ASIA-PACIFIC
DEVELOPMENT
JOURNAL

UNITED NATIONS

Editorial Statement

The *Asia-Pacific Development Journal* is published twice a year by the Economic and Social Commission for Asia and the Pacific.

Its primary objective is to provide a medium for the exchange of knowledge, experience, ideas, information and data on all aspects of economic and social development in the Asian-Pacific region. The emphasis of the *Journal* is on the publication of empirically based, policy-oriented articles in the areas of poverty reduction, emerging social issues and managing globalization.

The *Journal* welcomes original articles analysing issues and problems relevant to the region from the above perspective. The articles should have a strong emphasis on the policy implications flowing from the analysis. Analytical book reviews will also be considered for publication.

Manuscripts should be sent to:

Chief Editor
Asia-Pacific Development Journal
Development Research and Policy Analysis Division
ESCAP, United Nations Building
Rajadamnern Avenue
Bangkok 10200
Thailand

Tel.: (662) 288-1610
Fax: (662) 288-1000 or 288-3007
Internet: **journal.unescap@un.org**

CONTENTS

A note from the Editor

The debate on what would be an appropriate exchange rate regime for a developing country operating a semi-open economy, i.e. whether the exchange rate should be primarily fixed or primarily floating, has never been satisfactorily concluded. During the 1990s there arose a strong body of opinion that prefers a floating to the quasi-fixed crawling peg type regimes that are currently in vogue over much of the developing world. This view is based partly on the premise that markets should determine exchange rates and partly on the contention that any discrepancy between the official and parallel rates of exchange indicates a hidden subsidy paid to those who can acquire foreign exchange at the official rate by those who cannot. These points of view are not without justification. However, on the other side of the coin, freely floating rates, whatever their theoretical merits, have not, at a purely pragmatic level, proved to be the panacea they were claimed to be. This long-standing policy dilemma is addressed from the perspective of Bangladesh, where the Government is currently looking at the trade-offs involved in pursuing one or the other course. Broadly speaking, the author favours the existing arrangements that revolve around an adjustable peg, with little, if anything, to be gained by shifting to a floating rate regime.

Exchange rates do not, of course, exist in isolation. The exchange parity is an integral element in any macroeconomic framework whose objective is stability in the financial and asset markets. Given this background, the problem of devising early warning systems that revolve around a system of macroprudential indicators (MPIs) is addressed in the paper on efforts made by the Asian Development Bank (ADB) to develop a system for measuring the economic and financial vulnerability of countries to another 1997-type crisis and its attendant contagion effects. The paper highlights the central problem of having either an over-elaborate system with too many numbers or having one with only a core set of indicators and thus exposed to the risk of missing some vital sign in the months prior to the onset of a crisis. The problem of making finely balanced policy judgements, often on insufficient information, inevitably creeps in and Governments with an eye on the politics of the situation may opt to do nothing even in the direst of circumstances, whatever the early warning signals. Early warning systems are unlikely to override political inertia, one of the reasons for the recurrent financial crises in Latin America.

The 1997 crisis left China and India largely unaffected. But both countries have State-dominated banking systems that nevertheless have to contend with an array of major systemic issues and problems. Both countries had, in fact, been carrying out banking sector reforms in the 1990s, i.e. both before and after the crisis. Assessing the efficacy of these reforms thus far provides a basis not only for comparing the two countries but also for forming a view as to the kind of role that the banking system in each country is likely to play in facilitating growth in a rapidly evolving economic environment in the years ahead. One of the important conclusions that the paper reaches is that freeing up the management of banks and reducing State intervention in the financial system as a whole has to be accompanied by the vital quid pro quo of interest rate liberalization if banks are to price risk properly and thus perform their resource-allocation function effectively.

The Indian perspective provides the backdrop for an analysis of stock market behaviour in that country since 1990. The paper shows that the years since 1990, coinciding with progressive deregulation of the capital market and other liberalizing measures in the economy, have also been a period of unprecedented volatility for the stock markets of India. The volatility has been closely correlated with that in the international and the more open regional stock markets. What implications does this correlation have for investors, both individual and institutional? Are they likely to become more risk-averse and how will they diversify their portfolios to counter the volatility? How can the Indian Government deal with the problem? These are cogent issues requiring further discussion.

On the environment front, again from the Indian perspective, the economic reforms of the 1990s are seen to have been closely associated with higher energy consumption and, hence, higher CO_2 emissions. The authors suggest the need for much greater stress on a national energy policy for the country with more emphasis on energy conservation. Above all else, there is a need to confront the difficult issues involved in using the price mechanism for energy conservation and better balance between alternative energy sources, on the one hand, versus the need to provide affordable energy to the less well-off members of society on the other. Energy policies became de rigueur all over the world in the 1980s. Their importance declined in the 1990s as oil and gas prices declined. The first decade of the new millennium could well be a repeat of the 1980s and developing countries will need to be prepared for the challenges that might lie ahead.

Finally, a short research note examines the use of anti-dumping measures by the European Union against imports from China in the three-year period 1995-1998. The author suggests that there is significant evidence that anti-dumping measures have tended to be misused and makes the disquieting allegation that they are in effect trade-restricting devices. If countries are to be won over to the benefits flowing from free trade, such apprehensions are highly damaging and more effort needs to be put at WTO, and bilaterally, into preventing resort to anti-dumping measures on anything other than the most stringent grounds.

Shahid Ahmed

EXCHANGE RATE POLICY OF BANGLADESH –
NOT FLOATING DOES NOT MEAN SINKING

Mirza Azizul Islam*

The question of operating a primarily fixed or primarily floating exchange rate regime has long concerned academics and policy makers alike. This paper draws upon the literature on the subject and the experiences of some of the countries in the Asian and Pacific region that undertook major changes in their exchange rate regimes, from the perspective of the current policy choices facing Bangladesh. The paper concludes that Bangladesh's experience with an adjustable basket peg policy has been broadly positive and moving to a floating rate regime is not called for.

Media reports suggest that Bangladesh is under intense pressure by the International Monetary Fund (IMF) to change its prevailing exchange rate regime to one in which the nominal exchange rate will be determined primarily, if not solely, by the market forces of demand for and supply of foreign exchange. There are also indications that the Government is willing to comply once the foreign exchange reserve situation improves. In light of these developments, this paper seeks to examine if there exists any strong justification to opt for the change that the IMF has been apparently insisting upon.

The first section of the paper briefly describes the present exchange rate regime in Bangladesh. The second section draws upon literature on the subject to identify the general economic characteristics suitable for alternative exchange rate regimes and indicates the preferred option for Bangladesh in that light. The third section briefly reviews the experiences of some of the countries in the region that undertook major changes in their exchange rate regimes in recent years and the implications of these experiences for Bangladesh. The fourth section evaluates the performance of the present exchange rate regime of Bangladesh in terms of the key economic objectives that an exchange rate regime is expected to promote. The paper ends with concluding observations that summarize the key findings and their implications for the choice of the exchange rate regime in Bangladesh.

---

*   Formerly Additional Secretary, Government of Bangladesh, and formerly Chief, Development Research and Policy Analysis Division, ESCAP.

I. EXCHANGE RATE REGIME IN BANGLADESH

The exchange rate regime of Bangladesh can be characterized as one of an adjustable basket peg using a real effective exchange rate target. Given an existing nominal exchange rate, the corresponding real effective exchange rate is estimated. If it is observed that the real effective exchange rate (REER) as estimated on the basis of current par value significantly diverges from the desired or targeted REER, a corrective response is initiated in the form of changing the nominal exchange rate.

The estimation of REER involves three steps. The first is the calculation of the bilateral nominal exchange rates (NER) of the country under consideration, i (Bangladesh), with its trading partner country, j. In the case of Bangladesh, nominal exchange rates are usually announced in terms of the United States dollar ($) and data on exchange rates of trading partners are also available in terms of the dollar. Thus, bilateral exchange rates are calculated by using the following formula:

$$NER_{ij} \quad = \quad \frac{NER_{i\$}}{NER_{j\$}} \quad \text{....} \quad \text{....} \quad \text{....} \quad \text{....} \quad \text{....} \qquad (1)$$

Where NER_{ij} stands for the bilateral nominal exchange rate of Bangladesh with the trading partner j; $NER_{i\$}$ for Bangladesh's exchange rate with the dollar and $NER_{j\$}$ for the trading partners' exchange rate with the dollar.

The second step involves estimation of bilateral real exchange rates. This is based on the following equation:

$$RER_{ij} \quad = \quad NER_{ij} \, \frac{P_j}{P_i} \quad \text{....} \quad \text{....} \quad \text{....} \qquad (2)$$

where RER_{ij} is the bilateral real exchange rate of Bangladesh with trading partner j; P_j is the price index of the trading partner and P_i is the price index of Bangladesh. REER is finally estimated as per following:

$$REER \quad = \quad \sum W_{ij} \, RER_{ij} \qquad \text{....} \quad \text{....} \quad \text{....} \qquad (3)$$

where W_{ij} stands for the share of the trading partners in Bangladesh's trade and $\sum W_{ij}=1$.

As already noted, if the actual REER is found to be substantially different from the desired or targeted level, NER would be changed to reach that level. Then, the question arises as to what level or REER is deemed desirable and targeted.

Ideally, targeted REER should approximate the equilibrium exchange rate. However, estimating the equilibrium exchange rate that ensures healthy external balance

as well as desirable levels of domestic economic aggregates is a complex and arduous task. This cannot be routinely done. It is learnt that the authorities in Bangladesh monitor the movements of the REER compared to some base year and also qualitatively take into account several other domestic and external sector variables in determining the targeted REER. The external variables include the level of international reserves, current account gap, trends of exchange rate changes in the local interbank foreign exchange market and trends in the exchange rates of major neighbouring trade partners (India and Pakistan). Domestic variables include the domestic inflation rate, credit growth in the private and public sector, and the growth of broad money and liquidity.

The exchange rate policy decisions, though notified in all cases by the Bangladesh Bank, are made on behalf of and in close consultation with the Ministry of Finance. Bangladesh Bank does not have independent stewardship of exchange rate policy.

The Bangladesh Bank supports the current parity of the taka through a continuous presence in the market in the form of announced readiness to undertake United States dollar purchases and sales at rates decided by itself within the declared rate band (currently of one taka width) any time an authorized dealer approaches. Any adjustment in the parity is implemented through the announcement by the Bangladesh Bank of a revised band for buying and selling rates following which the dealers adjust their rates for transactions with their customers and among themselves. Upto 24 May 2001, Bangladesh Bank used to announce specified buying and selling rates. From 3 December 2000 Bangladesh Bank adopted the practice of declaring a 50 poisha band within which buying and selling transactions will be undertaken; this band was widened to taka 1.00 from 25 May 2001.

Prima facie, Bangladesh pursues an active exchange rate policy. This activism is reflected in the frequency of nominal exchange rate changes announced by the central bank. From 1983 onwards, there have been as many as 89 adjustments in the exchange rate of which 83 were downwards and only six were upward. However, the behaviour of economic agents is influenced by the impact of policy changes on the real variables that affect them. In the present context, the relevant variable is the real effective exchange rate. Table 1 shows the relationship between the nominal exchange rate and the real effective exchange rate during the past twelve years

Data in table 1 suggest that up until 1998, the authorities were basically pursuing a policy of stable REER. Thus between 1991 and 1998, REER depreciated by a mere 5 per cent. The subsequent years were marked by stronger depreciations. The mild appreciation of REER in 1998 could be one factor that encouraged policy makers to be more active in the exchange rate policy arena. Another factor could be that some of the competitor neighbouring countries were apparently depreciating faster.

Table 1. Indices of NER and REER (1991 = 100)

Year	NER	NER index	REER index
1991	36.60	100.0	100.0
1992	38.95	106.6	100.2
1993	39.57	108.1	104.6
1994	40.21	109.9	102.2
1995	40.28	110.1	102.9
1996	41.79	114.2	103.8
1997	43.89	119.9	105.5
1998	46.91	128.2	105.4
1999	48.00	131.4	112.8
2000	52.00	142.1	116.2

Source: Based on unpublished data from Bangladesh Bank.

II. CHARACTERISTICS SUITABLE FOR ALTERNATIVE REGIMES

It should be stressed at the outset that the task of identifying economic characteristics that dictate the choice of one regime or the other is enormously difficult. The difficulty arises due to several reasons. Much of the literature identifies these characteristics from the standpoint of two polar policy regimes. One of these can be branded as a regime of "hard peg" in which the value of the local currency is irrevocably fixed in terms of one or more foreign currencies. On the other extreme lies the regime of "free float" under which the exchange rate is allowed to fluctuate freely in response to the market forces of demand for and supply of foreign exchange. The actual practice of either of these regimes is rare. There is a host of other regimes which lie in between, variously labelled as "managed float", "independent float", "peg with sliding or crawling band", "flexible peg" etc.

The second difficulty arises from the fact that no single exchange rate regime is appropriate for all countries in view of differences in levels of economic and financial development and other aspects of their economic situation. Moreover, the regime that is appropriate for a particular country may change over time (Mussa and others, 2000).

The third difficulty is that the sustainability of a regime is also conditioned by the capacity of a country to formulate and effectively implement other economic policies which can reinforce the beneficial impact of a particular regime and neutralize the negative consequences. In particular, the credibility and the flexibility of monetary and fiscal policies are of crucial importance.

Notwithstanding the above difficulties, it is worthwhile to examine the economic characteristics that point to the appropriateness of a particular regime as benchmarks. These can be useful indicators for the choice of a regime in Bangladesh.

There is a vast literature on the choice of exchange rate regime.[1]   The conditions that generally point to the appropriateness of some form of pegged exchange rate regime are briefly discussed below.

- The degree of involvement with international capital markets is low. This condition ensures that the exchange rate will not be subject to large fluctuations in response to volatile inflows and outflows of short-term capital. Bangladesh clearly satisfies this criterion with a wide range of controls on capital and money market instruments, credit operations of the commercial banks, and transactions related to foreign direct investment and real estate.

- The share of trade with the country/countries to which its currency is pegged is high. As has been explained in the preceding section, this condition is fully met in Bangladesh as it follows the policy of a trade-weighted basket peg.

- The shocks it faces are similar to those facing the country/countries to which it is pegged. With stringent capital controls in place, the external shocks to the Bangladesh economy are transmitted primarily through the trade channel. In light of the point made above, this condition also holds for Bangladesh.

- Exchange rate based stabilization is considered attractive for the country. Given that there are lots of endogenous pressures from political and economic interest groups in Bangladesh to be lax in the conduct of monetary and fiscal policies, maintenance of some sort of a pegged exchange rate which forces monetary and fiscal discipline appears to be a desirable nominal anchor for Bangladesh.

- The country is wiling to give up its monetary policy independence and largely follow the monetary policy of the partner country. This condition is specially relevant for countries which pursue a policy of hard peg vis a vis a single currency. Since Bangladesh follows a policy of basket peg and the peg itself is adjustable, Bangladesh does not have to sacrifice its monetary policy independence entirely and blindly imitate another country's monetary policy stance.

- The country has high international reserves. This is an important requirement for a pegged exchange rate regime that Bangladesh does not adequately meet. However, the rationale for high international reserves under a pegged exchange rate regime arises from the fact that should the exchange rate come under pressure the authorities

---

[1]   See, for example, Mussa and others (2000); Velasco (2000) and the references cited in note 18 of the publication by Mussa and others (2000).

must have adequate foreign exchange to intervene effectively in the market to maintain the pegged rate. This condition does not appear to be an indomitable constraint for the present exchange rate policy in Bangladesh as the authorities can exercise two options, in addition to domestic policy instruments, to ease off pressure in the foreign exchange market. First, the exchange control regime can be tightened subject to obligations under Article VIII of the IMF Articles of Agreement. Second, the peg itself can be adjusted, as has been done many times over the years

The above discussion already suggests that some sort of a pegged exchange rate regime may be the preferred option for Bangladesh. At this point it is worthwhile to examine how does Bangladesh figure in terms of the economic or institutional requirements of a floating exchange rate regime.

The literature on the subject clearly highlights the need for a credible alternative nominal anchor for the conduct of monetary as well as fiscal policies as the exchange rate fails to provide such an anchor under the floating regime. The alternative anchor that is most often suggested is inflation targeting. Under the inflation targeting system, a country is committed to keep inflation within a predetermined target rate. Monetary and fiscal policies have to be tuned to ensure that the target is not violated. This in turn requires an independent central bank which can refuse accommodation to the Government if it is apprehended that the latter's fiscal stance is likely to cause inflation beyond the targeted rate. Furthermore, the central bank should have the independence to conduct monetary policy in such a manner that constrains the Government from financing its deficit through the commercial banks and other ways which may have inflationary consequences. Apart from the requirement of legal independence, the central bank also needs to be staffed by highly competent professionals who can predetermine an appropriate target rate of inflation, monitor the actual behaviour of inflation and implement systematic adjustments in monetary policy instruments to ensure that the target is realized in practice. No one would seriously doubt that these institutional imperatives for the success of inflation targeting are unlikely to be met in the near future in Bangladesh. Another major problem that Bangladesh is likely to face in this area is that, to a large extent, inflation is most likely caused in Bangladesh by supply shocks. In particular, the natural calamities have an important bearing on food prices, a major component of inflation in Bangladesh. This complicates the task of predicting the behaviour of inflation and also of controlling it through monetary policy instruments.

Another requirement for a floating exchange rate regime is that the country should have a deep and competitive foreign exchange market. If the market is thin and controlled by a small number of operators, free float will inevitably lead to a large degree of volatility. This is likely to inhibit trade as well as investment

(both local and foreign) due to greater exposure of economic agents to exchange rate risks. In principle, it can be argued that such risk can be hedged. In practice, this possibility would be of limited relevance for Bangladesh, given the facts that (a) the foreign exchange market of the country is pretty thin even for spot transactions and (b) no organized markets for currency futures and options exist. In the circumstances of Bangladesh where non-residents are unwilling to hold local currency exposure, there will be no net capacity to shift foreign exchange risks abroad at a reasonable price. Therefore, any hedging under a floating exchange rate would basically involve shifting of exchange rate risks of one domestic economic agent to another domestic agent.

A well-regulated, well-supervised and financially sound banking system is also a crucial requirement for a floating exchange rate regime, particularly so if one of the objectives behind the adoption of a floating exchange rate regime is to substantially open up the capital account. With the opening of the capital account, banks play a critical role in intermediating short-term capital flows. If the inflows are not invested appropriately, the exchange rate may come under indefensible speculative attack with disastrous consequences for the economy, as was the case with the East and South-East Asian economies in 1997. Appropriate investment of short-term external capital inflows has to satisfy at least two conditions. First, maturity mismatch has to be prevented. This means the time profile of the income stream generated by investment has to broadly correspond to that of the repayment obligations. Second, currency mismatch has to be avoided. There arises a currency mismatch if most of the income from investment is generated in local currency with repayment obligations inevitably denominated in foreign currency. One need not belabour the point that the banking system of Bangladesh would be simply incapable of meeting the stringent requirements of an open capital account.

Finally, the requirement of high international reserves under the pegged exchange rate regime is of no less relevance to the floating exchange rate regime either. The reason is that the authorities cannot remain as idle onlookers when the exchange rates fluctuate wildly. The experience of developing countries worldwide (in some cases even developed countries) shows that authorities cannot avoid intervening in foreign exchange markets under floating regimes in order to maintain a reasonable degree of stability in the exchange rate. The need for intervention may be even stronger for Bangladesh with its thin foreign exchange market which typically implies greater fluctuations. This is precisely the reason why the Finance Minister has pronounced many times that he would consider the adoption of floating exchange rate only after the country acquires a high level of reserves.

The upshot of the above arguments is that the ex-ante requirements for the adoption of a floating exchange rate regime are not satisfied in Bangladesh. Thus, the justification for a change in the present exchange rate regime is by no means obvious.

III. EXPERIENCES OF OTHER COUNTRIES

The experiences of some countries in the region which implemented major changes in their exchange rate regimes in recent years can provide useful lessons for Bangladesh. This section begins with a brief review of the experience of the five East/South-East Asian Countries (Indonesia, Malaysia, Philippines, Republic of Korea and Thailand) all of which adopted independently floating exchange rate regimes following the Asian crisis in the second half of 1997 with the exception of Malaysia which resorted to a fixed exchange rate policy[2].

The review here is concerned primarily with the comparison of exchange rate volatility before and after the crisis. It is well known that, before the crisis, these countries were basically pursuing pegged exchange rate policies though their regimes (with the exception of Thailand which officially had a pegged rate) were officially branded as managed floats. The post-crisis period is defined as the 24 month period beginning January 1999 and the pre-crisis period is defined as 24-month period ending in June 1997. Thus the period of extreme instability resulting from the crisis is left out of account. The magnitudes of exchange rate variations are captured in the following table.

Table 2 makes it abundantly clear that all the countries experienced much greater volatility in their exchange rates as they switched to floating regimes. And this happened despite the fact that they did not refrain from intervening in the foreign exchange market as well as using domestic policies to stabilize the exchange rates.

Table 2. Monthly exchange rate percentage changes

Country	Period	Range	Standard deviation
Indonesia	Pre-crisis	.033	.007
	Post-crisis	.230	.063
Malaysia	Pre-crisis	.027	.007
	Post-crisis	.000	.000
Republic of Korea	Pre-crisis	.043	.011
	Post-crisis	.066	.017
Philippines	Pre-crisis	.012	.003
	Post-crisis	.068	.017
Thailand	Pre-crisis	.016	.004
	Post-crisis	.070	.018

Source: Hernandez and Montiel, 2001.

---

[2]   This review draws heavily from Hernandedez and Montiel (2001).

Greater volatility and sharper depreciation have also been the experience of South Asian countries which adopted some sort of floating exchange rate regimes in recent years. India adopted a unified exchange rate system in March 1993 in which the exchange rate is determined by the supply and demand condition in the interbank foreign exchange market. The country's exchange rate remained fairly stable till August 1995, but then there was a sharp depreciation against the dollar by 12 per cent by the end of 1995. There was again a sharp depreciation by about 15 per cent between September 1997 and July 1998. By November 2001, there was a further depreciation by about 13 per cent and the rupee/dollar exchange rate was 48.0.

The adoption of a floating/flexible regime has not freed the Reserve Bank of India (RBI), the central bank of India, from intervening in the foreign exchange market. In fact, taking note of the fact that the thinness of the foreign exchange market as well as some large transactions can cause excessive volatility, RBI pursues an explicit policy of intervention in the spot market and also undertakes both forward and swap transactions in support of its exchange rate objectives.

Pakistan can be considered to have adopted a sort of floating exchange rate policy since July 2000 when the exchange rate band was abandoned. Between November 2000 and 2001, the exchange rate depreciated from Rs 57.5 to Rs 60.9 per US dollar. Exchange rate volatility was relatively high between mid-1998 until October 1999 when the fixed peg was adopted for a brief period. With the adoption of the floating system, volatility increased again to pre-peg level.

The State Bank of Pakistan also intervenes in the foreign exchange market. The interventions take the form of outright sales/purchases of foreign exchange, swap transactions and provision of foreign exchange to banks to cover certain bulky imports.

Sri Lanka adopted a free float on 23 January 2001. Immediately after the float, there arose considerable volatility. The currency fell drastically in two days following the float to as low as Rs 98/$ compared to Rs 79/$ in November 2000. This forced the authorities to intervene in support of the currency and introduce stringent control measures so as to restore the currency to Rs 87/$ by about March 2001. By November 2001, the rupee had depreciated to Rs 93/$.

The volatility and the sharp depreciation in Sri Lanka occurred inspite of putting in place precautionary foreign exchange regulations in conjunction with the float. Those regulations, *inter alia*, imposed limits on banks' daily net foreign exchange exposure; enjoined banks to ensure settlement of export credit by using export proceeds within 90 days (later extended to 120 days) and to impose penalties for overdue settlements; introduced restrictions and deposit requirements for banks' forward sales of foreign exchange and prohibited prepayment of import bills. The country also has a set of detailed guidelines for dealing in the foreign exchange market and for conduct of intervention by the central bank.

IV. HAS THE EXCHANGE RATE REGIME OF BANGLADESH PERFORMED POORLY?

This section examines the performance of Bangladesh in terms of certain key objectives that an exchange rate regime is expected to promote. The relevant objectives are: (a) the prevention of any major misalignment of exchange rate and, in particular, the prevention of appreciation of the real effective exchange rate which can hurt exports; (b) the promotion of exports and containment of the current account deficit; (c) moderation of inflation; and (d) enhancement of remittances – a matter of special concern for Bangladesh, given that the remittances financed a significant portion of the country's trade deficit throughout the 1990s (Islam, 2002).

(a) Misalignment of exchange rate

The prevention of misalignment implies that the actual exchange rate should correspond to the estimate of the equilibrium exchange rate. It is not easy to either define the equilibrium exchange rate or to estimate it. That would be a complex exercise in itself and is beyond the scope of the present paper. However, a recent study has undertaken such an exercise for Bangladesh (ADB, 2002a). The study concludes that the misalignment between the actual and equilibrium exchange rate for the period 1997 to 2001 has been small and has progressively narrowed since 1998. During 2001, the misalignment was only 2.2 per cent.

It will also be recalled from table 1 that the exchange rate policy certainly succeeded in preventing appreciation of the real effective exchange rate throughout the 1990s. In fact there has been more or less consistent depreciation of REER, the index rising to 116.2 in the year 2000 with 1991 as the base year. There was only one year, 1994, in which there was any noticeable appreciation and in that year the index fell to 102.2 compared to 104.6 in the preceding year.

It can thus be concluded that the exchange rate regime has avoided any major misalignment in the exchange rate.

(b) Exports and current account balance

Table 3 provides the perspective on export performance of Bangladesh in comparison with the other major South Asian economics.

It is evident from table 3 that Bangladesh has performed better than the other major South Asian countries. However, improved export performance cannot be the sole objective of exchange rate policy. What happens to the overall current account balance is an important consideration. Table 4 presents data on current account deficit.

It is quite clear that Bangladesh's achievement in terms of containing the current account deficit is by no means unsatisfactory. It has done consistently better than Sri Lanka, and better than Pakistan in all the recent years excepting 2001. The

Table 3. Average annual growth rate of export of goods and services

Country	Period	
	1990-1999	*2000-2001*[a]
Bangladesh	13.2	10.3
India	11.3	9.3
Pakistan	2.7	8.9
Sri Lanka	8.4	3.5

Sources: World Bank (2001) and ADB (2002 b).
[a] Relates to merchandise exports only

Table 4. Current account deficit as percentage of GDP

Country	Years				
	1997	*1998*	*1999*	*2000*	*2001*
Bangladesh	2.1	1.1	1.4	1.0	2.1
India	1.3	1.0	1.1	0.6	0.5
Pakistan	6.4	3.2	4.1	1.9	0.9
Sri Lanka	2.6	1.4	3.6	6.5	3.4

Source: ADB (2002 b).

only country with which Bangladesh compares somewhat unfavourably is India, but that should not come as a surprise even to a casual observer in view of India's high savings rate and level of industrialization.

(c)   Inflation

Experience shows that countries have developed with different degrees of inflation. Nevertheless, a consensus has emerged that high and unstable inflation rates are not conducive to development. High inflation reduces returns to savers and thus acts as a disincentive to save and invest. In particular, saving in financial form is likely to be discouraged. This complicates the task of mobilizing savings for productive investment. The viability of financial and capital market institutions which act as crucial intermediaries between savers and investors is impaired. High inflation is also likely to distort the pattern of investment in favour of real estate, gold or other forms of property as hedging devices without adding much to an economy's productive capacity. The international competitiveness of the economy is badly eroded by inflation. It generally encourages capital flight, exacerbates income distribution, gives rise to inequities in income distribution and aggravates poverty. Last but not the least, a high rate of inflation seriously undermines the popularity of the government.

The discussion of inflation in the context of the exchange rate regime becomes relevant because of two major considerations. First, a change in the exchange rate is almost certain to cause a change in the domestic prices of tradables. Second, the prices of non-tradables are also likely to be affected because the non-tradables often use tradable inputs and the demand switch generated by an initial change in the exchange rate may not elicit a corresponding supply response from the non-tradable sector to leave prices unchanged.

In the backdrop of the above arguments, it is useful to look at the performance of Bangladesh in respect of inflation. The relevant data are presented in table 5.

Table 5. Inflation in Bangladesh and selected South Asian countries

Country	Years					
	1996	*1997*	*1998*	*1999*	*2000*	*2001*
Bangladesh	6.6	2.5	7.0	8.9	3.4	1.6
India	4.6	4.4	5.9	3.3	7.2	4.7
Pakistan	10.4	11.3	7.8	5.7	3.6	4.4
Sri Lanka	14.6	7.1	6.9	5.9	1.2	11.0
South Asian average	5.8	5.2	6.3	4.2	6.2	4.6

Source: ADB (2002 b).

It is obvious from the data that Bangladesh has done reasonably well in terms of the inflation criterion. During the past decade, its inflation rate never reached double-digit level. In every year except 1999, the inflation rate in Bangladesh has been comparable to or lower than the South Asian average.

(d) Remittances

As noted before, remittances by Bangladeshi workers employed abroad play an important role in moderating the country's trade deficit. The country's performance in respect of remittances can be gauged from the table below:

Table 6. Number of persons going abroad for employment and remittances

Year[a]	Number of persons	Remittances (Millions of US dollars)
1991	96 691	763.91
1992	185 106	849.66
1993	237 779	944.57
1994	192 263	1 088.72
1995	199 925	1 197.63
1996	181 462	1 217.06
1997	227 584	1 475.42
1998	242 811	1 525.43
1999	270 390	1 705.74
2000	248 291	1 949.32
2001	213 339	1 882.10
2002 (July to March)	139 000	1 811.10

Sources: Bangladesh Bank (2002) and Ministry of Finance (2002).
Note: FY 1990-91 is defined as 1991.

Table 6 shows that remittances in dollar terms have maintained an uninterrupted upward trend. There was only a minor blip in 2001.

The discussion in this section makes it abundantly clear that the performance of Bangladesh in terms of certain key objectives that an exchange rate regime is expected to promote has been quite satisfactory. In the minimum, therefore, it can be stated that the present exchange rate regime of Bangladesh has served the country reasonably well.

V. SUMMARY AND CONCLUSIONS

The principal findings of the paper and their implications are summarized below:

- Bangladesh pursues an active exchange rate policy in the framework of a regime that can be characterized as one of adjustable basket peg.
- By and large, the country satisfies the conditions which justify the adoption of some sort of pegged exchange rate regime.
- In contrast, the economic and institutional prerequisites of a floating exchange rate regime are not met in Bangladesh.
- The experiences of other countries in the region show that a floating regime generates greater volatility in exchange rates. The attendant uncertainty is likely to affect adversely the overall trade and

investment climate which is already afflicted by many unfavourable elements in Bangladesh.

- The experiences of other countries also show that a floating regime does not eliminate the need for intervention in the foreign exchange market. Given the thinness of the market in Bangladesh, the need for intervention may be even greater in Bangladesh as the authorities cannot remain silent spectators when the exchange rate gyrates wildly.

- The present exchange rate regime in Bangladesh has served the country quite well. No major misalignment of the equilibrium exchange rate has occurred and the real effective exchange rate has not been allowed to appreciate. There has been satisfactory performance in terms of certain key macroeconomic indicators such as export growth, current account deficit, inflation and remittances by non-resident Bangladeshis.

Finally, it is instructive to bring to the attention of the readers the conclusions of a recent study by IMF economists (Mussa and others, 2000). According to this study, it can be safely stated that many developing and transition economies, especially those lacking a well-developed financial infrastructure including sophisticated financial institutions and broad and deep markets for foreign exchange (Bangladesh certainly belongs to this category), do not satisfy the requirements for a successful float.

In a different context, another IMF study specifically devoted to Bangladesh stated: "Given such pros and cons, the choice of exchange rate regime is not clear-cut. What matters is a set of sound economic policies that remain consistent with any chosen exchange rate regime" (Hossain, 2002, p. 23).

At a strictly philosophical level, one can argue that the exchange rate is a price and like any other price, it should be fully flexible. But to compare the price of foreign exchange which affects virtually all sectors of the economy with, let us say, the price of a pair of socks is both an intellectual absurdity and a practical folly.

REFERENCES

Asian Development Bank, 2002a. *Quarterly Economic Update*, (Dhaka, Bangladesh Resident Office), March.

_____, 2002b. *Asian Development Outlook 2002* (Hong Kong, Oxford University Press).

Bangladesh Bank, 2002. *Economic Trends* (Dhaka, Statistics Department of Bangladesh Bank), January.

Hern'andez, Leonardo and Peter Montiel, 2001. *Post Crisis Exchange Rate Policy in Five Asian Countries: Filling in the "Hollow Middle"?* (Washington, D.C., IMF, Working Paper No. WP/01/170).

Hossain, Akhtar, 2002. *Exchange Rate Responses to Inflation in Bangladesh* (Washington, D.C., IMF, Working Paper No. WP/02/XX).

Islam, Azizul, 2002. "The impact of exchange rate changes on selected economic indictors of Bangladesh", mimeo.

Ministry of Finance, 2002. *Bangladesh Economic Survey, 2002* (Dhaka, Government of Bangladesh).

Mussa, Michael and others, 2000. *Exchange Rate Regimes in an Increasingly Integrated World Economy* (Washington, D.C., IMF, Occasional Paper No. 193).

Velasco, Andre, 2000. *Exchange Rate Policies for Developing Countries: What Have We Learned? What Do We Still Not Know?* (New York and Geneva, United Nations Conference on Trade and Development).

World Bank, 2001. *World Development Report 2000/2001* (Washington, D.C., Oxford University Press).

LEADING INDICATORS FOR MONITORING THE STABILITY OF ASSET AND FINANCIAL MARKETS IN ASIA AND THE PACIFIC

Biswanath Bhattacharyay* and G. Nerb**

The Asian economic and financial crisis of 1997 has spawned a considerable body of analysis as to its origin, causes and resolution. It is generally recognized that structural weaknesses of the financial systems of the affected countries were at the core of the problem. It follows from this that monitoring the stability of financial markets, including asset markets, and devising early warning systems for problems in these markets would enable the authorities to deal better with potential crises and to develop more effective policy interventions to that end. The Asian Development Bank has undertaken the development of a system of MPIs macroprudential indicators (MPIs) to facilitate cross-country comparisons of economic and financial vulnerability in the Asian and Pacific region. This paper evaluates the significance of the MPIs chosen for this purpose and highlights the need for a core set of leading indicators for giving early warning of financial vulnerability.

In 1997, Thailand, Malaysia, Indonesia, the Philippines and the Republic of Korea reeled from a devastating financial crisis. Following years of robust growth, positive strides in standards of living and export expansion, these economies suffered from crippling devaluations, massive capital flight, corporate and banking failures and spikes in unemployment. In contrast with the substantial capital inflows in the early 1990s, close to US$100 billion of capital flew out of the region shortly after the Thai baht peg collapsed.

The Asian crisis has spawned a massive literature on the economics of the crisis that advance numerous hypotheses on the origin, development and resolution of crises. Although it is acknowledged that the financial crisis in Asia was multifaceted

*   Senior Planning and Policy Officer, Strategy and Policy Department, Asian Development Bank, Manila.
**   Director, Business Survey Department, IFO Institute for Economic Research, Munich, Germany.
     The views expressed in the paper are those of the authors and do not necessarily reflect those of Asian Development Bank or IFO Institute for Economic Research.

and that no single cause can explain the entire phenomena, it is generally recognized that structural weaknesses of the financial system were at the core of the problem.

More specifically, at the heart of the currency turmoil and banking crises is the speculative pressure that economic agents bring to bear on vulnerable financial and economic systems, and the shortcomings of policy responses on the part of national authorities and the international financial institutions alike. In such situations, the role of timely and accurate information is paramount in informing policy officials of the probability and potential severity of crises, the specifics of an individual crisis and the policy interventions required. Hence, the immediate aftermath of the crisis saw renewed calls for monitoring the stability of asset and financial markets, early warning, international cooperation in policy consultations, coordination, etc. It is in the context of the need to monitor the strength and vulnerability of financial markets where the development of macroprudential indicators (MPI) or financial soundness indicators acquires greater relevance. MPIs are defined broadly as indicators of the health and stability of financial systems.

Because the MPIs are indicators that measure certain attributes of the financial sector (e.g. measures of incidence of non-performing loans), they are appropriate tools for monitoring the stability or vulnerability of the financial system. Inasmuch as the soundness of the financial sector depends critically upon prevailing macroeconomic conditions (Sundarajan, Marston and Basu 1999), MPIs also include macroeconomic variables in addition to indicators specific to the financial sector. A number of MPIs are also used in models of early warning (Kaminsky, Lizondo and Reinhardt 1998). There is value in developing a common set of indicators to permit cross-country comparisons of experiences and to evaluate regional effects.

The Asian Development Bank (ADB), through a technical assistance project, undertook the development of a system of commonly agreed MPIs for selected developing member countries or areas, namely Fiji, Indonesia, the Philippines, Thailand, Viet Nam and Taiwan Province of China. This paper aims to evaluate a set of commonly agreed ADB MPIs and identify or select a core set of leading indicators that could give early warning signals of vulnerability of financial markets, and support regular economic and financial monitoring.

I. ASIAN DEVELOPMENT BANK MPIs

The process of identifying and collecting the MPIs is a necessary precondition for a comprehensive process of monitoring and responding to financial sector risks. Interpretation and analysis of these indicators is also a major challenge. The MPIs are used in macroprudential analysis, which is a tool that helps to quantify and qualify the soundness and vulnerabilities of financial systems. Macroprudential analysis can also be understood as the analytical framework for interpreting the MPIs or the indicators of financial soundness or stability. Clearly, the choice of the MPIs will

depend on the level of sophistication of the macroprudential analysis to be employed. For instance, the International Monetary Fund (IMF, 2001) collects not only the traditional macroeconomic indicators but also includes aggregated microprudential data (i.e. data at the firm level) and market-based indicators as well. This combination of MPIs is used by the IMF in conducting stress tests and scenario analysis to determine the sensitivity of the financial system to macroeconomic shocks. Alternatively, the vulnerability of the financial system can be assessed using simple benchmarks, critical or regulatory thresholds, or comparisons with peer group or historical norms.

Work on the MPIs and their interpretation is still recent and there is no consensus on an optimum set of MPIs nor of the best analytic framework to use. In fact, there is as yet no universally accepted definition of financial soundness or stability. Obviously, the degree of complexity of the macroprudential analysis will depend on factors such as degree of accuracy of assessing vulnerability that is desired, technical capacity of the monitoring agency, cost and availability of data and the structure, openness, and sophistication of the financial system. Although there is a limited amount of empirical work that has identified some possible MPIs, at this early stage in their development the identification and relative importance of the MPIs remains largely a matter of judgment given the aforementioned factors.

In general, there are a number of desirable characteristics of MPIs. First, from the point of view of crisis prevention, the MPIs should have early warning capability. Thus, taken from a statistical perspective, desirable MPIs should be leading indicators or at least coincident indicators. For short-term monitoring use, the ideal frequency of the indicators should be quarterly or monthly. Also, some capital market indicators can provide continuous monitoring of some aspects of the financial system.

Secondly, the set of MPIs should include a broad variety of indicators since currency and banking crises seem to be usually preceded by multiple economic problems. For instance, Kaminsky and Reinhardt (1999) identified 15 early warning variables whereas Goldstein, Kaminsky and Reinhardt (2000) add another nine variables to the earlier set. According to this research, the variables that have the best track record in anticipating crises include exports, deviations of the real exchange rate from trend, the ratio of broad money to gross international reserves, output and equity prices.

Third, qualitative variables should also be considered in the set of MPIs. Traditionally, MPIs in the literature are quantitative variables. However, the importance of qualitative variables cannot be underestimated, especially when dealing with financial variables. In emerging markets, where in the light of contagion, speculative pressure can be very powerful, qualitative measures can be important. Also, in developing markets, the qualitative analysis of possibly underdeveloped financial market infrastructures and supervisory institutions could provide important information about possible crisis situations. Thus, there is a need to combine quantitative and qualitative indicators for assessing the health of a financial market. The qualitative indicators or

information should include a judgment on the adequacy of the institutional and regulatory framework of countries.

Under the ADB's technical assistance project, an inception workshop was conducted in April 2000 and a follow-up a year later. One major objective of the first workshop was agreement on the list of indicators which should be included in a harmonized financial and monetary monitoring system. On this basis, each participating country would develop, compile, analyze and disseminate the commonly agreed key indicators on a regular basis. During the Inception Workshop, the participating countries in consultation with representatives from IMF, the Bank for International Settlements (BIS), Deutsche Bundesbank, Bank of Japan, Bank of Korea, Australian Bureau of Statistics, ESCAP, and ADB identified a set of commonly agreed MPIs, with the following subsets of indicators (Bhattacharyay, 2001):

a) External Debt and Financial Flows (8 indicators);
b) Money and Credit (17 indicators);
c) Banking (14 indicators);
d) Interest Rates (12 indicators);
e) Stock Markets and Bonds (9 indicators);
f) Trade, Exchange and International Reserves (10 indicators); and
g) Business Survey Data (9 indicators): mainly Manufacturing but also Construction, Retail and Wholesale Trade and Services.

