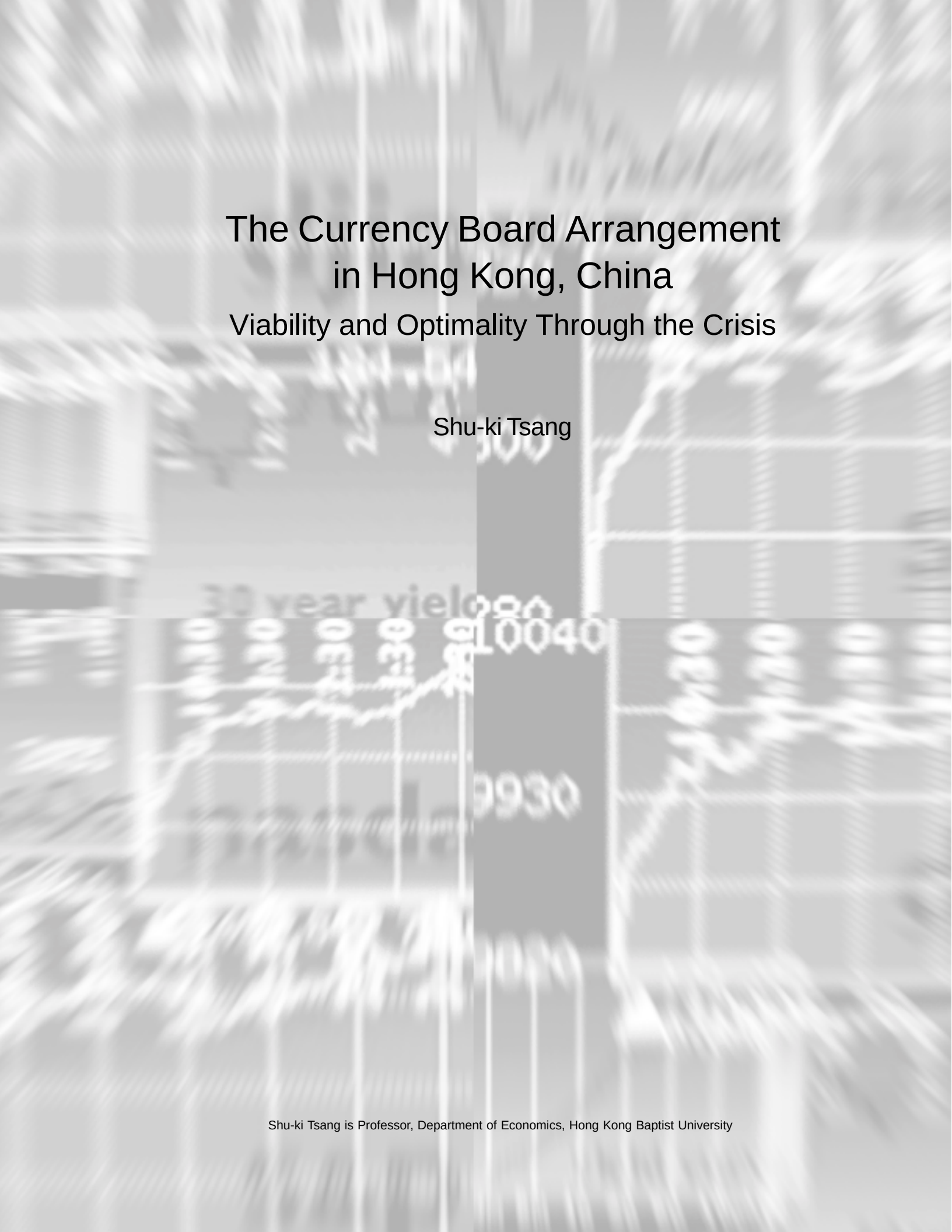
The Currency Board Arrangement in Hong Kong, China

Viability and Optimality Through the Crisis

Shu-ki Tsang



Shu-ki Tsang is Professor, Department of Economics, Hong Kong Baptist University

Summary

Overview

Currency board arrangements (CBAs) are a very strong form of fixed exchange rate regime. Like the gold standard, they rely on market forces, rather than on foreign exchange controls or interventions, to fix the exchange rate. CBAs have been adopted in a variety of institutional forms and with varying degrees of success in a number of economies.

In theory, the classical CBA, which originated in the 19th century, uses three anchors to fix the exchange rate: (i) economic discipline, because of the requirement that currency issues should be fully backed by foreign reserves; (ii) specie flow and interest arbitrage; and (iii) currency (cash) arbitrage, which binds the spot exchange rate. In practice, not all three anchors function effectively in every CBA.

Regarding economic optimality, the case for or against CBAs is broadly similar to the debate on fixed versus floating exchange rate, but the link between the narrower monetary aggregate and the balance of payments in a CBA tends to be even closer than in other fixed rate regimes. Williamson (1995) has identified some advantages and disadvantages of CBAs.

Insofar as a great deal of resources have been committed to CBAs to make them more credible and robust, they may have difficulty adjusting to major structural changes and irreversible divergence in the longer run. Modifying or abandoning them would carry very high adjustment cost or exit cost. In the extreme, total commitment begs the question of why the "dollarization" option—replacing the home currency with the foreign currency to which it is pegged—was not adopted instead.

The Currency Board Arrangement in Hong Kong, China

The CBA in Hong Kong, China, locally known as the "linked exchange rate system," or the "link" for short, was instituted on 17 October 1983 as a rescue measure in a currency crisis caused by Sino-British political conflict over the future of the territory. It is an idiosyncratic system since there is actually no currency board, and bank notes are issued by a few designated commercial banks, which alone deal directly with the monetary authority at the fixed exchange rate of HK$7.80 to the US dollar. This arrangement has given rise to a multilayered mechanism involving the monetary authority, the note issuing banks (NIBs), other commercial banks, and the general public, which largely explains the "imperfect" performance of the system. The market exchange rate has deviated from the official rate of 7.80 by an average of slightly less than 1 percent in the years since the inception of the system.

The link has evolved through several stages. From October 1983 to 1987, the Hong Kong government could not even define the monetary base, and the theoretical forces of bank note arbitrage and competition did not seem to work. The exchange rate was underpinned by government intervention in the foreign exchange market and interest rate manipulation. In the period from 1988 to 1993, the imposition of the "accounting arrangements" gave the government a handle for the monetary base through the Hongkong and Shanghai Banking Corporation (HSBC) as the ultimate clearing bank. The launching of the Exchange Fund bills and notes, as well as the creation of the liquidity adjustment facility (LAF) as a kind of discount window strengthened the ability of the monetary authority to influence interbank liquidity and interest rates in the two-tier system.

On 1 April 1993, the central bank, the Hong Kong Monetary Authority (HKMA), formally came into existence. In December 1996, a system of real time gross settlement (RTGS) was established, replacing the two-tier accounting arrangements in existence since 1988. Thenceforth, HKMA, like any other central bank, could transact directly with each commercial bank and influence interbank liquidity and

interest rates more effectively, with a view to maintaining exchange rate stability.

In October 1997, the Hong Kong dollar came under powerful speculative attack, as a result of the contagion effect of the Asian financial turmoil. Interbank interest rates shot up to unprecedented levels, and then showed substantial risk premiums, generating unpalatable consequences for the financial and property markets, as well as the real economy. A controversy arose as to the role of HKMA in handling the turbulence.

HKMA later clarified that as the link was on "autopilot" during the attack, the interest rate adjustments were part and parcel of a CBA, and therefore an inevitable "pain." The *Report on Financial Market Review* released by the government in April 1998 promised a firm commitment to the currency board principle of specie flow, namely, letting the flows of funds determine interest rate movements and refraining from manipulating the monetary base, other than necessary sterilization measures to offset exceptional domestic events. At the same time, though, HKMA reserved the option of intervening in the foreign exchange market at unspecified levels close to the rate of 7.80.

Technical Assessment

The post-1997 CBA in Hong Kong, China still uses the first two anchors of the classical currency board, i.e., (i) economic discipline based on adequate reserves, and (ii) specie flow. However, no effective mechanism for currency arbitrage has been put in place. Instead, HKMA has opted for discretionary foreign exchange market intervention, playing on "constructive ambiguity" or "the surprise element." The system is the only one of its kind in the world.

The government's *Report on Financial Market Review* confirmed the impracticability of bank note arbitrage in fixing the exchange rate in its CBA, a fact that had long been suspected since the start of the link in 1983. Indeed, cash arbitrage is inconsistent with modern financial development as the cash base represents a diminishing share of total money supply. Moving cash around to exploit arbitrage opportunities creates hazards for the banking system.

To deal with the ineffectiveness of cash arbitrage, Tsang (1996a, 1996b, 1997) proposed to the government the modern CBA version of Argentina, Estonia, and Lithuania (the AEL model). Under such a system, the monetary authority would guarantee not only the convertibility of the cash base at the fixed exchange rate, but also the convertibility of the reserves of the banking system, i.e., the whole monetary base, at that rate. Arbitrage could then be carried out electronically without any movement of cash. This would help minimize the efficiency risk of the exchange rate system, although perceived systemic risk could still result in risk premiums in interest rates. However, the government had reservations about such a way of strengthening arbitrage. Instead, it opted for discretionary market intervention at unspecified levels close to the 7.80 rate.

The key question is whether the combination of the "autopilot" specie flow mechanism and discretionary intervention in the foreign exchange market provides an effective defense of the CBA of Hong Kong, China. A related question is what the least-cost option is. In any case, just as the link was not overturned in the unprecedented speculative attack in October 1997, the probability that it will be derailed in the future remains small, unless external shocks of a much bigger scale emerge. The well-tested commitment of the government to the linked rate of 7.80, buttressed by one of the largest foreign reserves in the world should be able to see Hong Kong, China through.

Nevertheless, whether and how the cost of defense can be further reduced is still an open issue. The persistently high and volatile interest rates since October 1997 have led to a credit crunch and generated serious adverse impact on the economy

of Hong Kong, China. There seems to be a strong case for adopting the AEL model and instituting a system of deposit reserves whereby the excess reserves of banks could be used to ease the interest rate pain in case of a speculative attack on the Hong Kong dollar.

Economic Optimality

On the basis of Williamson's (1995) characterization of the "four virtues and seven vices" of a typical CBA, Hong Kong, China has been in a position to capitalize on the advantages and to minimize the potential harm caused by the disadvantages. A key factor is the healthy fiscal and international reserves position of Hong Kong, China. The huge reserves accumulated since the start of the link, however, highlight seigniorage and transition problems—the difficulties of earning sufficient returns on foreign assets during high domestic inflation. On the other hand, the lack of instruments to offset the inflationary pressure in the 1990s, especially asset inflation, points to a management problem.

Theoretically, the more flexible the real sector of an economy is, the more suitable is a fixed exchange rate, as the real sector will adjust quickly. A floating exchange rate system may bring instability to a small open economy with a huge financial sector, as speculative capital movements and attacks on the currency will be difficult to contain. A fixed exchange rate regime has the advantage of diverting pressure away from the exchange rate to other aspects of the economy and providing an important anchorage.

The major drawback of a fixed exchange rate regime is that while it requires stricter economic discipline, it does not serve as a very good barometer of imbalances that are building up in the economy. Bubbles could emerge, and the consequences might be very serious if the fixed rate collapses, as in the case of several economies in the East Asian region. Under the CBA, the economy of Hong Kong has shown some worrying signs of slower growth and asset-inflationary pressure in the 1990s, and of a bubble in the run-up to 1997.

As a very strong form of fixed exchange rate regime, a currency board system may find it hard to deal with major external shocks, structural divergence, and deep-seated economic imbalances that do not show up easily. A key issue is the exit cost of quitting the peg. If more is invested in building confidence in the system, more has to be foregone when it is finally deemed necessary to change track. Therefore, a balance has to be struck between the conflicting considerations of ensuring short-term stability and maintaining long-term flexibility.

