postdefault program.

The role of two financial intermediaries, the clearinghouse and the central securities depository (CSD), is critically important in designing the risk management system in clearing and settlement. The clearinghouse provides trade comparison and multilateral netting services. The CSD eliminates physical movement of securities certificates during transfer of ownership by storing them in a vault (immobilization) or eliminates the need for issuance of physical certificates of documents by having securities exist only as computer records (dematerialization). The two organizations are not necessarily separate. Depending on the institutional evolvement, the services offered by the two organizations may be consolidated in a single entity. In some countries, organized exchanges provide trade comparison services and matching as part of their automated trading system, leaving settlement-related functions with clearing entities. No matter what organizational form is adopted, the single most important safeguard in maintaining the financial integrity of the system comprises the membership standards. Stehm (1996) calls participation standards and the ongoing monitoring of participants' financial condition the "first line of defense."

The clearing entity defines minimum capital requirements for its members, which often exceed regulatory capital requirements. The initial membership application and approval process is the vehicle utilized to ensure the financial health of clearing members. For the success of the clearing and settlement entity's operations, a critical mass of participation must be achieved. Potential participants consist of: investment dealers/brokers, commercial banks, insurance companies, trusts, central banks, and institutional investors (mutual funds and pension funds). Broader participation, however, raises some regulatory complications in terms of minimum capital requirements, oversight of institutional risk management systems, financial surveillance, and regulatory defragmentation, etc., while the critical mass contributes to substantial cost savings in clearing and settlement. The clearing entity also imposes stringent standards on operational capabilities that include record keeping and reporting through computer and communications systems. To maintain membership standards on a continuous basis, clearing members must submit periodic financial reports and information relevant to their financial performance. They are subject both to periodic audit and inspection on compliance with regulatory requirements and to a comprehensive system for the prompt detection of financial and operational weaknesses. To ensure that monitoring is fully effective, their trade positions should be monitored on a real-time basis.

Several financial safeguards have been introduced to contain counterparty risk, including delivery versus payment, position limits, netting, marking-to-market, collateral requirement, same-day funds, securities borrowing and lending, and clearing fund.

Delivery versus Payment

Delivery versus payment is the most important safeguard to protect counterparties to securities trade from principal risk that is caused by unsynchronized delivery and payment because it represents the direct link between securities delivery and a funds payment. If the clearing entity is placed in the middle of settlements, the clearing entity faces principal risk. DVP may reduce liquidity risk but it is not an effective device for reducing replacement cost risk. Not all DVP approaches, however, can eliminate principal risk. It depends on the type of DVP approach. The BIS report (1992) on DVP identifies three broad approaches to achieving DVP: (i) "SFI" DVP in which all deliveries and payments are simultaneous, final, and irrevocable on a trade-by-trade (gross) basis; (ii) net cash DVP in which deliveries are settled on a trade-by-trade (gross) basis, but funds are paid on a net basis at the end of the processing cycle; and (iii) batch DVP in which deliveries and payments are settled on a net basis at the end of the processing cycle. Because both net cash DVP and batch DVP cannot completely eliminate principal risk, they are usually complemented by other risk management devices. For example, net cash DVP would expose the seller of securities to principal risk unless the seller receives an irrevocable commitment from the buyer's bank.[5] For batch DVP, book-entry transfers of securities do not occur until the end of the processing cycle, leaving all funds and securities transfers provisional. As a result, counterparties to trade still face potential liquidity risk and replacement cost risk unless an extension of credit is made available to a participant who may encounter settling difficulty.

Position Limits

The clearing entity imposes position limits on its clearing members.[6] Position limits are a function of a clearing member's liquid assets, trading volume, and exposure to a single client. While position limits represent a direct way of limiting credit losses, they may also discourage market manipulation.

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[5]However, the seller is still exposed to third party credit risk.

[6]A position limit is the maximum amount of buy and sell orders that can be owned or controlled by a stock exchange member in a single security.