The system of ADB MPIs can be classified into three categories, namely, (i) aggregated microprudential indicators of the health of individual financial institutions; (ii) macroeconomic indicators concerning the health of financial sectors; and (iii) qualitative business tendency survey indicators. The set is unique as it includes qualitative and leading business tendency survey indicators as key elements. Of course, as will be covered more fully later, these MPIs should have a clear theoretical link with the vulnerability and soundness of the financial sector.

The agreed set of indicators is comprised of the core set (commonly agreed) and some additional ones (specific to country needs). Table 1 reports the list of the 67 commonly agreed indicators.

It was agreed in the workshop that participating countries should for the time being adhere to the list of 67 commonly agreed indicators and the set of voluntary additional indicators and gain experience in using this information as an analytical tool before changing the list of indicators. Countries could compile and analyse any additionally agreed indicators for meeting country-specific requirements depending on data availability. Table 2 presents the 33 additional indicators that are specific to country needs.

Table 1. ADB commonly agreed macroprudential indicators

External Debt and Financial Flows

1. Total Debt (per cent of GDP) – ratio of total debt to nominal GDP.

    a. ...of which public debt
    b. ...of which private debt

2. Long Term Debt (per cent of total debt) – ratio of long term debt to total debt.

3. Short Term Debt (per cent of GDP) – ratio of short-term debt to nominal GDP.

4. Short Term Debt (per cent of total debt) – ratio of short-term debt to total debt.

5. Foreign Direct Investment (per cent of GDP) – ratio of foreign direct (expressed as flows) investment to nominal GDP.

6. Portfolio Investment (per cent of GDP) – ratio of portfolio investment (expressed as flows) to nominal GDP

Money and Credit

7. M1 Growth (per cent) – per cent difference from previous period. M1 are liabilities of the monetary system consisting of currency and demand deposits.

8. M2 Growth (per cent) – per cent difference from previous period. M2 equals M1 plus quasi-money.

9. Money Multiplier (ratio) – ratio of M2 to money base. Money base is the sum of currency in circulation, reserve requirement and excess reserves (with the central bank).

10. M2 (per cent of International Reserves) – ratio of M2 to international reserves.

11. M2 (per cent of GDP) – ratio of M2 to nominal GDP.

12. M2 to international reserves growth – the growth rate of M2 over international reserves.

13. Quasi money (per cent of GDP) – ratio of quasi money to nominal GDP.

14. Money Base Growth (per cent) – per cent difference from previous period.

15. Central Bank Credit to the Banking System – Central Bank's credit to the banking system.

16. Growth of Domestic Credit (per cent) – per cent difference from previous period. Consists of net claims from central government, claims on official entities and state enterprises, and claims of private enterprises and individuals.

17. Domestic Credit (per cent of GDP) – ratio of domestic credit to nominal GDP.

18. Credit to Public Sector (per cent of GDP) – ratio of credit to public sector to nominal GDP.

19. Credit to Private Sector (per cent of GDP) – ratio of credit to private sector to nominal GDP.

20. Capital Adequacy Ratio (per cent) – ratio of total capital to risk weighted assets (threshold value is 8 per cent meaning that the ratio should not be less than this value). Ratio of Tier 1 + Tier 2 capital to risk weighted assets. Tier 1 capital includes issued and paid-up share capital, non-cumulative preferred stock and disclosed reserves from post-tax retained earnings. Tier 2 capital can include a range of other entities. These are undisclosed reserves that passed through profit and loss account, conservatively valued revaluation reserves, revaluation of equities held at historical cost (at a discount), some hybrid instruments, general loan loss reserves (up to 1.25 per cent of risk weighted assets) and subordinated term debt.

Table 1. *(continued)*

21. Liquidity Ratio (per cent) – ratio of commercial banks' liquid assets to total assets: a) domestic liquid asset ratio and b) foreign liquid asset ratio.

Banking

22. Bank Capital (per cent of Total Assets) – ratio of capital equity including reserves, profits and loss to total assets.

23. Total Assets (per cent of GDP) – ratio of total assets (as in Monetary Survey without interbank positions) to nominal GDP.

24. Growth of Total Assets (per cent) – per cent growth from previous period.

25. Share of 3 Largest Banks (per cent of total assets)

26. Net Operating Profits (per cent of period-average assets)

27. Loan-Loss Provisions (per cent of Non-Performing Loans) – ratio of loan loss provision to non-performing loans

28. Non-Performing Loans (per cent of total loans) – ratio of non-performing loans

29. Loans to Key Economic Sectors and (per cent of total loans)

30. Real Estate Loans (per cent of total loans) – ratio of real estate loans to total loans.

31. Total Loans (per cent of total deposits) – ratio of total loans to total deposits (i.e., demand deposits, savings deposits and time deposits.)

32. International Liabilities from Banks with Maturities, Total (US$ million) – total international liabilities from commercial banks.

    a. short term borrowing
    b. long term borrowing – more than one year

33. International Liabilities with Maturities, one year and less (US$ million) – total international liabilities from commercial banks.

Interest Rates (mean rate)
    (In case of monthly data, average of daily rates; in case of quarterly data, monthly averages are to be applied)

34. Central Bank Lending Rate (e.o.p.) – end of period; rate at which the monetary authorities lend or discount eligible paper for deposit money banks.

35. Commercial Bank Lending Rate (a.o.p.)/Prime Rate – average of period; ratio of commercial bank lending rate to prime rate. Prime rate refers to the short and medium term financing needs of the private sector.

36. Money Market Rate/Inter-Bank Rate (a.o.p.) – average of period; rate at which short-term borrowings are effected between financial institutions.

37. Short-term (3 mos.) Time Deposit Rates – interest rates of savings account held in a financial institution for 3 months or with the understanding that the depositor can withdraw only by giving a notice.

38. Long-term (12 mos.) Time Deposit Rates – interest rates of savings account held in a financial institution for 12 months or with the understanding that the depositor can withdraw only by giving a notice.

Table 1. *(continued)*

39. US$ (international market)/Domestic Real Deposit Interest Rate – unweighted averages of offered rates quoted by at least 5 dealers early in the day for 3-month certificates of deposit in the secondary market.

40. Bond/Treasury Bill Yield (short term) – yield to maturity of government bonds (short-term)

41. Bond/Treasury Bill Yield (long term) – yield to maturity of government bonds (long-term)

Stock Markets and Bonds

42. Foreign Share in Trading (per cent of total volume of trading) – proportion of foreign share in trading to total volume of trading.

43. Share of 10 Top Stocks in Trading (per cent of total volume of trading) – proportion of top 10 stocks in trading to total volume of trading.

44. Composite Stock Price Index (in national currency unit) – equity price index of national capital city and expressed in national currency unit.

45. Composite Stock Price Index Growth – per cent difference from previous period of equity price index; end of period and based on national currency unit.

46. Composite Stock Price Index (in US$) – equity price index of national capital city and expressed in US$.

47. Market Capitalization (per cent of GDP) – ratio of market capitalization to nominal GDP. Market Capitalization refers to the total market value of stocks or shares.

48. Stock Price Earnings Ratio

Trade, Exchange and International Reserves

49. Export Growth (per cent) – export growth (fob) per cent difference from previous period.

50. Import Growth (per cent) – import growth (cif) per cent difference from previous period.

51. Trade Balance (US$ million) – difference between exports (fob) and imports (cif)

52. Current account deficit/surplus (US$ million)

53. Exchange Rate (average of period) – national currency unit to the US$

54. Exchange Rate (end of period) – national currency unit to the US$

55. Real Effective Exchange Rate – ratio of an index of the period average exchange rate of a currency to a weighted geometric average of exchange rate for the currencies of selected countries adjusted for relative movements in national prices of the home country and the selected countries. Refers to the definition used in the IMF, IFS series.

56. International Reserves (US$ million) – international reserves include total reserves minus gold plus gold national valuation.

57. Growth of International Reserves (per cent) – per cent difference from previous period.

58. International Reserves (per cent of imports) – ratio of international reserves to total imports.

Table 1. *(continued)*

Business Survey Data (Manufacturing, Construction, Trade and Services)

59. Assessment of Current Business Situation

60. Expectations on Business Situation in Next Months/Quarters

61. Limits to Business (present situation)

62. Stocks of Finished Products (present situation)

63. Assessment of Order Books

64. Selling Prices (future tendency)

65. Employment (future tendency)

66. Financial Situation (present situation)

67. Access to Credit (present situation)

Table 2. List of additional indicators

External Debt and Financial Flows

1. Short Term Debt (per cent of foreign reserves)

2. Use of IMF credit (per cent of GDP) – ratio of IMF credit to nominal GDP

Money and Credit (data from IFS)

3. Growth of Currency in Circulation (per cent)

4. M3 Growth – per cent difference from previous period. M3 equals M2 plus liabilities of other financial institutions.

Banking

5. Non-Performing Loans (per cent of average assets): simple average of assets over the period

6. Loans to Commercial Real Estate Sector (per cent total loans)

7. Loans to Residential Real Estate (per cent total loans)

8. International Liabilities from Banks, with Maturities over 1 year and up to 2 years (US$ million) – total international liabilities from commercial banks.

9. International Liabilities from Banks, with Maturities over 2 years (US$ million) – total international liabilities from commercial banks.

10. International Liabilities from Banks, with Maturities, unallocated (US$ million) – total international liabilities from commercial banks.

11. Gini coefficient of market shares of banks in terms of assets.

Interest Rates

12. Real Deposit Rate (3 mos.) (a.o.p.) – average of period; defined as the difference between deposit and inflation rate.

Table 2. *(continued)*

13. Real Lending Rate (3 mos.) (a.o.p.) – average of period; defined as the difference between commercial bank lending and inflation rate.

14. Real Lending Rate – Real Deposit Rate (each 3 mos.) – difference between commercial bank lending rate and deposit rate.

15. Real Lending Rate/Real Deposit Rate (each 3 mos.) – ratio of real lending rate to real deposit rate.

Stock Markets and Bonds

16. Gini Coefficient of Market Share of Stocks in Trading – measure of concentration of market capitalization (inequality of market share among the stocks traded during the day). This is the ratio of the actual concentration of total value of stocks among traded companies to the maximum concentration.

$$\text{Gini Coefficient} = \frac{N+1}{N-1} - \frac{2}{N(N-1)A}\left(\sum_{i=1}^{N} P_i\, a_i\right)$$

where:

P_i = is the rank of each company in the stock market counting from the top in terms of stock assets or market capitalization
a_i = stock asset of ith company
A = total asset or market capitalization of all securities
N = total number of companies listed

17. Turnover in stocks (as per cent of market capitalization)

18. Turnover in bonds (as per cent market capitalization)

    a. Volume of government bonds traded

    b. Volume of corporate bonds traded

19. Turnover in mutual funds (as per cent market capitalization)

20. Foreign investment in stock by sector

Business Survey Data (Manufacturing, Construction, Trade and Services)

21. Production/Turnover (present tendency)

22. Production/Turnover (expected tendency)

23. Capacity Utilization (present situation)

24. Credit Demand by Sector (only for survey of financial sector)

Supervisory Surveys

25. Lending and Credit Standards of Financial Institutions

26. Proportion of Institutions Having License Withdrawn

27. Spreads Between Reference Lending rates and Reference Borrowing Rates

Table 2. *(continued)*

28.	Spreads Between Depository Corporations' Securities and the Rate of Comparable Treasury Securities
29.	Securities Between Depository Corporations' Subordinated Debt Securities and the Rate for Comparable Treasury Securities
30.	Distribution of 3-Month Local Currency Interbank Rates for Different Depository Corporations
31.	Average Interbank Bid-Ask Spread for 3-Month Local Currency Deposits
32.	Average Maturity of Assets

Others

33.	Real Estate Price Index and Its Growth Rate

The concluding workshop was held in May 2001 in Manila. The objectives of the concluding workshop were to: (i) present and discuss the country compendium on commonly agreed MPIs as per the conclusions of the inception workshop as well as provide an analysis of the indicators; (ii) discuss the various approaches and methodologies used in producing the MPIs and the problems and issues encountered in generating them; (iii) appraise participants on the appropriate analysis and interpretation of the indicators and the usefulness of composite indicators for monitoring the asset and financial markets; and (iv) provide recommendations and share the countries' future plans on compiling, analyzing, interpreting, and disseminating MPIs and other activities related to the monitoring of the vulnerability of the asset and financial markets. The concluding workshop was attended by 13 participants from six countries and areas: Fiji, Indonesia, the Philippines, Taiwan Province of China, Thailand, and Viet Nam. There was one representative from IMF, one from the European Central Bank, eight from ADB (including an ADB consultant from IFO Institute, Germany), one from the University of Asia and the Pacific, and five observers from the Ministry of Finance, Viet Nam, the Ministry of Economy and Finance, Cambodia, the Ministry of Finance and Revenue, Myanmar, and the Bangko Sentral ng Pilipinas.

It needs to be appreciated that the task of macroprudential analysis or the framework for identifying and interpreting MPIs is still work-in-progress. Various international financial institutions such as IMF, ADB, as well as private firms are still in the process of developing or testing different systems. As such, there is no standard system for macroprudential analysis at present. Yet, as the experience of the Asian crisis shows, systematic monitoring of the financial and economic systems is an important element in crisis prevention strategies. Regional Technical Assistance (RETA) is thus envisioned to provide a catalytic role in developing macroprudential

systems in Asian and Pacific developing member countries. This role takes practical form in the identification, collection and dissemination of an initial set of MPIs.

All the participating countries have already undertaken the necessary steps to implement the gathering and dissemination of the commonly agreed MPIs. In fact, arrangements have been made for countries to submit to ADB two types of templates – monthly and quarterly – for eventual posting in the ADB website. The template organizes the MPIs according to the following categories: (a) external debt and financial flows(b) money and credit; (c) banking; (d) interest rates; (e) stock market and bonds; (f) trade, exchange and international reserves; and (g) business survey data. In preparing the core set of MPIs, some countries could not include all items in the recommended list of MPIs for the reason that the availability of data and collection problems varied significantly among the participating countries. For instance, some participating DMCs, especially those in transition, do not have fully developed stock markets. Hence, they could not report stock market-based MPIs. The MPI data are already available in the ADB statistics website. Most of the participating countries are submitting quarterly updates of MPIs. The commitment of the participating countries to regularly submit to ADB updates of the MPI is important for the systematic development and refinement of the MPI analysis. In future, other developing member countries of ADB will be invited to submit their MPIs on a regular basis to the ADB website. Furthermore, there is an urgent need to strengthen the capacity of those countries to analyse and interpret these MPIs.

One of the distinguishing features of the ADB MPIs, as proposed in this RETA, is the inclusion of information gleaned from business tendency/confidence surveys (BTS). The use of BTS within the framework of MPI is unique in the literature on MPIs. The main reason for incorporating BTS information as part of the MPIs is due to the ability of BTS to capture current and future profitability trends in the corporate sector. Precisely because expectations can play an important role in the business cycle, it can have a significant influence on investments, output and employment. Inasmuch as the health of the financial sector is tied up with developments in the real sector, e.g. the effect of the profitability in the corporate sector on the loan portfolios of banks and the information gathered from the BTS can have a bearing on the health of the financial system. More importantly, since BTS are by nature forward looking, the information they convey can augment the early warning capabilities of the conventional quantitative MPIs.

All participating countries are conducting business surveys or are in the process of introducing them. However, there is scope for further work on incorporating BTS in the MPI framework. Issues such as harmonization of the survey instrument and its interpretation are areas for capacity-building. ADB has recently implemented another regional technical assistance project (RETA 5938) jointly with OECD to help selected countries develop Business Tendency Surveys using the harmonized set of core questions used by most OECD countries. The countries or areas involved are China;

Hong Kong, China; India; Indonesia; Malaysia; the Philippines, the Lao People's Democratic Republic: Singapore; Thailand and Viet Nam. Under this RETA, each country conducted a pilot BTS Survey based on the improved and harmonized questionnaire, analyzed and interpreted the results and published a report and compendium on these qualitative statistics.

II. IDENTIFICATION AND EVALUATION OF CORE SET OF LEADING INDICATORS

Following the selection of the commonly agreed indicators, an attempt was made to identify a core set of leading indicators that could give early warning signals of the vulnerability of financial markets, based on graphical analysis of the series of MPIs compiled by countries.

One of the main objectives of this exercise is to identify indicators which appear to be particularly promising for financial and economic monitoring and which therefore should be included in a core list of harmonized indicators at ADB. Although a broad and exhaustive set of indicators could potentially give a more complete assessment of the soundness of financial systems, they can be costly to compile and unwieldy to maintain for the purpose of periodic monitoring. Hence, the workshops recommended that a separate core set of MPIs of manageable size be kept and updated regularly. Apart from this core set of indicators, there will be a number of series of special importance in some countries but not in all.

As indicated earlier, one criterion for inclusion in the core set of MPIs is early warning capacity. Hence, the MPI should be a leading indicator or, at the very least, a coincident one. For a short-term monitoring system, however, only indicators which are available at least on a quarterly basis (even better on a monthly one) can be useful. However, this requirement is not always fulfilled by all participants.

As the data series provided by the countries participating in RETA 5869 are not very long (available only from 1995 onward or even later) and are not always complete over the whole time span, it may not be appropriate at this stage to apply formal statistical methods like regression or factor analysis to identify the best candidates for a harmonized set of core MPIs but to use in this first round graphical inspection of the series. At a later stage, more formal statistical methods should be applied to identify the exact informational content of those series and to use multivariate analysis to estimate the joint impact of different subsets of indicators for explaining and forecasting banking and currency crises.

According to this pragmatic approach, the following series have been selected for the core set of ADB MPIs. In cases where a clear lead could not be detected this is labeled with coincident/leading. It appears at this stage that it is not possible to give a range of the lead in months or weeks. For this purpose, observations over a longer time span and the construction of a synthetic curve acting as reference series

would be necessary. Table 3 presents the core set of leading MPIs which are selected on the basis of trend analysis of commonly agreed indicators. The trend analysis for relevant countries is presented below.

Table 3. Core set of leading MPIs

Type of indicator	Title	Characteristics
Money and Credit		
7.	M1 Growth (percentage)	leading
8.	M2 Growth (percentage)	leading
4. (additional)	M3 Growth (percentage)	leading
15.	Central Bank Credit to Banking System	coincident/leading
16.	Domestic Credit Growth (percentage)	coincident/leading
17.	Domestic Credit Growth (in percentage of GDP)	coincident/leading
19.	Credit to Private Sector (in percentage of GDP)	coincident/leading
Banking		
26.	Net Bank Profits (in percentage of total assets)	leading
31.	Total Bank Loans (in percentage of total deposits)	leading
33.	International Borrowings with Maturities one year and less (US$ million)	leading
6. (additional)	Real Estate Loans	leading
Interest Rates		
36.	Money Market Rate/Inter Bank Rate	leading
Stock Markets and Bonds		
44.	Composite Stock Price Index	leading
47.	Market Capitalization (in percentage of GDP)	leading
48.	Stock Price Earnings Ratio	leading
Trade, Exchange and International Reserves		
55.	Real Effective Exchange Rate	coincident/leading
56.	International Reserves	leading
Business Survey Results		
59.	Current Business Situation	coincident/leading
60.	Expected Business Situation (next 6 months)	coincident/leading
62.	Stocks of Finished Products	coincident/leading
65.	Employment (Present Situation)	coincident/leading
66.	Financial Situation (Present Situation)	coincident/leading

According to business cycle and economic indicators research, reliable indicators (both coincident and leading) should not only have a sound statistical basis (e.g. broad coverage, representative, no missing data), short delay in publication, limited ex post revisions, a good track record in the reference period and, importantly, a solid theoretical foundation. Otherwise there exists the problem of measurement without theory ("fishing in the data").

Taking into account these requirements, the main arguments for selecting the above-mentioned indicators are the following:

Growth rates of M1, M2 and M3: liquidity indicators

The growth rates of money supply aggregates (percentage change from the previous period) – despite some irregular changes which could be smoothed out with a low-pass filter – signal in advance dangers for financial stability due to excess liquidity which may cause inflation to pick up or create over-exuberance of investment. This again may fuel speculative attacks on the currency, thus leading possibly to a currency crisis.

Excess liquidity can feed into the money financed fiscal deficit basis for currency crisis as in the first generation model for currency crises. Alternatively, excessive liquidity can lead to over investment or to real appreciation of the currencies with the attendant loss in export competitiveness. In such cases, "excess" money balances can render an economy vulnerable to shocks.

Apart from this theoretical foundation, the money aggregates have the advantage of availability in practically all countries on a monthly basis. The publication lag varies between one and three months; efforts should be made to shorten this time lag to about one month in all countries participating in this harmonized financial monitoring project.

Figures 1-5 (see appendix) present the trend of growth rates of narrow and broad money supply, namely, M1 (Thailand and Indonesia), M2 (Thailand and Indonesia), and M3 (Thailand).

Central bank credit to banking system

A large increase in central bank credit to banks and other financial institutions often reflects severe liquidity or solvency problems in the financial sector. Although central bank credit is part and parcel of the functions of the central bank as the facilitator of the smooth functioning of financial markets or as lender-of-last-resort, a spike in this variable heralds either a severe liquidity problem of a major bank (which can be problematic in itself), or worse, a systemic liquidity problem of the banking sector. Left unsolved in times of uncertainty a bank run in a particular bank may turn into a systemic run and unleash a solvency problem, unless the central bank

acts immediately to quell liquidity problems. At any rate, a large upward movement of central bank credit may indicate distress in the banking sector. On the other hand, large increases in central bank credit to banks could also be to stimulate bank lending to revive a sluggish economy, but this can also indicate possible recession-caused deterioration in the quality of bank lending indicator rather than a leading indicator indicating a potential crisis. Thus, this indicator should – as empirical evidence has proved – be more of a coincident nature.

Domestic credit growth (percentage) and domestic credit (percentage) of GDP

The leading character of domestic credit is not as obvious from a theoretical point of view than in the case of money supply aggregates. Nevertheless, sharp increases in credit demand over a longer time span bear the risk of over-investment (non-productive investment) which as a consequence may cause a deterioration of the credit portfolio of the banks. As a further argument for the leading character of these two indicators it can be brought forward that high growth rates of domestic credit are as a rule incompatible with a currency peg and could thus signal pending currency and banking problems. In addition, a persistent increase in domestic credit could lead to deterioration in credit quality. In an environment of euphoria and due to informational asymmetries, it is not easy to make a more measured assessment of credit applications. As the experience of the Asian crisis showed, a credit boom preceded a banking crisis (Evans, Leone, Gill and Hilbers, 2000).

On the other hand, the ratio of domestic credit as a percentage of GDP may start rising only in the early phase of the onset of a banking crisis. The reason for it is that the central bank – as the crisis unfolds – may be pumping money into the banks to alleviate their financial situation. This would explain why this series is not a clear-cut leading indicator but shows characteristics of a coincident indicator with regard to currency and banking crises. Furthermore, the construction of this indicator suggests that continued expansion of credit – either by momentum or other reasons – during recessionary periods would increase credit risk in the banking system, making it vulnerable to a banking crisis. Rapid credit growth could also induce unsustainable asset price increases, including for assets used as collateral for lending.

All countries included in RETA 5869 can provide domestic credit growth on a monthly basis. The publication time lag ranges between one and 24 weeks. The indicator no: 21 ("Domestic Credit in per cent of GDP") is available as a rule only on a quarterly basis as the GDP figures come out only four times a year. In Fiji and Indonesia, the indicator no: 21 is presented on a monthly basis; the quarterly GDP figures are obviously interpolated to get monthly estimates.

Figures 6-8 (see appendix) present the trend for domestic credit growth for Fiji, Indonesia and Thailand.

Credit to private sector (in per cent) of GDP

A sharp increase of this indicator may signal over-investment of the private sector which could lead to a deterioration in the quality of credit portfolios of the banking sector and, consequently, in financial institutions' cash flows, net income and solvency. An increase in consumer lending, including credit card debt, especially if financed by heavy capital flows, can lead easily to a current account deficit. A large current account deficit, accompanied by a loss of competitiveness can put some pressure on the exchange rate. Of course, a massive devaluation can put severe stress on the paying capability of debtors and undermine the asset quality of the banking system.

Monthly data are available from Fiji and Indonesia, otherwise there exist quarterly data with the exception of Viet Nam (only annual data). The publication time lag ranges between one and 24 weeks.

Figures 9-12 (see appendix) present the trend for credit to private sector in per cent of GDP for Fiji, Indonesia, Thailand and the Philippines.

Net profits (as per cent of average assets)

The indicator reflects one of the most commonly used measures of profitability. Unusually high profitability may be a sign of excessive risk taking. On the other hand, bank earnings are a buffer against capital erosion caused by shrinkage in asset value. Thus, a steady increase would be the optimal performance of this indicator from a macroeconomic point of view. High profits may also be indicative of protected or imperfectly competitive banking markets. Thus, a sharp decrease of this indicator is indicative either of more competition or a deterioration of credit quality.

As empirical evidence has shown, this indicator rose sharply in some places in 1997 (e.g. Taiwan Province of China) before collapsing in the wake of the financial crisis in 1998 and only slowly recovering since then. With the exception of Viet Nam, short-term data (at least quarterly) are available in all RETA 5869 countries. The publication time lag ranges between one and 24 weeks. Profitability data are significantly affected by practices for provisioning and recognition of impairment of assets, factors which should always be considered in analyzing these indicators.

Figures 13-15 present the trend for net profits for Taiwan Province of China, Indonesia and Thailand.

Total bank loans (as per cent) of total deposits

The ratio of credit to deposits may give indications of the ability of the banking system to mobilize deposits to meet credit demand. A high and growing ratio may indicate stress in the banking system and a low level of liquidity to respond to shocks. Banks that have large outstanding loans relative to the deposit base may be relying on a relatively volatile liability base and could be subject to contagion or to

suffer in the event of a slowdown in economic activity. This is particularly true if the bank loans are financed by foreign borrowings. This explains why this indicator proved to give early warning signals of financial vulnerability.

All countries participating in RETA 5869 can provide this indicator on a monthly basis. The publication lag ranges between one and 24 weeks.

Figures 16-18 (see appendix) present the trend for total bank loans in per cent of total deposits for Taiwan Province of China, Indonesia and Thailand.

International borrowings with maturities of one year and less (in US$ million)

A high and growing amount of short-term international borrowing bears the risk that large amounts of foreign capital may be withdrawn rapidly. Central to the justification of this indicator is the prevalence of maturity mismatches during the Asian crisis. During the banking crisis of 1997-1998, many banks in South-East and East Asia borrowed from the international capital markets in short maturities but relent the funds for longer terms. Because of moral hazard and the implicit guarantees that exchange rates will continue to be pegged indefinitely, this arrangement proved to be a profitable one for both the banks and their debtors (Corsetti, Pesenti and Roubini, 1999). However, given the shock of the collapse of the Thai baht peg and the ensuing contagion, many banking systems could not bear the pressure arising from the maturity mismatches and the depreciation of the currencies. Thus, this indicator appears from a theoretical point of view suited for giving early warning signals for liquidity crunches, caused e.g. by contagion effects of financial shocks in a neighbouring country.

Figure 19 (see appendix) presents the trend for international borrowings with maturities of one year and less in US$ million for Thailand.

Real estate loans

Many financial crises have been caused or amplified by downturns in particular sectors of the economy spilling over into the financial system. This has often been the case when a concentration of loans occurred in the real estate sector which can be subject to severe boom and bust price cycles. In Asia, for instance, almost all affected countries saw rising real estate and equity prices during the early 1990s, then sharp declines from around mid-1996. With hindsight, it can easily be said that the banking sectors of many Asian economies were particularly exposed to a narrow industry. Furthermore, the lack of diversification of the loan portfolio signals vulnerability of the banking system. Thus, this indicator when surpassing a certain threshold (defined country by country) can act as a leading indicator for financial disturbances.

Not all countries participating in RETA 5869 are providing this information. For Thailand quarterly data are only available since the fourth quarter 2000; prior to that only annual data existed.

Figures 20-21 (see appendix) present the trend for real estate loans for Indonesia and Thailand.

Money market rate/inter-bank rate (average of period)

A sharp increase of this rate signals a tight liquidity situation in the banking sector, which can possibly lead to solvency problems. Of course, sharp increases in interest rates could also exacerbate the adverse selection problem in financial markets (Mishkin, 1997). All countries participating in the RETA have provided this indicator on a monthly basis. The publication time lag is about one month.

Stock market indicators concerning the performance of the composite stock market index, market capitalization and the price earnings (PE) ratio

Stock market developments signal changes in market perceptions of capital investors. A steep decline in stock prices – which as a rule is also combined with a sharp drop of market capitalization (in per cent of GDP) – signals tensions in the capital markets which may spread sooner or later to the real sector of the economy, thus posing the danger to set in force a cumulative downward spiral. Indicators nos: 54 and 57 are generally accepted leading indicators for financial markets. The stock market indicators also reflect confidence in the economy quite broadly. Because the price of a stock is theoretically the net present value of the future stream of income, its movement reflects the potential profitability of firms. Extended to the macroeconomic plane, movement of the stock market index is taken as the collective assessment by stock market analysts of corporate profitability, which is tied up with general economic growth. Thus, the financial literature (Fama, 1981) often links the movements of the stock market index with future economic growth. It has been observed that prior to a crisis, stock prices tend to decline. This may indicate that the market players foresee a weakening of corporate profits or a general economic slowdown in the near future.

The same conclusion holds true for the stock price earnings ratio. If this indicator is already high and increases further this may signal increasing asset inflation, unsustainable in the medium term. This indicator can also be a measure of euphoria or speculation in the markets. Astronomical PE ratios can persist for a time (asset bubbles), but a correction invariably happens. The problem with high PE ratios is that it may falsely lead companies to over-invest and undertake heavy debt positions. Thus, this indicator gives warning signals that the stock asset bubble may burst with all the negative consequences known e.g. from Japan.

Apart from Fiji and Viet Nam, these indicators exist without any significant delay in all participating countries.

Figures 22-23 (see appendix) present the trend for composite stock price index for Indonesia and Thailand.

Real effective exchange rate

If real appreciation of a currency is not backed by corresponding productivity gains in the real economy, this implies a loss of international competitiveness which is possibly a source of increasing vulnerability of a county's economy. A loss in competitiveness arising from a peg might put pressure on policy makers to devalue in order to hit some economic growth targets. The financial markets will recognize the pressure of the policy makers to react to recessionary moves in the face of loss of competitiveness and would engage in speculative actions. If not managed well, this could lead to a currency crisis. Indeed, it has been observed that in the run-up to a crisis, the real value of the domestic currency was, on average, significantly higher than its mean during tranquil periods (IMF 1998).

Until now, monthly data for this indicator are only available for Thailand and Fiji and on a quarterly basis for the Philippines.

Figures 24-25 (see appendix) present the trend for the real effective exchange ratio for the Philippines and Thailand.

International reserves (in US$ million)

A low and declining amount of international reserves (central bank and the financial sector as a whole) signals possible problems for the country to meet international payment requirements. Thus, this series is seen particularly by capital market investors as one of the most important early warning indicators of financial vulnerability. This is an indicator of relative international illiquidity (Sachs, Tornelli and Velasco, 1995). Too low a level of reserves could increase the vulnerability of a financial system to changes in sentiments.

This indicator is available in all participating countries; Thailand, Taiwan Province of China and Fiji have provided monthly, Indonesia and the Philippines quarterly and Viet Nam only annual data.

Figures 26-28 (see appendix) present the trend for international reserves in Fiji, Indonesia and Thailand.

Indicators on business survey data

Business survey results in many countries have proved to be good leading indicators for the real economy. In particular, the business survey results for the manufacturing sector – which is still the cycle maker in most countries – show a significant lead compared with GDP and industrial production. Answers on the current business situation as well as on the expected business trend in the next three to six months mainly reflects the perceived profit assessment and outlook of managers, which is not only of great importance for the real economy (in particular for future production, investment and employment) but also has implications for the financial sector (soundness of the loan portfolios of banks, share price development).

For all these reasons, business survey results play in many countries a prominent role as leading indicators both for the real economy as well as for the financial sector. The majority of countries participating in RETA 5869 have started regular monthly or at least quarterly business surveys only recently. Thus, a thorough assessment of the leading character of these variables is not yet possible. The only exception is Taiwan Province of China and Indonesia where longer time series are available showing that these data give timely signals on economic trends. Also in Thailand where business survey data go back only to early 1999 they appear to give early information of the recovery phase after the Asian crisis and the slowdown in the first half of 2000 followed thereafter by a renewed economic pick-up.

III. CONCLUDING REMARKS

An attempt has been made here to identify a core set of MPIs which can be useful in monitoring the financial stability of the financial and asset markets. The above identification is based on the limited time series of MPIs compiled by the participating countries. The length of time series and missing data within the time series, frequency and time lag of availability of ADB MPIs vary considerable from country to country. Therefore, the above identification should be considered tentative. A rigorous and sophisticated quantitative analysis based on longer time series and more data should ideally be conducted by individual countries to identify a set of leading indicators appropriate for their economic situations and institutional environments. The analysis should be a continuous process as the core set may need inclusion or exclusion of some indicators depending on the forthcoming changes in the financial sector and in the economy. As monitoring the financial stability of a country involves both statisticians and financial sector supervisors, and employs supervisory and statistical data, there is a need for a closer collaboration and coordination among the statistical agencies producing the data and financial sector supervisors including central banks and security commissions.

In order to arrive at a smaller number of core leading indicators, one can consider constructing composite leading indicators. To what extent composite leading indicators might help in the analysis cannot be assessed at this stage. On the one hand, composite indicators facilitate structuring the vast amount of signals; on the other hand they can lead to an over-simplification of the analysis. Thus, it might be advisable to construct a group of composite indicators e.g. for each of the five segments (Money and Credit; Banking; Interest Rates; Stock Markets and Bonds; Trade, Exchange and International Reserves, as well as Business Survey Results), analogous to the weighting methods used in the supervisory CAMELS system (CAMELS is an acronym for six categories of bank performance: capital adequacy, asset quality, management, earnings and liquidity and sensitivity to market risk). As not enough experience has been gained with the ADB's MPI's, it is proposed to concentrate for the time being at

the ADB level on the core indicators and to go into more detail only when warning signals flash. At the country level, however, it is recommended that the full set of indicators be compiled and analyzed. After having gained more experience with these indicators a thorough revision should take place which might lead to some modifications of the set of core indicators collected, analyzed and disseminated at ADB level. This evaluation process must also draw on the experiences with indicators and early warning systems of the IMF, European Central Bank, BIS and others. Although this consultative process has begun well, it has been impeded by resource limitations at the ADB and other potential collaborating agencies.

Future work on the development of a country-specific early warning financial indicator systems should apply multivariate analysis to estimate the intensity of stress in the financial system based on simultaneous signals from a subset of indicators. This would help to assess better the probability of a looming financial crisis.

Another promising area for future work lies in the use of technology to address some of the problems associated with data collection, compilation and dissemination such as lags, problems in data coordination, among others. In order to streamline and improve the efficiency for searching and sharing statistical information across a multitude of sources, participating countries can consider the merits of cooperating in the Statistical Data and Metadata Exchange (SDMX) at some future stage. The SDMX is a joint collaboration of the Bank for International Settlements, the European Central Bank, Eurostat, the IMF, the OECD and the United Nations to explore common e-standards and on-going standardization activities. Their main goal is to gain efficiency and avoid duplication of effort in the field of statistical information. The technology for this initiative is underpinned by a) existing and emerging exchange protocols which have been implemented by central banks for exchanging time series, b) dissemination formats, and c) e-standards, such as Extensible Markup Language (XML). Exploring ways of adopting best practices in information exchange, as being developed in the SDMX, is certainly a task that has to be undertaken to strengthen the collection and dissemination of MPIs in the Asia-Pacific region.

REFERENCES

Bhattacharyay, B., 2001. "Strengthening and harmonization of MPIs for monitoring financial asset markets in Asia and Pacific", presented at the Concluding Workshop of RETA 5869, Manila, 16-18 May 2001.

Corsetti, G., P. Pesenti, and N. Roubini, 1999. "What caused the Asian currency and financial crisis?" *Japan and the World Economy*, September.

Evans, O., A. Leone, M. Gill and P. Hilbers, 2002. "Macroprudential indicators of financial system soundness", IMF Occasional Paper 192.

Fama, E., 1981. "Stock returns, real activity, inflation and money", *American Economic Review*, vol. 71, No. 4, pp. 545-565.

Goldstein, M., G. Kaminsky and C. Reinhardt, 2000. *Assessing Financial Vulnerability: An Early Warning System for Emerging Markets* (Institute for International Economics).

IMF, 1998. *World Economic Outlook*, May.

_____, 2001. *Macroprudential Analysis: Selected Aspects Background Paper*, 7 June 2001.

Kaminsky G., S. Lizondo, and C. Reinhardt, 1998. *Leading Indicators of Currency Crisis*, IMF Staff Papers, vol. 45, No. 1.

Kaminsky, G., and C. Reinhardt, 1999. "The twin crisis: the causes of banking and balance-of-payments problems", *The American Economic Review*, vol. 49, No. 3.

Mishkin, F., 1997. "Understanding financial crises: a developing country perspective", Annual World Bank Conference on Development Economics.

Sachs, J., A. Tornelli and A. Velasco, 1995. "Financial crisis in emerging markets", National Bureau of Economic Research, Working Paper No. W5576.