Relevance of Hong Kong, China's Experience for Asia

Like most other modern CBAs, the Hong Kong link was a crisis response. This means that the fixed exchange rate chosen might not necessarily be appropriate in the long run, unless the real economy is flexible enough to adjust even to major external shocks and structural divergence.

The idiosyncratic Hong Kong CBA has gone through several stages of evolution. As it stands, it is probably a model only for strong economies. For weaker economies, the AEL version is the only CBA that may be used to solve a currency crisis, given that the classical CBA based on cash arbitrage is a nonstarter, and that a CBA with credibility and discretion like that of Hong Kong, China cannot be easily imitated. In any case, the AEL model requires a relatively robust banking system or measures by the monetary authority to strengthen or protect it.

If Indonesia wishes to adopt a CBA to solve the country's currency crisis, two questions need to be asked: (i) Is the country ready to adopt the AEL model to minimize the efficiency risk associated with the exchange rate? (ii) What measures must be carried out to reduce the perceived systemic risk in the system, without unduly increasing the exit cost in the future?

There are four varieties of CBAs: (i) the classical currency board system found in many former British colonies, which relied on cash arbitrage; (ii) the Hong Kong CBA in the 1980s, in which there were no effective currency board or central banking defense mechanisms; (iii) the Hong Kong CBA as presented in the *Report on Financial Market Review* (FSB 1998); and (iv) the AEL model of Argentina, Estonia, and Lithuania, with deposit reserves as liquidity buffers. The first option is hopelessly outdated. The second option was a fluke for Hong Kong, China. In the contemporary context, the third option is a choice only for a strong economy with very large reserves. Yet the cost of defense could be huge, if speculators hold the view that the fixed exchange rate is out of line with the rapidly changing external environment. The fourth option therefore appears to be the only relevant model for an aspiring economy in the region.

An Asian economy that wants to adopt the AEL model has to make sure that it has the appropriate infrastructure. Moreover, the government must think very carefully about the level of the peg that it wants to lock in, in a world of uncertainty and dramatic exchange rate realignments. If the central bank regards the fall in its home currency as totally unjustified, far beyond any economic fundamentals, then fixing the spot exchange rate through the electronic arbitrage mechanism of the AEL model could generate a turnaround effect that might help to stabilize the system.

Technical Feasibility and Optimality: An Overview

Currency Board Arrangements: Three Anchors for Fixing the Exchange Rate

Currency boards are a peculiar form of fixed exchange rate system. An exchange rate can be fixed in either of two ways: (i) foreign exchange controls or government interventions in the market or both, or (ii) arrangements that directly harness self-interested market forces. In many developed economies, the first method has been the norm. On the other hand, market-driven systems include the gold standard (Officer 1989, 1993) and currency boards.

Currency boards have a long history, dating back to the 19th century when they were mainly adopted in the British colonies. The first one was established in Mauritius in 1849 (Schwartz 1993). Eventually, as many as 70 economies implemented similar arrangements and the system reached its heyday in the 1940s (Hanke, Jonung, and Schuler 1993; Williamson 1995). After the Second World War, they went out of fashion as newly independent territories sought monetary autonomy by setting up their own central banks, and floating-exchange regimes replaced the Bretton Woods system.

Currency board economics has been enjoying some kind of a revival (Liviatan 1993). Hong Kong resurrected it in 1983. Then Argentina adopted a similar scheme in 1991, Estonia in 1992, Lithuania in 1994, and Bulgaria and Bosnia in 1997. In early 1998, Indonesia thought of using a currency board to solve its economic crisis. More than a dozen economies now host currency board arrangements (CBAs), which vary substantially in institutional form, as well as relative performance.

A typical currency board issues cash (notes and coins) fully backed by foreign exchange reserves at a fixed exchange rate against a designated foreign currency (Schwartz 1993). Hence, in theory the board cannot issue any new cash without a balance of payments surplus. This supposedly leads to economic discipline in monetary and fiscal policymaking, which in turn can instill confidence and contribute to exchange rate stability (Hanke and Schuler 1994).

However, it is too far-fetched to argue that an exchange rate can be "fixed" by discipline-generated

confidence. There need to be practical mechanisms that bind the exchange rate. On a more technical level, a currency board differs from a pegged-rate regime based on bureaucratic intervention by the monetary authority. Like the gold standard, it relies on two automatic stabilizers to anchor the exchange rate: (i) specie flow, and (ii) arbitrage.

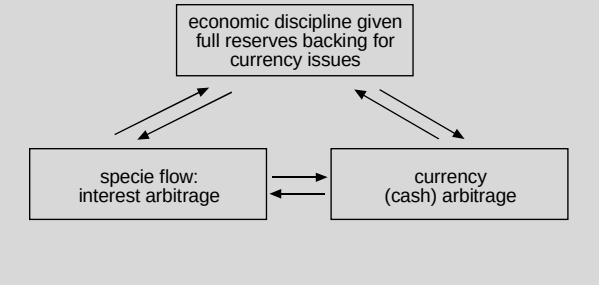
The specie flow process works like this: an outflow of capital, as a result of weaknesses in the economy or doubts about the exchange rate, would cause the money supply to contract, push up interest rates, and induce a counterflow of funds. The whole event is automatic and speedy, and the exchange rate can be fixed without government intervention (Hanke, Jonung, and Schuler 1993). A pitfall, however, exists in this process. Under normal circumstances, there is no denying that interest rate hikes may help stabilize a currency. However, if the exchange rate is itself fluctuating or seen to be insecure, higher interest rates would not necessarily induce a counterflow of capital. Exchange rate risk would necessitate an interest rate premium, and higher interest rates in turn might be regarded as a sign of weakness, leading to a vicious circle. In this sense, therefore, the specie flow process is not a very reliable mechanism for fixing an exchange rate.

Hence, the need for the second mechanism of the CBA: currency arbitrage (alternatively known as exchange rate arbitrage) which directly binds the exchange rate. Since the board has foreign reserves to cover all of the cash in circulation, cash arbitrage can be carried out. If the market exchange rate weakens below the official rate, people can first convert their bank deposits into cash, then go to the currency board to exchange the cash into foreign currency at the stronger official rate, and sell the foreign currency in the market, fetching an arbitrage profit. Like arbitrage under the gold standard where people shipped gold bullion between countries (Officer 1989, 1993), exchange rate arbitrage appeals to the self-interest of market participants. The selling pressure on the foreign currency will bring the market exchange rate back to the level of its official counterpart.

Let us look at a hypothetical example. Suppose a currency board in country A fixes its currency, the peso, at parity against the US dollar. If the market exchange rate weakens to P1.1 to the dollar, anyone can withdraw cash from his peso account in the bank, surrender the paper money to the currency board, and get US dollars at the fixed rate of 1.0. One million pesos in cash will fetch US$1 million. By selling the US$1 million in the market, he earns a riskless profit of P100,000. That is exchange rate arbitrage. When it unfolds on a large scale, the market exchange rate should align with the official parity.

In short, there are three anchors for a CBA: (i) economic discipline, because of the requirement that currency issues should be fully backed by foreign reserves; (ii) specie flow in the form of interest arbitrage; and (iii) currency (cash) arbitrage, which binds the spot exchange rate. As shown in Figure 1, these three anchors reinforce one another.

Figure 1: **Three Anchors for Fixing the Exchange Rate Under the Currency Board System**



A "perfect" CBA would allow all three anchors to function effectively. In reality, different CBAs have different institutional, policy, and macroeconomic drawbacks which prevent that from happening. As will be analyzed in detail below, while the CBA in Hong Kong, China has scored well regarding the first two anchors, it is still lacking in arbitrage efficiency.

Economic Optimality of Fixing the Exchange Rate Through a Currency Board Arrangement

From the perspective of economic optimality, whether the link has served Hong Kong, China well in terms of growth and price stability has been a matter for debate. Some have accused the link of adding to local inflationary pressure because of an undervalued Hong Kong dollar, while others, taking the opposite view, have argued that the real appreciation of the Hong Kong dollar since 1983 (as a result of the nominally fixed exchange rate being offset by inflation higher than that of the US) has undermined Hong Kong's competitiveness.

These two contrasting viewpoints hinge on the alleged lack of leeway in macroeconomic control in the form of exchange rate adjustment or monetary targeting (theoretically possible in a floating regime). Some, however, see this as a virtue because the government cannot meddle in a small open economy noted for its flexibility in real-sector adjustment.

As to the optimality of CBAs in general, the debate is broadly similar to that of fixed versus flexible exchange rates, except that the link between the monetary aggregate (at least its narrower definitions) and the balance of payments tends to be even closer in the case of a currency board compared with other measures to fix the exchange rate. In this regard, Williamson (1995) has identified four advantages and seven disadvantages concerning the system, to which this study will refer in evaluating the case of Hong Kong, China.

Nevertheless, a longer-run problem for a CBA is whether it can handle major structural changes and irreversible divergence. Insofar as a great deal of resources (foreign exchange reserves) and commitments (economic discipline, or even legal and monetary guarantees) have been built into the system to buttress the fixed exchange rate, modifying the system (e.g., changing the peg rate) may entail high adjustment cost, while abandoning it outright may result in rather heavy exit cost (Tsang 1998). Alternatively, target zoning or managed float, while not guaranteeing the "fixity" of the exchange rate, would involve lower costs in that regard. If it is argued that a CBA at a fixed exchange rate should never be changed, i.e., exit is ruled out, then the question is, why not simply adopt the counterpart foreign currency as one's currency—the so-called "dollarization" option. There will then be no need to defend the exchange rate.

The Currency Board Arrangement in Hong Kong, China

How the System Began

Hong Kong first established a CBA in 1935, following the collapse of the silver standard in the People's Republic of China (PRC) (see Nugée 1995). The Hong Kong dollar was pegged to the British pound sterling until 1972, with the exception of the war years of 1941 to 1945. Then it was pegged briefly to the US dollar, and floated from late 1974 until 1983, when the "linked exchange rate system," or the "link," was established.

The link, launched on 17 October 1983, was a reaction to the currency crisis arising from the Sino-British dispute concerning the political future of Hong Kong after 1997. Negotiations between the PRC and the United Kingdom (UK) regarding Hong Kong began in 1979 to 1982. Sino-British diplomatic jitters and confrontation in 1983 caused the local currency to plunge in the foreign exchange market, reaching a low of HK$9.60 to the US dollar in September 1983. The Hong Kong government was desperate to find a way to stabilize the exchange rate. In the end, it revived the currency board system, with the rate fixed at HK$7.80 to the US dollar, a substantially weaker rate compared with the year-end rates of 5.675 in 1981 and 6.495 in 1982.

The link works through a complicated system of bank note issuance and withdrawal, operated by a

few authorized note-issuing banks in the territory. The scheme has existed up to now, with some modifications in the course of the emergence of the Hong Kong Monetary Authority (HKMA) as the de facto central bank of the territory. HKMA was formally set up in 1993.

The link is essentially similar to the CBA of 1935–1972, except for two major differences: (i) the Hong Kong dollar is pegged to the US dollar instead of the British pound sterling as it was in the previous period, and (ii) the foreign exchange controls of the pre-1972 years have been totally dismantled and international capital flows are now much more significant.

It must be pointed out immediately that the CBA in Hong Kong, whether it be the pre-1972 scheme or the present linked rate system, has one outstanding, atypical, feature compared with traditional systems. Currency notes were, and are, issued by a few designated commercial banks instead of a currency board.[1] This gives rise to an indirect, multitiered mechanism involving the monetary authority, the note-issuing banks, other commercial banks, and the general public, which largely explains the "imperfect" performance of the system.