Netting

Trade-for-trade settlement is the most fundamental form of clearing and settlement since the identity of the counterparty is always maintained. In a strict sense, trade-for-trade settlement does not represent a "netting" process; it works like a netting scheme if the settlement computes net balances for the counterparty (IOSCO 1992). It works in low-volume markets or in high-volume markets with a highly automated system. Since the identity of the counterparty is known, transactions do not have to be guaranteed by the clearing entity. Two of the most common netting methods are multilateral netting (or daily netting) and continuous net settlement (CNS). Multilateral netting is a netting process in which all trades in the same security are sorted into final long and short positions for each participant. As counterparties to the transactions may change for settlement purposes, trade guarantees are essential. Since no offsetting is made with subsequent days' trades, as the name "daily netting" implies, the frequency of failed trades may be higher than in a netting scheme that allows interday netting. CNS is being considered as a promising alternative for many high-volume markets because it allows interday netting. With the adoption of CNS, the clearing entity interposes itself between the buyer and seller to become the counterparty to both parties. At the end of the CNS process, net positions of all participants should sum up to zero for the clearing entity in terms of the number of securities and the amount of funds. The IOSCO report (1992) identifies three advantages of the CNS system: (i) a large volume increase does not require a large increase in computer processing capacity, (ii) a high rate of settlement can be achieved, and (iii) "gridlock" is not a problem (unlike in trade-for-trade settlement). One drawback of this netting system is that the buyer and seller in the original transaction lose their identity after CNS processing. Hence, trade unwinding is not usually possible. If outstanding positions remain unfulfilled for extended periods due to difficulty in unwinding, then the parties to clearing and settlement may face replacement cost risk. Therefore, the clearing entity protects itself from the replacement cost risk by employing a process of marking-to-market.[7]

Marking-to-Market

Under the marking-to-market process, the value of all open positions is marked-to-market and any unrealized losses (or gains) from the previous day's value are paid to (or collected from) the clearing entity. The working modality differs from one clearing organization to another. For example, the Options Clearing Corporation of

[7]One of the referees correctly identifies an operational difficulty in implementing "marking-to-market" when the market suffers from the well-known "thin" trading problem that is common in the Asian and Pacific region. However, thin trading is not the main reason for slow adoption of marking-to-market systems in the region. Rather, relevant reasons may be found from the region's institutional evolution of the regulatory processes.

Chicago collects unrealized losses, while it does not pay unrealized gains, whereas the National Securities Clearing Corporation maintains a symmetric treatment of losses and gains (Parkinson et al. 1992).

Collateral Requirement

Each member is required by the clearing entity to collateralize its obligations. Full collateralization can be achieved if marking-to-market is performed on a real-time basis. The securities to be traded can be used as part of the collateral, but with an appropriate "haircut." The rest of the collateral must consist of cash and highly liquid assets such as government-issued securities.

Same-Day Funds

Same-day funds settlement requires that the necessary payment be made by wire transfer rather than certified checks. Using central banks' settlement facilities, an increasing number of countries are moving toward the same-day funds system, which reduces counterparty risks as well as third party credit risk.

Securities Borrowing and Lending

A well-functioning securities borrowing and lending (SBL) system is essential in facilitating clearing and settlement, short sales, and unwinding arbitrage positions. In addition, an SBL system may be able, if adequately managed, to promote market liquidity, arbitrage, elimination of illegal underground financial activities, and price stabilization. Usually, SBL is done on a fully collateralized basis where acceptable collateral is in the form of government securities, high quality corporate issues, letters of credit, and cash.

Clearing Fund

The clearing entity usually establishes a clearing fund (or guarantee fund) to protect against potential losses as a result of default or failure by its members. Parkinson et al. (1992) state that the objective of this fund is to collateralize a clearing member's direct obligations as well as its contingent liabilities in the event of default by another member. Although the IOSCO report (1992) suggests that the purpose of such a fund is to provide the clearing and settlement entity with the resources to pay out on its obligations (even when a participant fails to make good on its payment obligations), Parkinson's insight should be considered more appropriate for the Asian and Pacific region's equity markets in view of the low credit standings usually observed among relatively small firms listed on the organized exchanges.