Sundararajan, V., D. Marston, and R. Basu, *Financial System Standards and Financial Stability: The Case of Basel Core Principles*, (IMF Working Paper WP/01/62)

Appendix

Figure 1. Money supply growth (M1) in Thailand
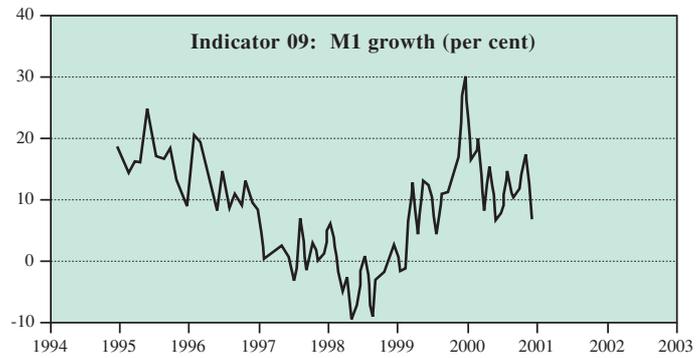
Figure 2.   Money supply growth (M1) in Indonesia
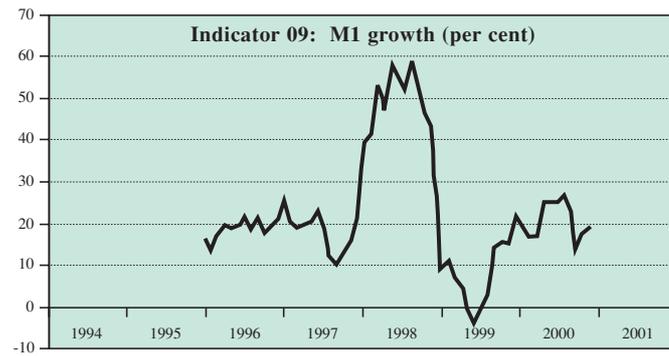
Figure 3.   Money supply growth (M2) in Thailand
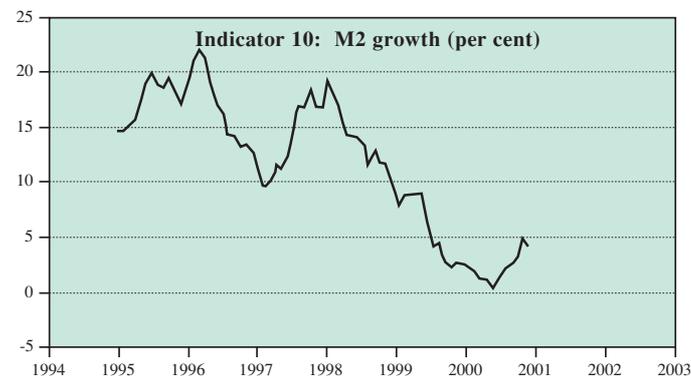
Figure 4. Money supply growth (M2) in Indonesia
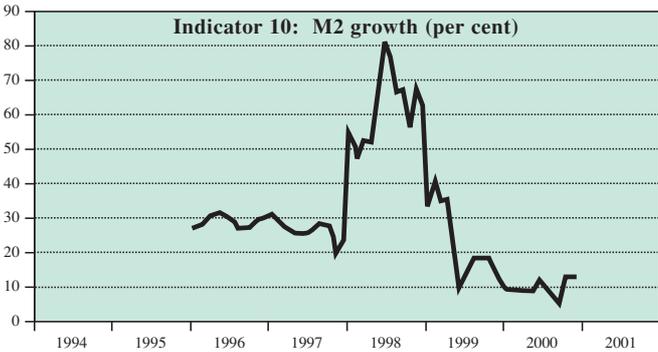
Figure 5. Money supply growth (M3) in Thailand
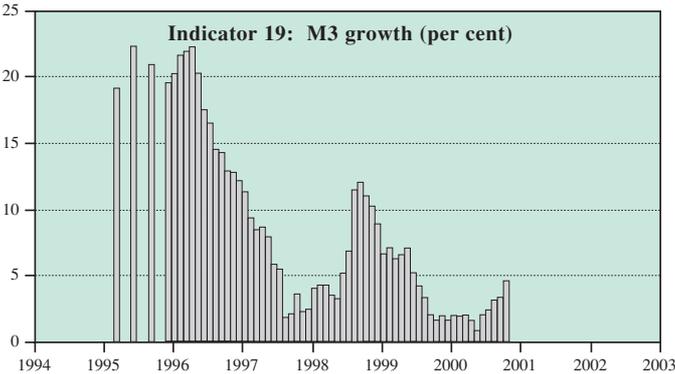
Figure 6. Domestic credit growth (per cent) in Fiji
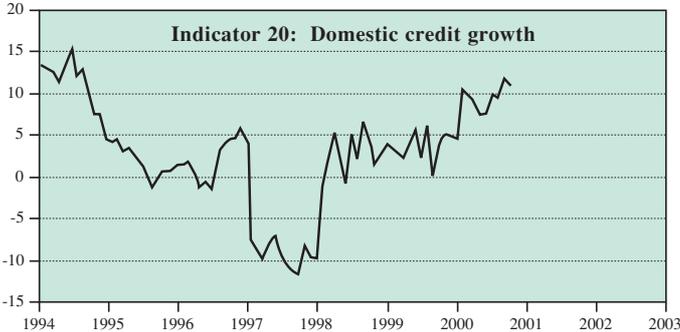
Figure 7. Domestic credit growth (per cent) in Indonesia
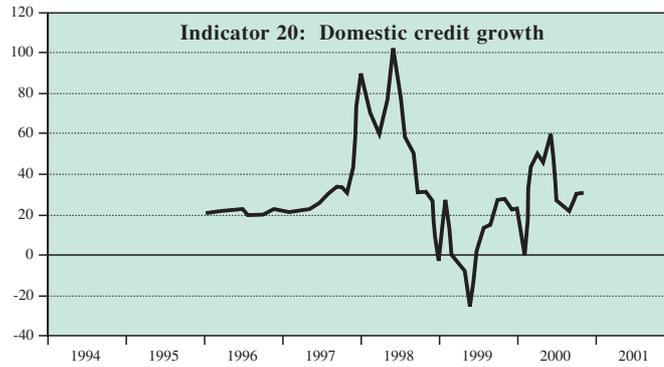
Figure 8. Domestic credit growth (per cent) in Thailand
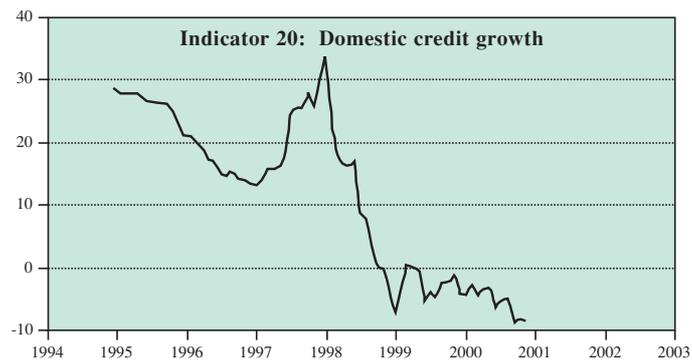
Figure 9. Credit to the private sector in Fiji
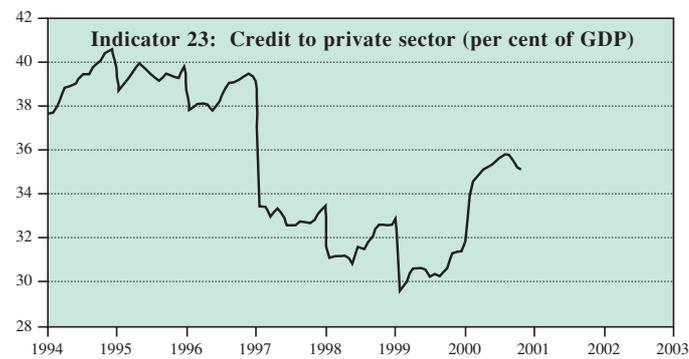
Figure 10. Credit to the private sector in Indonesia

Indicator 23: Credit to private sector (per cent of GDP)
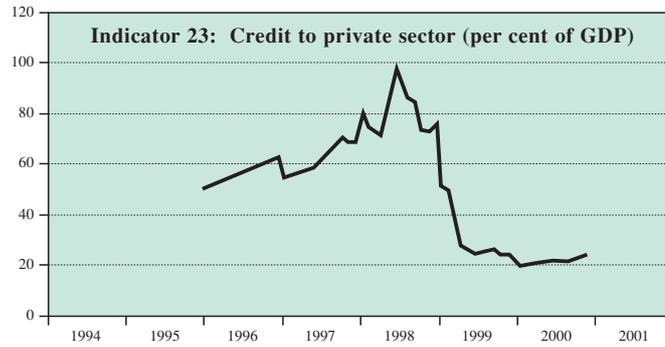
Figure 11. Credit to the private sector in the Philippines

Indicator 23: Credit to private sector (per cent of GDP)
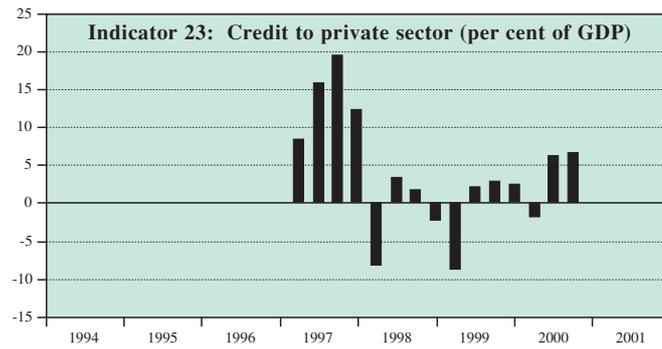
Figure 12. Credit to the private sector in Thailand

Indicator 23: Credit to private sector (per cent of GDP)
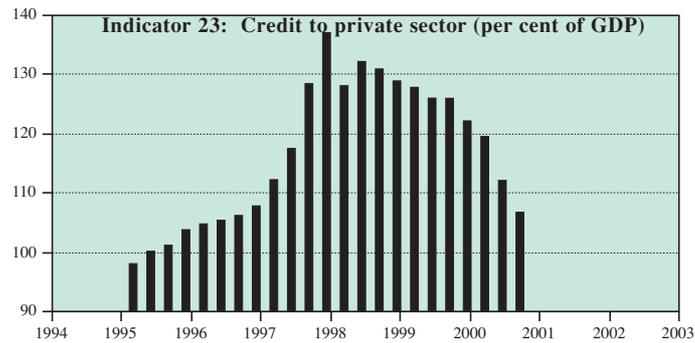
Figure 13. Net profits in Taiwan Province of China

Indicator 30: Net profits (as per cent of Total Assets)
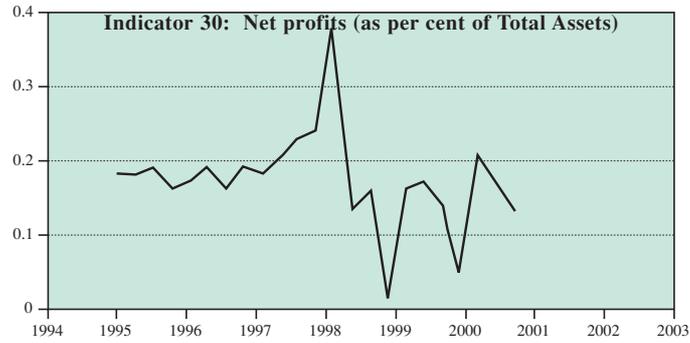
Figure 14. Net profits in Indonesia

Indicator 30: Net profits (as per cent of Total Assets)
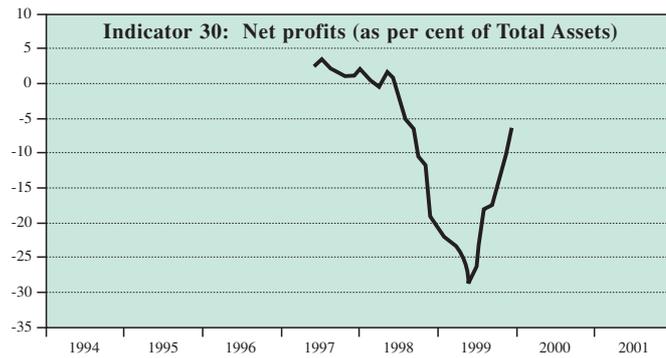
Figure 15. Net profits in Thailand

Indicator 30: Net profits (per cent of Total Assets)
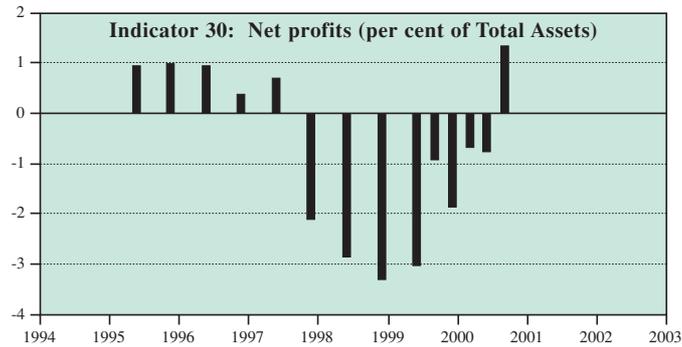
Figure 16. Total credit in Thailand

Indicator 34: Total credit (per cent of Total deposits)
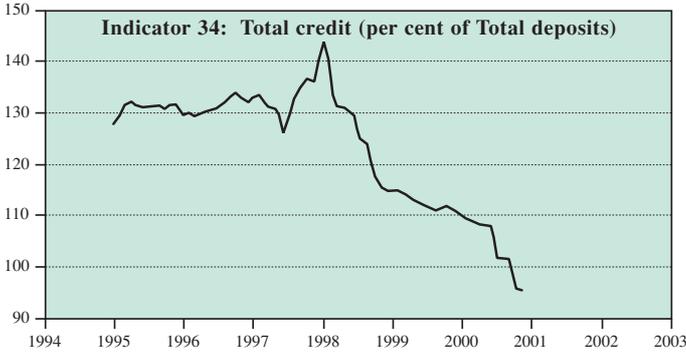
Figure 17. Total credit in Taiwan Province of China

Indicator 34: Total credit (per cent of Total deposits)
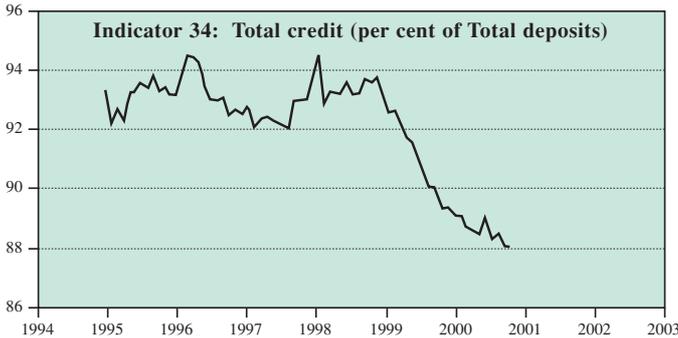
Figure 18. Total credit in Indonesia

Indicator 34: Total credit (per cent of Total deposits)
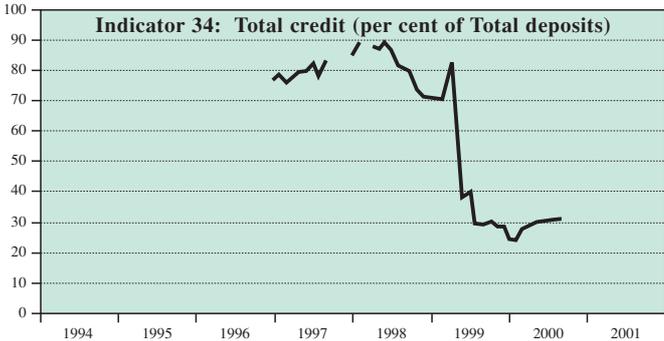
Figure 19. International borrowings with maturities in Thailand

Figure 20. Real estate loans in Indonesia

Figure 21. Real estate loans in Thailand
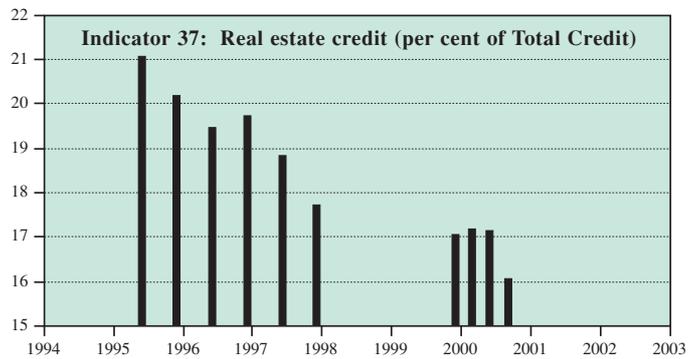
Figure 22. Composite stock price index in Indonesia

Indicator 54: composite stock price index (Capital City: NCU)
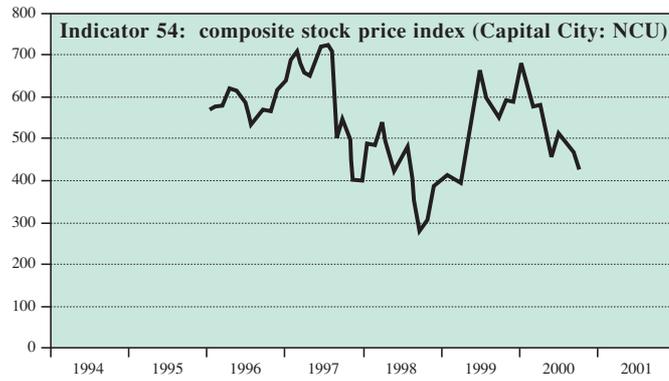
Figure 23. Composite stock price index in Thailand

Indicator 64: Composite Stock Price Index (Capital City: NCU)
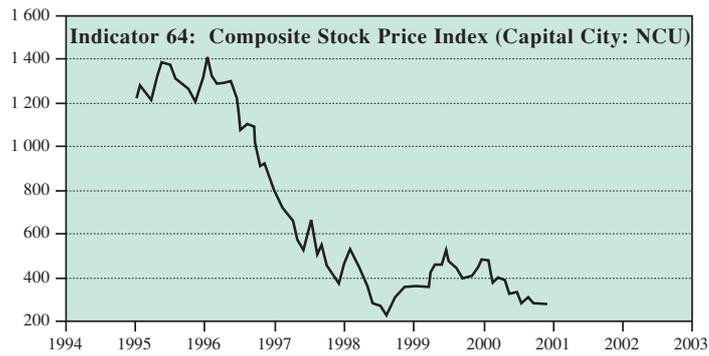
Figure 24. Real effective exchange ratio in the Philippines

Indicator 67: Real Effective Exchange Rate

Figure 25. Real effective exchange rate in Thailand
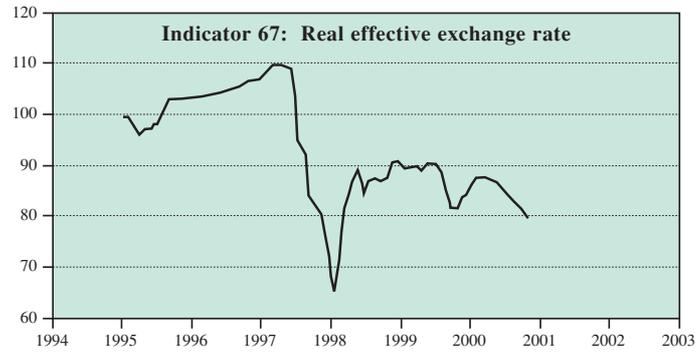
Figure 26. International reserves in Fiji
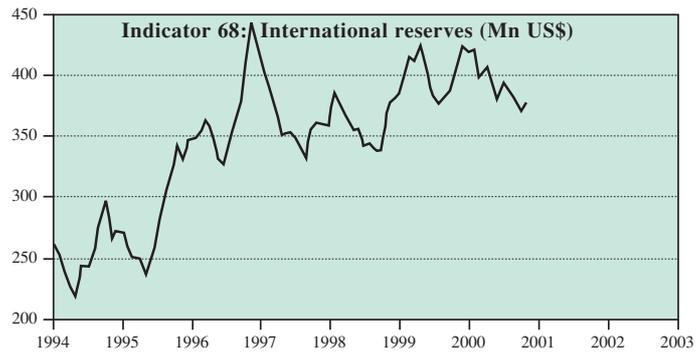
Figure 27. International reserves in Indonesia
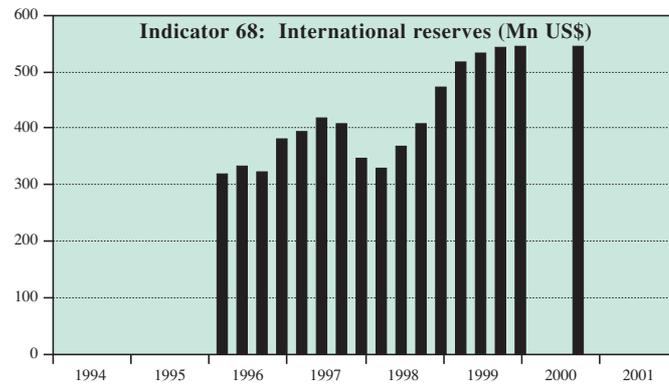
Figure 28. International reserves in Thailand
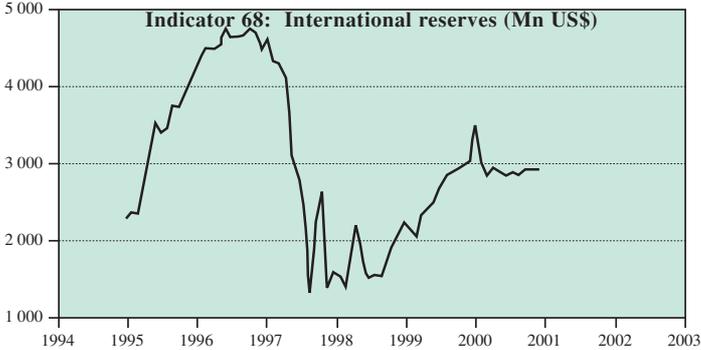
BANKING SECTOR REFORMS IN INDIA AND CHINA: DOES INDIA'S EXPERIENCE OFFER LESSONS FOR CHINA'S FUTURE REFORM AGENDA?

Sayuri Shirai*

India and China both carried out banking sector reforms in the 1990s. Despite taking a gradual approach, India's reforms have been the more comprehensive and have been implemented at a faster pace than in China. India's experience suggests that the following four issues would be relevant in China's future reform agenda: (1) privatizing the wholly state-owned commercial banks (WSCBs) and introducing measures to improve corporate governance; (2) removing Government intervention to make WSCBs more commercially oriented; (3) reducing the dominance of WSCBs by rationalizing weak banks and downsizing large WSCBs; and (4) if adopted, relaxing the stringent statutory liquidity requirement, which seems to discourage banks from lending. There are also lessons to be learned from India's reforms. First, the entry of new banks should be promoted provided they are sufficiently capitalized and are technology-oriented. Second, diversification of banks' business should accompany interest rate liberalization in order to compensate for the expected decline in net interest income and prevent banks from taking excessive risks. Third, strict regulations should be introduced to prevent connected lending.

One of the features of the East Asian financial crisis was that short-term, massive foreign capital inflows, which were largely intermediated by domestic banks, greatly exposed them to both currency and maturity mismatches (so-called "double mismatch"). Sudden shifts in market sentiment driven by the burst of bubbles revealed the vulnerability of these banking systems and triggered a reversal of capital flows, easily leading to a currency crisis and a banking crisis. The occurrence of these "twin crises" in East Asia deepened the economic downturn by generating a free fall of the exchange rate and expanding the local currency value of foreign debt.

Since the crisis, a consensus has been emerging among policy makers, academicians and media that avoiding a serious double mismatch is one of the most important policy objectives to prevent another crisis in the near future and thus, strengthening the soundness of the banking system in the borrower country is essential

* Associate Professor of Keio University and Visiting Scholar to the Asian Development Bank Institute, Tokyo.

(Yoshitomi and Shirai, 2000). Sound banking systems also serve as an important channel for achieving economic growth through the mobilization of financial savings, putting them to productive use, and transforming various risks (for example, Beck and others, 1999).

The East Asian financial crisis also revealed that excessive risk taking and weak monitoring functions by domestic banks were directly associated with a lack of clear relations between Governments, banks and large family businesses. This system may have worked effectively for these economies at the take-off stage and promoted rapid industrial development in the process; however, once capital account liberalization was introduced the systems became inappropriate in the management of massive capital inflows. This system now calls for drastic reforms to promote stronger incentives for financial institutions, particularly banks, to improve risk management and at the same time to improve prudential regulations adjusted for the new environment. The East Asian financial crisis gave rise to an opportunity to recognize the importance of balancing financial liberalization with adequate regulation and supervision prior to full capital account liberalization.

This liberalization issue is even more important and relevant for countries such as India and China, which have not yet launched full capital account convertibility and where state-controlled banks still remain dominant. In such countries, financial sector liberalization comes against more politically difficult issues than those that have already opened up their capital account to a substantial degree, since they have to first restructure predominantly state-controlled commercial banks (called "public sector banks" in India and "wholly state-owned commercial banks" [WSCBs] in China).

This paper focuses on banking sector reforms in India and China, which have been attracting increasing attention since their initiation in 1991 and 1994, respectively. While India's banking sector reforms have been regarded as following a gradual approach, they have been more comprehensive and have, in fact, been implemented at a faster pace than those of China. This paper assesses whether such differences in the reform programmes have brought any significant differences in the performance of public sector banks and WSCBs. Given that the two economies have similarities such as taking a cautious approach with respect to capital accout liberalization and gradually moving away from planned economic development, this paper also examines whether India's reform experiences can offer any lessons for China's future reform agenda.[1]

---

[1]   With respect to data availability and limitation, data on banks in India were obtained from the Prowess database for 1993-2000 compiled by the Center for Monitoring the Indian Economy Pvt. Ltd. This is the database mostly frequently used by researchers and covers all commercial banks excluding regional rural and cooperative banks. The database does not cover the initial reform period of 1991-1992. However, the assessment on the impact of the banking sector reforms without covering this period remains valid, as major elements of the reforms have begun since 1993. As for data on banks in China, data were obtained from the Bankscope data base. It should be noted that the quality of data in China is often questioned and, thus, the quantitative analysis should take into account this aspect. This paper does not cover foreign joint-venture banks and branches in China, since their scope and location of business are highly restricted, meaning these banks do not operate on a level playing field. Even though data on some of these banks are available, the coverage is small. However, the major domestic banks in terms of asset size (accounting for a little more than 80 per cent of assets held by all financial institutions) are covered.

The paper consists of five sections. Section I focuses on India's and China's banking sector reforms. Section II assesses these reforms by examining trends and patterns of performance over the reform period. Section III discusses six issues related to India's banking sector reforms (privatization, entry deregulation, statutory liquidity requirement, directed lending, diversification of business, and connected lending) and identifies lessons that might be applicable to China's future reforms by analyzing the policies adopted in India. Section IV discusses China's remaining reform agenda.

I. BANKING SECTOR REFORMS IN INDIA AND CHINA

Background of the reforms: India

India's commercial banking system mainly consists of 27 public sector banks (that are further classified as 19 nationalized banks and eight State Bank of India (SBI) banks (SBI and seven independently capitalized banking subsidiaries); 31 private sector banks (that are further classified as 23 old private sector banks and eight new private sector banks that emerged after 1991; 42 foreign banks; 196 regional rural banks; and 67 cooperative banks. The banking system had 959,955 employees and 51,267 branches in 2000; of which, public sector banks had a 90 per cent share. The SBI was originally established in 1806 and acquired its present status through an act of parliament in 1955. Nationalized banks refer to private sector banks that were nationalized (14 banks in 1969 and six in 1980) by the central government. In 1993, Punjab National Bank merged with another nationalized bank, New Bank of India, leading to a decline in the total number of nationalized banks from 20 to 19.

Prior to the 1991 reforms, India's banking sector had long been characterized as highly regulated and financially repressed. The prevalence of the reserve requirement (i.e., a cash reserve ratio [CRR] that requires banks to hold a certain amount of deposits in the form of deposits with the RBI), liquidity requirement (i.e., statutory liquidity ratio [SLR] that requires banks to hold a certain amount of deposits in the form of Governmentand eligible securities), interest rate controls and allocation of financial resources to the so-called priority sectors (i.e., agriculture, small scale industries and exports) increased the degree of financial repression and adversely affected the country's financial resource mobilization and allocation. Quantitative loan targets were imposed on nationalized banks to expand their networks in rural areas and extend credit to priority sectors. These banks were then increasingly used to finance fiscal deficits. Although non-nationalized private sector banks and foreign banks were allowed to coexist with public sector banks at that time, their activities were highly restricted through entry regulations and strict branch licensing policies.

As a result of elaborate Government intervention, many banks remained unprofitable. The average return on assets for public sector banks in the second half of the 1980s was only about 0.15 per cent and their non-performing assets (NPA)

amounted to 24 per cent of credit. Against this background, the first wave of financial liberalization took place in the second half of the 1980s, mainly taking the form of introduction of Treasury Bills (TB), development of money markets and partial interest rate deregulation. In 1986, the 182-day TB were introduced through an auction system. In 1988, the Discount and Financial House of India was established as an institution that would provide liquidity in the financial market. In 1989, both commercial paper and CDs were introduced. Coupon rates on Government bonds were gradually increased to reflect demand and supply conditions. In 1988, the maximum lending rate and ranges in minimum rates were unified and switched to a minimum lending rate (MLR) in 1988. As a result, this enabled banks to set interest rates more flexibly. In 1989, the maximum interest rates on call money were liberalized.

Banking sector reforms since 1991

Following most of the recommendations made in the 1991 report of the Narasimham Committee, the Government launched comprehensive banking sector reforms in that same year. India's banking sector reforms since 1991 can be summarized in the following six areas: first, the CRR declined from 15 per cent in 1991 to 5.5 per cent in 2001. The SLR declined from 38.5 per cent in 1991 to 25 per cent in 1997 and has remained at 25 per cent until today. A decline in the CRR and SLR increased banks' flexibility in allocating credit and hence gave banks an opportunity to improve their profitability. Second, interest rates became flexible with respect to all term deposits rates and lending rates on advances over Rs 200,000. Interest rate deregulation has encouraged banks to improve their cost efficiency and diversify into non-traditional business as a result of declining net interst income (table 1). Third, reform in priority sector lending – mainly through the expansion of coverage and interest rate decontrols on advances over Rs 200,000 – helped banks to mitigate the negative impact arising from such policy loans, while the targets of 40 per cent (of advances) on domestic banks and 33 per cent on foreign banks have not changed during the reform period.

Fourth, entry barriers were reduced both on private sector and foreign banks and their full ownership was granted. As a result, eight private sector banks and 26 new foreign banks entered the banking sector. With respect to branch barriers, public sector banks were allowed to rationalize some branches. Following India's commitment to the 1995 World Trade Organization (WTO) agreement in respect of the services sector, foreign banks have been permitted to open up to 12 branches a year. Also, these banks can be exempted from meeting branch requirements in rural and semi-urban areas provided that they, for example, contribute to the Rural Infrastructure Development Fund of the National Bank for Agriculture and Rural Development (NABARD), a refinance institution, or make deposits with the NABARD. Fifth, various prudential norms and more appropriate accounting standards were

Table 1. India: selected indicators of the commercial banking sector, 1993-2000

(percentage of assets)

	1993	1994	1995	1996	1997	1998	1999	2000
Cash and Balances with the RBI								
Nationalized Banks	11.9	11.7	13.9	13.2	10.2	10.4	10.1	8.8
SBI Banks	9.9	13.2	12.9	14.1	13.6	10.6	9.5	8.5
Old Private Sector Banks	17.8	16.5	14.4	12.6	10.1	10.1	9.3	8.7
New Private Sector Banks	–	–	9.0	9.2	8.3	9.0	7.3	6.8
Foreign Banks	12.9	9.2	9.7	7.4	5.8	5.4	4.1	3.6
Investments								
Nationalized Banks	32.2	40.0	37.5	36.7	40.4	40.7	40.6	41.2
SBI Banks	29.5	32.5	32.2	29.0	31.5	33.2	36.6	38.2
Old Private Sector Banks	28.4	32.5	32.4	27.8	30.8	32.7	33.7	34.4
New Private Sector Banks	–	–	23.2	18.5	30.5	34.4	38.1	40.2
Foreign Banks	29.5	36.9	29.4	19.3	24.9	26.1	32.9	34.1
Advances								
Nationalized Banks	45.4	39.9	40.8	41.2	39.3	39.0	39.1	40.5
SBI Banks	47.6	40.9	44.4	44.9	43.6	43.9	41.3	41.9
Old Private Sector Banks	42.2	42.0	44.2	48.0	46.8	43.5	43.3	44.6
New Private Sector Banks	–	–	28.3	51.2	47.7	42.0	39.7	39.2
Foreign Banks	44.4	44.7	45.2	48.6	46.3	45.5	38.2	42.9
Deposits								
Nationalized Banks	87.9	90.2	87.9	86.7	89.5	89.4	89.4	89.2
SBI Banks	77.4	77.2	78.1	76.2	77.9	79.6	79.5	79.5
Old Private Sector Banks	87.5	89.4	87.5	83.6	87.1	88.7	87.8	87.7
New Private Sector Banks	–	–	39.5	59.4	78.2	83.0	78.3	79.8
Foreign Banks	66.7	73.6	64.8	45.1	48.7	50.5	47.2	46.7
Net Interest Income								
Nationalized Banks	-0.9	-0.6	-0.5	-0.7	-1.1	-1.5	-1.6	-1.8
SBI Banks	0.0	-0.3	-0.3	0.3	0.2	-0.3	-0.6	-1.0
Old Private Sector Banks	0.4	0.1	0.4	0.2	-0.1	-1.0	-1.5	-1.3
New Private Sector Banks	–	–	0.3	1.9	0.5	-0.8	-1.5	-1.7
Foreign Banks	1.7	1.7	1.1	1.3	2.0	1.4	0.8	0.3
Income from Diversification								
Nationalized Banks	1.0	0.9	0.9	1.0	0.9	1.0	0.8	1.0
SBI Banks	1.6	1.6	1.7	1.7	1.5	1.6	1.4	1.6
Old Private Sector Banks	1.0	1.0	1.0	0.9	1.0	1.3	0.9	1.2
New Private Sector Banks	–	–	-0.9	1.5	1.4	1.9	1.2	1.3
Foreign Banks	1.8	1.6	1.4	1.5	1.8	3.3	2.1	2.1
Income from Investment								
Nationalized Banks	2.6	2.9	3.3	3.7	4.2	4.4	4.4	4.5
SBI Banks	3.1	3.3	3.7	3.3	3.5	3.8	4.0	4.1
Old Private Sector Banks	2.8	3.1	2.9	3.1	3.2	3.7	3.8	3.8
New Private Sector Banks	–	–	0.8	1.8	2.4	3.3	3.7	3.6
Foreign Banks	3.2	3.5	3.5	2.2	2.1	2.7	3.0	3.8

Source: PROWESS Database, Center for Monitoring Indian Economy Pvt. Ltd.

introduced. All banks have to meet an 8 per cent capital adequacy requirement. Better accounting standards have revealed part of the true status of NPA problems of public sector banks. This has not only increased pressure on these banks in terms of improving their balance sheets, but has also enabled the Government to conduct appropriate policies to deal with NPA problems. Sixth, nationalized banks were recapitalized by the Government and 11 public sector banks have been partially privatized.

However, these reforms should be regarded as a gradual approach for the following reasons. First, India's banking sector has been highly dominated by public sector banks, even though entry deregulation has taken place. Based on the asset base, the share of public sector banks remained more than 80 per cent, despite a decline from 87.2 per cent in 1995 to 80.5 per cent in 2000. The share of foreign banks remained at 7.5 per cent during 1995-2000, while that of private sector banks increased from 5.3 per cent in 1995 to 13 per cent in 2000. This suggests that the entry of new banks has exerted competitive pressures only at the lower end.

Second, while the SLR of 25 per cent has remained at a high level, banks currently hold Government bonds in excess of the SLR (table 1). Traditionally, banks' holdings of Government securities were heavily affected by the requirement of the SLR. Thus, one would expect that a gradual and steady decline in the SLR would have lowered the ratio of investment in Government securities to assets in line with the declining pace of the SLR. However, the share of investment has indeed increased during 1997-2000 and this phenomenon has taken place regardless of the ownership of banks. The increased holding of Government securities may reflect that (1) interest rates paid on Government bonds have increasingly become more market-based through auctions (table 1); (2) greater capital gains are expected as a result of declining interest rates; (3) stringent prudential norms and accounting standards have induced banks to become more cautious in terms of lending to the private sector and thus to prefer safer, more liquid Government securities; (4) lack of high-quality borrowers due to mild recession; (5) substitution of a decline in the CRR to maintain sufficient liquidity, and (6) banks' reluctance to increase advances because banks have to increase advances to the priority sectors proportionally. Meanwhile, the increase in Government bonds held by nationalized banks from 32 per cent of assets in 1993 to 40 per cent in 1994 can be attributed to the Government's recapitalization programme. As for the ratio of cash and balances with the RBI to assets, it has declined steadily owing to the decline in the CRR. The decline has also contributed to the increase in the ratio of investment to assets.

By contrast, public sector banks have reduced the share of advances to assets from 1992 to 2000, from 45.4 per cent to 40.5 per cent for nationalized banks and from 47.6 per cent to 42 per cent for SBI banks generating a shift from lending activies to investment in Government securities. Private sector and foreign banks followed the same pattern, although the latter increased their share in 2000. At this

stage, the issues of credit crunch have not yet become serious social problems thanks to a mild economic recession. Once economic growth accelerates, however, a decline in advances together with excess holdings of Government securities is likely to be binding and could crowd out the private sector, given that the fiscal deficit remains at a high level.

Third, interest rates on saving deposits as well as other saving schemes – such as, postal savings, public provident funds and national savings certificates – have also remained regulated. To the extent that some of these rates constitute the floor, an effective monetary policy is rendered more difficult. As for lending rates, those on advances over Rs 200,000 remain subject to the prime lending rate (PLR) and some spread guidelines, despite interest decontrols. The degree of divergence among each bank's lending interest rates is limited, partly because large, dominant public sector banks tend to be leaders in setting rates. Many banks offer lending rates below the PLR to high-quality borrowers in the presence of increasing competition from the CP market, making the PLR ineffective. In addition, lending rates on advances up to Rs 200,000 remain regulated and protected in a sense that rates are set below the PLR regardless of the risk and return involved in each lending project. These remaining regulations make it difficult for banks to increase lending activities since it is difficult for them to reflect the true credit risk of firms on the rates. Because of these factors, net interest income as a share of assets has declined for all banks. All banks except foreign banks have maintained negative net interest income.

Fourth, foreign banks do not compete with other banks not only in terms of customer base, but also in terms of deposit acquisition, implying that their impact on competition is limited. These banks focus on wholesale business and thus do not compete with domestic banks that concentrate on retail business. Foreign banks have also lowered their dependence on deposits from 67 per cent of assets (or equivalently, liabilities and equity) in 1993 to 47 per cent in 2000, while new private sector banks have increased the ratio from 40 per cent in 1995 to 80 per cent in 2000 and all other banks have more or less maintained 80-90 per cent of deposits during 1993-2000. Foreign banks mainly deal with other financial institutions and large corporate firms. This is evident from the fact that deposits per account are much higher in foreign banks, as compared with SBI banks, or nationalized banks, or private sector banks. Instead, foreign banks have increased equity rapidly from 6.8 per cent of assets in 1993 to 20.5 per cent in 2000, and borrowing from 21.8 per cent in 1993 to 28.5 per cent in 2000.

Fifth, the pace of partial privatization has been limited owing to the sluggish equity market. Another reason for the slow pace of privatization is that the balance sheets of some nationalized banks as well as their management and operational skills have remained very weak so that the cost of restructuring these banks would be presumably prohibitively high. As a result, investors have hardly showed interest in investing in these banks.

Background of the reforms: China

China's banking system consists of the four WSCBs, three policy lending banks, more than 100 commercial banks (mostly, city commercial banks), about 3,000 Urban Credit Cooperatives (UCCs), some 42,000 Rural Credit Cooperatives (RCCs), and about 190 foreign banks with branches or representative offices. The four WSCBs dominate the banking sector in terms of branches (108,507 as of the end of 1998) and employment (1.67 million staff).

Prior to 1979, China's banking system played only a limited role in promoting economic growth. It reflected the limited role of banks in a highly centralized planning system whose primary functions were collecting revenue from SOEs and allocating investment through budgetary grants (Ma, 1997). In these circumstances, banks simply provided credit needed by the state-owned enterprises (SOEs) for their production plans and provided/monitored cash used principally to cover labour costs and purchases of agricultural products.

The Government has embarked on a series of banking sector reforms since 1979. The programmes in the 1980s focused on the establishment of a two-tier banking system comprising primarily of a central bank and four specialized banks that are already owned fully by the central Government. This is in contrast to India, where a number of private sector and foreign banks existed in the early 20th century under colonialism and many of these banks were later nationalized under the planned economic development regime. Further, the reforms replaced direct grants with interest-bearing loans in an attempt to solve SOEs' soft-budget problems. From 1986, the People's Bank of China (PBC) was explicitly made responsible for monetary policy and the supervision of the financial system, including the money and capital markets. With the objective of containing inflation, moreover, the PBC took responsibility for formulating a credit plan that set an aggregate credit ceiling on each PBC branch according to the national economic plan and authorized each branch to allocate credit under the ceiling. Autonomy was given to every PBC branch, leaving room for them to act on behalf of the local governments, who intervened with respect to credit allocation. Moreover, PBC was not an independent regulatory body, functioning more as a line ministry under the State Council and thus its monetary policy decisions were subject to the approval of the Council.

Financial reforms since 1994

Once the two-tier banking system was formed, the Government launched the second wave of financial reforms. The Government separated policy lending activities from specialized banks by establishing three policy lending banks and introducing the Commercial Bank Law of 1995. Under the law, the four specialized banks became commercial banks (WSCBs) and are now subject to prudential regulations and are

supervised by the PBC, while the three policy lending banks are not subject to the law and their operations are guided by individual charters. The central Government reduced intervention by local governments in WSCB's credit allocation. For example, the PBC now selects the managers of its local branches at its headquarters.

Other reforms since 1994 are summarized thus: first, the reserve requirement was lowered from 20 per cent (including an excess reserve requirement of 7 per cent) in 1992 to 8 per cent in 1998. Second, banks were allowed to set lending interest rates freely within the specified range. In 1993, the PBC imposed a lending rate ceiling at 20 per cent and floor at 10 per cent on commercial banks, ceiling at 30 per cent and floor at 10 per cent on UCCs, and ceiling at 60 per cent and floor at 10 per cent on RCCs. In 1996, the PBC set the ceiling and floor both at 10 per cent with respect to commercial banks, and the ceiling at 40 per cent and floor at 10 per cent with respect to RCCs. In 1998, the ceiling was set at 20 per cent for loans to small and medium enterprises (SMEs) and at 50 per cent for UCCs. In 1999, the ceiling for SMEs was raised to 30 per cent. Moreover, the interbank markets were unified and the ceiling on interbank rates was lifted. Third, some private and local banks have been established. Fourth, the loan classification system was reformed in 1998 by introducing an internationally accepted five-tier classification. In 2001, moreover, prudential regulations and accounting standards were tightened in the face of the increasing challenges from globalization and China's accession to the WTO. Fifth, the Government recapitalized the WSCBs by injecting Y270 billion in capital in 1998 and transferred Y1.4 trillion of assets (about 20 per cent of combined outstanding loans) to the respective asset management companies (AMCs) in 1999. These exercises have improved the balance sheets of these banks.

Nevertheless, the speed and coverage of reforms are still very limited for the following reasons. First, the degree of concetration by WSCBs has barely changed, accounting for about 70 per cent of deposits. Even though the number of new banks has increased, most of them are largely owned by local governments or SOEs. Moreover, tight entry regulations continue to prevail. There are no explicit and transparent rules set by the Government with respect to entry criteria. Foreign banks have been closely regulated, since engagement in local currency-denominated transactions was largely limited to only Shanghai and Shenzhen and was allowed only against foreign capital enterprises. Following WTO accession, foreign banks will be allowed to engage in local currency-denominated transactions with resident firms within two years, and retail banking business with Chinese citizens will be allowed within five years. However, the dominance of WSCBs with an extensive branch network makes it difficult for foreign and new banks to penetrate into the retail banking sector and may have to depend on WSCBs' networks in some cases (for example, customers' remittance).