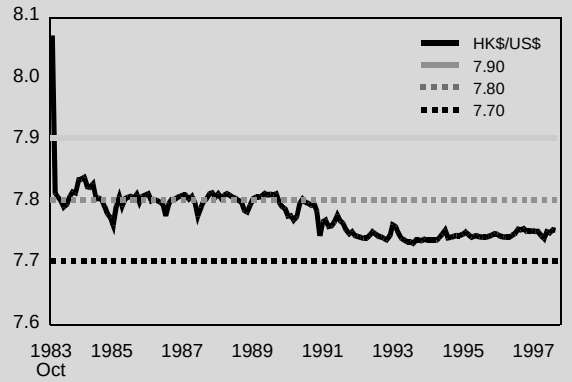
The imperfection is reflected by the fact that the market exchange rate still deviates by a non-negligible degree from the official rate despite the supposedly powerful forces of specie flow and arbitrage. The deviations have averaged slightly less than 1 percent in the years since the inception of the link (Figure 2). In the 1990s, the market rate has been on the strong side of the rate of 7.80. A strong rate is not necessarily a welcome phenomenon in a fixed exchange rate regime. As will be explained below, the government had to fend off speculative pressure for a revaluation of the Hong Kong dollar in 1987–1988.

Initial Operations of the Link

The core of the link is a note issuance and withdrawal mechanism (NIWM), which had two tiers at first, given the peculiarity that in Hong Kong, China notes are issued not by a currency board but by a few designated commercial banks:

- The note issuing banks (NIBs) have to deposit with the Exchange Fund of the government (which holds the territory's foreign exchange reserves) an equivalent amount of US dollars at the 7.80 rate to obtain certificates of indebtedness (CIs) for issuing Hong Kong dollar bank notes. The US dollar deposit earns no interest, but NIBs presumably get all kinds of goodwill in exchange. NIBs can withdraw the bank notes by surrendering CIs to the Exchange Fund and claim back the US dollar deposit. There were two NIBs at the time the system started in 1983: the Hongkong and Shanghai Banking Corporation (HSBC) and the Chartered Bank. There are now three: the Hongkong Bank, the Standard Chartered Bank, and the Hong Kong, China Branch of the Bank of China.
- Other banks in the territory obtained bank notes from NIBs and returned notes to the latter by a similar arrangement up to 1994. These banks had to place a noninterest-bearing US dollar deposit at the 7.80 rate with NIBs to obtain Hong Kong dollar notes; and the US dollar deposit was returned to them when they surrendered the notes. However, in the 1990s, the market

Figure 2: **Monthly Average Movement of the HK$/US$ Market Exchange Rate**



Source: Datastream.

exchange rate was persistently on the strong side of 7.80, and banks suffered an exchange loss in receiving cash deposits from customers and redeeming them with NIBs, which they tried to recover by imposing unpopular handling charges on customers. To rectify the situation, HKMA decided to modify the system in February 1994 to allow banks to obtain Hong Kong dollar bank notes from NIBs by placing Hong Kong dollar deposits with them, and to return the notes to NIBs by receiving their Hong Kong dollar deposits (HKMA 1994, pp. 19–20).

Aside from this two-tier mechanism, there is obviously the wider foreign exchange market where no interbank transactions in Hong Kong dollar bank notes are involved, e.g., retail sales of notes by banks to customers and interbank foreign exchange transactions in Hong Kong dollars versus Hong Kong dollars that are settled by accounting. At the time the system began, the government did not call it a kind of CBA. Instead, it invented the name "linked exchange rate system." According to top financial officials at the time (including the then Financial Secretary John Bremridge and Secretary for Monetary Affairs D.W.A. Blye), the market rate of these activities would converge toward the "linked" rate for note issuance and withdrawal by a mechanism that supposedly had two facets:

- *Arbitrage:* Any deviation of the market rate from 7.80 would generate a profitable arbitrage opportunity. For example, if the market rate was HK$7.90 to the US dollar, anyone who had access to the NIWM could obtain US$1 with HK$7.80 in cash, and could then sell the US$1 for HK$7.90 in the market, thus fetching a profit of HK$0.10 for every US dollar. It was the same as the cash arbitrage mechanism of the classical CBA described above.
- *Competition:* Access to the NIWM was not universal, under the two-tier system. In other words, arbitrage efficiency was not guaranteed, unlike an ideal currency board system, where everybody has direct access to foreign exchange at the officially announced rate. However, since all banks had access, a retail customer presumably could approach any bank, pay a fee, and connect with the NIWM. The more competitive the banking system is, the lower will be the access cost to the NIWM, and thus the total transaction cost for arbitrage, for any nonbank party. Hence, competition would increase arbitrage efficiency.

The fact that top officials did not present the link as a CBA, and placed little emphasis on either economic discipline or the specie-flow process—CBA's two other hallmarks—is understandable. Hong Kong in the first half of the 1980s was in political uncertainty; it went through three consecutive years of fiscal deficits that had set in starting in 1982–1985 after the bursting of an economic bubble; and the high interest rates during the currency crisis were exacting their toll. It was hardly a time to boost the territory's fiscal and monetary prudence, or to be optimistic about the effectiveness of high interest rates in fixing the exchange rate.[2]

Nevertheless, even the twin forces of bank note arbitrage and competition did not work to fix the link rate of 7.80 in the years after 1983, because of an intrinsic problem with engaging in cash arbitrage in a modern financial economy with a very small cash base. If the market rate were on the strong side of 7.80, say 7.75, a bank could theoretically sell a deposit of HK$775 in the interbank market to acquire US$100, which it could then transfer to NIBs to obtain HK$780 in cash, for a profit of HK$5. Unlike nonbank customers, however, the bank had no way of converting the cash into a deposit without reversing the foreign exchange transaction. Indeed, it would be burdened with a non-interest-bearing balance of HK$780. NIBs face the same problem when engaging in arbitrage with the Exchange Fund.

Should the bank find the extra cash really bothersome, it could, of course, redeem it at the 7.80 rate with an NIB and get back US$100 (reversing the

foreign exchange transaction). But then its arbitrage profit of HK$5 would immediately evaporate as it exchanged the US$100 back to an interbank deposit of HK$775 at the market rate of 7.75!

In the opposite case where the market rate of the HK dollar weakens to above 7.80, say 7.85, a bank (NIB) could sell US$100 in the market for HK$785 in the form of an interbank deposit, but then it would have difficulty converting the amount into cash, which theoretically it could transfer to NIBs (the Exchange Fund) for US$100.64 (785/780), for a profit of US$0.64. It might, of course, use its own vault cash to engage in arbitrage. But that would lower its cash-deposit ratio below the desired level.

Because of these problems of cash flood or cash drain, banks in Hong Kong were not keen to engage in any arbitrage despite the deviation of the market exchange rate from the official parity (Greenwood and Gressel 1988; Tsang 1996a, 1996b).

Hence, when there were speculative attacks on the Hong Kong dollar in the summer of 1984, with the spot exchange rate weakening briefly to 8.05, the monetary authority at the time—the Monetary Affairs Branch—had little choice but to intervene on behalf of the Exchange Fund in the market by selling US dollars. Moreover, despite doubts about their effectiveness, interest rate hikes had to be engineered. In contrast, when there were speculative pressures on the currency in anticipation of a revaluation in 1987–1988, the government had to counter by buying US dollars (selling Hong Kong dollars) and legally incorporating negative interest rates to discourage capital inflow. According to Nugée (1995), the government purchased US$2.7 billion in 1987 and US$3.1 billion in 1988. There was no "automaticity" to Hong Kong's currency board system at that time.

As the political situation gradually calmed down, the government began looking for ways to use interest rate tools more effectively, other than direct intervention in the foreign exchange market. The key problem in those years right after the establishment of the link was the lack of a leverage for the government to affect interbank liquidity and thereby interbank interest rates. HSBC, the territory's largest commercial bank which had been playing the role of pseudo central bank, clearing interbank settlements and providing last-resort liquidity, was under no obligation to place any reserves with the monetary authority. In contrast, it was the monetary authority that placed funds with HSBC and other selected banks. Given the size of the territory's reserves at the time, the placement and withdrawal of Exchange Fund deposits from the interbank market had rather limited effects. HSBC was expected to cooperate by raising or lowering interest rates as the macroeconomic situation warranted.

Toward the Establishment of a Central Bank

To end such anomalies, the government proceeded from 1988 onward to establish a central banking system alongside the idiosyncratic CBA to strengthen its control. In July 1988, the "accounting arrangements" were established. HSBC had to keep in the Exchange Fund through the Monetary Affairs Branch a reserve deposit equivalent in amount to its net clearing balance, i.e., the net amount of funds that the banking system placed with it for settlement purposes. Through this two-tier system, the Monetary Affairs Branch was able to manipulate the liquidity of the banking system through open-market operation. The efficiency of this process was greatly enhanced when the government started issuing Exchange Fund bills in March 1990 and Exchange Fund notes in May 1993.

In June 1992, the liquidity adjustment facility (LAF) was set up, and it has since played the role of lender of last resort by providing short-term liquidity to banks in trouble through collateral lending. The LAF bid and offer rates have become the benchmark interest rates, reflecting the authority's monetary stance. Finally, on 1 April 1993, HKMA was formally established by partly merging various

branches of the government including the Office of the Exchange Fund, the Monetary Affairs Branch, and the Office of the Commissioner of Banking (HKMA 1994b). In late 1996, HKMA established a real-time gross settlement (RTGS) system through a new clearing company, the Hong Kong Interbank Clearing Ltd. RTGS is an accounting mechanism between HKMA and all commercial banks, which allows the former to deal directly with the latter.

The idea of a currency board is lauded by its supporters precisely because it does away with the necessity of having a central bank which might mess up the economy by pursuing independent but ultimately unworkable or counterproductive monetary policies (Hanke and Schuler 1994). The setting up of a parallel central bank was regarded by some (e.g., Greenwood 1988) as a betrayal of the "automaticity" inherent in a currency board system.

The establishment of a central bank in Hong Kong may be less "embarrassing" if we look closer at the actual functions of HKMA. Rather than pursuing a monetary targeting function typical of advanced market economies, HKMA carries out monetary policy at the macroeconomic level to help stabilize and defend the linked exchange rate. This has been repeatedly stressed by top monetary officials (see, for example, Sheng 1995 and Nugée 1995).

The Strengthening of the Market Exchange Rate in the 1990s

Into the 1990s, the market exchange rate of the Hong Kong dollar has persistently been on the strong side of 7.80 (Figure 2). A key factor has been the turnaround in Hong Kong, China's economy and the large-scale capital inflow in 1992–1994, which led to the strengthening of the Hong Kong dollar. Under such circumstances, HKMA seems to have settled for a range of 7.72–7.75 as acceptable. An added dimension to the problem, however, involves the profits or losses incurred in the NIWM when the market rate deviates from the peg.

As discussed above, in February 1994, HKMA modified the note issuance and withdrawal system by allowing banks to obtain Hong Kong dollar bank notes from NIBs by placing Hong Kong dollar, rather than US dollar, deposits with them, and to return Hong Kong dollar notes to NIBs by receiving Hong Kong dollar deposits from them. However, this means that while NIBs still have access to the fixed rate of 7.80 at the Exchange Fund, the transactions between them and other banks are no longer based on the pegged rate. To obtain HK$780 in bank notes from any NIB, a bank only needs to place an interbank deposit of HK$780 with it. As a result, all non-note-issuing banks in Hong Kong can no longer engage directly in arbitrage, irrespective of how the market exchange rate behaves. Direct arbitrage has been confined to NIBs.