There is no magic formula to determine an optimum size of the guarantee fund. Some of the factors that may affect the size of the guarantee fund are daily market turnover, market volatility, settlement period, and counterparty risk. In the event that a participating member fails to meet its obligations, the clearing entity would (i) liquidate the member's position either by purchasing securities to cover a failed delivery obligation or by selling securities received in the event of a payment failure, (ii) have access to the defaulted participant's deposit in the clearing fund, (iii) utilize the clearinghouse's retained earnings, and (iv) charge against nondefaulting members' contributions to the clearing fund if the retained earnings are insufficient. This charge against nondefaulting members varies from one clearing entity to another. It may be pro rata on the basis of the nondefaulting members' bilateral dealings with the defaulting member or on the basis of nondefaulting members' required contributions to the clearing fund. Because it usually takes time to implement the postdefault program, clearinghouses arrange lines of credit with banks to ensure adequate liquidity.

Industry Standards, Industry Practices, and Best Practices

G-30 and ISSA Recommendations

Recognizing that clearing and settlement practices in each country were not uniform and uneven in quality, the Group of Thirty (G-30), an international private sector group of capital market institutions, made recommendations to set industry standards after the October 1987 market break. The G-30 study (1989) proposed nine recommendations relating to the clearing and settlement systems of national equity markets. The Executive Board of the International Securities Services Association (formerly called the International Society of Securities Administrators), however, endorsed some revisions to the original G-30 recommendations (ISSA 1995), which are compared in the Appendix.

Practices in the Asian and Pacific Stock Exchanges and FIBV Best Practices

Table 2 summarizes the status of clearing and settlement systems utilized by 13 stock exchanges in the Asian and Pacific region.[8] To facilitate comparison, the first column presents the G-30 recommendations.

[8]Namely, the Australian Stock Exchange, Stock Exchange of Hong Kong, National Stock Exchange of India, Jakarta Stock Exchange, Tokyo Stock Exchange, Korea Stock Exchange, Kuala Lumpur Stock Exchange, New Zealand Stock Exchange, Karachi Stock Exchange, Philippine Stock Exchange, Stock Exchange of Singapore, Taiwan Stock Exchange, and Stock Exchange of Thailand.

Trade Comparison between Direct Market Participants

Indonesia; Japan; Malaysia; Philippines; Singapore; Taipei,China; and Thailand report that trade comparison and verification are done either on a real-time basis or on day t+0. All other countries in the region meet the G-30 recommendation of t+1. A Fédération Internationale des Bourses de Valeurs (FIBV) report (1996) indicates that trade verification and confirmation are usually fully integrated or real-time linked (over 90 percent of the cases) to meet the G-30 recommendation for t+1 trade comparison between direct market participants. As the trading system is computerized and linked to the clearing and settlement system at an increasing number of exchanges, about one half of responding exchanges report completion of comparisons within the first hour of trading.

Participation of Indirect Market Participants

Although almost two thirds of FIBV members do not have centralized trade confirmation involving indirect market participants (mainly institutional investors), the Republic of Korea (hereafter Korea); Malaysia; Singapore; and Taipei,China report that trade comparison among indirect market participants is done on a real-time basis. Other economies in the region appear to have met the t+1 recommendation of G-30, with the exception of India.

Central Securities Depository

All stock exchanges in the region report that CSDs are in operation, whereas the FIBV reports that CSDs operate in 83 percent of the responding exchanges. In some exchanges, all physical scrips are stored at the CSD, but the overall storage ratio is 65 percent. The degree of immobilization ranges from India's 8 percent to Singapore's 100 percent. Dematerialization has yet to be implemented among the region's exchanges.

Trade Netting

Surprisingly, stock exchanges in Australia and Hong Kong, China are the only two of the 13 exchanges that use CNS. However, multilateral netting is common among all the economies except Pakistan. According to the FIBV report, 12 percent of responding FIBV members do not use any netting method, whereas 6 percent use bilateral netting, which is a rudimentary form of netting. The remaining exchanges use multilateral netting. Although the G-30 strongly recommended the adoption of CNS, only a few exchanges operate it.