Second, all banks have lowered the ratio of advances to assets (for WSCBs in recent years), and instead, increased investment in Government securities, especially

since 1998 when the interbank bond market was established (table 2). The shift from advances to investment indicates the presence of credit crunch problems in all banks. Compared with WSCBs, moreover, other commercial banks (OCBs) tend to invest in bonds more intensively. This may reflect their preference for investing in safer, liquid assets and the avoidance of high cost to establish branch networks and thus penetrate into retail markets. Further, OCBs maintain the ratio of deposits with the PBC to assets at a high level of 15 per cent, while WSCBs have maintained only about 8 per cent – reflecting (1) the interest rate paid by the PBC even for excess reserves, (2) cushions needed for settlement and clearing accounts, and (3) OCB's greater preference toward liquid asssets rather than lending activities.

Table 2. China: asset structure of the commercial banking sector, 1994-2000

(percentage of assets)

	1994	1995	1996	1997	1998	1999	2000
Deposits with the PBC							
Wholly State Owned Commercial Banks	5.2	9.9	12.7	13.0	9.6	8.7	7.9
Other Commercial Banks	14.7	12.1	14.9	17.7	14.5	15.3	14.5
Cash and Bank Deposits							
Wholly State Owned Commercial Banks	6.3	4.6	3.6	1.6	1.3	1.8	1.0
Other Commercial Banks	0.8	2.2	1.4	1.0	2.1	3.5	2.0
Investment in Securities							
Wholly State Owned Commercial Banks	2.9	3.3	3.7	3.4	8.4	7.9	10.9
Other Commercial Banks	10.4	8.9	14.5	9.1	15.7	15.7	17.1
Advances							
Wholly State Owned Commercial Banks	47.3	51.5	56.7	62.4	63.5	59.6	56.7
Other Commercial Banks	52.2	47.8	45.3	43.9	45.0	44.8	45.5
Net Interest Income							
Wholly State Owned Commercial Banks	3.1	1.7	1.9	2.2	2.3	1.9	1.8
Other Commercial Banks	2.5	3.4	3.3	3.4	3.1	2.3	2.2

Source: Bankscope, Fitch IBCA.

Third, interest rate liberalization was achieved only to a limited degree – largely in the wholesale market. While some flexibility was introduced on lending rates, ceiling rates have remained at well below the market clearing level. This is closely associated with an upsurge in illegal lending and corruption scandals in recent years involving the WSCBs. There are some cases that lending practices by WSCBs are based on personal connections, bribery, and pressure from local governments. Consequently, ordinary borrowers find it difficult to obtain loans from WSCBs. While the low lending interest rate policy aims at subsidizing SOEs, it has given rise to

collusive behaviour among financial institutions despite the penalties faced. The fact that black markets exist and their prevailing lending interest rates are two to three times higher than those of regulated lending rates indicates that banks have strong incentives to lend at higher lending rates. Deposit interest rates have remained regulated and banks have continued to be protected by relatively wide interest rate margins. PBC's continuation to control official lending and deposit interest rates prevents WSCBs from operating according to market principles. Given that banks are able to obtain cheap financing through deposits, interest rate deregulation in the wholesale market is expected to exert a minimum impact on banks' behaviour.

Fourth, banks' decisions to allocate resources are still subject to guidance and interference from the central Government, even though intervention by local governments in banks' allocation of credit has declined. Given that the Government continues to face high credit demand for infrastructure projects and development in the western region, the implicit and explicit influence by the central Government on WSCBs is likely to remain in the foreseeable future. Fifth, recapitalization of WSCBs and transfer of their NPA to the AMCs have been conducted without major reforms in the corporate governance of these banks and removal of central Government intervention. Thus, there are no guarantees that NPA of WSCBs will not increase in the near future. Even though Y1.4 trillion of NPA was transferred to the AMCs, the four WSCBs still held 26.6 per cent of NPA as of the end of September 2001. If proper accounting methods were applied, moreover, it is believed all WSCBs would have a negative net worth and thus would have been categorized as insolvent.

Between banking sector reforms in India and China, there are thus several similarities. Both countries lowered the statutory reserve requirement. The sequence of interest rate deregulation was similar: initiated in the wholesale market first, followed by an introduction of flexibility in the lending rates. Both countries made efforts to mitigate directed lending. Entry deregulation was reformed and prudential regulations and supervision were improved. The Government attempted to restructure state-controlled commercial banks through recapitalization programmes in both countries.

II. BANKING SECTOR PERFORMANCE IN INDIA AND CHINA

Based on an overview of the two countries' banking sector reforms, this section examines developments in the commercial banking sector of each country by evaluating changes in performance in the sector.

Profitability, earnings- and cost-efficiency

India: Foreign banks' profitability (defined as after-tax profits divided by return on average assets [ROA]) exceeded that of public sector banks in 1993-1997 (table 3). New private sector banks' ROA also exceeds that of public sector banks

Table 3. India: selected indicators of the performance of commercial banks, 1993-2000

(percentage)

	1993	1994	1995	1996	1997	1998	1999	2000
Profit after Tax/Assets (ROA)								
Nationalized Banks	-1.5	-3.2	0.0	-0.7	0.4	0.7	0.3	0.5
SBI Banks	0.4	0.2	0.4	0.6	0.7	1.2	0.7	0.9
Old Private Sector Banks	-0.2	0.5	1.2	0.8	1.0	0.9	0.6	0.9
New Private Sector Banks	–	–	1.1	2.3	2.2	1.9	1.3	1.2
Foreign Banks	2.0	2.0	2.0	1.6	1.6	1.1	0.4	-0.2
Income/Assets (INCOME)								
Nationalized Banks	10.6	10.1	9.9	10.7	11.1	10.5	10.3	10.4
SBI Banks	11.8	10.7	11.0	11.9	12.0	11.5	11.0	10.9
Old Private Sector Banks	10.9	10.5	10.5	11.4	11.8	11.8	11.4	11.3
New Private Sector Banks	–	0.3	3.2	11.0	11.1	11.3	10.8	9.3
Foreign Banks	14.9	13.0	12.2	13.4	13.3	13.8	12.4	12.8
Operating Expenses/Operating Income (COST)								
Nationalized Banks	96.7	94.5	89.1	90.0	89.3	87.0	88.6	87.5
SBI Banks	86.0	84.7	81.1	82.1	80.5	79.8	81.7	80.0
Old Private Sector Banks	86.4	84.5	81.6	82.5	83.1	82.5	87.5	82.4
New Private Sector Banks	–	74.5	76.4	73.2	72.4	72.1	77.8	73.8
Foreign Banks	67.7	60.9	80.7	81.7	87.2	68.6	81.2	72.2
Provisions for NPA, Contingencies, etc. /Advances								
Nationalized Banks	5.0	10.4	3.3	4.6	2.2	2.4	2.0	1.9
SBI Banks	4.8	3.8	4.2	3.7	3.0	2.5	2.8	2.5
Old Private Sector Banks	4.5	3.7	3.1	3.1	2.0	2.1	1.6	2.0
New Private Sector Banks	–	–	4.1	1.5	1.5	2.1	1.6	2.8
Foreign Banks	14.0	10.5	8.0	3.0	2.6	5.1	6.9	8.5
Capital plus Reserve/ (Liabilities and Equity)								
Nationalized Banks	1.7	2.3	3.9	3.4	4.1	4.8	4.3	4.0
SBI Banks	1.7	2.0	2.2	3.2	3.9	4.8	4.5	4.6
Old Private Sector Banks	3.2	3.6	4.0	5.6	5.4	5.5	5.6	5.6
New Private Sector Banks	–	–	9.0	25.5	10.0	7.8	6.3	6.0
Foreign Banks	6.8	7.9	17.4	25.0	28.4	25.2	25.4	20.5
Capital Adequacy Ratio[1]								
Nationalized Banks	–	–	–	8.2	10.2	10.5	10.9	11.1
SBI Banks	–	–	–	10.0	10.4	12.5	11.9	12.0
Old Private Sector Banks	–	–	–	10.5	11.3	12.0	12.6	12.3
New Private Sector Banks	–	–	–	42.7	15.9	13.9	12.0	13.4
Foreign Banks	–	–	–	–	41.4	38.0	43.9	31.9

Source: PROWESS Database, Center for Monitoring Indian Economy Pvt. Ltd.; Report on Trend and Progress of Banking in India, 1997-2000, RBI.

Note: [1] Excludes nationalized banks with negative networth.

during 1995-2000. However, the profitability of foreign and new private sector banks has shown a declining trend from the middle of 1990s, in part because of the entry of new banks, establishment of new branches, and expansion of business during this period. By contrast, both nationalized and SBI banks have improved their profitability in the latter half of the 1990s.

However, caution should be exercised particularly with regard to the improved performance of the nationalized banks, since profits of nationalized bonds include income from recapitalized bonds. ROA of nationalized banks was only 0.03 per cent in 1997, 0.05 per cent in 1998, -0.15 per cent in 1999, and 0.01 per cent in 2000, if income from recapitalized bonds were to be excluded. The ROA excluding income from recapitalized bonds has remained low and has even deteriorated during 1997-2000. This suggests that the improvement in the performance of nationalized banks is attributable to holdings of recapitalization bonds, not so much because of their efforts to restructure their management and governance systems. On the other hand, the improvement of the performance of SBI banks, all of which did not get recapitalized, may reflect an improvement of their management and governance. Overall, a decline in net interest income lowered banks' ROA, but the decline was offset mainly by an increase in income from investment and profits from diversification (defined as income arising from securities and foreign exchange transactions, and commissions and brokerage).

As for earnings efficiency (defined as income divided by assets or INCOME), foreign banks have been generally better performers. According to INCOME, foreign banks have consistently performed better than private sector and public sector banks, although foreign banks' income generating capacity deteriorated somewhat from 15 per cent in 1993 to 12.8 per cent in 2000. The poorer performance of domestic banks relative to foreign banks can be attributed to more stringent requirements imposed on domestic banks with respect to advances to priority sectors, greater Government intervention, concentration on the retail market and hence greater competition, poor management, and lower interest rate margins. Further, foreign and new private sector banks are generally more cost-efficient (defined as operating expenses divided by operating income or COST) than public sector banks. However, foreign banks have deteriorated in cost-efficiency during 1995-1997 and 1999, because of expansion of business. Indeed, nationalized banks and SBI have improved cost-efficiency over the sample period.

China: WSCBs have maintained profitability at a very low level – below 0.2 per cent throughout 1994-2000 (table 4). This level of profitability (measured by ROA) is remarkably small, especially when compared with OCBs, which achieved nearly 2 per cent profitability in 1994-1995. Meanwhile, it should be noted that OCBs' profitability has rapidly deteriorated from 1.8 per cent in 1994 to 0.6 per cent in 2000 – as against WSCBs, whose profitability has improved slightly in 2000.

Table 4. China: selected indicators of the performance of commercial banks, 1994-2000

(percentage)

	1994	1995	1996	1997	1998	1999	2000
Profit after Tax/Average Assets (ROA)							
Wholly State Owned Commercial Banks	0.1	0.2	0.1	0.1	0.1	0.1	0.2
Other Commercial Banks	1.8	1.7	1.6	1.4	1.2	0.8	0.6
Income/Assets (INCOME)							
Wholly State Owned Commercial Banks	16.0	12.6	11.2	12.4	6.2	5.0	4.4
Other Commercial Banks	6.8	8.3	8.1	8.3	6.3	4.9	3.9
Operating Expenses/Operating Income (COST)							
Wholly State Owned Commercial Banks	85.9	70.2	69.3	67.5	79.9	78.7	77.0
Other Commercial Banks	45.1	43.8	59.9	49.9	56.9	63.6	66.1
Capital plus Reserve/(Liabilities and Equity)							
Wholly State Owned Commercial Banks	3.5	3.3	3.0	3.2	5.8	5.4	5.3
Other Commercial Banks	8.8	6.4	8.2	6.8	9.5	8.4	5.3
Loan Loss Reserves/Loans							
Wholly State Owned Commercial Banks	0.5	1.1	0.9	0.7	0.8	1.2	1.0
Other Commercial Banks	0.6	0.7	0.9	1.3	1.6	1.7	1.4

Source: Bankscope, Fitch IBCA.

Interest income is the major source of income, accounting for more than 90 per cent of income. Although interest income includes income from investment, the major source of interest income is from advances. This is in sharp contrast to Indian banks, whose income sources are more diversified and interest income from advances accounts for only about 50 per cent of income. According to the net interest income ratio (net interest income divided by average assets), OCBs' net interest income ratio has consistently exceeded that of the WSCBs during 1995-2000. This may reflect the fact that OCBs are more conscious of returns and risk than WSCBs and thus charge higher lending rates that are allowed within the ceiling. However, net interest income has declined for the OCBs during 1998-2000 and the WSCBs during 1999-2000, contributing to a decline in profitability. This happened even though interest rate spreads expanded during this period. This may reflect a delay in interest rate payments on bank loans by borrowers as well as a cautious attitude toward new bank loans and refinancing previous loans. With respect to profitability related to non-interest income (such as commissions and income from trading), OCBs have constantly obtained more returns from non-traditional services than WSCBs. Thus, it can be said that OCBs have diversified more successfully than WSCBs, even though greater diversification is limited by the Commercial Bank Law.

As for the indicator of earnings efficiency proxied by INCOME, WSCBs have performed better than OCBs during 1994-1997. However, the difference was small during 1998-2000. Earnings-efficiency of both types of banks has deteriorated in recent years. With respect to the indicator of cost-efficiency proxied by COST, OCBs have been more cost-efficient than WSCBs throughout the reform period. However, OCBs' cost-efficiency deteriorated in 1998-2000, while that of the WSCBs improved slightly in 1998-2000. The increase in COST by OCBs during 1998-2000 reflects mainly an increase in operating expenditure, such as personnel expenditure. The increase in personnel expenditure is attributable to staff wage rises and an expansion of employment as the number of branches and offices rose.

Capital, asset quality, management and liquidity

India: The overall soundness of the banking sector is assessed from four aspects: capital adequacy, asset quality, management, and liquidity. In the case of the capital adequacy ratio, two indicators were used: equity plus reserves over assets and risk-weighted capital adequacy ratio. According to the first indicator, the ratio of foreign banks increased from 7 per cent in 1993 to 21 per cent in 2000 (table 3). In terms of the risk-weighted capital adequacy ratios, foreign banks have maintained the ratios above 30 per cent during 1997-2000, albeit at a decelerating trend. These ratios are significantly high not only from the global standard but also compared with other domestic banks. While these indicators have reported an increasing trend for old private sector and public sector banks, the scale of increase has been small. This suggests that foreign banks have greater incentives to lend prudently and remain well capitalized than other banks. This reflects in part that foreign banks have steadily reduced their deposit dependence ratio, while other banks have maintained their deposit-dependence ratio throughout the sample period.

Asset quality can be measured by (1) the ratio of contingent liabilities to assets, (2) asset growth, (3) the ratio of investment in Government securities to assets, and (4) the ratio of provisions for NPA to assets. The first indicator reports that the ratio of foreign banks (at around 25-30 per cent) has been greater than that of private and public sector banks (about 10 per cent). While this indicates that foreign banks are more exposed to high potential losses in cases of default, this outcome may simply reflect that foreign banks provide more complex and sophisticated services than domestic banks, given that their activities are concentrated in urban areas, wholesale markets and large clients. The second indicator reports that foreign banks (about 30 per cent) and new private sector banks (about 100 per cent) have faced rapid asset growth in 1996-2000 compared with other banks (about 20 per cent), signaling some kind of risk-taking behaviour. However, this may be explained simply by their early stage of establishment, not necessarily by risk-taking behaviour. The third indicator shows that all banks invested about 40 per cent of assets in Government securities,

which can be used as a large cushion against NPA. The fourth indicator reports that foreign banks generally allocated greater provisions for NPA. Given that more stringent accounting and auditing standards of their mother countries are applied to foreign banks, foreign banks are more resilient to adverse shocks.

With respect to management performance, the ratio of advances to deposits was used. Foreign banks attempt to improve their income by expanding their lending operations as compared with other domestic banks. The ratio of foreign banks surged from 56 per cent in 1993 to 94 per cent in 2000, while domestic banks maintained the ratio at about 40 per cent over the same period. Given that foreign banks' ratio of advances to assets is similar to other domestic banks (about 40 per cent of assets), this simply suggests that foreign banks lowered the deposit dependency ratio, as pointed out above. Finally, all banks have to maintain sufficient liquidity in terms of cash and balance with banks and the RBI and investment in Government securities, suggesting that they are relatively resilient to systemic banking crises.

China: As measures of soundness, the following four indicators were adopted: capital and reserves divided by assets, loan loss reserves as a share of loans, asset growth, and liquidity ratio. With respect to the first indicator, OCBs were more capitalized than WSCBs in 1994-1999 (table 4). Although WSCBs have increased capital from 3.5 per cent of assets in 1994 to 5.3 per cent in 2000, the improvement has been modest. In addition, OCBs had greater loan loss reserves as a share of loans than WSCBs in 1997-2000. Even though regulations require banks to set aside only 1 per cent of their outstanding credit, this suggests that OCBs have tended to put aside more provisions than WSCBs. As for asset growth, OCBs (44 per cent) were higher than WSCBs (12 per cent), but like Indian banks, this could be attributed to the entry of new banks. OCBs also held more liquid assets (proxied as deposits with the PBC divided by customer deposits) than WSCBs in 1997-2000. In particular, OCBs tended to hold excess reserves during 1998-2000, even after the reserve requirement sharply dropped from 20 per cent in 1993 to 8 per cent in 1998 and to 6 per cent in 1999. Moreover, the sum of deposits with PBC and bank deposits divided by assets shows that OCBs held more liquid assets (about 16 per cent) than WSCBs (about 10 per cent) during 1998-2000.

Comparison between India and China

There are several common features with respect to the banking sectors in India and China. First, in both state-controlled banks are dominant financial institutions. This phenomenon has not changed despite banking sector reforms adopted in both countries. While the number of public sector banks is greater in India than in China, the largest public sector bank, the SBI, accounts for over 20 per cent of deposits or assets in India, suggesting that the banking sector is oligopolistic. While Government involvement in the banking sector can be justified at the initial stage of economic

development, the prolonged presence of excessively large public sector banks often results in inefficient resource allocation and concentration of power in a few banks. Further, once entry deregulation takes place, it will put newly established banks in an extremely disadvantageous position.

Second, foreign and private sector banks generally performed better than public sector banks in terms of profitability in India. In China, OCBs were better performers than WSCBs. This suggests that state-controlled banks were generally poor performers than non-state-controlled banks in both countries, suggesting the need for restructuring state-controlled banks and at the same time promoting the entry of new banks. Nevertheless, it should be pointed out that this superiority of non-state-controlled banks was pronounced particularly in the initial reform stage in both countries.

Third, foreign banks have been more capitalized and more provisioned than other banks in India. Similarly, in China, OCBs have been more capitalized and more provisioned. This suggests that the balance sheets of state-controlled banks are less sound than non-state-controlled banks in both countries. Fourth, banks in India and China have displayed a tendency to increase holdings of Government bonds in recent years. This has happened in India even though the SLR declined. In China, there is no statutory liquidity requirement applied to Government bonds, but preference toward investment in securities was pronounced.

Fifth, both public sector banks as well as other banks in India have reduced the share of deposits with the RBI in assets, in line with a decline in the CRR. Instead, these banks have increased investment in Government bonds and have done so even by lowering advances. Similarly, WSCBs in China have lowered the share of deposits with the RBI in assets during 1998-2000 in line with a decline in the reserve requirement (to a lesser extent for OCBs). These banks have instead increased investment in securities and has done so even by lowering the share of advances in assets. This suggests that there may be some cases of crowding out the private sector. Indeed, both countries have informal credit markets, where credit is expended by unregulated non-bank financial institutions at substantially higher rates.

Sixth, WSCBs are not illiquid and they are able to operate in practice despite the weak structure of their balance sheets. This is because households have increasingly deposited their savings at these banks believing that they are protected by the central Government, which retains full ownership. Also, the underdeveloped state of the financial markets has left households no other choice but to save in banks or Government bonds. In India, many public sector banks in India have improved their performance and have been competing with small savings schemes, provident fund systems, and the capital market. However, like China, there are still a few weak public sector banks and they continue to remain operational. This reflects the public perception that public sector banks are protected by the Government and are thus safer than private sector banks.

Despite these similarities, there are clear differences in terms of performance between the two countries. First, public sector banks in India have improved their performance measured by profitability and cost-efficiency, and their differences compared with private sector and foreign banks have diminished over the reform period. On the other hand, there was no sign of improvement with respect to profitability; indeed, there was a decline in earnings-efficiency for WSCBs in China. Moreover, even though WSCBs improved cost-efficiency during 1994-1997, the cost-efficiency has since deteriorated.

Second, the decline in the difference with respect to profitability and cost-efficiency between public sector banks and other banks in India has emerged as a result of an improvement of performance of public sector banks and a deterioration of performance of foreign and new private sector banks. On the other hand, the decline in the difference with respect to profitability between WSCBs and OCBs in China has occurred as a result of a deterioration of performance of OCBs. In the meanwhile, the decline in the difference as for cost-efficiency has happened as WSCBs improved cost-efficiency while OCBs worsened it. These observations suggest that there was a non-negligible impact of the reforms on the performance of public sector banks in India (although caution has to be exercised on the interpretation of nationalized banks' performance, as indicated above), while no clear impact of reforms was observed with respect to the performance of WSCBs in China.

Third, the banking sector reforms have not generated a noticeable improvement in the soundness of WSCBs. Their capital adequacy and loan loss provisions have remained low. Paid-in capital (comparable to Tier-1) of WSCBs declined relative to bank assets from 12.1 per cent at the end of 1985 to 2.2 per cent at the end of 1997 (Lardy, 1999). Meanwhile, the soundness of public sector banks in India has improved especially based on the risk-weighted capital adequacy ratio and greater capitalization over the period.

Fourth, WSCBs continue to be agents of the central Government. Although explicit policy lending practices have been reduced, lending to SOEs still constitutes a large share of WSCBs' credit. Credit decisions by WSCBs are often influenced by central Government guidance. While banks in India are subject to priority sector lending requirement, the negative impact of this policy lending was reduced through expanding the defnition of priority sector lending and liberalizing interest rates on advances over Rs 200,000. Banks are allowed to choose sectors and projects with more flexibility under the target and sub-target requirements. While domestic banks are often asked to extend credit to specific individuals and projects under lending requirement to the weaker sections, this share accounts for only 10 per cent of advances.

III. LESSONS FROM INDIA'S EXPERIENCE

This section focuses on six issues related to India's banking sector reforms and identifies lessons that could be obtained from them and be applied to China's future reform agenda.

Privatization

The Indian Government did not engage in a drastic privatization of public sector banks. Rather, it chose a gradual approach toward restructuring these banks by enhancing competition through entry deregulation of foreign and domestic banks. This reflects the view of the Narasimham Committee that ensuring integrity and autonomy of public sector banks is the more relevant issue and that they could improve profitability and efficiency without changing their ownership if competition is enhanced.

Since this approach was introduced, some criticisms have been expressed (Joshi and Little, 1996). First, public sector banks continue to be dominant thanks to their better branch coverage, customer base and knowledge of the market compared with newcomers. Second, public sector banks would find it more difficult to reduce personnel expenditure because of the strong trade unions. Third, the Government would find it difficult to accept genuine competition within public sector banks. In response to these concerns, the Government decided to gradually expand private sector equity holdings in public sector banks, but still avoided the transformation of their ownership. However, many public sector banks have remained fully or largely owned by the Government.

Meanwhile, a consensus is emerging among academicians that state ownership of banks is bad for financial sector development and growth (World Bank, 2001). Based on data of the 10 largest commercial and development banks in 92 countries for 1970-1995, La Porta and others (2000) have found that greater state ownership of banks in 1970 was associated with less financial sector development, lower growth, lower productivity and that these effects were greater at lower levels of income. Barth and others (2001) have shown that greater state ownership of banks tends to be associated with higher interest rate spreads, less private credit, less activity on the stock exchange and less non-bank credit, even after taking into account other factors that could influence financial development. This suggests that greater state ownership tends to be anti-competitive, reducing competition both from banks and non-banks. Barth and others (2001) have also noted that applications for bank licenses are more often rejected and there are fewer foreign banks when state ownership is greater. Moreover, Caprio and Martinez-Peria (2000) have shown that greater state ownership at the start of 1980-1997 was associated with a greater probability of a banking crisis and higher fiscal costs.

With respect to privatizing banks, the World Bank (2001) takes the view that privatization can yield real benefits to economies provided that an appropriate accounting, legal and regulatory infrastructure is in place. It should be noted that premature privatization may give rise to banking crises. Clarke and Cull (1998) have demonstrated that Argentina promoted privatization of public sector banks in a reasonably developed regulatory and infrastructure environment, and thus, privatized banks improved productivity remarkably.

Based on panel data, Shirai (2002a) has reported the results of regression estimation that India's privatization has not produced any significant impact on improving the performance of public sector banks. Partial privatization has not improved their corporate governance so far through greater shareholder supervision. This is partly because individual voting rights have remained limited by rules to a maximum of 10 per cent, and partly because the share of the public sector (central Government or the RBI) has remained large. While privatization of viable public sector banks should be promoted further, information, legal, and judiciary infrastructure that is needed for developing a sound capital market should be strengthened. Mere privatization without institutional changes, where external shareholders and independent boards of directors cannot practice corporate governance properly, will not produce a favourable impact on the performance of partially privatized public sector banks.

In addition, the Government of India is of the view that the public sector nature of nationalized banks should continue even if the Government stake drops to the proposed 33 per cent (Raje, 2000). To improve the performance of public sector banks, the Government should alter this view and transform public sector banks to purely commercial-oriented banks with greater autonomy with respect to operations and human resources policies. This is particularly so if it wishes that these banks could become more profitable and efficient, thereby being able to compete with private sector and foreign banks in a level playing field and lowering their dependence on Government financial support. Moreover, the board of directors should be reformed by increasing the number of competent external directors, guaranteeing independence of the board from Government and political interference, improving accounting and disclosure standards and strengthening minority shareholders' rights. It is important to ensure a clear separation of management and ownership. The improvement of corporate governance in the banking sector would also help increase the price of initial public offerings and hence promote privatization.

Entry deregulation

Imposing entry barriers in the banking sector often gives rise to an inefficient resource allocation across sectors and projects and, at the same time, collusive behaviour among creditor banks and between banks and borrowers. On the other hand, such a policy can be justified theoretically if it improves banking sector efficiency, provided

that commercial banks perform a unique role that cannot be undertaken by non-bank financial institutions and capital markets. Commercial banks collect, analyze and process internal information about borrowers by forming long-term relationships with them. With these skills and expertise, banks are able to finance SMEs whose information is largely idiosyncratic (Yoshitomi and Shirai, 2001). Information held by banks can be idiosyncratic and non-transferable, but cannot and/or need not be standardized – whereas standardization of information about issuing firms is necessary for corporate securities. These features of banks are important especially when disclosure, auditing, and accounting requirements are loosely or inadequately implemented against borrowers, in the absence of sophisticated legal and institutional infrastructures.

This may explain partly why the banking system is likely to dominate at the early stage of economic development. Further, Rajan and Zingales (1998) have pointed out that in countries where corporate governance is inadequate and bankruptcy laws are virtually non-existent, the specific expertise of commercial banks – which know how to exercise power over borrowers even when explicit protections for the banks are inadequate – is necessary when extending loans to firms. They have also demonstrated the existence of a negative correlation between the degree of sophistication of accounting standards and the size of the banking sector.

When bank regulators determine entry criteria they need to ensure that commercial banks have an incentive to perform their information collecting and monitoring functions. To do so, bank regulators need to balance between allowing banks to maintain profitability (or earn economic rents that offset risks borne by banks in the process of providing various financial services) by limiting the entry of new banks and preventing them from extracting excessive rents by encouraging the entry. Without sufficient rents, banks may have no choice but to engage in risky activities because they need to fight for their market shares or profit margins. As a result, such risk-taking behaviour would reduce the value of banks' future earnings and associated incentives to avoid bankruptcy (Allen and Gale, 2000). To maintain sufficient profitability in the banking process, therefore, excessive competition among banks needs to be avoided through granting a relatively small number of them the privilege of offering demand deposits and payment services (Rajan, 1997).

While attempting to maintain adequate rents for banks, nevertheless, regulators need to introduce measures to prevent banks from engaging in excessive risk-taking behaviour and extracting rents from their borrowers more than is justified by risks that they bear. Otherwise, borrowers are discouraged from undertaking innovative, profitable ventures, thereby resulting in slower economic growth (Rajan, 1992). Thus, regulators need to carefully consider the extent of competition in the banking sector by taking account of the trade offs and supplement this policy with other prudential measures, such as capital adequacy requirements, that contribute to limiting excessive risk-taking by banks.

The analysis in section III has indicated that in India, foreign and new private sector banks were more profitable than public sector banks initially, although their profitability has deteriorated in recent years. Based on INCOME and COST indicators, foreign and private sector banks were relatively earnings- and cost-efficient in earlier periods, but public sector banks have gradually improved their performance in the reform period. This suggests that the performance of public sector banks has become comparable to the foreign and private sectors. These results show that ownership mattered initially in terms of performance differentials, but became less so in the later part of the reform period. In other words, entry deregulation has exerted some pressure on public sector banks and has encouraged them to perform better (however, caution should be exercised for nationalized banks with respect to this statement since an increase in their profits comes largely from interest income from recapitalization bonds).

Furthermore, despite entry deregulation, public sector banks have remained dominant. The SBI, the largest public sector bank, has even increased its share both in terms of deposits and assets. Given that public sector banks have scale advantages with nation-wide branch networks (especially as compared with private sector banks that tend to compete in the retail market), the current approach of improving their performance without rationalizing weak public sector banks and downsizing large public sector banks may not produce further and substantial benefits for India's banking sector. Furthermore, new banks continue to be prevented from competing on the same level playing field. This would encourage new banks to enter into different segments of markets such as niche or wholesale markets, thereby exerting less competitive pressure on existing dominant public sector banks.

Liquidity requirements

Imposing statutory liquidity requirement may be necessary as a policy to develop a Government bond market. The Asian Policy Forum (2001) has pointed out that over-dependence on bank-based financing and the underdeveloped state of bond markets in Asia have significant adverse implications, such as lack of measurement of the opportunity cost of capital, inefficient use of high savings and excessive short-term debt. The development of a local currency-denominated bond market can provide stable sources of longer-term local currency funding, in the process of helping to reduce a double mismatch and strengthen financial sector resilience. Moreover, bond markets help to improve the efficiency of resource allocation through market-determined interest rates; spread various borrowers' credit and market risks among a large number of dispersed investors; and, serving as a buffer when banking sector problems occur. Development of a Government bond market is a prerequisite for developing a corporate bond market. In addition, investment in Government securities could help to lower the share of high risk-weighted assets and would thus improve the capital adequacy and liquidity ratios.

On the other hand, the diversion of financial resources away from lending activities owing to the SLR requirement may increase banks' cost of operations from these activities. This is because banks may be able to reduce the costs of collecting and evaluating information regarding creditworthiness of their borrowers through economies of scale. The economies of scale occur in the presence of the fixed cost of hiring professional staff with special expertise in loan evaluation. Also, the economies of scale arises from banks' provision of settlement and checking accounts and other financial services to their borrowers, which gives them an opportunity to monitor the economic activities and cash flow movements of their borrowers. Moreover, large holdings of Government securities may crowd out the private sector. Shirai (2002a) has found that in India, investment in Government securities has tended to lower the performance of the whole banking sector. The regression estimation has found that this investment has affected adversely banks' profitability (based on ROA) and cost efficiency (based on COST).

Based on these factors, the statutory liquidity requirement should not be dismissed. Rather, it might be used not only as a policy to promote the development of a Government bond market, but also as a policy to strengthen banks' ability to manage with various shocks. However, as the Government bond market develops and banks' risk management improves, a reduction of the requirement should be considered. Large holdings of Government bonds, as is the case of banks in India, may not help them to improve their risk management in lending activities and give an incentive to banks in processing and evaluating information about borrowers and monitoring them.

Directed and subsidized lending

India's Government has attempted to mitigate the adverse impact of directed lending on banks' performance by expanding the coverage and gradually liberalizing lending interest rates on advances over Rs 200,000. Thus, the adverse impact of priority sector lending is expected to decline over the period and to contribute to improving banks' performance. Meanwhile, banks continue to be asked to extend credit to weaker sections, frequently to particular individuals and projects. Shirai (2002a) has reported regression estimation results that while priority sector lending has contributed to improving cost-efficiency (measured by COST) and earnings-efficiency (measured by INCOME), it has lowered the profitability of public sector banks, calling for a further reform in priority sector lending.

Also, the current practice of setting lending interest rates below the PLR for advances less than Rs 2,000,000 appears problematic. Banks should be allowed to set lending interest rates more flexibly by considering returns and risk of each project. The practice of setting below-PLR lending rates indicates the presence of subsidized lending by banks, making it difficult for banks to improve their performance further. This is particularly so when the Government does not provide explicit compensation

for this type of lending. Such lending, if performed by commercial banks, should be exercised at market terms and at banks' initiatives. In the long run, the Government of India should reform existing state-controlled development banks and other financial institutions and transfer all policy lending activities to these finiancial institutions. It is important to ensure a separation of commercial lending and policy lending, which would be a prerequisite for enhancing banks' accountability and management skills.

Scope of business

Financial conglomeration gives banks an opportunity to gain non-interest income, thereby sustaining profitability. This enables banks to maintain long-term relationships with clients throughout their life cycles and thus gives them an incentive to collect and produce internal information and monitor them. Such practices lower banks' incentives to take excessive risks. Also, banks can obtain diversification benefits by diversifying their activities whose returns are imperfectly correlated, thereby stabilizing their profitability. This in turn cuts the costs banks charge their lending and underwriting customers. Close multi-dimensional relationships between banks and firms can reduce the costs of obtaining funds for firms, improve their performance, make investment decisions less dependent on retained earnings, and make it easier for firms to resolve financial distress (Yoshitomi and Shirai, 2001).

Financial conglomeration also promotes efficiency by allowing banks to utilize internal information. Through long-term lending relationships, banks already possess internal information about creditworthiness of borrowers and features of their investment projects that are not readily available to outsiders. Thus, banks do not need to spend a great deal of resources in collecting information about their clients that is necessary for underwriting securities issued by them. So banks may be able to underwrite securities at lower costs than non-bank underwriters. Firms issuing information-sensitive securities may receive higher prices when banks underwrite them than when independent investment firms do so, because of perceived monitoring advantages of the banks that are a by-product of their lending activities.

Thanks to reputation, moreover, investors may be willing to purchase securities underwritten by bank underwriters rather than independent underwriters. To the extent that it is easier to gain a reputation in some businesses than in others and to the extent that there are spillovers in reputation, banks can use the reputation gained in offering one service to recommend their other services (Rajan, 1996). Banks also enjoy economies of scope from the production of financial services. They can spread the fixed costs in terms of physical and human capital needed for managing a client relationship over a wider set of products (Steinherr and Huveneers, 1990). Economies of scope can be exploited by using their branch networks and all their other existing delivery channels to distribute additional products at low marginal cost (Llewellyn, 1996). Also, banks can better handle the shifts in demand for the products they offer by quickly transferring resources within organizations.

These advantages, however, can be offset by the following disadvantages. First, public sector banks' engagement in securities business may promote a concentration of power in the banking sector. This is partly because banks become too large and partly because banks have a natural tendency to promote lending over securities, thereby indirectly deterring the development of capital markets. Further, the reputation and informational advantages enjoyed by public sector banks put them in an even more advantageous position, preventing other banks and investment firms from competing on a level playing field.

Second, banks' engagement in underwriting services may lead to conflicts of interest between banks and investors. Banks may decide to underwrite securities for troubled borrowers so that proceeds from the issue of securities can be used to pay off these banks' own claims to the companies. Banks may dump into the trust accounts they manage the unsold part of the securities they underwrite. Further, banks may impose tie-in deals on customers by using their lending relationships with firms to pressure them to purchase their underwriting services (e.g., using the threat of increased credit costs or non-renewal of credit lines). Banks may also use the confidential internal information that they possess when they underwrite firms' securities in a way that the firms do not contemplate, such as disclosing the information directly or indirectly to the firms' competitors.

Third, diversification may expose banks to various new risks. For example, banks may end up buying the securities they underwrite. They may also face greater market risks as they increase their share of securities holdings and market making activities. Further, derivatives involve higher speed and greater complexity, which may reduce the solvency and transparency of banking operations.

Given this background, Shirai (2002a) has found that Indian banks' engagement in non-traditional activities and an increase in profits from these activities have contributed to improved banks' performance based on profitability and cost-efficiency as well as the earnings-efficiency of the banking sector. In India, banks have been allowed to engage in diverse activities including securities and foreign exchange transactions, brokerage and dealing activities and other fee-based business even before the 1991 reform programmes have been launched. At the same time, the RBI is aware of problems arising from banks' engagement in non-traditional business and has tried to cope with them by encouraging banks to engage in this through subsidiaries, thereby putting in place firewalls between traditional banking and securities services to some extent. The expansion of the scope of banks' business has certainly helped offset a decline in net interest income from advances, driven by interest rate deregulation. This has an important policy implication for the sequencing of financial liberalization. Namely, regulators should introduce policy measures that would supplement an expected decline in net interest income caused by interest rate liberalization, in order to prevent banks from taking excessive risks in an attempt to maintain profitability.

In China, the Commercial Bank Law prohibited banks from engaging in securities and related business activities in 1994 after the occurrence of the 1992-93 chaos. In 1992, the Government permitted banks to transact some non-traditional banking business in 1992. Consequently, all the specialized banks and most of their major branches were encouraged to establish finance companies, which engaged in imprudent or fraudulent operations and led to financial chaos in 1992-1993. Also, many of these banks divested funds earmarked for agriculture and other key projects into stock market and real estate market speculation. When monetary policy was tightened in late 1993, many banks and branches lost money from these securities activities, causing instability in the banking system (Ma, 1997). Since then, the Government has required all banks to divest themselves of investment banking affiliates and prohibited commercial banks from engaging in securities trading and underwriting, investment in non-bank financial enterprises and productive enterprises and investment trust business under the Commercial Bank Law.

Since 1998, WSCBs have begun to provide money-managing services, including personal investment to individual clients. These banks have since established money-management offices in major cities. In July 2001, the PBC issued a provisional regulation on commercial banks' intermediate business to promote business innovation, improve bank services and competitiveness, and reduce financial risks. The PBC has defined intermediate businesses as those that do not constitute scheduled assets and liabilities, and produce non-interest income for banks including settlement, warranty, acceptance and trading. Thus, with PBC's ratification, commercial banks can engage in financial derivatives business, agency security business, investment bank business, information consultation and financial advisory services. Diversification of banks' business is likely to become an important component of the reform agenda in China, especially when the Government begins to promote further interest rate deregulation. However, it is important that regulators should implement necessary regulatory and legal systems that are able to cope with problems arising from banks' engagement in non-traditional business.

Connected lending

The RBI prohibits cross-holdings with industrial groups to minimize "connected lending" – one of the causes of the East Asian crisis. The Banking Regulation Act prohibits loans and advances to directors or to any firm or company in which directors are interested or individuals in respect of whom any of its directors is a partner or guarantor. In addition, banks are required to provide loans to their own subsidiaries or joint ventures on an arms-length basis. Banks' investments in subsidiaries are deducted from their Tier I capital. Considering that connected lending was one of the major problems causing excessive risk-taking by banks in Asian crisis-affected countries, it is appropriate for bank regulators in China to impose

this restriction from the beginning when entry deregulation has occurred. Once such practices are implemented, it is difficult to remove them later due to strong resistance, as is the case in a few East Asian countries.

IV. REMAINING AGENDA FOR CHINA

In China, the biggest constraint holding back drastic financial reforms arises clearly from the problems of borrowers – namely, the poor and deteriorating performance of SOEs. Growing numbers of SOEs have experienced a substantial decline in profits in the 1990s in spite of overall economic growth. This has not only caused a rapid deterioration of WSCBs' loan assets, but has also limited credit available to non-state firms by absorbing more than 75 per cent of bank loans, deterring investment and output growth of non-state firms. About half of the SOEs incur net losses nowadays, compared with only 30 per cent just a few years ago. Factory capacity utilization rates for major industrial products of SOEs have been at a level below 60 per cent.