The irony is that, with the market rate on the strong side of 7.80, NIBs are earning a profit from note issuance, which also removes any incentive on their part to engage in arbitrage that will push the market rate toward 7.80. Suppose that the market rate is 7.75. Any one of the three NIBs can sell an interbank deposit of HK$775 for US$100, which it can then transfer to the Exchange Fund for the right to issue HK$780 in cash. When NIB disburses the notes to the other banks, it obtains an interbank deposit of HK$780 from them, hence fetching a profit of HK$5 (HK$780 minus HK$775).

Note that this profit is totally risk free, just like that from arbitrage. Moreover, the opportunity loss is borne by the Exchange Fund: when an NIB transfers US$100 to it, the Fund has to let go of HK$780 in cash; but with the US$100 it can only get back HK$775 in the foreign exchange market, i.e., it foregoes HK$5 which ends up in NIB's coffers.

Of course, when it redeems the notes with the Exchange Fund, NIB incurs a loss. For every HK$780 of cash it surrenders, it gets back US$100 which it can sell for only HK$775 in the interbank market. Before that, though, NIB would have returned

HK$780 in deposit to the other banks that started the redemption process. However, since the demand for cash in absolute size, and hence the total amount of currency in circulation, have been rising with time, in any one year (neglecting seasonal fluctuations) there is usually a net issuance (issuance minus withdrawal) of bank notes. NIBs thus stand to profit if the market exchange rate stays on the strong side of the peg.

If NIBs were to engage in arbitrage to bring the market rate back to the 7.80 level, such profits from net note issuance will disappear. Of course, one can argue that with the small amount of bank notes in NIBs' possession, they may not be able to push the rate back to 7.80 through arbitrage, even if they were altruistic enough and willing to do so. On the other hand, the other banks are deprived of direct access to the Exchange Fund. Although in theory they could ask NIBs to engage in arbitrage for them as an agent, for a fee, that is a bit too far-fetched. The banks have apparently been indifferent to such a phenomenon.

The Real-Time Gross Settlement System

The establishment of the RTGS system in late 1996 represented a milestone in the history of the CBA of Hong Kong, China. The system allows HKMA to deal with each bank directly, replacing the two-tier accounting arrangements in use since 1988. It was instituted through a new clearing company, the Hong Kong Interbank Clearing Ltd., jointly and equally owned by HKMA as "the settlement institution, the provider of intraday liquidity, the current operator of the Central Moneymarkets Unit (CMU), the regulator of the payment system and the lender of last resort" (HKMA 1995), on the one hand, and the Hong Kong Association of Banks (HKAB) as "the institution responsible for interbank payment and clearing," (HKMA 1995) on the other.

According to HKMA (1995, 1997), the RTGS system incorporates the following core features:

- compliance with international standards;
- final settlement across the books of HKMA;
- a single-tier system in which all licensed banks will open clearing accounts with HKMA;
- banks would be able to obtain intraday liquidity through repurchase agreements (repo) with HKMA, using Exchange Fund bills and notes; and
- allowance for domestic and international linkages to facilitate real-time delivery versus payment (DvP) and real-time payment versus payment (PvP).

RTGS, one of the most advanced payment systems in the world, allows interbank transactions to be settled on a continuous gross basis in the general ledger of the Exchange Fund, which is managed by HKMA, and provides an interface with CMU's real-time book-entry clearing of government and private securities (DvP) and real-time settlement in foreign currency transactions (PvP). To facilitate uninterrupted settlement, banks could arrange auto intraday repo facilities with HKMA in case of insufficient funds to handle debit instructions in a queue management mechanism. The facilities have to be backed by authorized collateral of Exchange Fund paper (HKMA 1997a). At the end of the day, banks that fail to clear all debit instructions could go to LAF, which is open between 4:30 p.m. and 5:30 p.m. from Monday to Friday, and between 11:30 a.m. and 12:00 noon every Saturday.

LAF, established in 1992, is a kind of lender of last resort (LOLR) mechanism. Nevertheless, LAF in Hong Kong is unique in that it is an LOLR that receives deposits as well as lends out funds. Hence, it has both bid and offer rates. The practice is intended to facilitate liquidity management of licensed banks and orderly interbank market activities, such that banks with surplus funds, for example, can simply place them with HKMA. However, with RTGS in place, the bidding of funds by LAF seems increasingly unnecessary.

The Monetary Base and the Currency Board Arrangement

The CBA of Hong Kong, China has evolved since it began in October 1983. Interestingly, it has not functioned strictly according to theory. As discussed above, in the initial period (1983–1988), neither economic discipline nor specie flow was depended upon. The presumed bank note arbitrage process also did not work. The link rate of 7.80 was kept intact, albeit imperfectly, thanks to a combination of government intervention in the foreign exchange market, manipulation of interest rates, and administrative measures (e.g., the incorporation of negative interest rates in 1987).

One critical weakness of the CBA then was that the government could not even manage interbank liquidity and interest rates as banks did not have any account with it. Hence, the accounting arrangements were imposed in 1988. For the first time, the Monetary Affairs Branch could define the monetary base in Hong Kong: the amount of cash in circulation, plus the clearing balance of the banks. Nugée (1995), who was with the Reserves Management Department of HKMA at the time, said of the significance of the change:

- With this arrangement, the Government acquired control over the level of interbank liquidity, and the Exchange Fund effectively became the ultimate provider of liquidity to the banking system. This marked a significant change in official thinking, which hitherto had eschewed any significant central banking role for the Government or the Exchange Fund. Also at this time, the Government introduced legislative changes to remove statutory ceiling (of 60 percent) on interest rates…and…for charging negative interest rates. These changes gave the Government *total flexibility in raising or lowering interest rates in their defence of the exchange rate*.
- The Government next sought to extend its influence over the money markets beyond the very short overnight rate. The classic way for monetary authorities to influence interest rates is through *open market operations*, but in the case of Hong Kong, there were no official money market instruments or debt securities available for use as the Government had traditionally run a fiscal surplus. (*italics added*)

To provide the Exchange Fund with the necessary instruments to conduct "open market operations," the Hong Kong government embarked on a series of programs to introduce Exchange Fund bills (from March 1990) and notes (from May 1993). On the other hand, the LAF, set up in June 1992, allowed the Exchange Fund to supply additional liquidity to the banking system or absorb excess liquidity from it. "By varying the bid and offer rates of the LAF, the Government can influence short-term interest rates directly" (Nugée 1995, p. 13). The formation of HKMA in 1993 further modernized the territory's central banking operations. A revision introduced in March 1994 shifted HKMA's focus from targeting interbank liquidity to targeting interbank interest rates.

A parallel development since the 1980s has been the accumulation of huge fiscal and foreign exchange reserves by the government. Cumulative fiscal reserves represented about six months of annual government expenditure, on the average, in the 1980s, and went up to over one year of expenditure in the early 1990s. By official arrangement, the fiscal reserves were transferred to the Exchange Fund for the defense of the currency. As can be seen in Table 1, the CBA already had over 400 percent in reserves for its currency note issue by 1990—a phenomenon rather rare among CBAs.

These developments and evolving mechanisms enabled HKMA to modify its characterization of the link. The inhibitions of the 1980s were gone, and HKMA was confident enough to present the link as a currency board system (Latter 1993). Adequate reserves and economic discipline were then emphasized. However, "automaticity" was not yet on the agenda.

Table 1: **Balance Sheet of the Exchange Fund of Hong Kong, China, End 1986–1997 (HK$ million)**

Item	1986	1990	1994	1997
Assets				
Foreign-currency assets	84,715	192,323	381,233	523,891
Hong Kong dollar assets	3,876	3,874	24,126	44,863
Total	**88,591**	**196,197**	**405,850**	**568,754**
Liabilities				
Certificates of indebtedness	20,531	40,791	74,301	91,985
Fiscal reserves account	23,359	63,226	131,240	182,168
Coins in circulation	1,441	2,003	3,372	4,564
Exchange Fund bills and notes		6,671	46,140	89,338
Balance of banking system		480	2,208	480
Other liabilities	4,103	391	22,815	18,332
Total	**49,434**	**113,562**	**280,076**	**386,867**
Accumulated earnings	**39,157**	**82,635**	**125,774**	**181,887**
Ratio of reserves to currency in circulation	3.78	4.45	4.88[a]	6.30

[a] Figures for 1994 reflect accounting policies adopted in 1995. No adjustments were made on data for prior years.
Source: Hong Kong Monetary Authority, *Monthly Statistical Bulletin*, various issues.

Indeed, after its formal establishment, HKMA openly declared that it would defend the Hong Kong dollar through flexible ways of manipulating the monetary base and influencing interest rates. Deputy Chief Executive of HKMA Andrew Sheng said in February 1995 on the heels of the Mexican crisis:

> *… In recent years HKMA has introduced various reforms to its monetary management tools, or more aptly, our monetary armoury, to maintain exchange rate stability.…As was seen in January [1995], our determination to use the interest rate tool was sufficient to deter further speculation against the HK dollar. In fact, currently, the HK dollar is at a stronger level than it was at 1994 year end.* (Sheng 1995, p. 60)

Sheng (1995) was quite explicit about the activism of HKMA in defending the link:

> *To the extent that HKMA intervenes through the use of foreign exchange swaps, any increase in the monetary base is fully backed by foreign exchange. We use a whole range of instruments in influencing the level of interbank liquidity to manage interbank interest rates, and consequently, maintain exchange rate stability.* (p. 61)

There was, however, one remaining problem: under the two-tier accounting arrangements, the clearing balance of the banks showed some wide fluctuations "because banks on the odd occasion miscalculate their own liquidity position. That is why we need and are developing a new RTGS payment system to manage funds flow more efficiently" (Sheng 1995, p. 61).

As mentioned, the RTGS system was installed in December 1996, replacing the previous two-tier arrangements. It was the first time that the government could directly manage the clearing balance of the whole banking system in a transparent manner (HKMA 1997a). HKMA did not, however, make any major pronouncements about any fundamental changes in the link's mode. On an interactive CD-ROM (1997 edition), HKMA discussed the history of Hong Kong's monetary system and reforms in the following terms:

> *The main thrust of most of these reform measures is to strengthen the capability of HKMA to influence interbank liquidity and interbank interest rate for the purpose of ensuring exchange rate stability.* (HKMA 1997b)

In explaining its stance toward the first signs of East Asian financial troubles in mid-1997, HKMA described its monetary policy operations as follows:

Money market conditions were tightened on 21 July [1997] on signs of some speculative pressure on the exchange rate. As the exchange rate of the Hong Kong dollar quickly stabilised to close at 7.740 level on 25 July, liquidity was recycled back to the market and overnight Hong Kong interbank offered rate [HIBOR] eased to around 6.13 percent–6.25 percent at the end of July. (HKMA 1997c, pp. 117–118)

Autopilot(?) Developments after the October 1997 Attack

In October 1997, the Hong Kong dollar came under strong speculative attack, as a result of the contagion effect of the East Asian turmoil. The attack cast doubt on the nature and the robustness of the link.

Overnight interbank rates were up to 280 percent briefly on 23 October, and the spot exchange rate of the Hong Kong dollar strengthened at one point to 7.60, a record since the start of the link in 1983. To many observers, it appeared that the territory had to struggle to protect the fixed exchange rate through proactive actions by the monetary authority, with rather unpalatable consequences. Although the link remained intact, interest rates stayed at uncomfortably high levels afterward. The local stock and property markets plunged, sending shock waves around the world, and even causing a sharp fall on Wall Street (another first). Into 1998, the depressing effects of the episode on the local economy began to unfold as forecast growth rates were revised downward. Financial Secretary Donald Tsang predicted in his February budget speech a real gross domestic product (GDP) growth rate of 3.5 percent for the year, compared with 5.2 percent for 1997, but the Organisation for Economic Co-operation and Development **(**OECD) released a gloomy forecast of only 0.9 percent in April.