Table 2: **Status of Global Change–Clearing and Settlement Systems in 13 Stock Exchanges**

	Items	G-30 Recommendations	Australia	Hong Kong, China	India
1	Comparison of Trades among Direct Market Participants	t+1	t+1	t+0	t+1
2	Comparison of Trades among Indirect Market Participants	t+1	t+1	t+1	Under implementation
3	Central Securities Depository (CSD)	Yes	Major commercial banks and Australian Stock Exchange member brokers offer custodian nominee service. Clearing by CHESS	Central Clearing and Settlement System	National Securities Clearing Corp.
	Immobilization[1]	Yes	Yes	Yes	Yes
	Dematerialization[2]	Encouraged	No	No	No
	Pledging with the CSD[3]	Yes	Yes	Under plan	No
4	Trade Netting System	Yes	Yes	Yes	Yes
	Multilateral Netting[4]	Recommended	Yes	Yes	NR
	Continuous Net Settlement[5]	Highly Recommended	Yes	Yes	NR
5	Delivery versus Payment (DVP) Method	Yes	Yes	Yes	No
6	Same Day Fund Convention	Yes	Yes	Yes	No
7	Rolling Settlement System	t+3	t+3	t+2	t+5[6]
8	Securities Borrowing and Lending	Yes	Yes	Yes	Under implementation
9	International Securities Identification Number System	Yes	Yes	Yes	No

Table 2 continued.

	Items	Indonesia	Japan	Korea	Malaysia	New Zealand
1	Comparison of Trades among Direct Market Participants	t+0 to t+1	t+0	t+0	Real-Time Basis	Yes
2	Comparison of Trades among Indirect Market Participants	t+0 to t+1	t+1	t+1 through Institutional Affirmation and Settlement System	Real-Time Basis	Yes
3	Central Securities Depository (CSD)	Indonesian Securities Central Custody	Japan Securities Depository Center. Japan Securities Clearing Corporation is entrusted with clearing and settlement	Korea Securities Depository (also provides clearing service)	Malaysian Central Depository Bdn Bhd	Austra Clear New Zealand System
	Immobilization[1]	No	Yes	Yes	Yes	Yes
	Dematerialization[2]	No	No	No	No	No
	Pledging with the CSD[3]	No	Yes	Yes	No	No
4	Trade Netting System	Yes	Yes	Yes	Yes	Yes
	Multilateral Netting[4]	Yes	Yes	Yes	Trade-for-Trade	NR
	Continuous Net Settlement[5]	No	No	No	Trade-for-Trade	NR
5	Delivery versus Payment (DVP) Method	No	Yes	Yes	Yes	Yes
6	Same Day Fund Convention	No	Yes	Next Day Fund (Cheques vs. Securities Delivery)	Yes, at direct market participants level only (i.e., broking house)	Yes
7	Rolling Settlement System	t+4	t+3	t+2	t+3	t+3
8	Securities Borrowing and Lending	No	Yes	Yes	Yes	No
9	International Securities Identification Number System	Yes	Yes	Yes	Yes	Yes

Table 2 continued.

	Items	Pakistan	Philippines	Singapore	Taipei,China	Thailand
1	Comparison of Trades among Direct Market Participants	t+1	t+0	Real-Time Basis	Real-Time Basis on t+0	t+0
2	Comparison of Trades among Indirect Market Participants	t+1	t+0 to t+4	Real-Time Basis through IDAS	Real-Time Basis on t+0	t+1
3	Central Securities Depository (CSD)	CSD	Philippines Central Depository	The Central Depository (Pte) Ltd.	Taiwan Securities Central Depository Co. (also provides clearing service)	Thailand Securities Depository (also provides clearing service)
	Immobilization[1]	Yes	Yes	Yes	Yes	Yes
	Dematerialization[2]	No	Encouraged	No	No	No
	Pledging with the CSD[3]	Yes	Yes	No	Yes	Yes
4	Trade Netting System	Yes	No	Yes	Yes	Yes
	Multilateral Netting[4]	No	Trade-for-Trade	Yes	Yes	Yes
	Continuous Net Settlement[5]	Allowed during an accounting period as notified by exchange	Trade-for-Trade	No	No	No
5	Delivery versus Payment (DVP) Method	Yes	Yes	Yes	Yes	Yes
6	Same Day Fund Convention	Planned through CDC	Yes	Yes	Yes	Yes
7	Rolling Settlement System	No	t+4	t+3	t+2	t+3
8	Securities Borrowing and Lending	No	Under plan	No	Yes	Yes
9	International Securities Identification Number System	In process	Under plan	Yes	Yes	Yes