The poor performance of SOEs is attributable to growing competition, slackening efficiency due to the slow adoption of technological advancement and large accumulated debt. Also, SOEs are obliged to provide social services to workers and maintain their employment and, in some cases, continue to pay a salary to retirees. These practices make it difficult for the SOEs to become commercially oriented (Broadman, 1999). Moreover, the absence of clear identification of owners of the SOEs and inadequate property rights undermine corporate governance since it is not clear who should monitor managers. Also, the introduction of non-state shareholders through public listings has not resulted in a clear separation of ownership and management, since few outside shareholders exercise discipline on the management of the SOEs. In response to the rapidly deteriorating performance of SOEs, the Government attempted various experiments in the 1990s, including management contracting, providing greater autonomy to managers, corporatization and ownership diversification. Moreover, the supervisory capacity over most industrial SOEs (about 110,000 firms) has been transferred from the central Government to local governments (Broadman, 1999). Also, a multilayered organizational network has emerged by including State asset management bureaus, State asset operating companies and State asset supervisory committees. Nevertheless, only a few SOEs have been divested to the non-state sector and almost all of such firms have been small. It has also become increasingly apparent that the SOE reform strategy has produced problems unanticipated by the reform's framers, including asset stripping, decapitalization, wage manipulation and tax evasion. These problems have severely undermined banking sector performance.

By contrast, such SOEs' problems have been less pronounced in India, which makes it relatively easier for the Government to cope with banking sector restructuring.

In India, there are only about 300 SOEs at the central Government level, as compared with China with a few hundred thousand SOEs. Many of these firms have been already partially privatized since the early 1990s. Even during the planned economic development regime, there were already many private firms that operated across sectors. Thus, SOEs are not major borrowers of banks in India and, therefore, not the major cause of NPA.

China's second constraint acting against a smooth implementation of financial reforms is that the ownership of WSCBs has not changed and the intervention by the central Government in banks' resource allocation remains. Aware that privatization of the WSCBs (as well as SOEs) is a key to successful financial reforms, the Government recently announced that these banks would be gradually restructured by allowing them to become joint-stock companies listed on the stock exchanges. Immediately after the announcement, however, the stock prices of listed banks (and SOEs) plunged in the expectation that a massive disposal of stocks would lead to a decline in prices and thus investors would experience a capital loss. In response, the Government reversed its decision by suspending state share sales. The PBC Governor, Mr Die Xianglong, announced in November 2001 that WSCBs restructuring would be carried out in several steps: (1) an improvement of management skills with a rationalization of staff and organizations; (2) allowing WSCBs to become joint-stock companies with central Government holding more than 50 per cent of stock; and (3) encouraging them to list on the stock exchange. In addition, the Governor said that WSCBs would be allowed to sell shares to foreign investors.

In the case of India, public sector banks have been gradually and partially privatized in the 1990s. Even though there is no significant impact of partial privatization on the performance of public sector banks based on regression analysis, it has certainly increased pressure on the management of these banks. Moreover, all public sector banks used to be private sector banks prior to the nationalization and hence used to operate on a commercial basis. This makes it easier for public sector banks to improve their risk management skills and performance – a sharp contrast to China, where there were no such private banks prior to the reforms.

The third constraint is that entry of private sector banks is limited. Moreover, other commercial banks need to be restructured through listing shares in stock exchanges and improving their corporate governance. So far, there are only four publicly listed commercial banks. Shirai (2002b) has reported that these listed banks have not necessarily performed better than other banks. These banks have been less profitable (in terms of ROA) and less well capitalized than city banks. This suggests that the Government policy of approving listings is not necessarily based on the performance of the bank and the approval process is not transparent.

In India, allowing the entry of private sector and foreign banks that are well capitalized and high technology-oriented has certainly increased competitive pressures on public sector banks. Also, all private sector banks are listed on stock exchanges

and managers of these banks are very conscious of their performance. The stock market in India has developed rapidly since the 1980s. There are about 10,000 listed companies and 22 stock exchanges. In 1992, the National Stock Exchange of India was established in order to offer screen-based trading. In 1992, the Securities and Exchange Board of India (SEBI) Act was introduced. Pror to 1992, the Controller of Capital Issues (CCI) used to approve equity issuance based on the requirment of a debt-equity ratio of 2 versus 1 (higher ratio for capital-intensive industries). Shares could be issued only once a year. Since 1992, the CCI was abolished and SEBI became a special Government entity with the aim to protect investors and develop the capital market. Foreign institutional investors were also allowed to enter primary and secondary markets. Thus, the listing requirement is transparent and participation is open to all private firms. Moreover, the accounting and disclosure standards have been strengthened in the 1990s.

The fourth constraint is that the balance sheets of WSCBs have remained weak despite recapitalization and transfer of NPA to the AMCs. The Government of China needs to clean up and restructure the balance sheets of WSCBs more drastically before they become public. Once NPA problems are resolved, the Government must consider how to strengthen the capital base of these banks. However, the absence of secondary markets for credit and collateral and inadequate property rights makes it difficult to transfer, sell, or securitize WSCBs' assets, since the market price of the assets can hardly be realized and the ratio of realized asset values to book values is low. Improving the legal and institutional environment is essential to fulfilling this goal. Moreover, the Government should ensure that AMCs are granted the authority to restructure SOEs and formulate asset resolution procedures. This might include a revision of the bankruptcy law that would provide AMCs with the skills and incentives to discharge their responsibilities and would ensure that their financial positions are sound (IMF, 2000). Similarly, the balance sheets of OCBs should be cleaned up and restructured.

At the same time, as a related measure, the Government needs to adopt global standards on accounting, auditing and disclosure requirements in order to reveal the true status of the NPA problems of WSCBs. The Government had already tightened prudential regulations in 1998 and 2000. However, existing accounting principles appear to be problematic, especially as to the calculation of maturities of interest receivable and the principle of provisioning for NPA. Also, reliable, transparent business records of financial institutions are scarce, making mergers, restructuring, or closure of any financial institutions difficult. Thus, promoting standardization of information regarding financial institutions as well as enterprises is a prerequisite not only for successful restructuring of WSCBs and other financial institutions, but also to foster sound capital markets.

While prudential norms are still not adequate in India, the strengthening of these norms has helped the Government to grasp the true status of NPA of nationalized

banks when recapitalization practices were launched. As a result, some nationalized banks have improved their balance sheets, thereby enabling them to sell shares in the stock exchanges. Also, strengthening of provisioning requirements has helped these banks cope with NPA problems.

Finally, there are three good lessons that could be learnt from the experience of India's banking sector reforms and could be applied to China. First, the entry of new banks should be promoted provided that they are sufficiently capitalized and are technology-oriented. Second, diversification of banks' business should accompany interest rate liberalization in order to supplement an expected decline in net interest income and prevent banks' from taking excessive risks in an attempt to maintain profitability. Third, banks should be prohibited from connected lending. Considering that connected lending was one of the major problems causing excessive risk-taking by banks in Asian crisis-affected countries, it is appropriate for bank regulators to impose this restriction from the beginning when entry deregulation has occurred.

REFERENCES

Allen, Franklin, and Douglas Gale, 2000. *Comparing Financial Systems*, The MIT Press.

Asian Policy Forum, 2000. Policy Recommendations for Preventing Another Capital Account Crisis, Asian Development Bank Institute.

_____, 2001. Policy Recommendations for Designing New and Balanced Financial Market Structures in Post-Crisis Asia, Asian Development Bank Institute.

Barth, James, Gerard Caprio, and Ross Levine, 2001. "Banking systems around the globe: do regulation and ownership affect performance and stability?" Forthcoming in Frederic Mishkin, ed., *Prudential Regulation and Supervision: Why it is Important and What are the Issues*, Cambridge, Massachusette, National Bureau of Economic Research.

Beck, Thorsten, Ross Levine, and Norman Loayza, 1999. "Finance and the sources of growth", mimeo.

Broadman, Harry G., 1999. "The Chinese state as corporate shareholder", vol. 36, No. 3, *Finance and Development*, International Monetary Fund.

Caprio, Gerald, and Maria Soledad Martinez-Peria, 2000. "Avoiding disaster: policies to reduce the risk of banking crises", Discussion Paper, Egyptian Center for Economic Studies, Egypt.

Clarke, George R.G., and Robert Cull, 1998. "Why privatize: the case of Argentina's public provincial banks", Policy Research Working Paper No. 1972, World Bank.

International Monetary Fund (IMF), 2000. Article IV Consultation with China, 1 September, Public Information Notice (PIN) No. 00/71.

Joshi, Vijay and I.M.D. Little, 1996. *India's Economic Reforms: 1991-2000*, Clarenmdon Press, Oxford.

La Porta, Rafael, Florencio Lopez-de-Silanes, and Guillermo Zamarripa, 2000. "Soft lending and hard lending: related lending in Mexico", mimeo, Harvard University.

Lardy, Nicholas R., 1999. "When will China's financial system neet China's needs?"

Conference on Policy Reform in China, Stanford University.

Llewellyn, David. T., 1996. "Universal banking and the public interest: a British perspective", *Universal Banking: Financial System Design Reconsidered*, Anthony Saunders and Ingo Walter eds., Chicago: Irwin Professional Publishing, pp. 161-204.

Ma, June, 1997. "China's economic reform in the 1990s", World Bank, mimeo.

Rajan, Raghuram G., 1992. "Insiders and outsiders: the choice between informed and arm's-length debt", *Journal of Finance*, vol. 47, No. 11, pp. 1,367-1,399.

_____, 1996. "The entry of commercial banks into the securities business: a selective survey of theories and evidence", Universal Banking: Financial System Design Reconsidered, Anthony Saunders and Ingo Walter, eds., Chicago: Irwin Professional Publishing, pp. 282-302.

_____, 1997. "The past and future of commercial banking viewed through an incomplete contact lens", mimeo.

Rajan, Raghuram G., and Luigi Zingales, 1998. "Financial systems, industrial structure, and growth", mimeo.

Raje, Pradeep, 2000. "Where did India miss a turn in banking reform: is there a comeback ?", CASI Working Paper, Center for the Advanced Study of India.

Shirai, Sayuri, 2001. "Searching for new regulatory frameworks for the intermediate financial market structure in post-crisis Asia", Asian Development Bank Institute Research Paper No. 24.

_____, 2002a. "Road from state to market-assessing the gradual approach for the banking sector reforms in India", Asian Development Bank Institute Research Paper No. 32.

_____, 2002b. "Banking sector reforms in the case of the People's Republic of China-progress and constraints", in Economic and Social Commission for Asia and the Pacific and Asian Development Bank, *Rejuvenating Bank Finance for Development in Asia and the Pacific*. United Nations publication, Sales No. E.02.II.F.57 (ST/ESCAP/2206).

Steinherr, Alfred, and C. Huveneers, 1990. "Universal banks: the prototype of successful banks in the integrated European market? A view inspired by the German experience", Center for European Policy Studies, Financial Markets Unit, Working Paper No. 2.

World Bank, 2001. *Finance for Growth: Policy Choices in a Volatile World*, New York, Oxford University Press.

Yoshitomi, Masaru, and Sayuri Shirai, 2000. *Technical Background Paper for Policy Recommendations for Preventing Another Capital Account Crisis*, Asian Development Bank Institute.

_____, 2001. "Designing a financial market structure in post-crisis Asia: how to develop corporate bond markets", Asian Development Bank Institute Working Paper No. 15.

STOCK PRICE BEHAVIOUR IN INDIA SINCE LIBERALIZATION

H.K. Pradhan* and Lakshmi S. Narasimhan**

The study investigates the behaviour of Indian stock price indices for the 12-year period 1990-2001. This period coincides with major changes in the Indian capital market and the opening up of the Indian economy. The stock market witnessed unprecedented swings and volatility during this period, which have had severe repercussions for investors, both individual and institutional. The study also explores other important issues facing the Indian stock market such as return volatility, including its time varying pattern, tests of market, efficiency, impact of foreign capital inflows on the volatility of the indices and correlation of Indian indices with those of some Asian and developed country markets.

The study is based upon three Indian stock market indices from the Bombay and National Stock Exchanges, the BSE-30, BSE-100 and NSE-50 indices. It is organized in six sections. The first section gives a brief overview of the Indian stock market. Section II describes the data considered for the study and summarises its main features. Discussion of the volatility of returns begins in section III, as volatility is considered as an important distinguishing feature of emerging markets. Volatility measures are defined and computed as within-month and within-year standard deviations of continuously compounded daily returns during the period. These are compared to alternate volatility models widely used in the literature to generate an accurate measure of volatility and to test for the presence of asymmetric volatility in Indian stock markets.

Section IV deals with the testing of market efficiency using unit root tests as well as variance ratio tests. A moving window approach to observe the change in market efficiency over the period is presented and this is followed by a study on the characterization of foreign capital flows to India. Using Granger Causality tests the causal relationship between domestic returns and world returns is examined, as well as the relationship between domestic return volatility and foreign portfolio inflows into India. In the last section, the increasing correlation of Indian capital markets

---

*   Professor of Finance and Economics at Xavier Labour Relations Institute (XLRI), Jamshedpur, India.
**   Senior Doctoral Fellow at XLRI, Jamshedpur, India.

with important capital markets in the Asia-Pacific region and three developed country markets over time is tested. With Indian capital markets becoming more integrated with regional and international capital markets, they have become more prone to external shocks. By examining the stock price behaviour during the period 1990-2001, the study attempts to draw important lessons relevant to the economic life of India from the perspective of an emerging market.

I. AN OVERVIEW OF THE INDIAN STOCK MARKET

The financial sector in India has undergone rapid change in recent years. The deregulation of the securities markets and the gradual reform of the banking sector have ushered in a new era for the financial sector of the Indian economy. Significant changes have occurred, particularly on the equities side. The repeal of the Capital Issues (Control) Act in 1992 allowing companies to price their issues based on market conditions, rationalization of the process of price discovery in the primary market, enhancing the information content of stock prices through disclosure norms both at the time of issuance as well as while listing, improved trading and settlement practices and promotion of international best practices including rolling settlement are the most important changes in the equity markets. The screen based trading system introduced by the National Stock Exchange (NSE) has greatly enhanced the price formation process and has gradually made market prices reflect the fundamental values. The participation of foreign institutional investors (FIIs) in the capital markets since September 1992 and allowing Indian companies to raise funds from the international capital market have helped broaden the investor class.

Table 1 gives important statistics of the secondary market for the time period covered in this study for reference. The growth of the Indian capital market is evident from the table. The number of listed companies (9,922) in the country is second only to the United States of America. The total market capitalization and the turnover in the market have increased with a cumulative annual growth rate of 21.43 per cent and 46.00 per cent respectively. BSE-Sensex (BSE-30) and S&P CNX-Nifty (NSE-50) are the most popular market indices of the country's two leading stock exchanges, the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE) respectively.

II. DATA DESCRIPTION AND SUMMARY STATISTICS

The data set comprises of three value weighted market indices: BSE-SENSEX (BSE-30), BSE National Index (BSE-100) and S&P CNX-Nifty (NSE-50) comprising 30, 100 and 50 stocks listed in the stock exchanges. We consider monthly return data on these market indices for the 12 years covering the period 1990-2001 to observe the effects of financial market liberalization on the stock market. The National Stock Exchange (NSE) became functional only in 1993; however, the CNX-Nifty has been

Table 1. Selected indicators of secondary markets

At the end of financial year	No. of listed companies	S&P CNX-Nifty	BSE-Sensex	Market capitaliza-tion	Market capitaliza-tion ratio	Turnover	Turnover ratio
1990-91	6 229	366.45	1 167.97	110 279	20.6	–	–
1991-92	6 480	1 261.65	4 285.00	354 106	57.4	–	–
1992-93	6 925	660.51	2 280.52	228 780	32.4	–	–
1993-94	7 811	1 177.11	3 778.99	400 077	45.6	203 703	50.9
1994-95	9 077	990.24	3 260.96	473 349	45.6	162 905	34.4
1995-96	9 100	985.30	3 366.61	572 257	47.0	227 368	39.7
1996-97	9 890	968.85	3 360.89	488 332	34.6	646 116	132.3
1997-98	9 833	1 116.65	3 892.75	589 816	37.7	908 681	154.1
1998-99	9 877	1 078.05	3 739.96	574 064	34.1	1 023 382	178.3
1999-00	9 871	1 528.45	5 001.28	1 192 630	84.7	2 067 031	173.3
2000-01	9 922	1 148.20	3 604.38	768 863	54.5	2 880 990	374.7

Source: Reserve Bank of India, National Stock Exchange.
Note: Amount in rupees cores

back calculated from 1990 by the NSE. The data have been collected from the ISI-Emerging markets database and the NSE. Monthly return data have been considered for all the empirical tests, except otherwise mentioned, to have compatibility across the sections of this study. Charts 1, 2 and 3 present the details of the monthly returns and the movements of BSE-30, BSE-100 and NSE-50 respectively. The charts clearly reveal that growth in the stock market has also been accompanied by high volatility and swings in stock prices.

The summary statistics for the data are presented in table 2 in two panels. Panel A presents the statistics for the whole period i.e. January 1990 to December 2001. However, during the time period used for this study, the Indian stock market witnessed two securities scams that were accompanied by prolonged and persistent upward movement of the market. This persistent movement of the market and the resulting autocorrelation might have confounding effects on the data particularly for the tests for market efficiency done in section IV. Hence we present in Panel B of table 1, the summary statistics of the returns excluding the period of the two securities market scams i.e. July 1991 – April 1992 and April 1999 – February 2000. Apart from the standard statistics such as mean, variance, skewness and kurtosis of return data, Ljung-Box Q statistics are also provided for the significance of the autocorrelations with various lags.

Chart 1: BSE-30 and its Monthly Return: 1990-2001
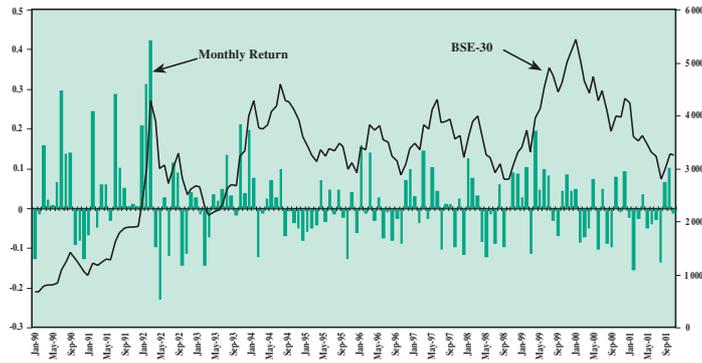
Chart 2: BSE-100 and its Monthly Return: 1990-2001
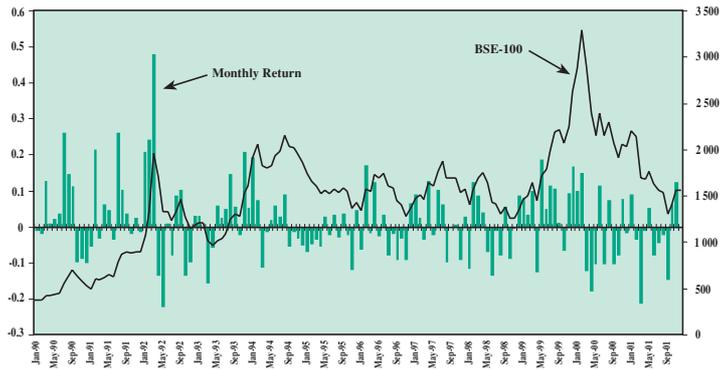
Chart 3: S&P CNX-Nifty and its Monthly Return: 1990-2001
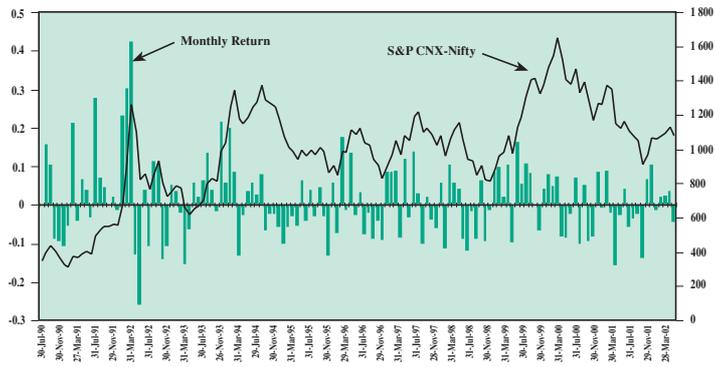
Table 2. Summary statistics for the market proxies

	BSE-100	*BSE-30*	*NSE-50*
Panel A			
Mean return	0.0097	0.0099	0.0081
Variance	0.0095	0.0092	0.0088
Skewness	0.3268	0.4821	0.3408
Kurtosis	1.0953	0.9252	1.1907
ρ_1	0.1441	0.1455	0.1143
	[3.0527]*	[3.1141]*	[1.8298]
ρ_2	0.0084	0.0297	-0.0001
	[3.0630]	[3.2446]	[1.8298]
ρ_4	-0.1504	-0.1515	-0.1559
	[8.7011]*	[8.6268]*	[7.9497]*
ρ_8	-0.1026	-0.1053	-0.0876
	[20.3905]**	[16.9182]**	[19.4885]**
ρ_{16}	-0.0893	-0.0662	-0.0879
	[42.5297]**	[39.2359]**	[43.1254}**
Panel B			
Mean return	0.0114	0.0116	0.0096
Variance	0.0140	0.0136	0.0121
Skewness	2.7310	3.2845	2.7920
Kurtosis	14.8135	21.9632	16.6261
ρ_1	-0.0179	0.0269	0.0032
	[0.0405]	[0.0919]	[0.0012]
ρ_2	-0.0427	-0.0332	-0.0434
	[0.2727]	[0.2318]	[0.2273]
ρ_4	-0.0504	-0.0490	-0.0375
	[1.5684]	[1.2668]	[1.2874]
ρ_8	-0.0779	-0.0880	-0.0824
	[5.3469]	[7.0789]	[5.7403]
ρ_{16}	0.0193	0.0119	-0.0590
	[9.8361]	[11.9648]	[9.4112]

Note: Panel A is for the whole period 1990-2001 and Panel B is for the same period excluding the period of security market scams (Jul'91 to Apr'92 and Apr'99 to Feb'00). * denotes Significant at 10 per cent level and ** denotes significance at 5 per cent level on Ljung-Box Q-statistic for serial correlation.

The data reveal the unique features of a typical emerging market return, viz. high mean and variance and highly non-normal distribution of the returns. Also from Panel A, it can be observed that the monthly returns are correlated at different lags and the Ljung-Box Q statistics reveals that they are significant at both 5 per cent and 10 per cent significance levels. Interestingly, once the data for the scam periods are excluded, the autocorrelations are no longer statistically significant (Panel B).

III. VOLATILITY

We start our discussion with volatility, as this is an important feature of the behaviour of emerging market returns. In this section, we study whether the policy changes as well as the operational platforms that have evolved in Indian stock markets have helped in reducing market volatility. Volatility is defined as the standard deviation of the returns and we employ daily returns of the three selected market indices to calculate within-month and within-year volatility. Following Schewart (1989), the standard deviation of the returns within a month is calculated as:

$$\sigma_{a,\,m} = \{[1/(n\text{-}1)] \sum_{t=1}^{n} (R_{m,\,t} - \mu_m)^2 \}^{0.5}$$

where μ_m denotes the mean return during the month and n is the number of trading days during the month. And $\sigma_{a,\,m}$ is the monthly volatility, measured as the standard deviation of the returns within the month m. The monthly volatility estimated is summed up to find the annual volatility for the respective years. Chart 4 gives the variance of the market returns in two panels: one for the time period 1990-1995 and the other for 1996-2001. The market was extremely volatile during the first scam period (July 1991 – April 1992) and the annualized variance of the returns was 48 per cent. Barring this period, the second panel is more volatile compared to the first panel. The figures of annual variance given in table 3 also corroborate the fact: volatility in the Indian stock markets has increased during the last few years.

**Chart 4. Monthly variance for 1990-1995 (Panel A)
and 1996-2001 (Panel B)**
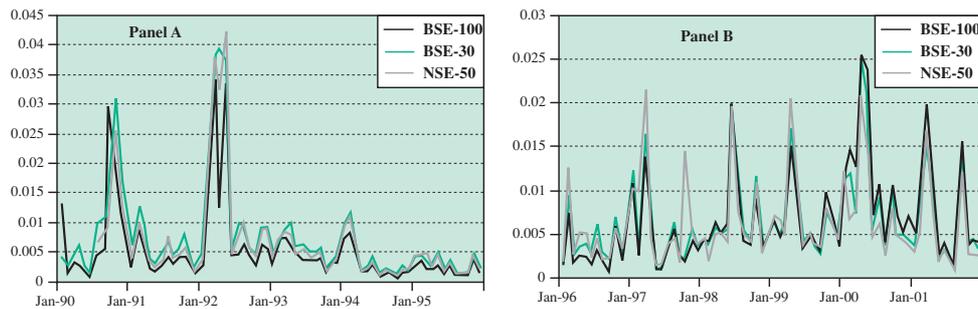
The financial literature has established and well documented that the phenomenon of volatility is time varying with the change in expected returns (see Bekaert and Wu, 2000). Studying the time varying volatility for an emerging market is all the more important because if the market is segmented, volatility is priced under

Table 3. Annual variance during 1990-2001

Annual variance	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
BSE-30	0.12	0.07	0.18	0.06	0.04	0.03	0.05	0.06	0.08	0.07	0.11	0.07
BSE-100	0.10	0.04	0.13	0.05	0.03	0.02	0.04	0.06	0.08	0.08	0.14	0.08
NSE-50	0.07	0.05	0.18	0.06	0.04	0.03	0.05	0.08	0.07	0.08	0.10	0.06

the conditional CAPM framework (Bekaert and Harvey, 1997). Another branch of volatility studies that is gaining increased attention in the literature is the asymmetric reaction of volatility to positive and negative news. For the same size of shocks in returns, negative news increase the volatility more than positive news. This has been attributed to changes in shocks across the markets. Hence, one would expect an emerging market like India to show a significant asymmetric volatility pattern. In order to investigate the dynamics of Indian stock market volatility and to test for the presence for asymmetric volatility, we estimate the conditional variance using three volatility models that are widely used in the financial literature. We use GARCH (1, 1) of Bollerslev (1986), Exponential GARCH (1, 1) of Nelson (1991) and the GJR-GARCH model of Glosten, Jagannathan and Rundle (1993). EGARCH and GJR-GARCH are asymmetric volatility models to test the presence of asymmetric volatility in Indian market. The parameterization of the variance under these models is given in table 4 for reference.

Table 4. Variance equations of volatility models

GARCH (1, 1) model (Bollerslev (1986))

$$h_t = \alpha_0 + \alpha_1 \, \varepsilon_{t-1}^2 + \beta \, h_{t-1}^2$$

EGARCH (1, 1) model (Nelson (1991))

$$\log(h_t) = \omega + \beta \log(h_{t-1}) + \gamma \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \alpha \left[\frac{|\varepsilon_{t-1}|}{\sqrt{h_{t-1}}} - \sqrt{\frac{2}{\pi}} \right]$$

GJR-GARCH model (Glosten, Jagannathan and Runkle, 1993)

$$h_t = \omega + \beta \, h_{t-1} + \alpha \, \varepsilon_{t-1}^2 + \gamma \, S_{t-1}^- \, \varepsilon_{t-1}^2 \quad \text{where } S_t^- = 1 \text{ if } \varepsilon_t < 0, \, S_t^- = 0 \text{ otherwise}$$

For estimating these models, the conditional mean of the returns needs to be specified. We define the relation between conditional mean and conditional variance as:

$$E_t\ [R_{t+1}] = \beta\ \sigma_t^2$$

where R_{t+1} is the nominal returns on the market index and σ_t^2 is the variance estimated at time t. This follows the intertemporal relation derived between risk and return. Though the original derivation is for excess returns, we assume that it holds for nominal returns, following Schewart (1989). We fit the models for the daily returns data using Maximum Likelihood procedures (see Engle and Ng, 1993). From the daily variance, monthly variance of the returns is estimated by summing up the daily variance for all the trading days of the respective month. Chart 5 plots the actual variance along with the volatility estimated using the three volatility models.

Chart 5. Monthly volatility charts for BSE-30, BSE-100 and NSE-50
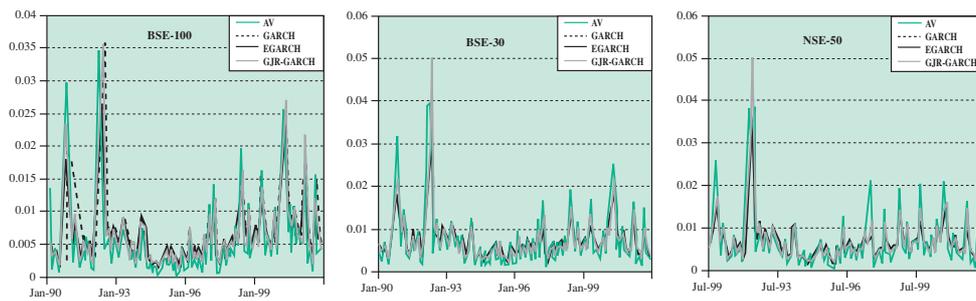
Four standard loss functions viz., Mean Error (ME), Mean Absolute Error (MAE), Root Mean Square Error and Mean Absolute Percentage Error (MAPE) are employed to find the performance of these models for explaining the return volatility. Table 5 gives the estimation of the standard loss functions.

The error statistics for the three volatility models are provided in table 6 for comparison. It is evident that asymmetric models outperform the simple GARCH model, and GJR-GARCH model generates fewer errors than the other two models. Also the coefficients for the asymmetric component are statistically significant. We have not attempted to study the impact of asymmetry for typical shocks that have occurred in the Indian stock market on the lines of Bekaert and Wu (2000) and Nelson (1991) as our objective was only to test for the presence of asymmetric volatility. Nevertheless, a detailed study of the asymmetric volatility on Indian stock markets would offer very interesting insights. Besides, the results of this subsection need to be read with caution because no out-of-sample forecasting has been done and the forecasting performance of the asymmetric volatility models is not known.

Table 5. Standard loss functions

$$ME = \frac{1}{N} \sum_{T=1}^{N} (\hat{\sigma}_T^2 - \sigma_T^2)$$

$$MAE = \frac{1}{N} \sum_{T=1}^{N} \left| \hat{\sigma}_T^2 - \sigma_T^2 \right|$$

$$RMSE = \sqrt{\frac{1}{N} \sum_{T=1}^{N} (\hat{\sigma}_T^2 - \sigma_T^2)}$$

$$MAPE = \frac{1}{N} \sum_{T=1}^{N} \left| (\hat{\sigma}_T^2 - \sigma_T^2)/\sigma_T^2 \right|$$

Table 6. Error statistics of volatility models

Market indices	Volatility models	ME	MAE	RMSE	MAPE
BSE-30	GARCH (1, 1)	0.00057	0.00205	0.00307	0.48065
	EGARCH	0.00041	0.00218	0.00253	0.48688
	GJR-GARCH	0.00059	0.00207	0.00241	0.48048
BSE-100	GARCH (1, 1)	0.00071	0.00267	0.00489	0.69044
	EGARCH	0.00049	0.00191	0.00272	0.53793
	GJR-GARCH	0.00076	0.00177	0.00241	0.53416
NSE-50	GARCH (1, 1)	0.00051	0.00199	0.00294	0.48319
	EGARCH	0.00030	0.00224	0.00348	0.49923
	GJR-GARCH	0.00053	0.00202	0.00301	0.48528

IV. MARKET EFFICIENCY

This section is devoted to testing weak form efficiency of the Indian stock market using unit root tests and variance ratio tests. We adjust the data for the second major securities market scam that occurred during the study period. Thus we do our tests for the whole time period as well as excluding scam periods and show that excluding the scam periods makes the autocorrelation of the returns statistically insignificant. Next we introduce a moving window approach following Yilmaz (2001) to observe the change in market efficiency over time (see Pant and Bishnoi, 2001).

We study market efficiency using two separate tests, viz. unit root tests and variance ratio tests. The Ljung-Box Q statistics for autocorrelation reported along with the summary statistics can be considered as the first test in this regard. The Q statistics for a particular lag (i) test the null hypothesis that all the autocorrelations till the lag i are jointly zero. Monthly returns at the market level are used for the variance ratio tests because daily returns might have spurious correlation due to problems such as non-synchronous trading and the inference may not be correct (Campbell and others, 1997). Though weekly returns would have given a better picture, to ensure compatibility with other sections of the study we proceed with calculating the variance ratios for monthly returns.

We start by performing the conventional Augmented-Dickey-Fuller (ADF) statistic of Dickey and Fuller (1981), and the Phillips-Perron (1988) test statistic to determine whether or not the stock price indices are stationary.

$$\Delta X_t \; = \; \alpha + \beta X_{t\text{-}1} + \sum\nolimits_{i=1}^{m} \gamma_i \, \Delta X_{t\text{-}i} + e_t$$

Ho: $\beta = 0$ versus H_1: $\beta > 0$, so that the null hypothesis implies a unit root, implying that the series is stationary. We use the indices as well as their first differences for both the tests, and conduct the tests for the whole period as well as for the two sub-periods. The results presented in table 7 reveal that the null hypothesis of the existence of unit roots is rejected at the level form of the indices, but is accepted in the first difference form, when both the ADF and Phillips-Perron (P-P) tests are conducted. The series are therefore found to be I(1) in levels but stationary in their first differences.

It is to be noted here that the unit root test is a necessary but not a sufficient condition for random walk tests. The unit root tests of the above form tests only whether the returns are stationary and it is the permanent/temporary nature of shocks to X_t concerns the unit root tests instead of its predictability. Also it is possible to have non-random walk alternatives in the unit root null hypothesis, which cannot be identified through this method (Campbell and others, 1997).

We further use variance ratios test developed by Lo and Mackinlay (1988) to test market efficiency. In the case of the random walk process (efficient market) the variance of random walk increments must be a linear function of the time interval and the variance ratio test exploits this property to test the informational efficiency. For example, in the case of efficient markets, the sum of the variances of r_t and $r_{t\text{-}1}$ must be twice the variance of r_t and this is tested by checking whether their ratio is statistically indistinguishable from one. In general terms, if we have nq+1 observations of logarithmic stock prices, we can obtain nq compounded returns r_0, r_1, r_2, .r_{nq} at equal intervals. The variance ratio test implies, that for any q greater than unity, the

Table 7. ADF and PP tests of unit roots in the Indian stock market

Time period	Augmented Dickey-Fuller (ADF)		Phillips-Perron (P-P)	
	Levels	First difference	Levels	First difference
BSE-30				
1990-2001	-2.132591	-5.398679	-2.456334	-10.93776
1990-1995	-2.011239	-5.122836	-1.986359	-6.632107
1996-2001	-2.178902	-5.183755	-2.002590	-8.865657
BSE-100				
1990-2001	-2.148115	-5.471261	-2.547507	-10.37392
1990-1995	-1.887661	-5.132758	-1.901104	-6.801123
1996-2001	-2.087326	-5.496198	-1.946581	-7.617739
NSE-50				
1990-2001	-2.420289	-5.176936	-2.477680	-10.71467
1990-1995	-1.632413	-4.780187	-1.811893	-6.324638
1996-2001	-2.182246	-5.165078	-2.082684	-8.968228

Notes: The Mackinnon (1991) critical value of ADF statistic for 139 observations with a trend and a intercept is -4.0263 at 1 per cent, -3.4426 at 5 per cent, and -3.1457 at 10 per cent level of significance, respectively. The corresponding values for the P-P statistic are -4.0245, -3.4417 and -3.1452, respectively.

ratio of $1/q$ of the variance of $(r_t - r_{t-q})$ to the variance of $(r_t - r_{t-1})$ which can be written as follows:

$$VR\ (q) = \sigma_b^2\ (q)\ /\ q * \sigma_a^2$$

where $\sigma_b^2\ (q)$ is an unbiased estimate of the variance of the qth difference of r_t and σ_a^2 is an unbiased estimator of the variance of the first difference of r_t. They can be estimated as given below.

$$\sigma_a^2 \equiv (1/nq - 1) \sum_{k=1}^{nq} (P_k - P_{k-1} - \mu)^2$$

$$\sigma_b^2 \equiv (1/m) \sum_{k=q}^{nq} (P_k - P_{k-q} - q\mu)^2$$

where $m \equiv q\ (nq - q + 1)\ (1 - 1/n)$ and $\mu = (P_{nq} - p_0)/nq$.

Lo and Mckinlay (1988) derive the asymptotic distribution of the variance ratios and offer two test statistics $Z(q)$ and $Z^*(q)$. The first test statistic $Z(q)$ is for testing the random walk process that assumes that the errors are IID and the $Z^*(q)$ is for testing the random walk process allowing for heteroscedasticity in the error term. The test statistics are given as:

$$Z(q) = [VR(q) - 1]/\sqrt{[\phi(q)]} \approx N(0, 1)$$

where $[\phi(q)] = [2(2q - 1)(q - 1)]/[3q(nq)]$

$$Z^*(q) = [VR(q) - 1]/\sqrt{[\phi^*(q)]} \approx N(0, 1)$$

where $\phi^*(q) = (\theta / nq)$

$$\theta = 4 \sum_{k=1}^{q-1} [\{1 - k / q\}\delta_k]$$

$$\delta_k = [nq \sum_{j=k+1}^{nq} (P_j - P_{j-1} - \mu)^2 (P_{j-k} - P_{j-k-1} - \mu)^2] / [\sum_{j=1}^{nq} (P_j - P_{j-1} - \mu)^2]^2$$

$\phi(q)$ and $\phi^*(q)$ are the homoscedastic and heteroskedastic asymptotic variance of the process (see Campbell and others, 1997). Under the null hypothesis, the prices follow random walk process RW1 or RW3. The test statistics as given by equations (8) and (10) are asymptotically normally distributed and the values obtained from the study if greater than the critical value of the standard normal process would mean rejecting the null hypothesis which is a random walk process and hence signifies market efficiency.

We start with the testing of the weak form efficiency (both RW1 and RW3) for the full period (1990:01 to 2001:12) as well as after excluding the scam period. The variance ratios and test statistics $Z(q)$ and $Z^*(q)$ are provided in table 8. With both the test statistics, we could not reject the null hypotheses of random walk for both the indices for all the four lags considered. The variance ratios estimated for the NSE-50 are more close to unity suggesting that NSE-50 might be more efficient compared to other market indices. The VR statistics in Panel B, suggest that, as expected, the variance ratio moves closer to unity on excluding the data during the scam period and the null hypothesis could not be rejected in any of the cases. Also VR (16) for Panel B is in the range of 0.58 to 0.75 which suggests mean reversion of the returns. This can be corroborated by the significant negative correlation reported in the summary statistics for the same lag.

In principle, stock market liberalization should improve the efficiency of the markets. This is because the investor base becomes wider with the participation of

Table 8. Variance ratios for monthly market returns

Market portfolio	No of observations	VR(2)	VR(4)	VR(8)	VR(16)
Panel A					
BSE-100	144	1.1520 [1.8247] (1.2674)	1.1814 [1.1637] (0.7956)	1.1852 [0.7516] (0.5515)	1.0582 [0.1585] (0.1238)
BSE-30	144	1.1458 [1.7502] (1.2378)	1.2038 [1.3071] (0.9104)	1.2021 [0.8197] (0.6036)	1.0745 [0.2030] (0.0999)
NSE-50	137	1.1149 [1.3460] (0.9289)	1.1056 [0.6609] (0.4435)	1.1083 [0.4288] (0.3073)	0.9581 [-0.1113] (-0.0863)
Panel B					
BSE-100	123	0.9901 [-0.1103] (-0.1303)	0.9934 [-0.0393] (-0.0436)	0.9620 [-0.1425] (-0.1532)	0.6906 [-0.7797] (-0.8323)
BSE-30	123	1.0292 [0.3232] (0.3973)	1.0611 [0.3621] (0.4008)	1.0097 [0.0364] (0.0382)	0.7503 [-0.6291] (-0.6456)
NSE-50		1.0056 [0.0604] (0.0824)	1.0125 [0.0721] (0.0734)	1.0026 [0.0095] (0.0078)	0.5858 [-1.0136] (-0.7578)

Foreign Institutional Investors (FII) on Indian stocks and also with the international listing of Indian stocks directly or through ADR/GDRs (American or General Depository receipts. Allowing the setting up of private mutual funds also contributes, and has contributed, to the increased scrutiny and increased trading of Indian stocks. Besides, the introduction of screen-based trading has removed the deficiencies of the open outcry system and improved the price discovery process. The logical conclusion of these arguments is that market efficiency should improve over time.

Hence we proceed to test this conjecture with the help of a moving window technique. For this purpose, we construct moving windows of constant width (60 months) and this would move from 1990:01 till the end of the data period. The selection of 60 months as window width is purely for the sake of convenience and so as to have sufficient data points in every window. Also, it is quite conventional in asset pricing studies spanning longer time periods to keep the length of sub periods as five years. The moving window construction can be pictorially represented as is done below.