A controversy arose concerning the extent of HKMA's intervention in the markets and its responsibility for the unprecedented high interest rates. HKMA later argued that the system was on "autopilot" at the time of the attack in late October 1997 and that the Authority was just "sitting there passively" (Yam 1998, p. 13). Some critics countered by pointing out that HKMA had openly warned banks in the morning of 23 October that those that repeatedly used the LAF to borrow Hong Kong dollar funds would be penalized. This, in the critics' view, touched off a strong "announcement effect" that made banks scramble for funds. There were also reports of HKMA intervening in the foreign exchange market, selling US dollars and buying Hong Kong dollars.

To clarify the situation, HKMA and the government took a big step in defining the link as an automatic currency board system. HKMA Chief Executive Joseph Yam made an important speech on 3 March 1998 in Japan (Yam 1998). Then on 23 April 1998, the government published its report on the October 1997 turbulence, the *Report on Financial Market Review* (FSB 1998).

A key change was HKMA's announced commitment not to actively manage the monetary base to defend the exchange rate. The monetary base of Hong Kong, China has two components: (i) cash in circulation, and (ii) the clearing balance of the banking system. Since bank notes are issued and withdrawn by NIBs according to classical currency board principles, the first component is beyond the control of the government. Before the October 1997 turbulence, HKMA did try to influence the second component, the clearing balance, in its defense of the link. In the *Report on Financial Market Review* (FSB 1998, paras. 3.36–3.41, Annex 3.5), it was made clear that HKMA would follow the rule of automatic specie flow:

In line with the discipline of the currency board system, the clearing balance will be affected by the flow of funds into or out of the Hong Kong dollar. When there is an inflow of funds involving HKMA passively buying US dollars

sold to it by the banks and providing the Hong Kong dollars, the clearing balance of the banking system will rise.…Conversely, when there is an outflow of funds involving HKMA passively selling US dollars and buying Hong Kong dollars from the banks, the clearing balance of the banking system will fall.…

HKMA adheres strictly to this discipline which in effect involves the clearing balance of the banking system varying with the amount of US dollars sold to or brought from HKMA at the initiatives of the banks.…(FSB 1998, paras. 3.36–3.37)

HKMA has chosen to abandon the proactive manipulation of interbank liquidity (the clearing balance) and interbank interest rates as a means of defending the link. In effect, HKMA will allow the specie flow process—one of the two automatic stabilizers of the classical currency board system—to unfold naturally in the future. This is a major policy shift. Nevertheless, HKMA will maintain the option to sterilize the monetary effect of several types of "exceptional circumstances," including:

- Occasions when initial public offerings (IPOs) of shares and other large-scale Hong Kong dollar transactions risk creating extreme conditions in the interbank market.
- The necessity of entering into intraday repos (of eligible papers) and overnight repos (through the LAF) to "smooth the settlement of interbank transactions."
- Activities that may inadvertently affect the clearing balance, e.g., a transfer of fiscal surpluses from the government to HKMA.

In all these circumstances, HKMA will undertake to neutralize their effects on the monetary base by recycling or offsetting interbank liquidity through appropriate actions, so that the clearing balance remains the same. Note that these are sterilization measures to contain domestic rather than international shocks. Hence, the tricky question of whether sterilization is possible for a small open economy under a fixed exchange rate regime is not directly relevant here.

In terms of the triangular scheme for a CBA to fix its exchange rate that was presented at the beginning of this study (Figure 1), HKMA seems to have finally arrived at a situation where two of three anchors can be effectively used: (i) economic discipline on the basis of adequate reserves, and (ii) automatic specie flow. The problem lies with the third anchor—exchange rate arbitrage.

In its *Report on Financial Market Review*, the government rejected bank note arbitrage—a key pillar of the classical currency board system—as an effective mechanism for binding the exchange rate (FSB 1998, para. 3.34). This is consistent with the view of Tsang (1997, 1998), and should have very significant implications for the theory of how CBAs can fix the exchange rate on "autopilot." However, HKMA has not put in place an alternative arbitrage mechanism, rejecting the proposal by Tsang (1996a, 1996b, 1997) of adopting the AEL (Argentina, Estonia, Lithuania) model of convertible reserves under which arbitrage can be performed without bank notes or cash (FSB 1998, paras. 3.64–3.65).

Instead, HKMA has opted for a tactic of "constructive ambiguity" (Yam 1998, p. 24), under which it would choose the level of exchange rate at which it intervenes directly in the foreign exchange market. As can be noted from Table 1, Hong Kong, China has huge foreign exchange reserves. At the end of 1997, these were more than six times the currency in circulation—far exceeding the 100 percent coverage sought for the classical CBA. In fact, including the Land Fund, which was transferred to the management of HKMA in September 1997, Hong Kong, China had the third largest foreign exchange reserves in the world, representing over 40 percent of M3 in Hong Kong dollars—a comfortable position which few, if any, other CBAs are in.

Under the strategy of "constructive ambiguity":

… HKMA will need to decide which particu-

lar level to enter the foreign exchange market to support the exchange rate. This involves judgement by HKMA as to whether or not the circumstances have become abnormal, for example, when there is speculation.… Furthermore, the intervention level may not exactly be at 7.80, although very close to it. For instance, when there are signs of speculative pressure, HKMA may establish its presence in the foreign exchange market even though the exchange rate is on the strong side of the link. (FSB 1998, para. 3.43)

This will enable HKMA to play on "the surprise element" (FSB 1998, para. 3.44c). It is, however, unclear whether HKMA will attempt to sterilize the monetary effects of its future foreign exchange market interventions to defend the link against speculative attack, so as to follow strictly the principle of maintaining intact the clearing balance of the banking system and therefore the monetary base.

Technical Assessment

Vulnerability, Strength, and Uniqueness of the Currency Board Arrangement

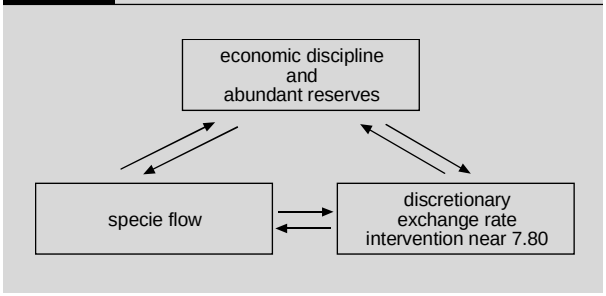
The link has evolved through different stages since it began in October 1983. In a number of major ways, it is not what it used to be. The official subscription to currency board principles should not be taken at face value.

The link is still vulnerable to speculative attack. There is no currency board, and notes are issued by designated NIBs, which alone can deal with the Exchange Fund at the fixed exchange rate. Note-based arbitrage has not been practicable, rendering one of the two automatic stabilizers inoperative (Tsang 1996a, 1996b). Since the other stabilizer is in theory highly dependent on the efficiency of arbitrage, it also has not functioned very well. Hence, the market exchange rate has persistently strayed from the official rate of 7.80.

However, the economic fundamentals in Hong Kong, China are relatively better than in most economies with CBAs. The territory also has ample ammunition against speculators and nonbelievers, as evidenced by its huge international reserves. It can augment the link through its central bank (HKMA), which has made known its clear commitment to the fixed exchange rate. The system has therefore survived major attacks.

As the CBA stands, instead of the traditional triangle of currency board anchorage presented in Figure 1, HKMA relies on a new triangle, as shown in Figure 3. It is a unique currency board arrangement, with the arbitrage anchor replaced by discretionary intervention in the foreign exchange market to buttress an officially committed exchange rate: HK$7.80 to the US dollar.

Figure 3: **The Currency Board Arrangement Triangle in Hong Kong, China, as of April 1998**



Cash Arbitrage as a Nonstarter

As far as currency board economics is concerned, a clear lesson from the experience of Hong Kong, China is that cash arbitrage is hopeless in defending a modern-day CBA. Greenwood and Gressel (1988) detected the problem sometime ago, and Tsang (1996a, 1996b) tried to tackle it. The idea of cash arbitrage has actually been banished from official discussions, and the *Report on Financial Market Review* ruled out its practicability in Hong Kong, China (FSB 1998, para. 3.34). In a banking system with fractional cash reserves, allowing depositors to

convert deposits into bank notes for the sake of engaging in arbitrage is hazardous business.

The cash base in the territory has been contracting in relative size. By the end of 1997, "authorized institutions" (including licensed banks, restricted license banks, and deposit taking companies) had a Hong Kong dollar cash-deposit ratio of less than 1 percent, while the territory wide ratio of notes to deposits was only about 5.6 percent (Table 2).[3] Banks would hardly want to facilitate arbitrage activities that required first of all the conversion of deposits into currency notes, as large conversions could turn into a bank run. (Shipping gold bullion around has no similar hazardous consequence.) This is a definite drawback of the currency board system vis-à-vis the gold standard. Actually, bank note arbitrage was rarely observed in the territory, and certainly not during the attack in October 1997.

Worse still, modern financial developments point irreversibly to a further diminishing cash base, and the cashless society is widely predicted to arrive sometime in the 21st century. How then would a currency board be able to fix its exchange rate through cash arbitrage?

Table 2: HK$ Cash-to-Deposit Ratios in Hong Kong, China, End 1985–1997 (percent)

Year	Ratio of Notes in Circulation to Total HK$ Deposits for Whole Economy to Total HK$ Deposits	Ratio of Notes and Coins (i.e., cash) Held by All "Authorized Institutions"
1985	7.60	1.10
1986	7.55	1.14
1987	8.14	1.21
1988	8.15	1.08
1989	8.27	1.22
1990	7.86	1.07
1991	7.70	1.09
1992	8.51	1.31
1993	8.03	0.99
1994	7.32	1.02
1995	6.63	0.88
1996	5.90	0.76
1997	5.59	0.84

Source: Census and Statistics Department, *Annual Digest of Statistics*, various issues; Hong Kong Monetary Authority, *Monthly Statistical Bulletin,* various issues.

The Argentina, Estonia, Lithuania Model of a Convertible Monetary Base

One way out is to modernize the CBA and adopt the convertible reserves mechanism of the AEL model, under which interbank exchange rate arbitrage can be performed without cash.

In practice, Hanke, Jonung, and Schuler (1993, p. 5 and Appendix A) observed that "in some cases," a currency board "issues deposits" fully backed by foreign reserves, and in their recommended "model constitution" for a currency board in Russia, they allowed for such a possibility. Baliño and Enoch (1997) noted that there is a central bank in quite a few modern CBAs, and that the central bank in several cases (such as in Argentina, Estonia, and Lithuania) takes deposits from commercial banks and holds foreign exchange reserves beyond the amount of notes and coins in circulation to cover those deposit liabilities. Unfortunately, Baliño and Enoch did not point out the operational differences between a CBA that guarantees the convertibility only of notes and coins and one that guarantees the convertibility of the entire banking reserves (or the monetary base in the modern context) as well. In fact, there are very significant implications, particularly with regard to arbitrage efficiency and the stability of the exchange rate.

Singling out Argentina, Estonia, and Lithuania for detailed investigation, Tsang (1996a, 1996b) found that the AEL model overcame the problems of cash-based arbitrage. Argentina began a currency board–type system in 1991, Estonia in 1992, and Lithuania in1994 (Bennett 1994; Enoch and Gulde 1997). Although these countries were latecomers compared with Hong Kong, China, their improved arrangement has shown a much higher degree of arbitrage efficiency and exchange rate stability, with the spot exchange rate invariably quoted around the official rate, despite political and economic turbulence.

In the AEL model, banks have an account with the central bank, to hold their deposit reserves and

other balances. The central bank guarantees the full convertibility of these bank balances at the fixed exchange rate. This setup avoids the problem of moving cash around for arbitrage.