NR means not reported.
[1]The storage of securities certificates in a vault in order to eliminate physical movement of certificates/documents in transfers of ownership.
[2]The elimination of physical certificates of documents of title that represent ownership of securities so that securities exist only as computer records.
[3]Pledging is a procedure within the CSD that allows securities to be used as collateral to secure loans, options/futures contracts, and other forms of credits.
[4]A netting system in which all trades in the same security are grouped to a final long or short position for each participant. In this type of netting, the trading counterparty may change.
[5]In this system, daily netting is employed and all open trades at the end of the day are then offset against the next day's trades.
[6]Rolling settlement of t+5 is mandatory in the exchanges where trading in dematerialized securities is available.

Delivery versus Payment

DVP is the system most crucial in reducing counterparty principal risk. India and Indonesia are the only countries in the region that do not use the DVP system. Although the simultaneous, final, and irrevocable DVP model is the most effective among the DVP approaches in containing principal risk, only 9 percent of FIBV members rely on this model. Most exchanges (53 percent) use the "batch" DVP model with settlement guarantee schemes. Surprisingly, a few exchanges have no direct link between delivery and payment at all, exposing their clearing and settlement systems to principal risk. The commonly adopted settlement guarantee schemes include insurance, margin/collateral, and participant guarantee. Other indirect guarantee mechanisms suggested by FIBV members include position limits and a capital adequacy test.

Same-Day Funds

The same-day fund convention has yet to be adopted by India, Indonesia, and Pakistan. Japan adopted it in December 1997. Although the G-30 recommendation called for the same-day fund convention across all instruments, the FIBV report questionnaire was more concerned with the use of automated funds transfer and the availability of credit for settlement purposes. As a result, it is not clear whether "same-day funds" rather than "next-day funds" are implied in automated transfer. It is noted that checks are widely used for settlement.

Rolling t+3 Settlement

Approximately two thirds of FIBV member exchanges have adopted a rolling t+2 or t+3 settlement schedule, making the G-30 recommendation for t+3 settlement an industry standard. At present, most of the exchanges surveyed for this study have adopted either t+2 or t+3 (the exceptions are India, Indonesia, Pakistan, and Philippines). Average nonsettlement (or "fail") rates range from 0 to 15 percent, with an average of 2.5 percent for responding exchanges. An important related issue is the frequency of the settlement processing cycle per day. Three quarters of the responding exchanges operate one settlement cycle per day, which indicates that multiple daily processing cycles have yet to be adopted to improve overall system performance.

Securities Borrowing and Lending

The G-30 recommendation for SBL has yet to be widely adopted. Only one half of the responding exchanges permit SBL. Indonesia, New Zealand, Pakistan, and

Philippines have not introduced SBL. Korea and Taipei,China established an SBL system in the 1970s which was modeled after the Japanese system. After a trial period, the Hong Kong Stock Exchange has been expanding short-selling activities in Hong Kong, China. Malaysia established a domestic market in securities borrowing and introduced rules on regulated short-selling in December 1995. However, these were suspended with the onset of the Asian financial crisis, with a view to reinstating them at an appropriate time. Thailand completed the SBL framework in 1997 and necessary tax amendments have been passed since 1998 with the condition that the loan transactions must be conducted through the Thailand Securities Depository or a licensed SBL intermediary. Banks and finance companies (if permitted by the Bank of Thailand) and securities firms are eligible to apply for an SBL license.