Construction of moving window with constant width

1990:02	1995:01

1990:03	1995:02

••••••••
••••••••

1997:01	2001:12
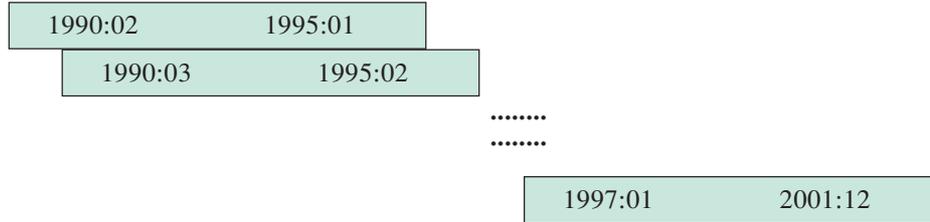
The Z-statistics obtained for the moving windows are plotted against time to observe the change in informational efficiency. The critical values to reject the null hypothesis of random walk is 1.96 at a 5 per cent significance level. The moving windows at the end would contain data for the latest period and the test statistics for them must be better than the test statistics for the windows at the beginning if the market is becoming more efficient. Or, in other words, the plot of the test statistics for the moving windows should be dropping in case of increasing market efficiency (chart 6). As expected, the test statistics fall smoothly as we consider the latest data and move away from the critical values. Taken together, the empirical evidence based on the variance ratio and unit root tests reveal the evolving market efficiency in Indian stock price indices.

Chart 6. Evidence on increasing market efficiency
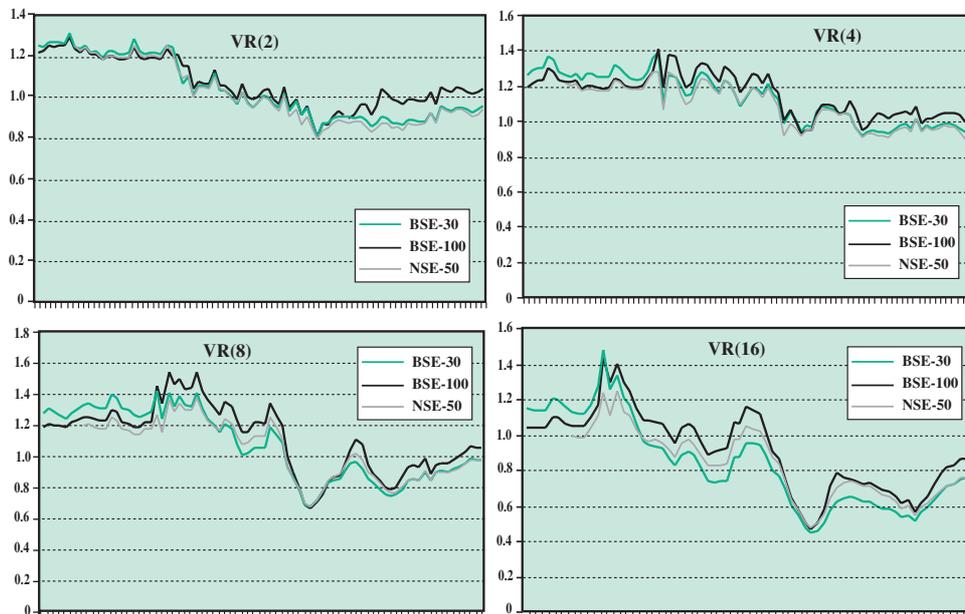
V. FOREIGN PORTFOLIO INFLOWS

Foreign portfolio flows play a very important role for emerging economies by providing the much needed capital for economic growth. The Indian stock market after opening to Foreign Institutional Investors (FII) has attracted considerable capital flows into the stock exchanges. During 2000/01 foreign portfolio investments in India accounted for over 37 per cent of total foreign investments and 47 per cent of the total current account deficit, the corresponding figures for the preceding year being 59 per cent and 64 per cent respectively (Chakravarti, 2001).

Bekaert and Harvey (2000) documents significant reduction in the cost of capital for 18 emerging markets including India after they opened their capital market to foreign investors. The presence of foreign investors changes the marginal investor in the market and pushes up share prices thus reducing the cost of capital. This reduced cost of capital is one of the reasons for the economic booms witnessed in emerging economies immediately following liberalization (Henry, 2000 and Kim and Singhal, 2000). But the benefits from foreign portfolio flows do not come without cost. Often they also are blamed for the increase in volatility of the domestic returns. This is substantiated by the empirical literature that foreign investors engage in return chasing and exert significant influence on local market variances (see Bohn and Tesar, 1996, Clark and Berko, 1997, Choe and others, 1999). This has resulted in countries like Malaysia re-imposing some constraints for foreign investors. Charts 7A and 7B display the time series behaviour of net FII flows into India along with the trends in BSE-100 and its volatility, generally establishing the volatility causation.

Chart 7A. FII Flows BSE-100
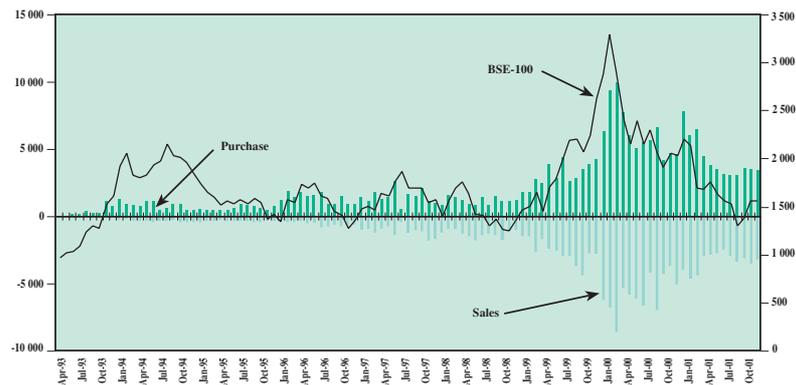
Chart 7B. Net FII Flows and Varance of BSE-100
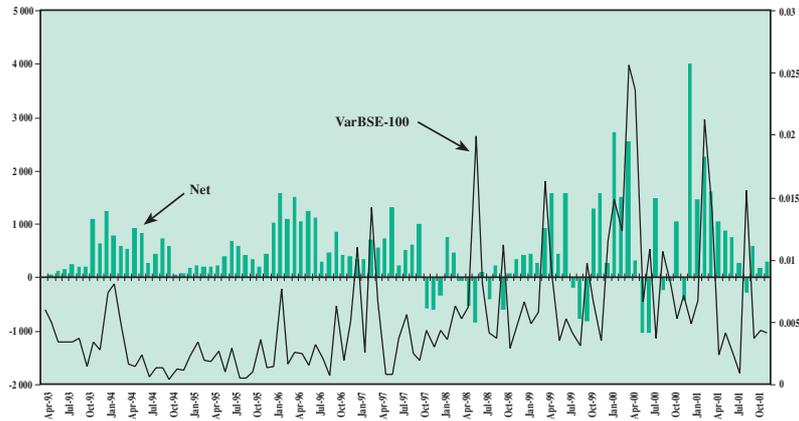
In this section, we test whether foreign investors have played a role in the increase in volatility in the Indian stock market. We employ Granger causality testing to establish the causal relationship between the FII in flows and the domestic market returns and its variance. Additionally we use other important variables such as rupee-US dollar exchange rates and MSCI indices for the US to characterize foreign portfolio flows to India. Taken together these variables would indicate the primary factors that determine the FII flows to India.

Typically the Granger causality test involves the estimation of the bivariate regressions as given below:

$$Y_t = a_0 + a_1 Y_{t-1} + ... + a_l Y_{t-l} + \beta_l X_{t-1} + ...\beta_l X_{t-l}$$

$$X_t = a_0 + a_1 X_{t-1} + ... + a_l X_{t-l} + \beta_1 Y_{t-1} + ...\beta_l Y_{t-l}$$

We estimate the F-statistics for the test of joint hypothesis $\beta_1......\beta_l = 0$. The null hypothesis set as X does not Granger cause in the first regression, and Y does not Granger cause (GC) X in the second regression. The choice of lag length is restricted to two months, without stretching the variables too far.

Pair-wise Granger causality tests between monthly net FII flows and variables such as monthly return on BSE-30, BSE-100 indices and NSE-50, within-month variance in return in these indices, rupee-US dollar exchange rate and return on MSCI-USA are calculated for the period March 1993-December 2001. As revealed from table 9, there is evidence of returns causing portfolio inflows and this in turn affecting the behaviour of returns and their variances in the Indian stock markets. We have

Table 9. Results of the pair-wise Granger Causality tests

Null hypothesis	F-statistics	Probability
Granger Causality between BSE-30 return and FII flows (net)		
Returns on BSE does not GC FII flows (net)	7.08680	0.00133
FII flows (net) does not GC returns on BSE	2.16850	2.16850
BSE return does not GC FII flows (purchase)	2.80657	0.06528
FII flows (purchase) does not GC BSE return	1.35658	0.26233
Granger Causality between variance in BSE-30 return and FII flows (net)		
Variance in BSE returns does not GC FII flows (net)	1.41449	0.24797
FII flows (net) does not GC variance in BSE returns	2.34943	0.10078
Variance in BSE return does not GC FII flows (sales)	1.20445	0.30426
FII flows (sales) does not GC variance in BSE return	6.46262	0.00231
Granger Causality between NSE return and FII flows (net)		
Returns on NSE does not GC FII flows (net)	4.11977	0.01914
FII flows (net) does not GC returns on NSE	1.34019	0.26655
NSE return does not GC FII flows (purchase)	2.63408	0.07686
FII flows (purchase) does not GC NSE return	0.98209	0.37818
Granger Causality between variance in NSE return and FII flows (net)		
Variance in NSE returns does not GC FII flows (net)	0.93118	0.39755
FII flows (net) does not GC variance in NSE returns	1.44817	0.23998
Variance in NSE return does not GC FII flows (sales)	0.89831	0.41058
FII flows (sales) does not GC variance in NSE return	3.27055	0.04217
Granger Causality between the rupee -dollar exchange rate and FII flows		
Exchange rate does not GC FII flows (net)	1.58927	0.20929
FII flows (net) does not GC exchange rate	0.99344	0.37400
Granger Causality between the MSCI index and FII flows		
Return on MSCI-US index does not GC FII flows (net)	0.78294	0.45990
FII flows (net) does not GC return on MSCI-US index	2.73511	0.06984

also examined the causation between the return and purchases and between variances and sales. The returns on the indices seem to be causing the FIIs to purchase, and the variance to cause selling pressures in the Indian stock markets. The causality of rupee-US dollar exchange rate and MSCI-US to the FII inflows is rather weak in the Indian situation. Taken together the evidence shows the influence of FII inflows on volatility in Indian stock markets.

VI. IMPACT OF FOREIGN SHOCKS

The volatility and correlations in emerging markets have received increasing academic attention during the last decade. As barriers to foreign investment have been dismantled and with the trend towards greater globalization, the stock markets in many emerging markets have shown stronger co-movements. However, this has also been accompanied by greater volatility. Volatility in the major emerging markets has been traditionally associated with local political and economic events (Aggarwal and others, 1999) or when global factors dominate domestic ones such as oil crises, the Gulf war and the Asian financial crises affecting all financial markets (Longin and Solnik, 1995). Bekaert and Harvey (1995) document the time varying integration of 12 emerging markets with the world wherein they find evidence for a movement towards higher level of integration for India. This would imply that the Indian capital market has become more prone to external shocks.

In this section, we test whether the contemporaneous correlation of Indian stock market returns have increased over time with the returns of eight Asian emerging markets and three developed markets. The Morgan Stanley Capital Index (MSCI) has been used for finding the returns of the Asian emerging markets as well as the developed markets. Chart 8 presents the MSCI movements for the whole period for all the countries selected. The correlation between the markets is presented in table 10 for the whole period (1990-2001) as well as for before the Asian crisis (1990-1996) and after the Asian crisis (1998-2001).

It can be observed from table 10 that the correlation based on US dollar returns are higher among Asian countries, although their values are well below unity. The high correlation among Asian stock market indices suggests the possibility of increased market integration in the post-1997 period. With further reduction in barriers to foreign investment, it is possible for stronger co-movements among these markets.

We compute the pair-wise Granger causality tests of the returns to see the direction of impacts of Asian markets on India. The results of the tests are presented in table 11. It is interesting to observe that Asian markets do affect Indian stock markets, prominent among them are Hong Kong, China; the Republic of Korea; Malaysia; Pakistan; the Philippines; and Thailand. However, the impact of India on the Asian markets seems to be non-existent.

Chart 8. Morgan Stanley Capital Index for various markets
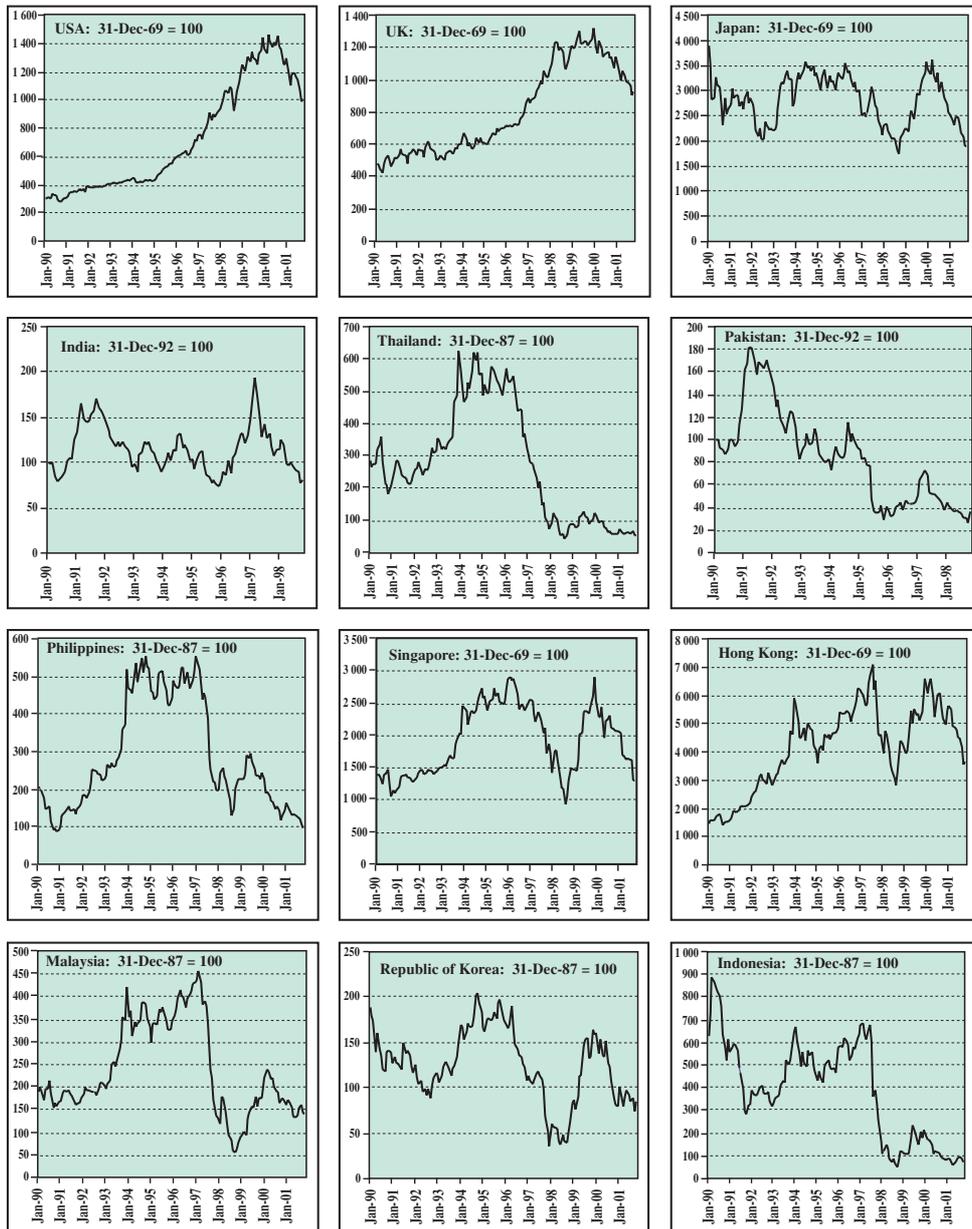
Table 10. Contemporaneous correlation among markets

Panel A: For the time period 1993-2001

	Hong Kong,China	India	Indonesia	Japan	Korea (Republic of)	Malaysia	Pakistan	Philippines	Singapore	Thailand	UK	USA
Hong Kong, China	1											
India	0.22	1										
Indonesia	0.53	0.28	1									
Japan	0.36	0.14	0.289	1								
Korea (Republic of)	0.32	0.21	0.382	0.52	1							
Malaysia	0.56	0.28	0.603	0.24	0.31	1						
Pakistan	0.25	0.42	0.174	0.04	0.14	0.23	1					
Philippines	0.64	0.2	0.594	0.29	0.35	0.62	0.12	1				
Singapore	0.77	0.28	0.648	0.42	0.36	0.61	0.27	0.68	1			
Thailand	0.62	0.20	0.595	0.35	0.60	0.60	0.27	0.75	0.68	1		
UK	0.54	0.10	0.289	0.45	0.29	0.31	0.15	0.33	0.51	0.35	1	
USA	0.54	0.20	0.403	0.43	0.35	0.31	0.13	0.42	0.54	0.46	0.67	1

Panel B: For the time period 1993-1996

	Hong Kong,China	India	Indonesia	Japan	Korea (Republic of)	Malaysia	Pakistan	Philippines	Singapore	Thailand	UK	USA
Hong Kong, China	1											
India	0.03	1										
Indonesia	0.7	0.35	1									
Japan	0.08	-0.1	0.029	1								
Korea (Republic of)	0.22	0.22	0.166	0.34	1							
Malaysia	0.72	0.16	0.485	0.18	0.22	1						
Pakistan	0.29	0.35	0.283	-0	0.24	0.3	1					
Philippines	0.72	0.16	0.528	-0	0.07	0.64	0.44	1				
Singapore	0.71	0.21	0.575	0.29	0.37	0.79	0.28	0.68	1			
Thailand	0.74	0.15	0.568	0.02	0.29	0.6	0.44	0.79	0.67	1		
UK	0.49	0.11	0.365	0.3	0.22	0.44	0.05	0.24	0.51	0.24	1	
USA	0.51	-0.1	0.51	0.17	0.05	0.22	-0	0.17	0.3	0.31	0.55	1

Panel C: For the time period 1998-2001

	Hong Kong,China	India	Indonesia	Japan	Korea (Republic of)	Malaysia	Pakistan	Philippines	Singapore	Thailand	UK	USA
Hong Kong, China	1											
India	0.3	1										
Indonesia	0.53	0.25	1									
Japan	0.47	0.27	0.324	1								
Korea (Republic of)	0.31	0.22	0.343	0.65	1							
Malaysia	0.48	0.31	0.581	0.18	0.25	1						
Pakistan	0.21	0.44	0.117	0.1	0.13	0.2	1					
Philippines	0.65	0.23	0.591	0.48	0.44	0.55	-0	1				
Singapore	0.81	0.36	0.70	0.50	0.35	0.59	0.28	0.71	1			
Thailand	0.57	0.23	0.552	0.52	0.66	0.56	0.19	0.79	0.71	1		
UK	0.55	0.08	0.318	0.59	0.44	0.3	0.16	0.47	0.55	0.44	1	
USA	0.55	0.24	0.403	0.64	0.5	0.37	0.06	0.57	0.61	0.55	0.79	1

Table 11. Pair-wise Granger Causality between stock market indices

Null Hypothesis:	1993-2001		1993-1996		1998-2001	
	F-Statistic	Probability	F-Statistic	Probability	F-Statistic	Probability
India does not Granger Cause Hong Kong, China	0.5801	0.4481	0.0000	0.9977	0.6672	0.4185
Hong Kong, China does not Granger Cause India	5.8694	0.0172	6.5179	0.0143	0.8646	0.3576
Indonesia does not Granger Cause India	1.7408	0.1900	1.7677	0.1907	0.6073	0.4401
India does not Granger Cause Indonesia	0.0875	0.7680	0.1158	0.7353	0.2174	0.6434
Japan does not Granger Cause India	0.3391	0.5617	0.2859	0.5956	0.0462	0.8308
India does not Granger Cause Japan	0.0018	0.9660	0.1039	0.7487	0.1850	0.6693
Rep. of Korea does not Granger Cause India	6.4661	0.0125	2.0317	0.1613	3.1542	0.0828
India does not Granger Cause Rep. of Korea	0.2362	0.6280	0.2397	0.6269	0.0108	0.9176
Malaysia does not Granger Cause India	11.9218	0.0008	2.1869	0.1465	9.6747	0.0033
India does not Granger Cause Malaysia	0.1429	0.7062	0.0027	0.9585	0.5264	0.4721
Pakistan does not Granger Cause India	3.6565	0.0587	8.0547	0.0069	1.4131	0.2411
India does not Granger Cause Pakistan	3.0360	0.0845	2.7186	0.1065	0.2141	0.6459
Philippines does not Granger Cause India	5.3433	0.0228	6.8032	0.0125	0.4067	0.5270
India does not Granger Cause Philippines	1.0071	0.3180	1.7734	0.1900	0.1631	0.6883
Singapore does not Granger Cause India	2.1016	0.1503	3.2637	0.0778	0.1487	0.7017
India does not Granger Cause Singapore	0.0075	0.9314	0.0229	0.8805	0.0015	0.9696
Thailand does not Granger Cause India	4.8737	0.0295	14.3993	0.0005	1.0705	0.3066
India does not Granger Cause Thailand	0.2353	0.6287	1.0149	0.3194	0.0041	0.9494
UK does not Granger Cause India	2.4234	0.1227	0.7850	0.3805	1.4722	0.2316
India does not Granger Cause UK	0.1993	0.6562	1.7318	0.1952	0.1383	0.7118
USA does not Granger Cause India	0.4731	0.4931	0.7675	0.3859	0.2664	0.6084
India does not Granger Cause USA	0.1710	0.6801	1.2423	0.2712	0.0308	0.8616

VII. CONCLUSIONS

We have studied the stock price behaviour in India for the period 1990-2001. Various tests of market efficiency suggest that the Indian stock market is becoming informationally efficient and efficiency has increased over time. The volatility of the returns has been found to increase over the period under study and this can be partly attributed to the impact of foreign portfolio flows. Also there is significant asymmetric volatility i.e. negative news have more impact on the variance of the returns than positive news. Granger Causality tests suggest that domestic returns affect foreign portfolio flows and, in turn, affect domestic returns and its variance. Finally, the correlation with the other Asian markets has increased post the Asian crisis, although the impact of India on the 1997 Asian markets seems to be non-existent.

REFERENCES

Aggarwal, R., C. Inclan, and R. Leal, 1999. "Volatility in emerging stock markets", *Journal of Financial and Quantitative Analysis*, vol. 34, No. 1, pp. 33-55.

Bekaert, G., and C.R. Harvey, 1995. "Time varying world market integration"*, Journal of Finance*, vol. 50, No. 2, pp. 403-445.

_____, 1997. "Emerging equity market volatility"*, Journal of Financial Economics*, vol. 43, pp. 29-77.

Bekaert, G. and G. Wu, 2000. "Asymmetric volatility and risk in equity markets", *Review of Financial Studies*, vol. 13, pp. 1-42.

Bohn, Henning and Linda Tesar, 1996, "US equity investments in foreign markets: portfolio rebalancing or return chasing?" *American Economic Review*, vol. 86, pp. 77-81.

Bollerslev, T., 1986, "Generalized autoregressive conditional heteroscedasticity", *Journal of Econometrics*, vol. 31, pp. 307-27.

Campbell, J., A. Lo, and A.C. Mackinlay, 1997, *The Econometrics of Financial Markets*, Princeton University Press, New Jersey.

Chakravarti, R., 2001, "FII flows to India: nature and causes", *ICRA Bulletin of Money and Finance*, October-December, pp. 61-79.

Choe, Hyuk, Bong-Chan Kho and Rene M. Stulz, 1999, "Do foreign investors destabilize stock markets? The Korean experience in 1997", *Journal of Financial Economics*, vol. 54, pp. 227-264.

Clark, John and Elizabeth Berko, 1997, "Foreign investment fluctuations and emerging market stock returns", *Federal Reserve Bank of New York Staff Papers*, No. 24, May.

Dickey, D. and W. Fuller, 1981, 'Likelihood ratio statistics for autoregressive time series with a unit root', *Econometrica*, vol. 49, pp. 1057-1072.

Engle, Robert and Ng Victor, 1993, "Measuring and testing the impact of news on volatility"*, Journal of Finance,* vol. 48, pp. 1749-1778.

Glosten, Lawrence R., Ravi Jagannathan and David E. Rundle, 1993, "On the relation between the expected value and the volatility of the nominal excess return on stocks", *Journal of Finance,* vol. 48, pp. 1779-1801.

Henry, Peter B., 2000, "Do stock market liberalizations cause investment booms?".

Kim, E. Han and Vijay Singhal, 2000, "Stock market openings: experience of emerging economies", *Journal of Business*, vol. 73, No. 1, pp. 25-66.

Lo, A. and A.C. Mackinlay, 1988, "Stock market prices do not follow random walks: evidence from a simple specification test", *Review of Financial Studies*, vol. 1, No. 1, pp. 41-66.

Longin, F., and B. Solnik, 1995, "Is the correlation in international equity returns constant: 1960-1990?", *Journal of International Money and Finance*, vol. 14, No. 1, pp. 3-26.

Nelson, D. 1991, "Conditional heteroscedasticity in asset returns: a new approach", *Econometrica*, vol. 59, pp. 347-370.

Pant, Bhanu, and T.R. Bishnoi, 2001, "Testing random walk hypotheses for Indian stock market indices", *Proceedings of the Fifth Capital Markets Conference 2001, UTI institute of capital markets.*

Phillips, Peter C.B. and Pierre Perron, 1988, "Testing for a unit root in time series regression" *Biometrica*, vol. 75, No. 2, pp. 335-346.

Schewart, G.W., 1989, "Why does stock market volatility change over time", *Journal of Finance*, 44, 1115-1153.

Yilmaz, Kamil, 2001, "Market development and efficiency in emerging stock markets", *home.ku.edu.tr/ ~kyilmaz/papers/emerging.pdf.* 27 June 2002.

ECONOMIC REFORMS, ENERGY CONSUMPTION CHANGES AND CO2 EMISSIONS IN INDIA: A QUANTITATIVE ANALYSIS

Kakali Mukhopadhyay* and Debech Chakraborty**

Energy based on fossil fuel consumption is very closely linked with environmental pollution in the form of CO2 emissions, a major element in global climate change. This paper analyses the changes in India's energy consumption and CO2 emissions during the five-year period following the 1991 reforms, i.e. 1991/92 to 1996/97. The authors extend the energy Input-Output Structural Decomposition Analysis (SDA) to identify changes in energy consumption during this period. Results indicate that India's energy consumption, which increased by 5.7 per cent a year in this period, was determined by a number of forces. The most significant role was played by the final demand structure followed by technical change and interaction between final demand structure and technical change. The CO2 emission trends reveal that the most dominating sectors have been petroleum products and electricity. The paper makes some broad policy recommendations for the future pattern of energy use in India.

Faced with rising inflation and a balance of payments crisis in mid-1991 the Government of India introduced a fairly comprehensive policy reform package, comprising currency devaluation, deregulation, de-licensing and privatization of the public sector. The Government of India also initiated new strategies for the energy sector in tune with the economic reforms in mid-1991. The energy strategies were: i) to initiate a shift from non-renewable sources of energy to renewable sources and to provide wider access for the rural and urban poor to adequate energy supplies at affordable costs, ii) to ensure efficiency in the use of energy in all production processes, iii) to review the use of all energy intensive materials and provide for their substitution by less energy intensive materials through Rand D, iv) to ensure efficiency in the use of equipment in the energy sector, especially in thermal and nuclear power generation through improved plant availability, v) to initiate measures aimed at reducing energy intensity in different sectors, through changes in technology and/or processes, vi) to

---

   *   Post-doctorate Research Fellow, Centre for Development and Environment Policy, Indian Institute of Management, Joka, Calcutta, India.

**   Professor of Economics, Department of Economics, Jadavpur University, Calcutta, India.

optimise inter-fuel substitution, vii) to propagate renewable resources based on decentralised and environmentally benign non-conventional technologies and viii) to maximise the availability of indigenous energy resources such as oil, natural gas, coal and hydroelectric power, as well as non-conventional energy by way of bio-gas, solar energy and wind energy.

As is known, energy consumption based on fossil fuel consumption is closely linked with environmental pollution through CO_2 emissions, which is contributing to global climate change. Global climate change has become one of the most important issues of recent times. The CO_2 emissions from fossil fuel combustion have been identified as the single most significant source of GHG (green house gas) emissions into the atmosphere from human activities. In the global context, a comparison of the CO_2 emissions from India with the global total indicates that the total Indian contribution from various sources is about 2.2 per cent of the global emissions. The emissions of CO_2 in India are of the order of 1191 tgc (teragram, or 1 million, metric tons of carbon). The energy sector is the largest contributor to GHG emissions in India. A large amount of CO_2 is emitted from the combustion of fossil fuels in India. Of these, coal accounts for nearly 70 per cent and oil for 26 per cent, while the rest is from natural gas. Steel plants, thermal power plants, the cement industry and railways are the major industrial consumers of coal.

Considering the above energy problems and aspects of environmental pollution, especially of CO_2 emissions, a detailed quantitative analysis of energy consumption changes and of the resultant CO_2 emissions is called for. The object of this paper is to analyze energy consumption changes and CO_2 emissions in India during the period 1991-92 to 1996-97 and to draw relevant policy conclusions from the analysis.

As a first step in this exercise a Structural Decomposition Analysis for energy consumption changes is specified. It is an ideal technique to study "over-period" changes. Similar attempts have been made by Rose and Chen (1991) for Taiwan Province of China, Lin and Polenske (1995) for China, Han and Lakshmanan (1994) for Japan, and Wier (1998) for Denmark. For CO_2 intensities we have used an input-output technique. The methodology for relating input-output activity to the natural environment in an input-output framework is familiar and popular for environmental studies. Numerous studies have dealt with energy and environmental analysis by applying the input-output method. Among them Leontief and Ford (1972) for the U.S., Breuil (1992) for France, Gay and Proops (1993) for the U.K., Hayami and others (1993) for Japan, Lin (1998) for China, Chang and Lin (1998) for Taiwan Province of China, Zhang and Folmer (1998) for Germany should be mentioned. Sengupta (1992), Dash and Saxena (1995), Majumdar and Parikh (1995), Chaturvedi (1997), Gupta and others (1997), Mukhopadhyay and Chakraborty (1999, 2000), Mukhopadhyay (2000, 2001) have studied the problems of the energy sector in India.

However, these works have not analysed quantitatively the contribution of the different causative factors, for example the role of technology, exports, imports,

household consumption and Government consumption in changes in energy consumption changes during the period under study. This paper will accordingly make an attempt to understand the changing pattern of energy consumption in the Indian economy after reforms in the early 1990s and the various factors responsible for these changes. It will make estimates of CO2 emissions and its intensities based on a multi-sectoral framework. The paper is organized as follows: the theoretical model adopted for energy consumption changes is outlined in section 1. The data and empirical results are presented in section II. Section III presents the methodology and results for CO2 emissions and intensities. Section IV concludes the paper with some broad policy recommendations.

I. THE MODEL

We start our model formulation from a static monetary input-output model. Mathematically, the structure of the input-output model can be expressed as:

$$X = Ax + Y \qquad\qquad .... \ (1)$$

The solution of (1) gives

$$X = (I - A)^{-1} Y \qquad\qquad .... \ (2)$$

Where $(I - A)^{-1}$ is the matrix of total input requirements. For an energy input-output model, the monetary flows in the energy rows in equation (2) are replaced with the physical flows of energy to construct the energy flows accounting identity, which conforms to the energy balance condition.

We apply a "hybrid method". This method always conforms to energy conservation conditions.

In equation (2), X is a hybrid unit total output vector (nx1) in which the outputs of energy sectors are measured in million tons of coal replacement (MTCR), while the outputs of other sectors are measured in million rupees (M.RS). Y is a hybrid unit final demand vector (nx1), A is a hybrid unit technical coefficient matrix (nxn), I is an identity matrix (nxn).

Next, we develop a Structural Decomposition Analysis (SDA) in this model, which involves analysis of economic changes by means of a set of comparative static adjustments of key parameters of Input-Output tables.

Now the energy balance equation of an economy can be formed as:

$$EX = E (I - A)^{-1} Y \qquad\qquad .... \ (3)$$

Where E is a selective energy matrix (nxn), which is a diagonal matrix composed of ones and zeros, with ones appearing in the diagonal locations that correspond to energy sectors and all the other elements of the matrix being zeros.

Equation (3) is still under the assumption that energy consumption is entirely supplied through domestic production. However, energy imports constitute a significant portion of total energy consumption. Conceptually, imports are excluded from GDP, but energy imports are consumed in the economy and energy exports and changes in stocks are excluded from the economy. Therefore, the total energy consumption of an open economy should be the total energy equivalent of domestically produced energy plus energy contained in energy imports minus energy contained in energy exports and energy contained in changes in stocks.

Now, adding energy imports and subtracting energy exports and changes in stocks, equation (3) will be

$$EX + Em - Eu - Ew = E\,(I - A)^{-1}Y + Em - Eu - Ew = e \qquad \text{.......... (4)}$$

e is the vector (nx1) of total energy consumption in the economy;
Em is the energy imports vector (nx1) whose elements are the actual imports for energy sector and zero for the other sectors;
Eu is the energy export vector (nx1) whose elements are the actual exports for the energy sector and zero for the other sectors;
Ew is the energy change in stock vector (nx1) whose elements are the actual change in stock for the energy sector and zero for the other sectors.

The new final demand can be written as

$$y' = Y + m - u - w$$

or $y' - m + u + w = Y$

Therefore, using $F = (I - A)^{-1}$, equation (4) would be

$$e = EF\,(y' - m + u + w) + Em - Eu - Ew$$
$$= EFy' - EFm + EFu + EFw + Em - Eu - Ew$$
$$= EFy' - E\,(F - I)m + E\,(F - I)\,u + E\,(F - I)w \qquad \text{.......... (5)}$$

A change in the energy consumption of an economy between any two years (year o and year t) can be expressed as:

$$\Delta e = e_t - e_o$$

Substituting equation (5), we obtain

$$\Delta e \; = \; EF_t\,y_t' - E\,(F_t - I)m_t + E\,(F_t - I)u_t + E\,(F_t - I)w_t - [EF_o\,y_o' - E\,(F_o - I)m_o$$
$$+ E\,(F_o - I)u_o + E\,(F_o - I)w_o] \qquad \text{.......... (6)}$$

From equation (6), we have finally

$$\Delta e = E\,(F_t - F_o)y_o + EF_o\,(y_t{'} - y_o{'}) + E\,(F_t - F_o)\,(y_t - y_o) - E\,(F_o - I)\,(m_t - m_o)$$
$$+ E\,(F_o - I)(u_t - u_o) + E\,(F_o - I)(w_t - w_o) \qquad .... \quad (7)$$

The first term on the right-hand side of equation (7) is clearly the effect of technical change on energy consumption in an economy. The second term signifies the effect of change in the new final demand, which includes energy imports but excludes exports and changes in stocks. The third term is the interaction between change in technologies and change in the new final demand. The fourth term is defined as the effect of change in the fuel mix of energy imports. The fifth and sixth terms clarify the effect of change in the fuel mix of energy exports and energy change in stock.

(a)   Expansion of the first term of equation (7)

Let us assume that changes in energy use technology and changes in non-energy – use technology within each sector are separable. The effect of technical changes can be further decomposed into three components: i) the effect of technical change on energy consumption, ii) the effect of technical change in non-energy consumption and iii) the effect of interaction between the two using a row replacing method (Han and Lakshmanan, 1994). It implies that the energy rows of the technical coefficient matrix change while keeping the non-energy rows unchanged, and keeping the energy rows of the technical coefficient matrix unchanged, while the non-energy rows of the technical coefficient matrix change. It can be symbolized as $A\,(e_{t.}n_o)$ which is a hypothetical technical coefficient matrix with new energy input coefficient rows (i.e. for period t) and old or base period non-energy input coefficient rows (i.e. for period o). Similarly, $A\,(e_o\,n_t)$ is a hypothetical technical coefficient matrix with old or base period energy input coefficient rows and new or current period non-energy input coefficient rows.
According to our previous formulation, we have

$$F\,(e_t\,n_o) = [I - A\,(e_t\,n_o)]^{-1}$$

$$F\,(e_o\,n_t) = [I - A\,(e_o\,n_t)]^{-1}$$

The effect of technical changes, i.e. the first term on the right-hand side of equation (7), can be expressed as

$$E\,(F_t - F_o)y_o$$
$$= E\,[F_t - F\,(e_t\,n_o) + F\,(e_t\,n_o) - F\,(e_o\,n_t) + F\,(e_o\,n_t) - F_o - F_o + F_o]y_o$$
$$= E\,[\{F\,(e_t\,n_o) - F_o\} + \{F\,(e_o\,n_t) - F_o\} + \{F_t - F\,(e_o\,n_t)\} - \{F\,(e_t\,n_o) - F_o\}]y_o$$

$$= \text{E } [\text{F } (e_t\, n_o) - \text{F}_o]y_o$$
$$+ \text{E}[\text{F}(e_o\, n_t) - \text{F}_o\,]y_o$$
$$+ \text{ E } [(\text{F}_t - \text{F } (e_o\, n_t) - (\text{F } (e_t\, n_o) - \text{F}_o)]y_o \qquad \text{..........} \quad (8)$$

The first term on the right-hand side indicates the effect of changes in energy input coefficient; the second term implies the effect of changes in the non-energy input coefficient; and the third term defines the effect of interaction between two kinds of change.

All terms of equation (8) bear clear economic meanings. The interaction term $\text{E } [\text{F}_t - \text{F } (e_o\, n_t\,)]y_o$ is the effect of changes in energy input coefficients under the new or current non-energy input coefficient environment. Thus, it includes both the pure effect of changes in energy input coefficients, i.e.

$\text{E } (\text{F } (e_t\, n_o) - \text{F}_o)y_o$, and the interaction between changes in non-energy input coefficients and changes in energy input coefficients. Subtracting the pure effect of changes in energy coefficients from the interaction term, we get the effect of interaction between the two kinds of change, i.e. the effect when the two kinds of change happen simultaneously.

(b)   Expansion of the second term of equation (7)

The second term of equation (7) identifies the new final demand which can be further decomposed into domestic final demand (including private consumption, public consumption, gross final capital formulation), exports, imports and changes in stocks.

Public consumption plus private consumption and gross final capital formulation are contained in the vector y^d, which represents domestic final demand (nx1).

y^x represents non-energy exports (nx1) whose elements for energy sectors are zero.

y^m represents non-energy imports (nx1) whose elements for energy sectors are zero.

y^c represents non-energy change in stock (nx1) whose elements for energy sectors are zero.

Let p be the row summation vector (1xn) that consists entirely of ones and define

$$\lambda^d = py^d{}_t/py^d{}_o, \; \lambda^x = py^x{}_t/py^x{}_o$$

$$\lambda^m = py^m{}_t/py^m{}_o, \text{ and } \lambda^c = py^c{}_t/py^c{}_o$$

Considering the preceding statement, final demand, as given by the second term in equation (7), can be restructured as

$$EF_o \, (y_t' - y_o')$$
$$= EF_o \, [(y^d_t + y^x_t - y^m_t + y^c_t) - (y^d_o + y^x_o - y^m_o + y^c_o)]$$

By putting the above elements and after derivation we get

$$= EF_o \, [(y^d_t - \lambda^d \, y^d_o) + (y^x_t - \lambda^x \, y^x_o) - (y^m_t - \lambda^m \, y^m_o) + (y^c_t - \lambda^c y^c_o)$$
$$+ \, \lambda^d \, y^d_o + \lambda^x \, y^x_o - \lambda^m \, y^m_o + \lambda^c \, y^c_o - (y^d_o + y^x_o - y^m_o + y^c_o)] \ldots \ldots \quad (9)$$

The term $EF_o \, (y^d_t - \lambda^d \, y^d_o)$ gives the effects of changes in domestic demand; $EF_o \, (y^x_t - \lambda^x \, y^x_o)$ gives the effects of changes in the structure of non-energy exports; $EF_o \, (y^m_t - \lambda^m \, y^m_o)$ gives the effects of changes in the structure of non-energy imports $EF_o \, (y^c_t - \lambda^c \, y^c_o)$ gives the effects of changes in the structure of non-energy change in stock; and

$$EF_o \, [(\lambda^d \, y^d_o + \lambda^x \, y^x_o - \lambda^m \, y^m_o + \lambda^c \, y^c_o) - (y^d_o + y^x_o - y^m_o + y^c_o)] \text{ gives}$$

the effects of changes in the macro structure of final demand.

Here, the macro structure of final demand refers to the changes in final demand components.

Finally, we calculate the contribution of an individual product or product group k from the structure of final demand of equation (9) as

$$\Delta e_{y, \, k} = EF_o \, (y'_t - y'_o)$$

where $\Delta e_{y, \, k}$ is the matrix of energy consumption changes associated with each product k and y'_t and y'_o denote the diagonal matrices of the final demand vectors in periods t and o. It also estimates how much of energy use resulting from final demand shifts comes directly from the purchases of energy product (k) and how much of it comes indirectly from the purchase of non-energy products.