Suppose we are in a country where the domestic currency, the peso, is pegged to the US dollar at parity under a convertible reserves scheme. Banks must quote the official rate of P1 per US dollar. But if Bank A were to quote an exchange rate of P1.1 to the dollar, Bank B could sell US$1 million to Bank A for P1.1 million, ask A to transfer the pesos to B's account at the central bank, and transfer US$1 million to A's account. On demand, the central bank would convert the pesos into US$1.1 million for Bank B, which then fetches an arbitrage profit of US$100,000. Bank A, on the other hand, suffers a loss of P100,000 as it receives only P1 million for its US$1 million at the central bank. An unrepentant Bank A stands to lose unlimited sums in the interbank market.

No cash movements are involved, as the central bank clears the arbitrage transactions between the two banks (Tsang 1997). Note that after settlement, the central bank's foreign reserves will be reduced by US$100,000, i.e., the central bank risks losing reserves if a commercial bank like A were to rebel against the peg. However, that loss is matched by a corresponding shrinkage (P100,000) in Bank A's balance sheet. Since the deal is settled by accounting transfers through telephone calls and electronic means, the transaction cost is reduced to an absolute minimum. This arrangement for cashless or electronic arbitrage is obviously superior to the cash-based arbitrage mechanism under the classical currency board.

In reality, under the convertible reserves system, no bank would dare to quote an exchange rate different from the official rate. All commercial banks are bound by the rules of the game to quote the official exchange rate, within a very narrow buying and selling spread that truly reflects petty transaction cost; otherwise they will be hit by their market rivals. Therefore, no actual arbitrage needs to take place, and the central bank is in no fear of losing foreign reserves.[4] With this improved form of CBA, Argentina, Estonia, and Lithuania have been able to literally fix their spot exchange rates despite serious economic or political instability (Tsang 1997). Hong Kong, China can adopt the convertible reserves system to rein in the market exchange rate and defend itself more firmly against currency attacks.

On 1 April 1993, the central bank, HKMA, came into existence. In late 1996, the RTGS system was instituted. On top of the normal clearing balance, HKMA could ask each bank to submit to it an equivalent amount of US dollars to obtain notes from NIBs.[5] At the same time or alternatively, HKMA may impose a deposit reserve ratio requirement on the banks. To overcome possible resistance from the banking sector, the ratio, which is interpreted in some quarters as a financial tax, should be kept small, and interests might be paid on a part of those reserve deposits beyond a certain ratio. The idea is not to tax the banks, but to ensure suitable liquidity in the reserve account to minimize any possible impact on the interest rate. As explained above, if the system works, no actual arbitrage occurs and the spot exchange rate can still be perfectly fixed. In that situation of benign equilibrium, the deposit reserve ratio might be very small, even approaching zero. In reality, though, for a modern financial center like Hong Kong, China, where large cross-border flows of funds are a fact of life and speculative attacks on the currency can occur at any time, a deposit reserves system does have the merit of providing a reservoir of reserve funds to help ease the interest rate pain.

Under the RTGS system, the aggregate banking balance with HKMA should theoretically be zero, since one bank's receipt is another's expenditure. Banks also need not deposit any money at HKMA as the balance is non-interest bearing. In practice,

because of imperfect information and precautionary liquidity management on the part of banks, as well as unplanned inflow and outflow of funds, the aggregate balance usually fluctuates between a few billion Hong Kong dollars and may even turn negative. Suppose there is a deposit reserves system at 5 percent, i.e., for every HK$100 of deposit that a bank receives, it should keep a reserve of HK$5 with HKMA. Because banks would be penalized if their reserves fell below the required level as a result of an unanticipated increase in deposits, they would keep 1 to 2 percent in excess reserves (assuming that reserves are interest bearing). At 2 percent, this excess would be about HK$30 billion, since licensed banks have about HK$1,500 billion in Hong Kong dollar deposits. If liquidity in the clearing account were to dry up suddenly, banks could transfer any portion of the HK$30 billion in their reserves account to the clearing account. Interest rate pressures might then be reduced.

Alternatively, HKMA can allow for an averaging provision in the deposit reserves requirement. For example, the stipulated 5 percent will be a monthly average of daily balances. On any business day, a bank may lower it down to, say, 2 percent, i.e., only 40 percent of the required level. It will, of course, need to ensure that in the subsequent days, higher than 5 percent of reserves have to be kept at HKMA, so that the monthly average can be achieved. This arrangement will also provide banks with a liquidity buffer.

With huge foreign exchange reserves, HKMA would have little problem in settling electronic arbitrage at the fixed exchange rate among financial institutions. The AEL model requires an even lower degree of activism on the part of HKMA. The results would be less unpalatable for the economy of Hong Kong, China if the speculators were to return, as the latter would see that all the banks are bound by self interest to quote around the rate of 7.80. In other words, speculators would have to fight the whole banking system, not just HKMA, in their bid to derail the link.

Reservations about the Argentina, Estonia, Lithuania Model

Tsang (1997) proposed the AEL model for Hong Kong, China during the consultation exercise of the Hong Kong, China government after the October 1997 turbulence (FSB 1998). However, the government, in its *Report on Financial Market Review*, rejected the proposal, as it regarded the distinction between the monetary arrangements in Hong Kong, China and those in the AEL model as "relatively minor"—a point on which it did not elaborate (FSB 1998, para.3.65). Moreover, the report raised a number of concerns (FSB 1998, paras. 3.44 and 3.65):

- The AEL model "will not protect the economy from the interest rate pain" resulting from speculative attack. Argentina in 1995 was cited as an example of high interest rates. Moreover, "since there is no scope for the exchange rate to move, the impact of the flow of funds will fall entirely upon interest rates," thus leading to greater interest rate volatility.
- There are "transitional problems of moving the exchange rate from the present level to 7.80."
- The "proposed statutory reserve requirement will be very unpopular among banks." Moreover, the LAF mechanism already provides a cushion against sharp interest rate movements.

These concerns are legitimate, but should be analyzed from the appropriate perspective. There is no denying that even the AEL model cannot escape interest rate pain; which system can?[6] Although the spot exchange rate is fixed, the forward rate is not. Local interest rates could still be higher than those of the foreign counterpart, along with weak forward exchange rates. Nevertheless, it is important to distinguish between two different types of perceived risk: (i) efficiency risk, and (ii) systemic risk.

One reason for the interest rate pain may be that market participants are not sure whether the allegedly fixed exchange rate system could really fix the spot rate. In other words, there is an efficiency risk regarding the exchange rate and market participants

demand an interest rate risk premium. In a small open economy that also happens to be an international financial center like Hong Kong, China, such an efficiency risk should not be underestimated as there is no recourse to any form of exchange controls. Over time, though, the fixity of the spot exchange rate under an effective arrangement should lead to a consolidation of confidence, and domestic-foreign interest rates and spot-forward exchange rates would converge as people dared to engage in interest arbitrage. In the case of the AEL model, such a phenomenon has occurred in Argentina, Estonia, and Lithuania, as analyzed by Baliño and Enoch (1997, Appendix 1).

Convergence has, however, not been perfect in the three countries: local interest rates have remained higher than those of the US dollar (to which the Argentine peso and the Lithuanian litas are pegged) and the German deutschemark (to which the Estonian kroon is linked). This is due to the existence of systemic risk (Tsang 1998b). Although market participants observe the fixity of the spot exchange rate, they are not sure that such a "perfect" system that is working so well will not be abandoned in the future, not because it is defective, but because of other economic or political factors. No matter how good it is in anchoring the exchange rate, whether a fixed-rate regime is best for the economy is always a controversial issue. Commentators familiar with the situation in the three AEL countries also understand why some people there might be nervous, justifiably or otherwise, about the possibility of a coup d'état or external invasion. The choice of Argentina in 1995 (in the aftermath of the Mexican crisis and in the midst of presidential elections) was a perfect counterexample for the government of Hong Kong, China to cite: it was a time when systemic risk was so huge in the country. However, the question can be reversed: without the AEL model fixing the exchange rate of the peso against the US dollar, would the situation not have been even more disastrous?

If Hong Kong, China adopts the convertible reserves system of the AEL model, the efficiency risk should be eliminated rather quickly. Interest rate convergence could unfold at a faster pace than that observed in the three countries. As to the systemic risk, the political and economic situation in Hong Kong, China is far more stable than in those countries: no one in the territory would seriously fear the possibility of a coup d'état or invasion, although repegging or refloating for optimality considerations can never be entirely ruled out.

Let us return to the specifics of applying the AEL model to Hong Kong, China. It has already been pointed out that the required reserve ratio could be set at low levels and banks may be paid some interest to reduce their resistance. With the spot exchange rate locked at 7.80 and quoted by all banks, speculators will have to think very carefully before launching any attack, as they will be working against the whole banking system. Such hesitation should reduce the pressure on the link, and hence on interest rates through the specie-flow process.

The present deviation of the market exchange rate from 7.80 seemingly provides a "scope of adjustment" other than interest rate movements. However, it is relatively small in magnitude (less than 1 percent). Alongside "constructive ambiguity" (Yam 1998, p. 24) or "the surprise element" (FSB 1998, para. 3.44), such a deviation actually introduces uncertainty into the system. Under the present circumstances, whenever the market rate breaches 7.75, people would, justifiably or otherwise, regard it as a sign of weakness (despite the rate being on the strong side of 7.80) and expect HKMA to intervene. There is a danger that 7.75 will become a self-imposed defense line if the authority is excessively concerned about the transitional problems of moving the market rate to 7.80.

The nonalliance of the market exchange rate with the official rate could also have been the source of the problem: in the heat of the East Asian crisis, speculators might have regarded the "nonfixity" as a sign of insecurity of the link, and therefore decided to have a go at it. If there had been no such deviations,

because of, say, a more robust arbitrage mechanism, speculators might not have come in, or might not have been so aggressive.

Overall Comments on Technical Feasibility

The key question is whether the combination of the "autopilot" specie flow mechanism and discretionary foreign exchange market intervention in the CBA of Hong Kong, China, as shown in Figure 3, provides an effective defense of the link. A related question is what the least-cost option is. HKMA obviously thinks that the answer to the first question is yes. According to a press report, the answer to the second question seems to focus on reducing the impact of interbank transactions and settlements on the clearing balance, i.e., improving the mechanism of RTGS, so as to smooth out interest rate movements in the specie flow process (*Ming Pao*, Hong Kong, 17 February 1998). The *Report on Financial Market Review* also discussed deepening the fixed interest rate market to increase "the ability of the economy to tolerate the interest rate pain" (FSB 1998, paras. 3.123–3.125).

In any case, just as the unprecedented speculative attack in October 1997 did not overturn the link, the probability that the East Asian financial turmoil will derail it remains small, unless external shocks of a much bigger scale emerge. The well-tested commitment of the government to the link rate of 7.80, buttressed by the third largest foreign reserves in the world (and over 40 percent of M3 in Hong Kong dollars), should be able to see Hong Kong, China through.

Nevertheless, whether and how the cost of defense can be further reduced is still an important and unsettled issue. The crux of the matter apparently is: Should this be done through an effective exchange rate arbitrage mechanism, or through measures that reduce the impact of movements of funds on interest rates? The very high and volatile interest rates witnessed since 23 October 1997 have become a serious factor depressing the banking sector. A credit crunch seems to be unfolding. After reaching a peak of HK$1,609 billion in September 1997, the stock of Hong Kong dollar loans and advances by licensed banks fell and stagnated around HK$1,550 billion in the first four months of 1998. This would have had a very adverse effect on the real economy. If the situation is not rectified, the economy of Hong Kong, China might be headed for a deep recession.

Hence, there is a real need to improve the CBA in Hong Kong, China because the Hong Kong dollar has become a speculators' target: it is the only currency in the East Asian region, other than the PRC yuan, that has not succumbed and been devalued. We can put forth a strong case for adopting the AEL model of instituting an effective electronic arbitrage mechanism, as well as a deposit reserves system that enlarges the pool of interbank funds and helps to reduce interest rate pressures.