International Securities Identification Number System

The introduction of this system is in the planning stage in India and Pakistan, while the Philippines will introduce it soon. All other exchanges adopted it.

Risk Management Systems in Practice

Table 3 presents key features of risk management systems in clearing and settlement in the Asian and Pacific region. Since CSD participants are largely stock exchange members, no separate financial requirements are imposed by the CSDs. For those economies with CSD requirements specified, the requirements do not differ from those of stock exchanges for member brokers.

With the exception of Singapore; Taipei,China; and Thailand, many organized stock exchanges do not impose position limits. This contrasts with financial derivatives markets where position limits represent one of the important financial safeguards for clearing and settlement entities.

Table 3: **Risk Management in Clearing and Settlement**

	Items	Australia	Hong Kong, China	India	Indonesia	Japan
1	Financial Requirements of CSD Members	No (minimum capital requirement for Australian Stock Exchange members)	Yes	Yes	No (minimum capital requirement for Jakarta Stock Exchange members)	No (minimum capital requirement on Tokyo Stock Exchange members)
2	Position Limits	No	No	Yes	No	No
3	Clearing and Settlement Fund	Yes	Yes	Yes	Yes	Yes
4	Marking-to-Market	Yes	Yes	Yes	No	Yes
5	Collateral Requirement	No	Yes	Yes	No	No
6	Participant Guarantee or Loss Sharing	No	Yes	Yes	No	Yes
7	Insurance Coverage	Yes	Yes	Yes	No	Yes
8	Bank Credit Lines	No	Yes	Yes	Yes	Yes
9	Contract Novation (clearinghouse serving as counterparty)	Yes for broker/ broker trades only	Yes	Yes	No	No

Table 3 continued.

	Items	Korea	Malaysia	New Zealand	Pakistan
1	Financial Requirements of CSD Members	No (minimum capital requirement for Korea Stock Exchange members)	Yes	No	Yes
2	Position Limits	No	No	No	No
3	Clearing and Settlement Fund	Yes	Yes	No	Yes
4	Marking-to-Market	Yes	Yes	No	Yes
5	Collateral Requirement	Yes	No	No	Yes
6	Participant Guarantee or Loss Sharing	Yes	No	No	Yes
7	Insurance Coverage	No	No	No	No
8	Bank Credit Lines	No	Yes	No	No
9	Contract Novation (clearinghouse serving as counterparty)	Yes	No	No	Yes

Table 3 continued.

	Items	Philippines	Singapore	Taipei,China	Thailand
1	Financial Requirements of CSD Members	No (minimum capital requirement for Philippine Stock Exchange Members)	S$30 million capital (including other Stock Exchange of Singapore requirements to be met)	No (minimum capital requirement on Taiwan Stock Exchange members)	No (only minimum shareholder's equity of the member company of 400 million baht will be required)
2	Position Limits	No	Yes	Yes	No
3	Clearing and Settlement Fund	No	Yes	Yes	Yes
4	Marking-to-Market	No	Yes	Yes	Yes
5	Collateral Requirement	No	No	No	Yes
6	Participant Guarantee or Loss Sharing	No	No	Yes	Yes
7	Insurance Coverage	Yes	No	No	Yes
8	Bank Credit Lines	No	No	Yes	Yes
9	Contract Novation (clearinghouse serving as counterparty)	No	Yes (for clearing members and DVP participants)	No	Yes

Clearing and settlement funds are fairly common among the region's stock exchanges. Summarized in Table 4 is the size of clearing and settlement funds relative to annual trading value as reported by eight exchanges at the end of 1997.

Table 4: **Relative Size of Clearing and Settlement Funds, Selected Stock Exchanges, 1997 (percent)**

Economy	Size
Thailand	0.121
Taipei,China	0.118
Korea	0.042
Australia	0.035
Pakistan	0.023
Indonesia	0.019
Hong Kong, China	0.009
Japan	0.004[a]

[a]Includes default compensation fund.