II. DATA AND EMPIRICAL RESULTS

To implement the model and conduct the Structural Decomposition Analysis of energy consumption changes and to calculate the CO_2 emission trend we have used input-output data prepared by the Government of India, Planning Commission (1995), price indices from the NAS (National Accounts Statistics), and energy flow data published and information on CO_2 emissions from the relevant national and international agencies.

Results and Discussion

Energy consumption changes and sources of change

Energy consumption and the causes of changes are presented in table 1. Table 1 records the changes in absolute amounts during the period 1991/92 to 1996/97. It is observed from table 1 that during this period India's total commercial energy consumption increased by 278.65 mtcr (table 1) or 5.7 per cent p.a. Although the coal sector performed reasonably well in 1991/92 to 1996/97, some major weaknesses have also emerged. It is observed that during this period coal and lignite consumption increased by 58 mtcr (table 1) or 4.83 per cent p.a. from 1991-92 to 1996-97, oil and gas sector also recorded an increase at 5.5 per cent p.a., while electricity consumption was the highest i.e. 7 per cent p.a during this period an increase by 79 mtcr.

In fact, electricity, gas and water supply have decelerated sharply from an average growth of 9.5 per cent in the Seventh Plan to 7.4 per cent in the Eighth Plan period. Effective reforms in all these areas have been limited. The rate of growth of power generating capacity has declined during 1996/97. During the first half of the 1990's oil production increased at an annual rate of less than 1 per cent p.a. The 19 per cent increase in production in 1994/95 arrested the declining trend. The shortfalls are on account of uncertain reservoir behaviour in the Bombay offshore basin, problems in the north-eastern region and delays in implementation of joint venture projects. On the consumption front it reflects a moderate increment i.e. 5.5 per cent p.a. or 141.65 mtcr (table 1) between 1991/92 and 1996/97. Natural gas consumption peaked gradually during the period to 6 per cent p.a. Out of it, 56 per cent of gas was utilized for energy purposes, mainly for power generation, and 44 per cent was used as feedstock, mainly for fertilizer plants. More remarkable change occurred between 1995/96 and 1996/97: consumption of crude oil picked up at 75.4 mt; being 10.8 per cent higher than in 1994/95. This spurt in growth matches with a pick-up in industrial activity during 1995/96. During 1991/92 to 1996/97, the growth of hsd (high speed diesel) increased at a rate of 7.3 per cent p.a. The increase in coal consumption in the power sector has been mainly due to improved PLF (plant load factor) performance of the existing plants.

Sources of change

Six different factors can be identified which contributed to the change in energy use: i) technical change, ii) change in the final demand structure, iii) change in energy imports, iv) change in energy exports, v) change in stocks and vi) interaction between technical change and the structure of final demand.

Table 1. Structural decomposition analysis of energy consumption changes in India from 1991-92 to 1996-97 (Mtcr)

	Coal and Lignite	Cr. oil and Natural Gas	Electricity	Total
Total Energy Consumption Change	58.000	141.650	79.000	278.650
Technical change	-39.000	-41.860	-5.660	-86.520
Changes in energy input coefficient	-56.000	-221.000	-19.440	-296.900
Changes in non-energy input coefficient	22.570	215.740	15.390	253.700
Interaction term	-5.370	-35.870	-1.600	-42.840
Changes in final dd structure	109.650	139.440	88.350	337.440
Effects of changes in str of dom. dd	36.940	83.160	18.440	138.540
Effects of changes in str of non-energy export	0.690	9.470	0.930	11.090
Non-energy import	-2.180	-2.500	-1.750	-6.430
Non-energy changes in stock	2.970	-1.300	2.350	4.020
Macro structure of final dd	75.740	49.890	68.930	194.560
Sector wise contribution				
Coal and lignite	37.700	2.050	0.670	40.420
Crude oil and natural gas	0.000	0.090	0.000	0.090
Electricity	13.600	8.260	33.230	55.090
Agriculture	7.700	83.940	8.260	99.900
Mining and quarrying	-2.690	-26.530	-4.930	-34.150
Sugar	0.350	3.070	0.290	3.710
Food and beverages	3.930	22.170	2.810	28.910
Textile and textile products	13.380	54.110	15.430	82.920
Wood and wood products	0.040	0.355	0.040	0.435
Paper and paper products	-0.040	-0.090	-0.020	-0.153
Leather and leather products	2.140	13.700	2.090	17.930
Rubber and plastic products	0.700	5.100	0.770	6.570
Petroleum products	-5.040	-284.400	-0.880	-290.300
Fertilizer	-1.250	-12.630	-1.040	-14.920
Chemical and chemical products	2.580	20.490	2.840	25.910
Cement	-0.750	-0.800	-0.320	-1.870
Other metallic and mineral products	0.910	3.160	0.250	4.320
Iron and steel	-0.100	-0.290	-0.040	-0.430
Basic metal products and machinery	8.420	38.070	6.880	53.370
Construction	12.360	54.170	8.960	75.490
Transport services	5.310	101.500	3.280	110.090
Trade and other services	10.340	54.530	9.720	74.590
Changes in energy import	-0.220	-3.440	-0.280	-3.940
Changes in energy export	-0.040	-0.060	-0.030	-0.130
Changes in energy changes in stock	-0.260	-1.050	-0.330	-1.640
Interaction of tech ch and final dd structure	-12.270	49.990	-3.320	34.400

(i)   Technical change

During 1991/92 to 1996/97 moderate technical changes took place to reduce energy consumption. Though the percentage impact was very little small, it was spearheaded by three sectors (coal, crude oil, and electricity). The contribution in this respect was 39 mtcr or 3.25 per cent in the case of coal, 41.86 mtcr or 1.64 per cent annually in the case of crude oil and natural gas, but electricity shared a small amount i.e. 5.66 mtcr or 0.44 per cent p.a.

Thus, it would appear that the coal sector has improved technically more than electricity. The efficient technology in the coal sector is hidden under exploration, exploitation, and benefication for improving the quality and efficient utilization of coal. New mining technologies have been introduced during the reform period with a fair degree of success.

The slight technical improvement in the case of oil and natural gas has been possible due to the minimization of the flaring of the associated gas, the higher off-take of natural gas and the minimization of the risks of exploration both by an optimal mix of exploration in different basins in India and vigorous measures for energy conservation and inter-fuel substitution.

But, in the case of electricity technical change did not occur as in coal and oil and gas. Agricultural pump sets increased at the rate of 7.7 per cent p.a. and electricity consumed in the agricultural sector increased at the rate of 13.3 per cent p.a. Electricity consumed in agricultural pump sets installed has increased from an average of 3,672 kwh to 7,880 kwh in the five years to 1996/97. This has happened due to energy inefficiency. The effect of technical change can be classified as (i) change in energy input coefficient, (ii) change in non-energy input coefficient and (iii) interaction between the previous two.

Changes in energy input coefficient reduced energy use by 296.90 mtcr (table 1) or 6.09 per cent annually. The major contribution was by crude oil and natural gas in this respect, by 221 mtcr or 8.7 per cent p.a. However, changes in the non-energy portion of production technology increased energy consumption and reduced energy savings by 253.7 mtcr or 5.2 per cent annually. The changes in non-energy input coefficient also have an energy impact. Here also the major portion is shared by crude oil and natural gas. This increased energy consumption by 215.74 mtcr or 8.47 per cent p.a.

To minimize flaring the Government had undertaken a major gas flaring reduction programme. During the period 1991/92 to 1996/97 both creation of capacity and its utilisation improved substantially. Due to technical improvement in capacity utilisation the growth rate of crude throughput also performed well at 58.6 per cent in 1995/96 which was 4 per cent higher than 1991/92.

The non-energy input coefficient in case of electricity sector increased energy consumption by 15.39 mtcr (table 1). The flat tariff structure and high level of

subsidy provided by the Government and free electricity to farmers has permitted the inefficient use of electricity. Over-used and ill-maintained pump sets cause wasteful consumption of electricity and also of water. Efficiency in the use of electricity declined in the production of newsprint, cotton and blended yarn, polyster-filament yarn, aluminium and steel. But the interaction between the energy and non-energy coefficients reduced energy use by 42.84 mtcr (table 1) or 0.08 per cent p.a. with the crude oil sector contributing more.

Changes in energy input coefficients and interactions both worked to drive down the energy consumption of the Indian economy, while the non-energy input coefficient changes have totally offset the negative effect of both energy input coefficient changes and interaction that increases energy use. The opposite effects of these changes imply that one major characteristic of India's technical change in this period was the substitution of material inputs for energy inputs. Actually, material inputs or non-energy inputs embody a large quantity of energy. So smaller energy input requirement per unit of output worked directly and indirectly to reduce the total energy use, while bigger non-energy material input requirement per unit of output worked indirectly to increase total energy use through increased output levels.

(ii)   Changes in final demand structure

These have been an important factor behind the increase in energy consumption during 1991/92 to 1996/97. The share of individual sectors are 109.65 mtcr or 9.13 per cent p.a. for coal, 139.44 mtcr or 5.47 per cent for crude oil and natural gas and 88.35 mtcr or 7.85 per cent p.a. for electricity in this respect. The demand for coal during 1991/92 to 1996/97 from the various coal consuming sectors has shown a sharp and unanticipated increase. The demand for the power sector alone is 210 million tons of coal in the year 1996/97 as against 185.30 million tons indicated for the year at the beginning of the Eighth Five Year Plan and 194 million tons demanded at the mid-term appraisal carried out in September 1994. At the same time, as a result of various constraints, including those of finance, land acquisition and transportation, the coal companies have indicated a domestic production of only 288.65 million tons for 1996/97. This implies an increase of 6.8 per cent over actual production in 1995/96.

On the electricity front, the pattern of utilisation of electricity from public utilities has undergone a small change between 1992/93 and 1996/97. The share of the domestic sector has increased from 19.37 per cent to 23.52 per cent. The shares of commercial and miscellaneous sectors have increased very sharply from 10.28 per cent in 1992/93 to 13.38 per cent in 1996/97. The demand for electricity in the household sector is expanding rapidly as the pressure of urbanisation continues to increase and the availability of consumer durables also continues to expand. It is estimated that 40 per cent of the total electricity consumed in the household sector is

used for lighting. Fans consumed another 31 per cent of the electricity used while refrigerators, air conditioners and televisions account for about 28 per cent of the electricity consumed by the household sector during our study period. Nearly 50 per cent of the total electricity consumed in major power consuming industries was from captive power plants in 1994/95. Several of the relatively newer and faster growing industries, such as gems and jewellery, garments and electronics, are far more energy intensive; on the other hand, electricity consumption in fertilizer and pesticides and casting and forging has declined in absolute terms during the study period.

If we separate the final demand structure under five heads like macro structure of final demand, effects of changes in domestic demand, effects of changes in the structure of non-energy exports, non-energy imports, non-energy change in stocks, we observe that the lions share goes to macro structure of final demand i.e. 194.56 mtcr or 3.99 per cent annually. The positive effect of change in the structure of final domestic demand on energy consumption has far reaching significance as the growth of the Indian economy is becoming more domestic demand driven. In the case of coal, macro structure of final demand is greater (75.74 mtcr) than the structure of domestic demand (36.94 mtcr). But in the case of crude oil, the opposite consequences happened, i.e. 83.16 mtcr in domestic demand and 49.89 in macro structure of final demand. The electricity sector showed a wide gap between the structure of domestic demand (18.44 mtcr) and macro structure of final demand (68.93 mtcr). The rapid pace of urbanisation and diverse urban growth patterns involve many structural changes in the economy which have major implications for energy use. Out of the remaining three heads, the non-energy import sector slightly reduced the energy use of the economy during our study period i.e. 6.43 mtcr.

The sector-wise contribution resulting from final demand structure shows that the contribution made by the energy product is 95.60 mtcr out of 337.44 mtcr and non-energy products is 241.84 mtcr out of 337.44 mtcr during 1991/92 to 1996/97. Coal and electricity have a major share of energy products. So, the intensity of these sectors has been rising sharply mainly on account of higher coal consumption by the power sector and higher electricity consumption by the industrial sector, i.e. 33.23 mtcr. During the Eighth Plan period 40 per cent of electricity was consumed by the energy sector itself and the remaining 60 per cent was consumed by energy intensive industries like textiles (15.43 mtcr), agriculture (8.26 mtcr), basic metals, metal products and machinery (6.88 mtcr), construction sector (8.965 mtcr), trade and other (9.72 mtcr) and transport. The consumption of electricity per unit of product in the above industries is much higher than that in developed countries (Teddy, 1995/96). Part of it reflects the dated vintage of the production processes in use.

Consumption of kerosene increased at an annual rate of 1.6 per cent during the period 1991/92 to 1996/97. Diesel consumption in the country has almost doubled in the 10 years from 1986/87 to 1996/97. It had a growth of 7.3 per cent p.a. during this period. During our study period, consumption of lubes and greases grew by

almost 5 per cent p.a. One major agricultural operation is irrigation, which is largely performed by using diesel and electric energy. The number of electric and diesel pumps has increased to 10.5 million and 4.9 million respectively by 1993/94. Power consumption in the agricultural sector expanded at the rate of 12-13 per cent p.a. during 1971 to 1996. As a result this sector's share in the total power consumed has increased steadily from 10 per cent in 1970/71 to nearly 30 per cent in 1996/97. The increase in power consumption in the agricultural sector is the result of an increase in irrigation pump sets in use and a sharp increase in the usage hours of the pump sets.

The industrial sector relies only partly on the utilities for its power requirements. Nearly 48 per cent of the total electricity consumed in major power consuming industries was from captive power plants. The findings show that product groups like textile products, petroleum products, chemicals, basic metals etc. are the leading sectors that have increased energy consumption. Chemicals, construction, transport, trade, basic metals, metal products and textile machinery, increased the consumption of crude petroleum. The share of commercial energy consumed in the transport sector in the total commercial energy consumed has increased steadily. Besides, the consumption of oil in the transport sector has gradually increased mainly because of greater use of private modes of transport. Also oil has gradually replaced coal as a fuel. This is evident from the declining share of coal from about 30 per cent in 1970/71 to 5 per cent in 1994/95, whereas the share of oil increased from 30 per cent to 95 per cent in the same period. This change is attributed to greater dependence on road transport, and shift from steam traction to diesel and electric traction in the railways.

(iii)   Change in energy imports

This covers the limited amount of 3.94 mtcr (table 1) in the period 1991/92 to 1996/97. The major portion was on account of rise in domestic crude oil and natural gas production.

(iv)   Change in energy exports

During the period 1991/92 to 1996/97 energy consumption increased slightly i.e. 0.13 mtcr. India is not a major exporter of coal. However, coal exports meet the demand from neighbouring countries. Coal exports are destined to Bangladesh, Nepal, and Bhutan. The quantity of coal exported during 1995/96 was about 0.098 mt.

(v)   Change in energy stocks

This behaved in a similar fashion to imports. It decreased energy consumption by 1.64 mtcr during 1991/92 to 1996/97.

(vi)   Interaction between technical change and change in final demand structure

In the period 1991/92 to 1996/97 this interaction has increased energy consumption by 34.40 mtcr. The lion's share of it goes to crude petroleum by 49.99 mtcr or 1.96 per cent p.a., but two other sectors i.e. coal and electricity shared very little (12.27 mtcr and 3.32 mtcr respectively). Thus, the reform period shows that final demand expansion increased India's energy consumption by 6.9 per cent p.a. while, on the other hand, production technology changes reduced energy consumption by 1.77 per cent p.a. The consumption of energy produces consequences for the environment. The commercial energy activities cause air pollution. This includes the use of fossil fuels (coal and oil), industrial processes etc. The air pollutants are mainly CO_2 emissions. Before any alternative strategies for energy consumption can be advanced it is necessary first to try to calculate the level of CO_2 emissions and their intensity in the next section.

III. THE METHODOLOGY AND RESULTS OF CO_2 EMISSIONS

In this section an attempt has been made to estimate carbon dioxide emissions and their intensities in major energy consuming industries with the help of an input-output model. In reality, CO_2 is released mainly from fossil fuel combustion and from bio-mass combustion. The sources of fossil fuel combustion are coal, oil and gas. Here we consider fossil fuel combustion only. The CO_2 emissions from fossil fuel combustion have been estimated by the following IPCC (Intergovernmental Panel on Climate Change) guideline, wherein total CO_2 emissions = (actual fuel consumption) * (carbon emission factor) * (fraction of carbon oxidized) * (molecular weight ratio of CO_2 is to carbon i.e. 44/12 or 3.66).

For an analysis of CO_2 emissions we need to extend the above conventional input-output framework in one important respect i.e. we have to compute the amount of CO_2 emission that takes place in various activities. We apply the fuel specific carbon emission factors to the row vector of the fossil fuel sector of the respective input-output table to estimate the total CO_2 emitted by the coal and oil sectors. We use an emission factor of 0.55 (mt of CO_2)/mt for coal and 0.79 (mt of CO_2)/mt for crude oil and 0.67 mt of CO_2/m.c.m for natural gas to arrive at carbon emissions by different sectors due to coal and oil and natural gas separately. The values of the fraction of carbon oxidized for the fuels are 0.98 for coal and lignite, and 0.99 for crude oil and natural gas. We then follow the normal convention of measurement of carbon dioxide in carbon equivalent units.

For conversion to CO_2 units the carbon emission figures are multiplied by 3.66. The estimated figures are displayed in tables 2 and 3. The total quantity of CO_2 emitted owing to burning of fossil fuel inputs used by various production sectors and final demand is shown in table 3. On the basis of the above estimated figure we

calculate the direct carbon dioxide emission coefficient and total (direct and indirect) carbon dioxide emission coefficient.

Now $C = C(j)$---- (3*) is a vector of fossil fuel emission coefficients representing the volume of CO_2 emissions per unit of output in different sectors. That is when the sectoral volume of CO_2 emissions is divided by sectoral output, which then gives us the direct CO_2 emission coefficient. This is shown in table 4. The direct and indirect carbon emission coefficient of sector j can be defined as $\Sigma C_j r_{ij}$, where r_{ij} is the (i, j) th element of the matrix $(I - A)^{-1}$. The direct and indirect CO_2 of a sector is defined as emission caused by the production vector needed to support final demand in that sector. The next part reports the findings.

Findings

Table 2. CO_2 emissions (In mt of CO_2) in India from 1991/92 to 1996/97 (fossil fuel combustion)

	Coal	Oil and gas	Total
1991-92	473.05	110.59	583.80
1996-97	595.20	172.62	767.82

Table 3 displays estimated CO_2 emissions by sectors for the years 1991/92 and 1996/97 respectively. During 1991/92 to 1996/97 the rate of growth of emissions has been observed at 6.29 per cent. We can observe from table 2 that coal combustion releases more CO_2 than oil. The emission released from the coal sector is rather high thus affecting the overall CO_2 emissions. During the early years of reform energy consumption grew at 5.6 per cent p.a. and the released CO_2 was 6.29 per cent. This fact suggests that during this period the consumption of coal (4.8 per cent) and oil (5.5 per cent) had been reduced. The high emission was primarily due to the high rate of energy consumption itself. Out of the three fossil fuel sectors, electricity contributes a major part and its contribution gradually rises from 171.15 mt of CO_2 in 1991/92 to 214.60 mt of CO_2 in 1996/97 (table 3). The petroleum product sector emits CO_2 at a fairly high level i.e. 222.98 mt of CO_2 in 1991/92 rising in 1996/97 to 250.89 mt of CO_2.

As we have observed from our study the electricity sector, which is the major user of coal in India, accounts for more than 25 per cent of total emissions in the country throughout the period. In the same manner, petroleum products, which are the major user of crude oil, account for more than 40 per cent of total emissions in the country throughout the period. Iron and steel, transport, textiles, other metallic mineral products, basic metals, metal products and machinery are the top sources of CO_2 emissions compared to other non-energy activities.

**Table 3. Estimated CO2 emissions in India during 1991-92 to 1996-97
by sectors (Mt of CO2)**

Serial No.	Sectors	1991-92	1996-97
1	Coal and lignite	2.34	2.16
2	Cr. oil and Natural Gas	0.00	0.00
3	Electricity	171.15	214.60
4	Agriculture	5.75	4.74
5	Mining and quarrying	0.04	0.05
6	Sugar	0.99	1.01
7	Food and beverages	15.77	16.89
8	Textile and textile products	24.53	25.53
9	Wood and wood products	0.32	0.35
10	Paper and paper products	10.53	10.86
11	Leather and leather products	0.57	1.07
12	Rubber and plastic products	0.94	1.15
13	Petroleum products	222.98	250.89
14	Fertilizer	12.21	14.89
15	Chemical and chemical products	6.90	9.22
16	Cement	18.25	17.68
17	Other metallic mineral products	16.87	18.55
18	Iron and steel	66.30	77.30
19	Basic metal, metal products and machinery	20.58	21.97
20	Construction	6.15	6.85
21	Transport	30.32	31.25
22	Trade and other services	22.32	19.08
23	Total	656.16	746.08
24	Total final	-72.36	21.74
25	Gross	583.80	767.82

The CO2 emissions from final demand (private consumption + Government consumption + investment demand + net export demand) gradually increased from -72 mt of CO2 in 1991/92 to 21 mt of CO2 in 1996/97 (table 3). Here the sign of final demand component is negative due to the high import amount of the crude oil sector. One positive aspect from the result of final demand shows that the imported amount has been gradually controlled. The study also reflects that the CO2 emissions in private consumption were highest during 1991/92 (108.60 mt of CO2).

We now turn to the direct and total CO2 emission coefficient as presented in table 4. The results contained in table 4 show that all the sectors show a more or less similar pattern in case of direct and total coefficients throughout the period. The total coefficient is higher in all sectors than the direct coefficient. However, some sectors deserve attention. The results reveal that electricity ranks the highest among all

Table 4. Direct and total CO2 emissions coefficient in India during 1991-92 to 1996-97 (Mt of CO2/mtcr)

Serial no.	Sectors	1991-92 Direct	1996-97 Direct	199192 Total	1996-97 Total
1	Coal and Lignite	0.00957	0.00731	0.07806	0.07870
2	Cr. Oil and Natural Gas	0.00000	0.00000	0.05346	0.05844
3	Electricity	0.82052	0.80731	1.41212	1.31151
4	Agriculture	0.00001	0.00001	0.00108	0.00104
5	Mining and Quarrying	0.00002	0.00001	0.00395	0.00516
6	Sugar	0.00005	0.00006	0.00098	0.00101
7	Food and beverages	0.00014	0.00024	0.00124	0.00141
8	Textile and textile products	0.00012	0.00008	0.00124	0.00133
9	Wood and wood products	0.00003	0.00002	0.00082	0.00078
10	Paper and paper products	0.00057	0.00042	0.00225	0.00204
11	Leather and leather products	0.00004	0.00002	0.00086	0.00080
12	Rubber and plastic products	0.00004	0.00003	0.00123	0.00122
13	Petroleum products	0.03668	0.02995	0.04191	0.03445
14	Fertilizer	0.00096	0.00083	0.00489	0.00375
15	Chemical and chemical products	0.00009	0.00016	0.00199	0.00230
16	Cement	0.00429	0.00275	0.00828	0.00678
17	Other metallic mineral products	0.00118	0.00137	0.00424	0.00465
18	Iron and steel	0.00133	0.00114	0.00581	0.00544
19	Basic metal, metal products and machinery	0.00005	0.00008	0.00151	0.00157
20	Construction	0.00000	0.00000	0.00241	0.00230
21	Transport	0.00022	0.00012	0.00834	0.00655
22	Trade and other services	0.00004	0.00002	0.00051	0.00046

sectors throughout the period. It can be seen that the total coefficient (direct and indirect) of the electricity sector in 1991/92 was 1.41 but that it dropped to 1.31 in 1996/97. In the case of coal, it is observed that it remains constant between 1991/92 and 1996/97 i.e. 0.078. A similar pattern has been reflected in the case of direct emissions. For crude oil the figure is a little higher. A rising trend is observed during 1991/92 to 1996-97 i.e. 0.058. Of the other sectors, petroleum products contribute somewhat higher than the other sectors. The transport sector was 0.0083 mt of CO2/mtcr in 1991/92 moving to 0.0065 mt of CO2/mtcr in 1996/97. The direct coefficient also shows a similar trend. The intensity of the cement sector gradually falls from 0.0082 to 0.0067. The performance regarding carbon intensities in the cement sector has really improved. It has occurred in conjunction with the installation of relatively expensive new technologies such as pre-calcing facilities, high efficiency roller mills and variable speed motors. Actually higher efficiency and improved

technology lead to low intensity of carbon emission. The direct intensity of the construction sector is lowest among all sectors. This is because it does not make much use of fossil fuel based energy to construct a building or a road. However, the construction sector uses many energy intensive materials such as bricks, cement, iron and steel, aluminium glass and asbestos. Hence, the indirect part achieves prominence in this respect leading to high value of total intensity. These facts indicate that sectors like construction, textiles, trade, agriculture and transport emit CO_2 at a fairly high level largely due to indirect effects.

Given the higher value of indirect coefficients and the larger volume of activity, the above sectors turn out to be the most responsible for CO_2 emissions in India when they are viewed in terms of total (direct and indirect) emissions due to the magnitude of final demand in each sector.

IV. SUMMARY AND CONCLUSIONS

This paper has shown that India's energy consumption increased by 5.7 per cent p.a or 279.27 mtcr (table 1) from 1991/92 to 1996/97. Six different forces behind this increase have been identified. Among them the most significant role, as garnered from the empirical results, has been played by the structure of final demand, technical change and the interaction between the structure of final demand and technical change. The remaining forces had very little impact on energy consumption. The CO_2 emission trends has revealed that the most dominating sectors are petroleum products and electricity. This phenomenon is due to the direct effect of crude oil and coal respectively. The next positions are occupied by the iron and steel and transport sectors respectively. Overall, CO_2 emissions have risen gradually from 1991/92 to 1996/97. As far as the intensities are concerned, electricity contributes a major part. In actual fact, the increase in emissions is most strongly correlated with fuel consumption, which, in turn, is influenced by population growth and rising income levels.

So far as energy strategies are concerned, specifically strategies to conserve energy and to minimize CO_2 emissions over time, India has not been able to develop any credible framework or policy approaches to meet such objectives. The strategies that have been adopted by the Government during the period 1991 to 1996 for reducing the consumption have not been successful. Though the 25 leading industries recorded significant energy savings and have received national awards for energy conservation in the year 1996 the performance of major sectors like transport and agriculture have not been successful in conserving energy.

Considering the above, it would be worthwhile to point out a few important issues that should get appropriate weightage in any future energy policy. These issues can be summarised as:

(i)   The Government of India must adopt an overall policy that promotes the growth of less energy-intensive components of final demand.

(ii)   The Government should develop energy conservation legislation to enforce punitive action under the law and to ensure stricter implementation.

In the latter context, it is suggested that much higher priority has to be given to the conservation of energy in national policy-making. This will play a significant role in alleviating the shortage of energy and in reducing environment pollution. The Government must take measures, such as publicity campaigns and differential taxes and subsidies, to promote energy conservation in the country. The enhancement of national consciousness in this regard and progress in the understanding of the underlying scientific and technological issues involved in energy conservation would promote rationalization and greater efficiency in energy consumption in the country.

In this connection it is recommended that efficiency and conservation of energy is also possible through inter-fuel substitution. Inter-fuel substitution can help to mitigate the problem of carbon emissions. Replacing high carbon coal and mid-range oil with lower carbon natural gas, or with zero carbon renewable and nuclear power can dramatically lower CO_2 emissions. In the industrial sector substituting natural gas for coal is the most obvious shift. More specifically, in the case of electrification, the promotion of biomass-based power plants would be an appropriate policy option to mitigate CO_2 emissions. The use of plant material as fuel and feedstock in place of fossil fuels can have a significant effect on the reduction of net CO_2 emissions. Alcohol biomass fuels for transport have played a major role in Brazil (Goldenberg and others, 1993) and plantations in other countries, including India, could provide significant quantities of bio fuels (Hall and others, 1993).

Out of the fuel sector electricity emissions show the highest increase among energy sources suggesting that local electric plants should increase the share of non-fossil fuels and natural gas to reduce CO_2 emissions in India. Thus pollution can be reduced or even prevented by the use of alternative energy sources. Some wind energy, small scale hydro and conversion of waste to energy are already competitive even with conventional sources of supply. A few other renewable technologies may be appropriate for India. Among these are solar hot water systems for meeting process heat requirements in industries, solar dryers, fuel cell technology and the application of hydrogen energy and bioliquid fuels for surface transport.

Reducing emissions by preventive options for pollution control (improved efficiency and switching to other energy sources) are generally considered advantageous over control options. Furthermore, it is possible to decouple economic growth from primary energy consumption by investing in more efficient supply frameworks, improving energy efficiency amongst end-users and substituting renewable energy technologies for fossil fuels.

A proper weightage should be given to the iron and steel industry in India as it is one of the major sources of air pollution as our findings report. It involves not only upgrading the industry's processing procedures but also increasing the effective utilization of coal consumption in the production of steel.

For energy conservation, efficiency and research and development and technological upgradation a suitable national energy price policy has to be framed. It is a fact that energy prices are low in the country. In India coal, kerosene and natural gas are subsidized. Ideally, all energy prices should truly reflect the cost of using fossil fuels including the cost to society from pollution and environmental degradation. Therefore, until there is a realistic consensus on how environmental standards are to be met, fossil fuel subsidies should not be encouraged. Clearly, such changes are not easy to implement. Hence, the Government of India should devise appropriate fiscal incentives linked to energy savings and tax concessions, rather than subsidies, in order to achieve economy in the use of energy over the long term.

A mix of information, market-based tax and investment credits, better regulations, higher efficiency standards, enhanced use of voluntary agreements like the energy star programme, removal of trade and investment barriers and resolving the international disagreements over intellectual property rights will all be needed for industry to reduce the problem of CO_2 emissions and green house gases further.

For controlling CO_2 the use of natural gas is gaining wide popularity across the globe as it is comparatively cleaner than the other fuels and has around half the carbon content of coal. Its development, coupled with the adoption of suitable technology such as combined cycle gas turbines for electricity generation, is likely to lead to natural gas taking a larger share in primary energy requirements. Across the land, pipeline networks would have to be set up to distribute natural gas. Though the high cost of transportation makes it presently uncompetitive with other fuels the possibility of increasing its use has to be explored judiciously.

The Government should consider introducing clean energy technology. Clean energy technology (CET) is defined as those technologies that combine more efficient processes and reduced pollutant production without necessarily entailing a change in the form of energy used. Clean coal technologies like integrated gasification combined cycle (IGCC) plants should be encouraged in industry and power generating plants. These technologies typically reduce emissions of CO_2 and provide improvements in energy efficiency when compared with traditional coal combustion technologies.

One other aspect deserves mention in this context. Emitted gases have the capacity to be transported over large distances, sometimes many hundreds of kilometers, and may give rise to depositions in another country. The potential for such transboundry air pollution was evident in the recent Indonesian forest fires. The area affected by the air pollutants from the fire spread for more than 3,200 kilometers east to west, covering six Asian countries and affected around 70 million people. Major weather patterns in Asia facilitate the transboundry transport of air pollutants from land to sea

and the reverse in summer. Pollutants can thus be carried from country to country in the region. It is, therefore, not possible for individual countries to solve the associated problems alone. There is an obvious and strong need for regional intergovernmental co-operation in this field (SEI, 2000).

REFERENCES

Breuil, J.M., 1992. "Input-output analysis and pollutants emissions in France", *The Energy Journal*, vol. 13, No. 3.

Chang, Y.F. and S.J. Lin, 1998. "Structural decomposition of industrial CO2 emission in Taiwan: an input-output approach" *Energy Policy*, vol. 26 No. 1 pp. 5-12.

Chaturvedi Pradeep, 1997. *Energy Management Policy Planning and Utilization*, Concept Publishing Company, New Delhi.

Dash U.K. and K.K. Saxena, 1995. *Input-Output Analysis of Energy: An Application to Indian Economy (1979-89)*, XI International Conference on Input-Output Techniques, Papers for the Plenary Session, 27 November – 2 December.

Gay, S. and J.L.R. Proops, 1993. "CO2 production by the U.K. economy: an input-output assessment" *Applied Energy*, vol. 44, pp. 113-130.

Goldenberg, J. and others, 1993. "The Brazilian fuel alcohol program" in Johansen, T.B., Kelly, H. and Reddy, A.K.N. and Williams, R. (eds.) *Renewable Energy: Sources for Fuels and Electricity*, Island Press, Washington, D.C.

Gupta, S. and others, 1997. *Energy Consumption and GHG Emissions: A Case Study for India, Global Warming* (Asian Energy Studies) TERI publication.

Hall, D.O. and others, 1993. "Biomass for energy supply prospects" in Johansen, T.B., Kelly, H. and Reddy, A.K.N. and Williams, R., eds. *Renewable Energy: Sources for Fuels and Electricity*, Island Press, Washington, D.C., pp. 593-651.

Han Xiaoli and T.K. Lakshmanan, 1994. "Structural changes and energy consumption in the Japanese economy 1975-85: an input-output analysis", *The Energy Journal*, vol. 15, No. 3, pp. 16-188.

Hayami, H., and others, 1993. "Estimation of air pollutions and evaluating CO2 emissions from production activities using Japan's 1985 input-output tables", *Journal of Applied Input-Output Analysis*, vol. 1, No. 2, pp. 29-44.

Leontief, W. and D. Ford, 1972. Air pollution and the economic structure: empirical results of input-output computation, in A Broody and A.P. Carter, eds. *Input-Output Techniques*, Amsterdam.

Lin X. and Karen R. Polenske, 1995. "Input-output anatomy of China's energy use: changes in the 1980, *Economic System Research*, vol. 7, No. 1, pp. 67-83.

Lin, G., 1998. "Energy development and environmental constraints in China", *Energy Policy,* vol. 26, No. 2, pp. 119-128.

Majumdar, S. and Jyoti Parikh, 1995. "Macroeconomic consistency in energy planning: a case study of India, *Journal of Quantitative Economics*, vol. 11, No. 2, pp. 95-121.

Mukhopadhyay, K., 2000. "Industrial CO2 emissions in India during 1991-92 to 1996-97: an input-output approach", paper accepted for the 36th Annual Conference of the Indian Econometric Society held at Devi Ahilya University, Indore (4-6 February).

Mukhopadhyay, K. and D. Chakraborty, 1999. "Energy consumption changes in India during 1973-74 to 1991-92". *Economic System Research,* vol. 13, December.

_____, 2000. "Energy consumption changes and CO2 emissions in India during 1968-69 to 1996-97, "Paper presented at the 13th International Conference on Input-Output Techniques, Macerata University, Italy (21-25 August).

Mukhopadhyay, K., 2001. "Energy consumption changes and CO2 emissions in India during 1968-69 to 1996-97: A quantitative approach, Phd. dissertation (Jadavpur University).

Planning Commission, The Eighth Five-year Plan, 1991-96. Government of India, New Delhi.

_____, 1992. The Eighth Five-year Plan (1992-97), Government of India, New Delhi.

_____, 1995. A technical note to the Eighth Five-year Plan of India, Input-Output Transaction Table for 1991-92, New Delhi, Government of India.

Rose A. and C.Y. Chen, 1991. "Sources of change in energy use in the U.S. economy, 1972-82". *Resource and Energy,* 13, pp. 1-21.

SEI, 2000. *Regional Air Pollution in Asia*, Stockholm.

Sengupta, R., 1992. *Energy Modeling for India*, published by the Planning Commission in India.

TEDDY, 1995/96. *Tata Energy Data Directory Year Book*, "Environmental effects of energy use", pp. 220-225, TERI publication.

_____, 1998/99. Tata Energy Data Directory Year Book, TERI Publication.

Wier, M., 1998. "Sources of changes in emissions from energy: A structural decomposition analysis". *Economic System Research*, vol. 10, No. 2, pp. 99-112.

World Development Report, 1993. *Managing India's Environment – Selected Aspects* Chapter 3, World Bank, Washington, D.C.

Zhang X.Z. and H. Folmer, 1998. "Economic modeling approaches to cost estimates for the control of CO2 emissions: a case study of Germany and U.K.". *Energy Economics, February,* vol. 20, No. 1, pp. 101-120.

AN ANALYSIS OF EU ANTI-DUMPING CASES
AGAINST CHINA

Y.H. Mai*

In this study, an analysis of Chinese exports to the European Union (EU) of the products subject to anti-dumping duties shows that anti-dumping measures tend to significantly reduce bilateral trade flows. The rise in Chinese exports to EU would have been more than 3 per cent higher without the imposition of 21 anti-dumping duties in 1995-1998. A close investigation of EU anti-dumping cases against China also reveals that calculation of anti-dumping margins suffers from imperfect information and is therefore highly likely to lead to biased rulings. The high rate of termination due to withdrawal of complaints poses the question whether the scheme encourages industries to use it to fight against "fair" competition as opposed to "unfair" competition.

With the reduction in tariff levels under the General Agreement on Tariffs and Trade (GATT), the predecessor of the World Trade Organization (WTO), import-competing industries in developed countries appear to have turned to anti-dumping for protection since the 1980s. If a company exports a product at a price lower than the price it normally charges on its own home market, it is automatically said to be "dumping" the product. Such behaviour can be explained in terms of exporters tolerating initial losses in order to gain market share in the importing country. Under such circumstances, the anti-dumping scheme enables the affected industries in the importing country to lodge a complaint. In response to the complaint, the importing country Government may initiate an investigation. If a case of dumping is established, the importing country Government may take action against the dumping, such as levy a tariff on the concerned products from the exporting country.

For member countries of the WTO, anti-dumping action is governed by the anti-dumping agreement that resulted from the Uruguay Round negotiations. The WTO agreement disciplines anti-dumping actions by providing rules for calculating the amount of dumping, detailed procedures for initiating and conducting anti-dumping investigations, rules on the implementation and duration of anti-dumping measures, and particular standards for dispute settlement panels to apply in anti-dumping disputes.

*   Senior Research Fellow, Centre of Policy Studies, Monash University, Victoria 3800, Australia.

A growing body of literature has expressed concern over the explosion in anti-dumping actions since the 1980s (Rugman and Anderson, 1987, Robert and Robert, 1991, Finger, 1993, Jones, 1994, and Krueger, 1995). This research concluded that anti-dumping measures are harmful to the importing country and to the multilateral trading system. It has negative impacts on competition and consumer welfare and involves huge institutional costs for the importing countries. With active anti-dumping and other administrative protection measures, trade policy that is efficient in promoting income growth through trade liberalization takes on the role of redistributing income, policy objectives that can be more efficiently carried out by tax and expenditure policies (Krueger, 1995). However, much less work has been done in analysing the negative impact of anti-dumping measures on exporting countries, mostly developing countries. Lahiri and Sheen (1990) have demonstrated that dumping might not be welfare improving for the dumper. But some case studies in Finger (1993) have found that the effects of anti-dumping measures have had little effect on exporting country industries.

Despite the growing research confirming the negative effects of anti-dumping actions on importing countries, Governments in developed importing countries, nevertheless, tend to give way to pressure from interest groups representing import competing industries, usually over unemployment concerns. Recently, the debate over anti-dumping issues has gained renewed importance as developing country exporters are questioning the way that anti-dumping measures are used.

China, the largest developing economy, has suffered most from anti-dumping measures adopted by the United States and EU. As a consequence, China has started to participate more actively in the process of anti-dumping investigations. This has resulted in some anti-dumping cases terminated without the imposition of duties on Chinese exports.

In the new round of WTO negotiation, some WTO members have requested a review of the anti-dumping regime agreed in the Uruguay Round negotiations. The Deputy US Trade Representative, Richard Fisher was asked to express views on this issue during a Worldnet Dialogue with participants from member countries of the Association of Southeast Asian Nations (ASEAN) in 1999. He responded that it is important to put the anti-dumping issue in perspective. He said less than half per cent of trade volume is subject to anti-dumping actions. If the current anti-dumping regime is removed, its replacement could be even more harmful to the countries concerned due to rising protectionism in textiles and other import competing industries in the US. Such sentiment is likely to be even stronger when the economic cycle experiences one of its periodic downturns in the US. However, he agreed that the current scheme is not perfect and there was a large room for improvement. The EU also claims that anti-dumping duties and price undertakings covered only 0.7 per cent of the total of EU imports in 1998 and its impact on EU trade should not be exaggerated (EC, 2000b).

This study argues that the percentage of imports subject to anti-dumping measures is not a good indicator of the impact of anti-dumping measures on trade, as it tends to underestimate the effects. Even if the impact of anti-dumping measures on trade is not very big from the perspective of developed countries, the impact can be significant from the perspective of the developing countries. The negative impacts of the anti-dumping scheme on the world trading system therefore cannot be dismissed by adducing the rather small quantities superficially affected by it.

I. AN OVERVIEW OF THE EU ANTI-DUMPING SCHEME

The EU believes that common rules and a general acceptance that certain types of behaviour are unfair must underpin the efforts of opening up markets through a multilateral trading system like WTO. While supporting the fundamental principles of WTO, EU is also determined to see that EU businesses are not disadvantaged by the unfair trade practices of others. A set of trade policy instruments that is policed by the European Commission (EC) were designed to restore fair international competition and ensure a level playing field for all producers on the EU and third country markets. Anti-dumping measures is one such trade policy instrument[1] (see appendix 1).