Economic Optimality

Williamson's "Four Virtues and Seven Vices" of Currency Board Arrangement

In his studies on currency boards, Williamson (1995) succinctly listed four advantages and seven (potential or actual) disadvantages of CBAs. It may be useful to briefly review them here before looking at the case of Hong Kong, China. A currency board may have the following advantages and disadvantages:

Advantages

- it assures *convertibility* because of the requirement of full reserve cover;
- it instills *macroeconomic discipline* by preventing the monetization of fiscal deficits and the pegging to a presumably low-inflation currency;
- it provides a guaranteed *payments adjustment mechanism* under which monetary flows become endogenized at the fixed rate, hence inducing balance in the real sector;
- because of the above three features, it creates *confidence* in the monetary system and therefore promotes trade, investment, and growth.

Disadvantages

- the *seigniorage* problem: because of the necessity of keeping assets in foreign currency as reserves, a currency board may earn less if domestic investments give a better yield;
- the *startup* problem: a currency board may not have enough foreign assets for the initial launching;
- the *transition* problem: a currency board may start from a highly inflationary situation and the transition to a fixed exchange rate may result rapidly in an overvaluation of the domestic currency;
- the *adjustment* problem: a currency board cannot resort to exchange rate changes to secure balance-of-payments adjustments even in the case of external shocks; the problems will be acute if flexibility in the real sector is not high;
- the *management* problem: a currency board cannot run an independent monetary policy; moreover, it tends to produce aggravating procyclical effects (unless the economy to whose currency the domestic one is pegged happens to behave in offsetting cyclical patterns);
- the *crisis* problem: a currency board may not be able to act as a lender of last resort to financial institutions, because it violates the "basic precept of issuing domestic currency only in exchange for foreign currency rather than against domestic assets";
- the *political* problem: a currency board may not be able to impose fiscal discipline because politics may weigh in favor of the finance ministry.

Taking Williamson's "four virtues and seven vices" about currency boards as aggregate assessment criteria, Hong Kong, China's CBA should obviously be endorsed. First, the territory has been able to capitalize on the major advantages of a currency board because of:

- much more than 100 percent reserves to cover for currency issuance and *convertibility*;
- remarkable domestic *fiscal surpluses* and the choice of the US dollar as the peg (as the US entered into a period of low inflation);
- flexibility in the real sector which adjusts quickly to the *payments mechanism* under a fixed exchange rate;
- the "China factor" (economic linkage between the PRC and the territory after 1978) which has so far augmented *confidence* in the linked rate in promoting trade, investment, and growth.

Second, the peculiar situation of Hong Kong, China means that the seven disadvantages raised by Williamson are offset to a significant extent:

- the *start-up* problem has not been an issue for Hong Kong, China given its huge international reserves;
- the *adjustment* problem has been rectified to a certain extent by flexibility in the real sector;
- the *crisis* problem is not a real problem given Hong Kong, China's foreign exchange and fiscal reserves (the monetary authority can spare reserves to carry out the role of lender of the last resort);
- the *political* problem: politically backed fiscal nondiscipline has not been, and is unlikely to become, a problem in Hong Kong, China as the Basic Law governing Hong Kong as a Special Administrative Region (SAR) under Chinese sovereignty after 1997 stipulates rather stringent standards of fiscal behavior for the government.

But there are still three problems to deal with, i.e., the *seigniorage* problem, the *transition* problem, and the *management* problem. The first two problems do point to a controversial issue in the management of Hong Kong, China's foreign exchange reserves: given the credibility of the linked exchange rate of 7.80, and yet the high inflation rate in Hong Kong, China vis-à-vis the US, it may not be advisable for Hong Kong, China to keep such a high percentage of investment in foreign assets. What was the point in having a 630 percent cover

for currency notes (see the 1997 figures in Table 1). It appears that in their preoccupation with building up reserves to defend the link, the Hong Kong, China authorities have not paid enough attention to optimality considerations. From this perspective, Hong Kong, China should have invested more in itself.

Regarding the *management* problem, there have been some controversial issues for Hong Kong, China, which Williamson (1995, p. 25) has singled out:

> *Another clear example of the costs of being unable to run a monetary policy tailored to local needs is to be found in the recent experience of Hong Kong. During the US recession of the early 1990s, Hong Kong imported low interest rates from the United States because of its link to the US dollar at a time when its own domestic situation cried out for monetary restraint in order to try to break an asset price boom before it led to the sort of disaster experienced by Japan. Hence the Hong Kong authorities were relieved when US interest rates rose in 1994. Yet it would have been much better if they had been able to act to raise their own interest rates ahead of the US decision.*

This passage highlights the lack of instruments in Hong Kong, China to offset inflationary pressure, given the commitment to defend the linked rate of 7.80.

Williamson (1995) also discusses the issue of a "natural candidate," i.e., to which foreign currency should the local currency be pegged? The Hong Kong dollar has been pegged to the US dollar since 1983. But from 1935 to 1972, the local currency was pegged to the pound sterling (Nugée 1995). In general, the "natural candidate" should be the currency of the foreign economy with which the domestic economy has the closest economic relations. Before the territory was industrialized in the postwar period, its most important economic partner was obviously the UK. The US took over that position after the economic takeoff. In the 1980s, over one third of the territory's manufacturing exports were absorbed by the US market. Moreover, about 70 percent of its exports (including those to non-US destinations) were priced in US dollars. So the choice of the link seemed "natural." Of course, in the future, when the PRC currency, the renminbi, becomes a fully convertible currency and Hong Kong, China's economic integration with the PRC further develops and matures, a repegging of the Hong Kong dollar to the yuan can be considered.

The Economics of Small Open Economies: Fixed versus Floating Exchange Rate

The debate between the relative merits of fixed versus floating exchange rate regime is still unsettled, and will probably never be settled. In general, the more flexible the real sector of an economy is, the more a fixed exchange rate is suited to it because nominal prices do not have to be changed through exchange rate movements in case of external shocks. The real sector will do the job by quickly adjusting. Hong Kong, China is noted for flexibility in the production responses of its enterprises and in the labor market. Given the economic link between the territory and the PRC (the former has relocated massive production facilities to the Pearl River Delta to make use of its much lower-cost labor and other resources), local growth may also not be very sensitive to movements in the exchange rate of the Hong Kong dollar.

Moreover, for a small open economy like Hong Kong, China, a floating exchange rate regime may not bring much monetary autonomy. Local interest rates cannot deviate significantly from foreign ones, especially those of the US dollar. Historically, in both the floating-rate era (late 1974 to September 1983) and the fixed-rate regime (October 1983 to December 1997), the differential between three-month Hong Kong dollar HIBOR (Hong Kong interbank offered rate) and US dollar LIBOR (London interbank offered rate) was not wide. In terms of standard deviation, it was 1.89 percent in the former period, and 1.44 percent in the latter (on the basis of

average monthly figures). In the more recent period of January 1996 to April 1998, the standard deviation went up to 1.86 percent. Of course, after the speculative attack on the Hong Kong dollar in October 1997, HIBORs have stayed at very high levels and have shown large volatility. The monthly average standard deviation between three-month Hong Kong dollar HIBOR and US dollar LIBOR in the six months of November 1997 to April 1998 turned out to be 2.16 percent, while the daily average was 2.57 percent.

To look at the matter from another angle, a floating exchange rate system for a financial center like Hong Kong, China carries considerable instability risk, particularly as the territory is going through a very sensitive period of political transition. Speculative capital movements and attacks on the currency are difficult to contain in a floating-rate regime. A fixed-rate regime does have the advantage of diverting pressure away from the exchange rate to other aspects of the economy that are less vulnerable to financial fluctuations and "hit and run" activities. It thus serves an important anchorage function.

Nevertheless, the above considerations have to be cast in the proper perspective: if the external shocks are really big, it may be too much to ask the real economy to do all the adjusting. Even for a financial center, a floating exchange rate would give useful information about the unfolding imbalances in the economy. London, New York, Singapore, and Tokyo all operate under floating exchange rates. In the longer run, there is the problem of whether the fixed rate or even the peg itself should be modified at all, should there be an irreversible structural divergence between the home economy and the foreign economy to whose currency the domestic one is pegged (Tsang 1998a). One obvious example is the divergence between the British economy and the Hong Kong economy in the postwar years. The British economy was on the decline, while Hong Kong was witnessing an economic takeoff. The peg of the Hong Kong dollar to the pound sterling became increasingly untenable. Even after the Hong Kong dollar was revalued against the pound sterling in 1967, the pressure continued. After a brief period of repegging to the US dollar (1972–1974), the local currency had to float at the end of 1974 (Nugée 1995).

As a very strong form of fixed exchange rate regime, a currency board system may find it hard to deal with major external shocks, structural divergence, and deep-seated economic imbalances that do not show up easily. A key issue, which was not discussed by Williamson (1995), is that of exit cost: the cost of quitting the peg. If more is invested in building confidence in the system, more has to be forgone when it is finally deemed necessary to change track.

Growth and Inflation in Hong Kong, China

While the nominal exchange rate of the Hong Kong dollar against the US dollar has remained around the 7.80 level, the cumulative inflation differential between Hong Kong and the US was about 90 percent in 1984–1997 (i.e., the Hong Kong consumer price index rose by 90 percent more than its US counterpart in the period). Hence, the Hong Kong dollar has appreciated substantially in real terms against the US dollar. Even if we consider that both the nominal and real exchange rates of the Hong Kong dollar were undervalued at the time the link began, the discounted real appreciation (compared with an equilibrium level) would still be notable. This has been cited as one reason why real GDP growth has declined under the link rate, as shown in Tables 3 and 4.

Table 3 shows some worrying statistics. The problem seems to lie in the 1990s when low GDP growth has combined with high inflation. Table 4 gives a historical comparison for the past three decades. Common perception has it that the "China factor" lifted the economy of the territory, particularly after

Table 3: Hong Kong, China's Real Gross Domestic Product Growth and Inflation Rate in Historical and Comparative Perspectives, 1976–1997 (%)

	Real GDP Growth	Inflation Rate					
Year	Hong Kong, China	Hong Kong, China	Industrialized Countries	Korea	Singapore	Taipei,China	United States
1976	17.1	3.5	7.9	15.3	(1.9)		5.7
1977	12.5	5.7	8.2	10.2	3.2	7.0	6.5
1978	9.5	6.1	7.3	14.5	4.8	5.8	7.6
1979	11.7	11.6	8.9	18.3	4.1	9.8	11.3
1980	10.9	15.5	11.6	28.7	8.5	19.0	13.5
1981	9.4	15.4	10.1	21.3	8.2	16.2	10.3
1982	3.0	10.5	7.6	7.2	3.9	3.1	6.2
1983	6.5	9.9	5.3	3.4	1.2	1.3	3.2
1984	9.5	8.1	4.7	2.3	2.6	0.0	4.3
1985	0.4	3.2	4.0	2.5	0.5	(0.2)	3.6
1986	10.8	2.8	2.3	2.8	(1.4)	0.7	1.9
1987	13.0	5.5	2.9	3.0	0.5	0.5	3.7
1988	8.0	7.5	3.3	7.1	1.5	1.2	4.0
1989	2.6	10.1	4.5	5.7	2.4	4.4	4.8
1990	3.4	9.8	5.0	8.6	3.4	4.2	5.4
1991	5.1	12.0	4.4	9.3	3.4	3.5	4.2
1992	6.3	9.4	3.2	6.2	2.3	4.5	3.0
1993	6.1	8.5	2.8	4.8	2.2	2.9	3.0
1994	5.4	8.1	2.3	6.3	3.1	4.1	2.6
1995	3.9	8.7	2.5	4.5	1.7	3.7	2.8
1996	5.0	6.0	2.3	5.0	1.4	3.1	2.9
1997	5.2	5.7	2.0	4.5	2.0	0.9	2.3

( ) = negative values are enclosed in parentheses.
GDP = gross domestic product.
Sources: International Monetary Fund, *International Financial Statistics,* various issues; Bank of Taiwan, *Financial Statistics Monthly*, various issues.