The relative size of clearing and settlement funds ranges from 0.004 percent (Japan) to 0.121 percent (Thailand). Even though no generalization is allowed by this small base, it appears that market turnover and price volatility are important determinants of the relative size of clearing and settlement funds. The three economies that are well known for high price volatility and market turnover maintain the largest clearing and settlement funds. (When this survey was conducted in 1997, Malaysia, New Zealand, and Philippines reported that the funds were not in place.)

The region's equity markets finally caught up with the practices in the advanced markets by adopting marking-to-market as part of their risk management systems subsequent to the Asian financial crisis. Two exceptions are Indonesia and Philippines. Hong Kong, China; India; Korea; Pakistan; and Thailand report the imposition of collateral requirements. Apart from Australia, all other economies report the adoption of participant guarantee and/or loss sharing.

The most interesting finding from the survey is the novation feature where the clearinghouse becomes the counterparty to the buyer and the seller of the original contract. Once novation is complete, the clearinghouse is usually obligated to make payment or delivery if a participant fails to meet the settlement obligations. In Japan; Malaysia; Philippines; and Taipei,China, there is no novation of contract in a strict legal sense. Singapore reports that novation is applicable only to clearing members of the exchange. Although it is understandable why Malaysia and Philippines do not have the novation feature in view of their trade-for-trade settlement, no significant differences in risk management systems are noted between those exchanges with and without contract novation.

Policy Considerations for Improvement of Clearing and Settlement

Given the current status of capital market development in the Asian and Pacific region, two important observations are in order: first, an increasing number of economies are joining the exclusive club of capital markets with financial derivatives; and second, intraregional and interregional capital flows are increasing in the form of cross-border portfolio investment. These new developments require serious policy considerations for the improvement of clearing and settlement in practice.

Hong Kong, China and Singapore established derivatives markets in 1986. These two markets introduced options on individual stocks later, while Korea introduced equity index futures and options in 1996 and 1997, respectively; Malaysia introduced equity index futures in 1995. Taipei,China established an organized exchange called the Taiwan International Mercantile Exchange to trade equity index futures. With demutualization of stock and futures exchanges and clearing organizations, Hong Kong, China; Malaysia; and Singapore are now in a position to consolidate two separate clearing entities for the cash market and derivatives market, whereas one single entity handles clearing and settlement of both types of instrument in Korea. Taipei,China utilizes two separate clearinghouses for financial derivatives and the underlying cash markets. Given the diversity of instruments and clearing structure in these emerging markets, the US experience in the wake of the October 1987 market break must be carefully studied for a better, particularly more efficient, risk management system. Harmonization of settlement cycles across different instruments, cross-margining, and information sharing between clearing entities must be promoted. One of the five recommendations made by the Brady Commission (1988) was related to clearing and settlement. It recommended the unification of clearing systems across marketplaces to reduce financial risk because (i) no clearinghouse is able to accurately assess intermarket exposure among its clearing members and among their customers, and (ii) separate clearing also hampers lenders' assessment of the risk exposure of market participants and interferes with collateralization of intermarket positions. Hence, it was suggested that stocks, stock index futures, and stock options be cleared through a single mechanism. ISSA and the US General Accounting Office (1990) also made similar recommendations for the harmonization of rules and practices to reduce potential risks associated with clearing and settlement. A single clearing and settlement mechanism will emerge as a critical policy issue in Korea and Taipei,China since these two economies adopted the policy of allowing two separate exchanges to manage the equity market and the financial derivatives market. It is too early to predict market structure in India, Indonesia, Pakistan, Philippines, and Thailand since financial derivatives have yet to be launched.

In view of the policy recommendations made by a number of studies including those of the Brady Commission (1988) and the US General Accounting Office (1990) and ongoing consolidation processes of stock and financial derivatives exchanges in Hong Kong, China; Malaysia; and Singapore, it is strongly recommended that a single entity of clearing and settlement be adopted in those economies when the financial derivatives markets are created. For Korea and Taipei,China, any trade-off between a single entity and multiple clearing and settlement entities must be weighed carefully.