During 1992-1998, EU has, on average, around 90 cases of anti-dumping and anti-subsidy investigations in progress each year. On average about 20 provisional duties were imposed in the cases under investigation and 30 investigations were concluded each year[2] (table 1).

Out of the concluded cases, a high percentage (38 per cent) was concluded by terminations (table 1). The most common reason for the termination of cases was withdrawal of the complaints by EU industries. Other reasons for terminations were *de minimis* dumping or no injury found. Furthermore, a predominant number of EU anti-dumping and anti-subsidy investigations were against low and middle-income countries. About 85 per cent of investigations initiated during 1992-1999 were against countries classified by the World Bank as low and middle-income countries (table 2). This evidence supports the claim by some developing countries that anti-dumping measures that cost their companies much time and money during the investigation usually end up without any cases against them.

---

[1]   Other EU trade policy instruments include anti-subsidy, trade barriers regulation, and safeguards.

[2]   Anti-subsidy cases are included in the tables because summary statistics on anti-dumping cases are mixed with statistics on anti-subsidy cases in EU annual reports. However, a dominant number of cases are anti-dumping cases. For example, on the current list of EU anti-dumping and anti-subsidy cases as of June 2000, only 33 out of 330 cases were anti-subsidy cases. All the 49 cases concerning China were anti-dumping cases.

Table 1. EU anti-dumping and anti-subsidy cases, 1992-1998

	1992	1993	1994	1995	1996	1997	1998	Average 1992-98
Number of investigations in progress during the period	85	78	94	98	102	99	91	92
Provisional duties imposed during the period	18	16	25	21	11	33	30	22
Total number of investigations concluded during the period	28	27	29	21	48	37	44	33
Investigations concluded by imposition of definitive duty or acceptance of undertakings during the period	16	19	21	13	23	24	28	21
Investigations concluded by terminations[1] during the period	12	8	8	8	25	13	16	13
Terminated cases as a percentage of total concluded investigations during the period	43	30	28	38	52	35	36	38

Source: EC, *Annual report from the Commission to the European Parliament on the Community's Anti-dumping and Anti-subsidy Activities*, 1996, 1998; EC, anti-dumping and anti-subsidy statistics covering the first three months of 2000.

Note: [1] Investigations might be terminated for reasons such as the withdrawal of the complaint, *de minimis* dumping or injury, etc.

Although China is not the largest trading partner of EU[3], it has been the most frequently investigated trading partner with 46 cases initiated during 1992-1999. India, the Republic of Korea and Taiwan Province of China follow China closely on the anti-dumping and anti-subsidy list of EU. Three large ASEAN economies, Thailand, Malaysia and Indonesia are also among the top ten most frequently investigated exporting countries. In terms of regional distribution, Asian countries accounted for two thirds of EUs anti-dumping and anti-subsidy investigations during 1992-1999 (table 2).

---

[3]   China is the fourth largest trading partner of EU in terms of total trade volume. China ranked fourth as a source for EU imports and seventh as a destination for EU exports in 1999.

**Table 2. EU anti-dumping and anti-subsidy cases: investigations initiated by
country or area of export, 1992-1999**

Country or area	1992	1993	1994	1995	1996	1997	1998	1999	Sum 1992-99
China	8	4	5	5	6	5	1	12	**46**
India	–	–	4	1	4	6	7	7	**29**
Republic of Korea	3	2	–	4	1	3	7	9	**29**
Thailand	1	2	5	4	–	3	–	7	**22**
Taiwan Province of China	1	1	1	–	1	4	–	12	**20**
Malaysia	2	2	2	2	1	2	–	4	**15**
Indonesia	–	–	4	4	1	1	–	4	**14**
Russian Federation	3	1	3	1	1	2	–	1	**12**
Ukraine	2	1	1	1	–	1	2	2	**10**
Japan	–	1	2	–	–	2	–	4	**9**
Asia	**19**	**12**	**26**	**23**	**16**	**29**	**15**	**62**	**202**
Share in total	49	57	60	70	64	64	52	72	**63**
Low and middle income countries	**33**	**18**	**39**	**30**	**22**	**35**	**29**	**65**	**271**
Share in total	85	86	91	91	88	78	100	76	**84**
Total	**39**	**21**	**43**	**33**	**25**	**45**	**29**	**86**	**321**

Source: EC, *Annual report from the Commission to the European Parliament on the Community's
Anti-dumping and Anti-subsidy Activities*, 1996, 1998; EC, anti-dumping and anti-subsidy
statistics covering the first three months of 2000.

　　　　EU iron and steel, textiles, chemical and electronic industries are the most
active in utilising the anti-dumping scheme. Over 75 per cent of investigations were
initiated by these four industries during 1992-1999. The EU is the world's largest
steel producer, accounting for 21 per cent of world production in 1998 (EC, 1999a).
The industry initiated 69 out of a total of 321 anti-dumping and anti-subsidy cases
during 1992-1999 (table 3). The textile industry followed closely with 60 cases initiated
during 1992-1999. The EU is the world's largest importer and second largest exporter
of textiles and clothing products.

　　　　As the world's largest producer of chemicals, pharmaceuticals and cosmetics,
the EU chemical industry initiated 58 anti-dumping investigations during 1992-1999.
The EU is also an important producer of electronic goods, accounting for about
26 per cent of world production in 1998 (EC, 1999b). During 1992-99, the EU
electronic industry initiated 56 anti-dumping and anti-subsidy cases (table 3).

**Table 3. EU anti-dumping and anti-subsidy cases:
investigations initiated by product sector, 1992-1999**

Product	1992	1993	1994	1995	1996	1997	1998	1999	Sum 1992-99
Chemical and allied	10	5	3	4	–	8	–	28	**58**
Textiles and allied	–	1	17	4	10	8	9	11	**60**
Wood and paper	–	–	–	1	–	7	–	–	**8**
Electronics	13	7	3	7	–	14	–	12	**56**
Other mechanical engineering	–	2	4	3	–	1	–	5	**15**
Iron and steel	3	–	7	2	9	4	19	25	**69**
Other metal	5	5	3	5	1	1	–	–	**20**
Other	8	1	6	7	5	2	1	5	**35**
Total	**39**	**21**	**43**	**33**	**25**	**45**	**29**	**86**	**321**

Source: EC, *Annual report from the Commission to the European Parliament on the Community's Anti-dumping and Anti-subsidy Activities*, 1996, 1998; EC, anti-dumping and anti-subsidy statistics covering the first three months of 2000.

II. CHINA AND THE ISSUE OF MARKET ECONOMY STATUS

In addition to the high frequency of EU anti-dumping investigations against China, the non-market economy issue also makes anti-dumping loom in annual bilateral trade talks between China and the EU. Up to April 1998, the EU anti-dumping legislation categorised China as a non-market economy.

For the purposes of establishing normal prices (or home market prices, appendix 1) in dumping investigations concerning China, information on domestic prices and costs is considered unreliable because of the significant distorting effect of state influence and control and the absence of meaningful market signals due to state administration of prices. Therefore in these cases normal value is based on information from companies in another market economy country, the *analogue country.*

The EU anti-dumping legislation specifies that an appropriate market economy (an analogue country) shall be selected in a not unreasonable manner for comparison. However, in practice, due to limited information available at the time of selection and the time limits for anti-dumping investigations (15 months), analogue countries selected for determining home market prices for China have ranged from lower income countries like India to high income countries like Japan and Norway (table 4). For example, in the case of coumarin, the US was selected as the analogue country for China because it was the only market economy country in which it was possible to find a producer willing to provide the needed information.

As many of the analogue countries selected were at a higher stage of economic development compared with China (table 4), the estimation of home market prices was likely to be biased towards the finding of dumping. The labour costs in these analogue countries tend to be higher than labour costs in China.

Since April 1998, individual companies in China have been given an opportunity to prove that they operate in market economy conditions in accordance with certain criteria (see appendix 2). This is to reflect the fact that as a result of on-going reforms in China, individual companies are likely to be operating in market economic conditions and therefore their prices and costs may be appropriate for the

Table 4. Analogue countries selected for the investigation of anti-dumping cases against China, 1996-1998

Cases	Year of initiation	Analogue countries or areas used
Refractory chamottees	1993	USA
Coumarin	1994	USA
Powered activated carbon	1994	USA
Iron or steel tube or pipe fittings	1994	Thailand
Colour TV (review)	1995	Singapore
Glyphosphate	1995	Brazil
Footwear with textile uppers	1995	Indonesia
Footwear with leather or plastic uppers	1995	Indonesia
Ring binder mechanisms	1995	Malaysia
Cotton fabrics unbleached	1996	India
Briefcases and school bags	1996	Taiwan Province of China
Luggage and travel goods	1996	Taiwan Province of China
Handbags	1996	Indonesia
Stainless steel fasteners	1996	Taiwan Province of China
Ferro-silico manganese	1996	Brazil
Personal fax machines	1997	Republic of Korea
Cotton grey fabrics	1997	India
Unwrought unalloyed magnesium	1997	Norway
Thiourea dioxide	1997	Japan
Certain laser optical reading systems	1997	Malaysia
Steel stranded ropes and cables	1998	Norway

Source: EC, *Annual Report From the Commission to the European Parliament on the Community's Anti-dumping and Anti-subsidy Activities*, 1996, 1997 and 1998.

calculation of normal prices. Indeed, market forces determine about 95 per cent of industrial product prices, 90 per cent of retail prices, and 80 per cent of agricultural and raw material prices in China (see the *South China Morning Post*, 17 June 1999).

If a Chinese company can prove that its export activity is not subject to state interference, it can apply for *individual treatment* (for criteria, see appendix 3). When granted individual treatment, the anti-dumping margin of the company concerned will be established by comparing its own export prices and normal prices from the analogue country. This is an option open to exporting producers who may not be able to meet all the criteria for full market economy treatment. A full market economy treatment is granted when a company can show that neither its domestic nor its export activities are subject to state interference. While not granted individual treatment, a countrywide dumping margin is normally calculated for all Chinese firms comparing analogue country prices and importing prices in EU based on the information available.

To meet the deadline for anti-dumping investigations, the EC requests the Chinese exporters concerned to complete a special claim form for market economy status and return it to the EC within three weeks of the initiation of a proceeding. If any information is missing in the completed claim form, or if it is returned late, the claim is automatically rejected.

The success rate of Chinese firms in claiming market economy status has been low. The amendment to EU anti-dumping legislation became effective on 1 July 1998. From July 1998 to October 1999, 27 Chinese companies claimed market economy treatment, but only three were granted the treatment (table 5).

The most common reasons for refusal of market economy treatment were the accounting and auditing standards. Other accounting issues were the valuation of state assets transferred to the companies including land. For those companies with foreign direct investment, the most common reason was prohibition of restriction on domestic sales. Other reasons for refusal of market economy treatment include state suppliers of raw materials, state influence in setting prices, barter trade and majority state ownership.

In these investigations, different Chinese companies failed to meet different criteria of market economy status. In some cases, such as the investigation concerning quarto plates, it was evident that, as a group, the companies that applied for market economy status could in fact meet all the relevant criteria (EC, 2000a).

While the use of Chinese firm's prices tends to lead to under-estimated dumping margins, the non-market economy way of calculation tends to lead to over-estimated dumping margins for many Chinese firms. The difference between the two ways of calculation could be dramatic. For example, in the case of footwear with leather or plastic uppers, individual treatment was granted to one exporter. This resulted in zero anti-dumping duty for the particular exporter while a variable duty to ensure a minimum price of ECU 5.7 per pair was levied on all other exporters. In the case of handbags, two companies were granted individual treatment. This resulted in

Table 5. Market economy status in anti-dumping investigations concerning China

Cases	Number of market economy claims	Number of claims accepted	Reasons for refusal of market economy status
Yellow phosphorus	3	1	• No audited accounts provided • State holds directly or indirectly 2/3 majority of shares • One company not an exporter • Suppliers controlled by the state
Malleable cast iron fittings	3	0	• No audited accounts provided • Financial situation distorted as a result of improper valuation of assets transferred to the company from the state • State interference in setting salaries and through particular tax rebate
TV tubes	1	0	• No audited accounts • Majority of suppliers controlled by the state • No export licence
Coke 80+	1	0	• Unreliable accounts not prepared in line with international accounting standards
CD boxes	3	2	• Domestic sales prohibited • No legal status in China • No individual company accounts available
Quarto plates	6	0	• All companies fully or partially owned by the state • Agreements to purchase raw materials from state owned suppliers • Only nominal fees paid for land-use rights • Barter trade practised
Hair brushes	2	0	• No domestic sales allowed
Glycine	6	0	• Three of the claimants are not exporting producers of the product concerned • Related companies failed to claim market economy treatment • Incomplete financial statements • Restrictions on domestic sales
Electronic weighing scales	2	0	• Restrictions on domestic sales • Companies follow pricing law and consequently sell at loss making prices in China
TOTAL	**27**	**3**	

Source: EC, "Proposal for Council Regulation: amending Regulation (EC) No. 384/96 on protection against dumped imports from countries not members of the European Community", Brussels, 15 June 2000

0 per cent duty for one company and 7.7 per cent duty for the other, while the rest of the exporters were levied 38 per cent duties.

Unfortunately, it is not yet possible to investigate the difference between anti-dumping margins for firms with and without market economy status. For the three Chinese firms that were granted market economy status, their cases (CD boxes and yellow phosphorus) were terminated without definitive measures imposed.

III. THE EFFECTS OF ANTI-DUMPING ON CHINESE EXPORTS TO EU

To understand the effects of anti-dumping measures on trade, bilateral trade statistics of the products subject to definitive anti-dumping measures are analysed in this study. On the EU current anti-dumping and anti-subsidy list as of June 2000, 49 out of a total of 330 cases were against China[4]. These cases consisted of:

- 11 cases with definitive measures imposed before 1995;
- 21 cases with definitive measures imposed during 1995-1998[5];
- 1 case with definitive measures imposed in 1999;
- 10 new cases under investigation with 5 provisional duties imposed; and
- 6 cases initiated since late 1999 terminated without any definitive measures.

Subject to available information and data, this study is only able to look at the trade effect of the new measures imposed during 1995-98. The analysis reveals that anti-dumping measures are generally very trade restrictive. Coincident to the imposition of anti-dumping duties, bilateral trade flows typically reverse their trend of growth from upward to downward. For example, EU initiated an anti-dumping investigation on imports of footwear with textile uppers from China in 1995. Following the investigation, a provisional duty of 94.1 per cent was levied between February and October of 1997. From November 1997, a definitive duty of 49.2 per cent was imposed. Before the imposition of anti-dumping duties, Chinese exports of footwear with textile uppers to the EU had increased from US$171 million to US$178 million. Coincident to the levy of the anti-dumping duties, Chinese exports of the products dropped from US$178 million in 1996 to US$95 million in 1997 and US$90 million in 1998 (table 6).

---

[4]   All 49 cases were anti-dumping cases (no anti-subsidy cases).

[5]   These cases exclude those definitive measures that resulted from reviews of definitive measures imposed before 1995, unless the review led to increased duty or more restrictive measures.

Table 6. Definitive measures and bilateral trade flows 1995-1998

(Million US Dollars)

Cases	1995	1996	1997	1998	Fall in bilateral trade flows	Provisional measures	Definitive measures
Textile, clothing and footwear							
Footwear with textile uppers	171.0	178.1	95.1	90.4	1996-98: 87.7	Feb. 97: 94.1 per cent	Nov. 97: 49.2 per cent
Footwear with leather or plastic uppers	263.8	360.9	396.2	312.7	1997-98: 83.5	none	Feb. 98: 0 per cent or variable duty for minimum price of ECU 5.7 per pair
Electronics							
Colour TV	67.7	97.5	39.9	38.2	1997-98: 1.7		Nov. 98: 44.6 per cent
Microwave oven	35.9	36.0	48.6	77.5	0.0	July 95	Jan. 96: 12.1 per cent
Personal fax machines	14.5	16.6	52.7	39.9	1997-98: 12.8	Nov. 97	Apr. 98: 21.2-51.6 per cent
Metals							
Unwrought unalloyed magnesium	37.4	28.7	53.1	51.0	1997-98: 2.1	May 98: variable duty for minimum price of ECU 2,797 per ton	Nov. 98: variable duty for minimum price of ECU 2,622 per ton
Silicon metal	16.5	27.6	37.1	27.8	1997-98: 9.3		Dec. 97: 49 per cent
Ferro-silico-manganese	63.1	41.1	27.9	1.6	1996-98: 39.5	Sep. 97: 19.6 per cent	Mar. 98: ECU 58.3 per ton
Stainless steel fasteners*	120.5	88.1	75.6	90.6	0.0	Sep. 97: 16.2-75.7 per cent	Feb. 98: 13.6-74.7 per cent
Iron or steel tube or pipe fittings	7.5	10.5	14.9	14.3	0.0	Oct. 95	Apr. 96: 58.6 per cent
Other mechanical engineering							
Ring binder mechanisms	3.0	3.5	8.4	11.6	0.0	July 96: 35.4 per cent	Jan. 97: 32.5-39.4 per cent

Table 6. *(continued)*

(Million US Dollars)

Cases	1995	1996	1997	1998	*Fall in bilateral trade flows*	*Provisional measures*	*Definitive measures*
Bicycle parts	37.2	51.8	67.2	89.7	0.0		Jan. 97: 30.6 per cent exemptions granted to EU bicycle assemblers
Chemicals							
Artificial corumdum	14.8	12.3	11.4	11.6	1996-97: 0.7		Oct. 97: ECU 204 per ton
Refractory chamottees	0.7	0.0	0.0	0.1	1995-97: 0.7	July 95	Jan. 96: variable duty for minimum price of ECU 75 per ton
Coumarin	4.4	1.0	0.6	0.7	1995-97: 3.8	Oct. 95	Apr. 96: ECU 3,479 per ton
Glyphosate	8.5	4.9	2.4	0.8	1996-98: 4.1	Sep. 97: 21.1 per cent	Feb. 98: 48 per cent
Powered activated carbon*	10.7	14.5	12.3	14.1	0.0	Aug. 95	Jun. 96: ECU 323 per ton
Peroxodisulphates	2.5	0.9	0.9	1.1	1995-97: 1.6	95	Jan. 96: 83.3 per cent
Misc. manufactured products							
Handbags	88.8	87.6	85.2	81.0	1996-98: 6.6	Feb. 97: 0-39.2 per cent	Aug. 97: 0-58.3 per cent
Pocket lighter	21.1	19.4	11.3	10.2	1995-98: 10.9		May 95: ECU 0.065 per lighter
Polyolefin sacks and bags	21.8	22.8	20.2	12.5	1996-98: 10.3		Oct. 97: 102.4 per cent
Total					**275.3**		

Source: *China Customs Statistics Yearbook*, 1995, 1996, 1997, 1998; EC, list of anti-dumping and anti-subsidy measures, europa.eu.int/comm/trad, accessed 19 June 2000; EC, *Annual Report From the Commission to the European Parliament on the Community's Anti-dumping and Anti-subsidy Activities*, 1996, 1997, and 1998; and EC, *Official Journals*, various issues.

Out of the 21 cases with definitive measures imposed between 1995-1998 (table 6):

- 15 cases showed a fall in bilateral trade flows coincident to the imposition of duties.
- In four cases, bilateral trade flows continued to rise (in one of the cases, bicycle parts, this was due to exemptions from duties for EU bicycle assemblers). Past experience shows that, when measures are considered as insufficient, subsequent reviews are lodged that often lead to more restrictive measures.
- In two of the cases, the pattern of change in bilateral trade flows was not clear. In one case, the bilateral trade flow fell with a time lag. In the other case, the bilateral trade flow fluctuated.

As bilateral trade flows generally tend to fall following the imposition of anti-dumping duties, the notion of the percentage of trade volume subject to anti-dumping measures almost certainly tends to under-estimate the effects of anti-dumping on trade. An appropriate estimation of the effects of anti-dumping duties on trade would be to investigate how the trade flow of the products concerned changes following the imposition of anti-dumping duties. Ideally, the impact can be measured by comparing the actual bilateral trade level with the level it would have grown to without the imposition of the duties. Such an exercise requires the simulation of the growth trends of trade flows. However, before conducting such an exercise, it is useful to calculate the actual fall in bilateral trade flows coincident to the imposition of duties. While omitting the growing trend in trade flows in many cases, the calculation can provide a lower-boundary estimation on how anti-dumping duties affect bilateral trade flows of the products concerned.

In this study, the fall in bilateral trade flows coincident with the imposition of anti-dumping duties is calculated based on Chinese customs data. The calculation results show that the fall in bilateral trade flows coincident to the imposition of definitive measures between 1995-98 amounted to US$275 million[6] (table 6). To obtain a sense of the relative size of this number, it is compared with the change in total Chinese exports to EU between 1995-1998. Between 1995-1998, total Chinese exports to EU increased by US$9,051 million. The fall in Chinese exports to EU coincident to the imposition of definitive anti-dumping duties between 1995-1998 amount to 3 per cent of the total increase in Chinese exports to EU.

As discussed above, this calculation tends to under-estimate the effects of anti-dumping duties on trade as it is based on the actual fall in bilateral trade flows without taking into account the growing trends before the imposition of duties. However, this calculation at least indicates that without the imposition of the definitive

---

[6]   The falls in bilateral trade flows in the two cases where trade flows exhibited an unclear pattern of change are counted as zero.

duties between 1995-1998, the increase in Chinese exports to EU would have been more than 3 per cent higher.

It may be argued that these falls in bilateral trade flows have been caused by other factors. During the period covered in this study (1995-1998), the Asian financial and economic crisis has indeed been identified as the major factor that led to a modest slackening of the export performance of China. However, statistics also show that, while Chinese exports to Asian economies declined during the crisis, Chinese firms diversified their exports to the EU and US markets. As a result, Chinese exports to EU and US continued to rise during the Asian crisis.

Even though the 21 cases investigated above are only part of the 49 cases on the EUs list of anti-dumping cases against China, they have shown that, from the Chinese perspective, the effects of anti-dumping measures on trade can be much more significant than from EU's perspective.

IV. CONCLUSION

A close investigation of EU anti-dumping cases against China reveals that three issues are important in relation to the impact of anti-dumping measures on trade. First, the calculation of dumping margins is a challenging task. Although great efforts have been devoted to make anti-dumping investigation a fair process, the scheme suffers from imperfect information that is highly likely to lead to biased rulings. In particular, the non-market economy way of calculating dumping margins for China is a practice that has replaced one set of bias (under-estimation) with another (over-estimation).

Second, the high rates of termination due to withdrawal of complaints also poses the question whether the scheme tends to be used by industries to fight against *fair* competition as opposed to *unfair* competition. Investigations and provisional duties levied can be highly disruptive to exporting firms even if eventually no definitive measures are imposed.

Third, as anti-dumping measures tend to significantly change bilateral trade flows, the percentage of imports subject to anti-dumping measures is not a good indicator of the effects of anti-dumping duties on trade. A more appropriate measure of the impact of anti-dumping on trade is to estimate the extent that anti-dumping duties affect bilateral trade flows. In this study, the fall in bilateral trade flows coincident to the imposition of 21 definitive duties was calculated. The results show that the rise in Chinese exports to EU would have been more than 3 per cent higher without the imposition of the duties in 1995-1998. The actual effects of anti-dumping measures on bilateral trade flows should be much bigger, taking into account the effects of all 49 cases against China and the upward trend of the trade flows for most products before the imposition of the duties. Thus, from the perspective of developing country exporters, the impact of the anti-dumping regime on trade can be much more dramatic than from the perspective of developed country importers.

REFERENCES

EC, 1999a. Trade in goods: the steel sector, europa.eu.int/comm/trad/goods, accessed 22 May 2000.

_____, 1999b. Trade in goods: the electronic sector, europa.eu.int/comm/trad/goods, accessed 22 May 2000.

_____, 2000a. Proposal for Council Regulation: amending Regulation (EC) No. 384/96 on protection against dumped imports from countries not members of the European Community, Brussels.

_____, 2000b. Trade Policy Instruments, europa.eu.int/comm/trade/policy, accessed 22 May 2000.

Finger, J.M., ed. 1993. *Anti-dumping: how it works and who gets hurt*, Studies in International Trade Policy (Ann Arbor, University of Michigan Press).

Jones, K.A., 1994. *Export Restraint and the New Protectionism: The Political Economy of Discriminatory Trade Restrictions* (Ann Arbor, University of Michigan Press).

Krueger, A., 1995. *American Trade Policy: Tragedy in the Making* (Washington, D.C., AEI Press).

Lahiri, S., and J. Sheen, 1990. "On optimal dumping", *The Economic Journal*, 100 (Conference 1990), pp. 127-136.

Robert, B., and L. Robert, 1991. *Down in the Dumps* (Washington, D.C., Brookings Institution).

Rugman, A.M., and A.D.M. Anderson, 1987. *Administered Protection in America* (London, Croom Helm).

Appendix 1. EU anti-dumping and anti-subsidy scheme[a]

EU's rules to deal with dumping date back to the organization's earliest days. They are targeted at dumped imports that cause significant injury to EU producers. The first anti-dumping and anti-subsidy legislation of EU was enacted in 1968 and has been subsequently modified several times. A new set of rules governing the anti-dumping scheme came into force in 1995 when WTO was established. The new set of rules (updated in 1996) was based on measures agreed under WTO.

According to the new rules, anti-dumping duties can be levied if the following conditions are met:

- a finding of dumping: the export price at which the product is sold on the EU market is shown to be lower than the price on the producer's home market;
- a material injury to EU industry: the imports have caused or threaten to cause damage to a substantial part of the industry within the EU, such as loss of market share, reduced prices for producers and resulting pressure on production, sales, profits, productivity etc.;
- the interests of EU: the costs for EU of taking anti-dumping measures must not be disproportionate to the benefits.

When an industry in EU considers that dumped imports from non-EU countries are causing it material injuries, it may submit a complaint to the EC, either directly or through its national government. The EC then has 45 days to examine the complaint, consult the member states and decide whether or not there is enough evidence to merit a formal investigation. The case will be rejected if there is not enough evidence or if the complainants do not represent at least 25 per cent of the total EU production of the product in question.

Once a case is accepted, the EC will conduct a formal investigation within 15 months. The investigation covers whether or not dumping is taking place, which can be a complex calculation, and also whether dumped imports are causing material injuries to EU industry. Measures may also be imposed if imports are hindering the establishment of a new industry within EU or there is a clear and imminent threat of material injury.

Anti-dumping measures will only take place if they are shown to be in the broader EU interest. Producers, importers, users and consumers are able to present their views.

If the investigation confirms the existence of injurious dumping and if the Community interest test is positive, the EC may, after consulting with member states, impose provisional duties. The duties levied are within the dumping

margin, the difference between the price on the home market (the normal price) and the price charged on the EU market (the export price). The provisional duties may last for six to nine months.

Subsequently, the EC responds to comments by interested parties and discloses information underlying its conclusions. If the initial findings are confirmed after disclosures and verifications, the EC will propose the imposition of definitive duties to the EU Council of Ministers. In the case of coal and steel products, the EC can impose definitive measures itself after consultation with Member States. Definitive duties are valid for five years before they expire.

If the initial findings are not confirmed or dumping is not evident, the proceedings will be terminated without the adoption of any definitive measures.

A regulation imposing anti-dumping duties may be challenged in the European Court of First Instance, and the WTO dispute settlement procedure may be used to settle disputes between WTO signatories.

Source: EC, "Trade Policy Instruments", europa.edu.int/comm/trade/policy, accessed 22 May 2000. [a] EU also takes action against subsidies given by exporting country Governments since they help exporters to reduce production costs and cut the prices of their exports unfairly. Again, WTO agreements allow member countries to adopt anti-subsidy measures. The WTO Agreement on Subsidies and Countervailing Measures disciplines the use of subsidies and regulates the actions countries can take to counter the effects of subsidies. Available statistics on anti-dumping and anti-subsidy are often mixed together.

**Appendix 2.   Criteria to determine whether or not a company operates
in market economy conditions**

- Decisions of firms are taken without significant state interference and are made in response to market signals;
- Accounts must be independently audited in line with international accounting standards;
- Production costs and the financial situation of the company is not affected by distortions carried over from the former state-led economic system, barter trade or compensation of debts;
- Companies are subject to bankruptcy and property laws; and
- Exchange rate conversations are carried out at market rates.

Source: EC, 'Proposal for Council Regulation: amending Regulation (EC) No. 384/96 on protection against dumped imports from countries not members of the European Community', Brussels, 15 June 2000.

**Appendix 3. Criteria for individual treatment
(revised version of the year 2000)**

If the following criteria are met, a Chinese company can be granted individual treatment that allows anti-dumping margins to be calculated according to its own export prices and normal prices in the analogue country.

Old criteria applied before the year 2000:

- The majority of the shares should belong to genuinely private companies and no state officials should appear on the board or in a key management position; the fact that a foreign investor controls the company concerned will be considered a relevant indication of independence.
- The land on which the facilities of the company are built should be rented from the state at conditions comparable to those in a market economy country or purchased (e.g. proper contractual lease).
- The company should have the right to hire and dismiss employees and the right to fix salaries.
- The company should have full control over its supply of raw materials and inputs in general.
- The supply of utilities should be guaranteed on the basis of proper contractual terms.
- Proof is given that profit can be exported and capital invested can be repatriated (only in the case of foreign investment, e.g. joint venture).
- The export prices should be determined freely; the fact that export sales are made to a related party located outside the country in question will be a decisive factor.
- Freedom to carry out business activities should be guaranteed, in particular in respect of the following: there should be no restrictions on selling on the domestic market; the right to do business cannot be withdrawn outside proper contractual terms; and quantities produced for export should be determined freely by the company in accordance with the traditional demand of its export markets.

New criteria following a review in the year 2000:

- Exporters are free to repatriate capital and profits (applicable to wholly foreign owned firms or joint ventures).
- Export prices and quantities, and conditions and terms of sale are freely determined, and the majority of the shares belong to genuinely

> private companies. State officials appearing on the board or in key management positions should be in a clear minority. The presumption is that a state-controlled company cannot guarantee its independence from state interference, and the burden rests with the exporter to prove otherwise.
>
> - Exchange rate conversations are carried out at the market rate.
> - State interference is not such as to permit circumvention of measures if exporters are given different rates of duty.
>
> *Source:* EC, "Proposal for Council Regulation: amending Regulation (EC) No. 384/96 on protection against dumped imports from countries not members of the European Community", Brussels, 15 June 2000.

REJUVENATING BANK FINANCE FOR DEVELOPMENT
IN ASIA AND THE PACIFIC

The heads of Governments at the United Nations Millennium Summit held in September 2000 adopted the United Nations Millennium Declaration, urging countries to work towards detailed development goals that include poverty eradication and human development. The International Conference on Financing for Development held at Monterrey, Mexico in March 2002 underscored the fundamental reality that in order to achieve these goals the need for mobilizing domestic financial resources in addition to international resources was paramount.

In the ESCAP region, the banking sector remains the primary source of domestic resources for private sector development with debt markets for the private sector in their infancy. However, the operations of the banking system in many countries in the region remain fragile owing to a variety of factors such as a low capital base, excessive government intervention, poor regulations, ineffective supervision and insufficient risk-management skills. Fragile banking systems not only misallocate resources, but are also prone to periodic crises, putting savers' funds at risk with serious consequences for economic growth. In several countries in the region, five years after the Asian financial crisis banks are still suffering from an overhang of non-performing loans. Even though there has been considerable progress region-wide with regard to banking sector restructuring, a number of outstanding issues remain to be tackled to rejuvenate banking as one of the main instruments in economic development.

Against that background, this volume provides an overview of domestic resource mobilization for development in Asia and the Pacific. It also reviews country cases in the banking sector and in the related field of microfinance in order to disseminate a range of experiences and lessons for guiding policy in the future. Country studies on the banking sector include China, India and Thailand, while those on microfinance cover Bangladesh, the Philippines and the Republic of Korea. Policy makers in the region should find the case studies in both fields useful for devising long-term strategies to rejuvenate their banking systems.

PROTECTING MARGINALIZED GROUPS DURING ECONOMIC DOWNTURNS: LESSONS FROM THE ASIAN EXPERIENCE

Following the 1997 economic crisis, Governments in East and South-East Asia expanded several existing employment/income-generating/protecting programmes. This strategy was adopted as the affected countries lacked the automatic stabilizers or universal social insurance programmes which could be used to benefit those who had lost their jobs or other sources of income during the crisis. This timely ESCAP publication attempts to evaluate the effectiveness of these programmes in benefiting the target groups. Lessons learned during the evaluation are used to outline an Asian Social Protection Framework which can be used, among other things, to reassure society that the needs of ordinary men and women will not be forgotten during any future economic downturns.

The genre of the programmes evaluated essentially revolves around the public works and microcredit programmes in Indonesia and Thailand and the Unemployment Insurance and the Small and Medium Enterprise credit programme in the Republic of Korea. Beneficiaries of the programmes, as well as relevant implementing agencies, were approached to provide information on the impact of the programmes on income and employment generation. Focus group interviews with the non-beneficiaries who were eligible, but did not join the programmes, were conducted to identify the reasons for their non-participation. The data collected and other relevant information have been analysed and the results obtained were then put before a group of senior policy makers from selected Asian countries to ascertain their views. The group recommended that the lessons learned from the study could be used to identify the elements of an Asia Social Protection Framework package capable of protecting persons associated with the formal, informal and self-employed sectors against income/employment shocks arising out of economic restructuring, downsizing or downturn.

In the light of their recommendations an Asian Social Protection Framework could encompass the following elements:

(1)   Implementation of macroeconomic and other policies that promote broad-based economic growth

> (2)   Recognition of the Government's responsibility and leadership as the 'social protection provider' of last resort; hence the need to create a comprehensive social safety system with the active cooperation and participation of the local community
>
> (3)   Recognition of the existence of a large self-employed and informal sector and thus the inherent limitations of contributory social insurance schemes and the need for targeted schemes such as rural public works programmes, and strengthening of the informal sector consistent with the commitments enshrined in the Copenhagen Declaration and Programme of Action
>
> (4)   In the formal sector, recognition of the need to develop a comprehensive contributory scheme (funded by employers and workers) to provide for social insurance as well as unemployment insurance
>
> (5)   Explicit provision of expenditure on social protection in the budgetary/ fiscal framework of the Governments
>
> (6)   Effective collaboration between the Government, civil society and the private sector in designing social safety nets
>
> (7)   Harnessing of family ties, human contacts, community self-help and 'other' philanthropic activities to build "private safety nets"

Such a framework, while undoubtedly ambitious, does provide a basis to enable Governments in the region to look at the full gamut of social protection issues. It also highlights the policy trade-offs involved in their resolution, the opportunity costs of overemphasizing one or other objective and the clear need to bring these issues to the forefront of public debate. Without appropriate pressure from public opinion, social protection issues are unlikely to attract the needed attention of Governments in the region. This publication performs a useful service in bringing the complex issues of social protection to the attention of a wider audience.

SUBSCRIPTION FORM

(Please type or print)

NAME: _____

POSITION: _____

ORGANIZATION: _____

ADDRESS: _____

                   _____

                   _____

                   _____

           COUNTRY: _____   POST-CODE: _____

TELEPHONE: _____   FACSIMILE: _____   E-MAIL: _____

SUBSCRIPTION RATES FOR *ASIA-PACIFIC DEVELOPMENT JOURNAL* (2 ISSUES PER YEAR)

❏   1 year $US 35.00

❏   3 years $US 90.00

Please mail this form together with your subscription fee in US dollars to:

> Chief, Conference and General Services Section
> Division of Administration
> Economic and Social Commission for Asia and the Pacific (ESCAP)
> United Nations Building, Rajadamnern Avenue
> Bangkok 10200, Thailand

✂ ---

This publication may be obtained from bookstores and distributors throughout the world.
Please consult your bookstore or write to any of the following:

Sales Section   Tel.: (212) 963-8302
Room DC2-0853   Fax: (212) 963-4116
United Nations Secretariat   Telex: 422311 UN UI
New York, NY 10017
United States of America

Sales Section   Tel.: (41) (22) 917-1234
United Nations Office at Geneva   Fax: (41) (22) 917-0123
Palais des Nations   Telex: 23711 ONU CH
CH-1211 Geneva 10
Switzerland

Chief, Conference and General Services Section
Division of Administration
Economic and Social Commission for Asia and the Pacific (ESCAP)   Tel.: (662) 288-1234
United Nations Building, Rajadamnern Avenue   Fax: (662) 288-1000
Bangkok 10200, Thailand   Telex: 82392 ESCAP TH

READERSHIP SURVEY

The Development Research and Policy Analysis Division of ESCAP is undertaking an evaluation of the publication: *Asia-Pacific Development Journal,* with a view to improving the usefulness of future publications to our readers. We would appreciate it if you could complete this questionnaire and return it, at your earliest convenience, to

> Director
> Development Research and Policy Analysis Division
> ESCAP, United Nations Building
> Rajadamnern Avenue
> Bangkok 10200, THAILAND

QUESTIONNAIRE

Rating for quality and usefulness (please circle)	Excellent	Very good	Average	Poor
1. Please indicate your assessment of the *quality* of the publication in terms of:				
– presentation/format	4	3	2	1
– readability	4	3	2	1
– timeliness of information	4	3	2	1
– coverage of subject matter	4	3	2	1
– analytical rigour	4	3	2	1
– overall quality	4	3	2	1
2. How *useful* is the publication to your work?				
– provision of information	4	3	2	1
– clarification of issues	4	3	2	1
– its findings	4	3	2	1
– policy suggestions	4	3	2	1
– overall usefulness	4	3	2	1

3.   Please give examples of how this publication has contributed to your work.

....

....

....

....

4.   Suggestions for improving the publication:

....

....

....

....

5.   Your background information, please:

Name: ....

Title/position: ....

Institution: ....

Office address: ....

....

Please use additional sheets of paper, if required, to answer the questions.

Thank you for your kind cooperation in completing this questionnaire.

Instructions to contributors

1.   MANUSCRIPTS

Authors are requested to submit two copies of their manuscripts in English. Contributors should indicate in their covering letter to the Editorial Board that the material has not been previously published or submitted for publication elsewhere. The length of manuscripts should not normally exceed 25-30 double-spaced A4-size pages. Manuscripts are accepted subject to editorial revision.

The manuscripts should be typed, double-spaced, on one side of white A4 paper. Since all manuscripts will be refereed by professionals in the field, the name(s) of the author(s), institutional affiliation(s) and other identifying information should be placed on the title page only, in order to preserve anonymity.

The title page should contain the following: (a) title; (b) name(s) of the author(s); (c) institutional affiliation(s); and (d) complete mailing address, telephone number and facsimile number of the author, or of the primary author in the case of joint authors. The second page should contain the title, the name(s) of the author(s) and an abstract of approximately 150 words. Acknowledgements (if any) should appear after the abstract.

Once a manuscript is accepted for publication, the author(s) should submit a copy of the manuscript on a computer diskette labelled with the title of the article, the name(s) of the author(s) and the word processing software used. The preferred word processing software is MSWord.

2.   FOOTNOTES AND QUOTATIONS

Footnotes, if any, should be numbered consecutively with superscript arabic numerals. They should be typed single-spaced and should be placed at the foot of each page. Footnotes should not be used solely for citing references.

Quotations should be double-spaced. A copy of the page(s) of the original source of the quotation, as well as copy of the cover page of that source, should be provided.

3.   TABLES

All tables should be numbered consecutively with arabic numerals. Each table should be typed double-spaced on a separate page and should follow the list of references. There should be a clear indication in the text where the table should be inserted. Full source(s) should appear below the table, followed by notes, if any, in lower-case letters.

4.   FIGURES

All figures should be provided as camera-ready copy and numbered consecutively. Figures should be planned to fit the proportions of the printed page. There should be a clear indication in the text where each figure should be inserted. Full source(s) should be provided below each figure.

5.   REFERENCES

Authors should ensure that there is a *complete* reference for every citation in the text. References in the text should follow the author-date format followed, if necessary, by page numbers, for example, Becker (1964: 13-24). List only those references that are actually cited in the text or footnotes. References, listed alphabetically, should be typed double-spaced on a separate page in the following style:

Ahmed, E. and N. Stern, 1983. "Effective taxes and tax reform in India", Discussion Paper 25, University of Warwick.

Desai, Padma, ed., 1883. *Marxism, Central Planning, and the Soviet Economy* (Cambridge, MA, MIT Press).

Krueger, Alan B. and Lawrence H. Summers, 1987. "Reflections on the inter-industry wage structure", in Kevin Lang and Jonathan S. Leonard, eds., *Unemployment and the Structure of Labour Markets* (London, Basil Blackwell).

Sadorsky, P., 1994. "The behaviour of U.S. tariff rates: comment", *American Economic Review,* vol. 84, No. 4, September, pp. 1097-1103.

Terrones, M., 1987. "Macroeconomic policy cycle under alternative electoral structures: a signalling approach", unpublished.