With the volume of cross-border investment increasing, the clearing and settlement system of each of the domestic markets must be coordinated. The task force appointed by the FIBV made four recommendations for improved cross-border settlement in the future (FIBV 1989): (i) adoption of international settlement conventions as proposed by the G-30, IOSCO, and the European Union; (ii) establishment of cross-border settlement links among national and international CSDs; (iii) immobilization of securities in the issuer's country and transfer by a book-entry system; and (iv) listing of foreign securities in their original form. A BIS study (1995) on cross-border settlement notes that cross-border trades usually involve additional intermediaries (e.g., local agents, global custodians, and international CSDs) and their involvement complicates the analysis of risks. Unfortunately, domestic and international settlement procedures are not the same and they require uniform cross-system treatments. This is one area that calls for immediate attention to facilitate international capital flows with a minimum amount of disturbance.[9]

[9]Refer to Rhee (2000a, 2000b) for updated information on postcrisis capital market reforms in the region and regionalization efforts.

Appendix

G-30 and ISSA Recommendations on Clearing and Settlement

Recommendation 1: Trade Comparison between Direct Market Participants

G-30: By 1990, all comparisons of trades between direct market participants should be accomplished by t+1.

ISSA: All comparisons should be accomplished by t+0. Matched trade details should be linked to the settlement system.

Recommendation 2: Participation of Indirect Market Participants

G-30: By 1992, indirect market participants should be members of the t+1 trade comparison system.

ISSA: Indirect market participants should achieve positive affirmation of trade details on t+1.

Recommendation 3: Central Securities Depository

G-30: By 1992, each country should have a central securities depository (CSD) function in place.

ISSA: Each country should have in place an effective and fully developed CSD, organized and managed to encourage the broadest possible direct and indirect industry participation. The range of depository-eligible instruments should be as wide as possible. Immobilization or dematerialization of financial instruments should be achieved to the utmost extent possible. If several CSDs exist in the same market, they should operate under compatible rules and practices, with the aim of reducing settlement risk and enabling efficient use of funds and available cross-collateral.

Recommendation 4: Trade Netting

G-30: Each country should study whether a trade netting system would be beneficial and, if so, implement it by 1992.

ISSA: Each market is encouraged to reduce settlement risk by introducing either real time gross settlement or a trade netting system that fully meets the "Lamfalussy recommendations."[10]

Recommendation 5: Delivery Versus Payment

G-30 DVP should be employed as the method for settling all securities transactions and should be in place by 1992.

ISSA: DVP should be employed as the method of settling all securities transactions where DVP is defined as simultaneous, final, irrevocable, and

[10]The Lamfalussy Report refers to the BIS report (1990).

immediately available exchange of securities and cash on a continuous basis throughout the day.

Recommendation 6: Same Day Funds

G-30: All securities administration and settlement payments should be made consistent across all instruments and markets by adopting the "same day funds" convention.

ISSA: No change.

Recommendation 7: Rolling t+3 Settlement

G-30: A "Rolling Settlement" system should be adopted by all markets. Final settlement should occur on t+5 by 1990 at the latest and on t+3 by 1992.

ISSA: A rolling settlement system should be adopted by all markets. Final settlement for all trades should occur no later than by t+3.

Recommendation 8: Securities Borrowing and Lending

G-30: Securities borrowing and lending should be encouraged as a method of expediting the settlement of securities transactions. Existing regulatory and taxation barriers that inhibit the practice of lending securities should be removed by 1990.

ISSA: Securities borrowing and lending should be encouraged as a method of expediting the settlement of securities transactions. Existing regulatory and taxation barriers that inhibit the practice of lending and borrowing securities should be removed by 1990.

Recommendation 9: ISIN Numbering System

G-30: By 1992, each country should adopt the standard for securities messages developed by the International Organization for Standardization (ISO Standard 7775). In particular, countries should adopt the international securities identification number (ISIN) system for securities as defined in the ISO Standard 6166, at least for cross-border transactions. These standards should be universally applied by 1992.

ISSA: By 1992, each country should adopt the standard for securities messages developed by the International Organization for Standardization (ISO Standard 7775). In particular, countries should adopt the ISIN numbering system for securities issues as defined in the ISO 6166.

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