Table 4: Average Real GDP Growth and Consumer Inflation, 1961–1997 (percent)

Year	Real GDP Growth per Year	Average Annual Consumer Inflation Rate
1961–1970	8.8	5.3
1970–1980	9.0	8.7
1980–1990	6.5	8.1
1990–1997	5.2	8.3

GDP = gross domestic product.
Source: Census and Statistics Department. 1998. Estimates of GDP 1961-1997. Hong Kong, China Special Administrative Region.

the "Deng whirlwind" of 1992, when paramount leader Deng Xiaoping made a tour to southern PRC and enjoined the government to speed up economic growth and reform. In Hong Kong, China, however, the whirlwind has apparently resulted in more inflation, both consumer and asset inflation, than growth.

Inflation and Asset Price Bubbles

It is necessary to look at the inflation issue more closely. We can investigate it from two angles: (i) inflation transmitted through trade, and (ii) asset inflation.

As far as inflation transmitted through trade is concerned, there is little evidence that the link has been the culprit, as Table 5 shows. The unit value index (UVI) of imports is the deflator for imports, and it has not shown any serious upward pressure since the start of the linked rate system. Of course, the deflator is determined by two factors: (i) the exchange rate, and (ii) foreign inflation. While foreign inflation has remained low, one could always say that a stronger exchange rate would have kept an even tighter rein on the UVI.

A more subtle argument against the link involves the concept of asset inflation. Insofar as the linked rate underreflected the fundamental strength of the economy of Hong Kong, China in the light of its rapid linkage with the PRC economy and the tremendous potential of the latter, local assets might look exceptionally attractive to foreign investors, and inflow of

Table 5: **Inflation, Import Price, and Exchange Rate Indices, 1981–1997**

Year	% Change in CPI	% Change in Unit Value Index of Import	Import-weighted Effective Exchange Rate Index (year-end)
1981	15.4	11.0	125.0
1982	10.5	5.6	117.7
1983	9.9	12.1	101.1
1984	8.1	11.0	116.5
1985	3.2	(2.6)	111.8
1986	2.8	5.0	107.2
1987	5.5	4.1	94.9
1988	7.5	4.1	94.9
1989	10.1	3.6	104.6
1990	9.8	2.5	104.4
1991	12.0	1.9	103.5
1992	9.4	0.2	108.1
1993	8.5	(0.6)	107.1
1994	8.1	2.8	112.9
1995	8.7	5.0	112.8
1996	6.0	(1.3)	116.2
1997	5.7	(2.3)	131.6

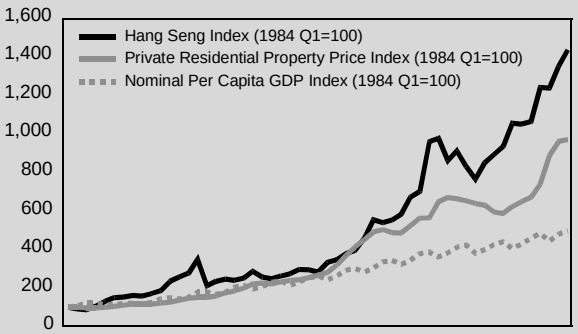
( ) = negative values are enclosed in parentheses.
CPI = consumer price index.
Source: Census and Statistics Department, *Hong Kong Monthly Digest of Statistics*, various issues.

outside money would cause asset inflation. Sheng (1995) tackled the hypothesis of asset bubbles and found it wanting. He argued that a flexible exchange rate might not avoid asset inflation as "recent evidence of asset price bubbles occurred mainly in countries with flexible exchange rates, such as Australia, Japan, Scandinavian countries, and UK. All these countries were free to use their interest rate tools, and yet the bubble occurred" (p. 56).

Nevertheless, the East Asian financial crisis does focus attention on the necessity of keeping strict economic discipline in a fixed or pseudo-fixed exchange rate regime. Overinvestment in the real estate and financial sectors had fueled bubbles in a number of economies in the region (in particular Indonesia, Malaysia, and Thailand), which unwittingly also ran considerable current-account deficits financed by capital inflows (quite a large share of which is short-term hot money). Since these economies adopted an implicit nominal or real peg to the US dollar, the underlying contradictions could have built up over a period of years without showing explicit strains. Ironically, that is the key weakness of a successful fixed exchange rate regime: short-term problems are hidden under the superficial calm of the peg. A floating exchange rate system would be a better barometer of economic imbalances.

Hong Kong has also shown signs of an economic bubble in the 1990s. Figure 4 tracks the relative performance of the quarterly averages of per capita GDP, private residential property prices, and the Hang Seng Index of the local stock market since the first quarter of 1984 (when the indexes are normalized to 100). Per capita GDP is chosen as a proxy for average income and purchasing power. Prices of real estate and stock shares should not overshoot it by too much, even granting considerations of changes in saving behavior and portfolio selection. From Figure 4, it can be observed that while the three indices basically moved together in the 1980s, wide gaps opened up in 1992 but without any ramifications on the exchange rate, which has stayed on the strong side of 7.80 (Figure 2).

Figure 4: **Quarterly Averages of the Hang Seng Index, Private Residential Property Price Index, and Nominal Per Capita GDP Index**



GDP = gross domestic product, Q1 = first quarter.
Source: Datastream and Census and Statistics Department.

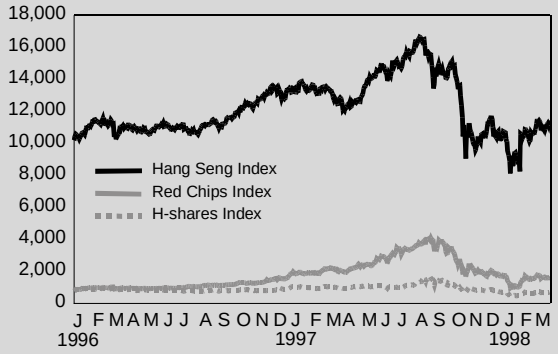
On another front, the "China factor" had apparently contributed to a financial bubble in Hong Kong. In the run-up to the resumption of sovereignty on 1 July 1997, PRC capital funds reportedly poured

into the property and stock markets in the territory, perhaps in an effort to show support for the incoming SAR, or simply as a result of uncontrolled speculation in the era of decentralization and liberalization. In any case, international financial fund managers followed suit. A bubble rapidly emerged and then became self-destructive.

Property prices put forth a dramatic upswing in the fourth quarter of 1996, when rumors about the inflow of PRC capital abounded. In the twelve months that followed, the average price index of residential property units rose by about 50 percent, while that of large units surged by almost 60 percent. Equally breathtaking was the rise in PRC-related stock shares listed in the territory. There are two types of such shares, for which price indices are compiled: (i) the China Enterprises Index, or the so called "H-shares" index; and (ii) the China-Affiliated Corporations Index, or the "red chips" index. As can be observed in Figure 5, the H-shares index and the red-chips index showed huge volatility around the 1997 transition, reflecting highly speculative activities.

All these point to one important conclusion: an economic bubble can emerge from a fixed exchange rate regime, including one that professedly follows the strong principle of the currency board system. The government should keep a keen eye on the longer-term viability of the fixed exchange rate (Tsang 1998a).

Figure 5: **Stock-Market Indices**



Source: Datastream.

Overall Comments on Optimality

On the basis of Williamson's (1995) characterization of the "four virtues and seven vices" of a typical CBA, Hong Kong, China has been in a position to capitalize on the advantages and to minimize the harm caused by several potential disadvantages. A key factor is the very healthy fiscal and international reserves position of the government. The huge reserves accumulated since the start of the link, however, highlight seigniorage and transition problems—the difficulty of earning sufficient returns on foreign assets in a situation of high domestic inflation. On the other hand, the lack of instruments to offset the inflationary pressure in the 1990s, in particular asset inflation, points to a management problem.

The more flexible the real sector of an economy is, the more a fixed exchange rate is suited to it, as the real sector will adjust quickly, without having to go through nominal and relative price changes arising from exchange rate movements. Hong Kong, China seems to be a relatively flexible economy. For a small open economy with a huge financial sector like that of Hong Kong, China, a floating exchange rate system may bring instability, as it will be difficult to contain speculative capital movements and attacks on the currency. A fixed-rate regime does have the advantage of diverting pressure away from the exchange rate to other aspects of the economy and providing an important anchorage. Its major drawback is that while it requires stricter economic discipline, it does not serve as a very good barometer of imbalances that are building up in the economy (Tsang 1998a). Bubbles could emerge, and the consequences could be very serious if the fixed rate collapses, as has been the case in Indonesia, Malaysia, and Thailand.[7]

Nevertheless, as a very strong form of fixed exchange rate regime, a currency board system may find it hard to deal with major external shocks, structural divergence, and deep-seated economic imbalances that do not show up easily. A key issue is the exit cost of quitting the peg (Tsang 1998b). If more is invested

in building confidence in the system, more has to be forgone when it is finally deemed necessary to change track. Therefore, a balance has to be kept between the conflicting considerations of ensuring short-term stability and maintaining long-term flexibility.

Relevance of Hong Kong, China's Experience for Asia

Hong Kong, China's System as an Idiosyncratic Currency Board Arrangement

Hong Kong, China adopted its CBA in 1983 in response to a crisis. In fact, most economies hosting CBAs did so for similar reasons. Argentina used the system to end hyperinflation; Estonia and Lithuania, to enhance their fragile new national currencies after throwing out the Russian ruble. Hence the exchange rate chosen might not necessarily be appropriate in the long run, unless the real economy is so flexible that it can make all the adjustments, including adjustments to major shocks and structural changes.

From the above analysis, it can be seen that as a CBA, Hong Kong, China's regime is quite unique, after several stages of evolution since 1983. As it stands, it is neither the classical version practiced in former British or French colonies, as shown in Figure 1, nor the modern convertible reserves mechanism of the AEL model. It is presumably based on automatic specie flow, buttressed by discretionary exchange rate intervention by HKMA, at unspecified levels close to the official rate of 7.80. Behind these, of course, are huge reserves and the macroeconomic discipline of the government. This idiosyncratic system, with its latest update in April 1998, is shown in Figure 3 above.

Can Hong Kong, China's System or the Argentina, Estonia, and Lithuania Model Be Imitated?

In a way, such a system can be imitated only by strong economies, in terms of its technical viability.[8] Other than Singapore and Taipei,China, no other countries or territories in the region have foreign exchange reserves that cover so much of the money supply. In fact, quite a few have had so little reserves that they needed to be bailed out by the International Monetary Fund. In any case, such an observation begs the question of why a strong economy needs to establish a fixed exchange rate regime as rigid as a CBA. Both Singapore and Taipei,China have shunned the choice.

Even if a relatively weak economy gathers sufficient international reserves, it should not, in our view, adopt either the classical currency board based on cash arbitrage or Hong Kong, China's unique system. The AEL model is the only way to contain a currency crisis, because it provides an effective arbitrage mechanism that technically binds the spot exchange rate, in lieu of direct foreign exchange controls. This provides an important psychological anchor for market participants as it minimizes efficiency risk.

The drawback of the AEL model is that the banking system has to share the defense role with the monetary authority, against exogenous shocks (Tsang 1984; Santiprabhob 1997). In other words, banks cannot reduce their risk by deviating from the official spot rate, because of the threat of losing money in interbank arbitrage transactions. The impact on them may be quite heavy if there is significant systemic risk, as was true of Argentina in 1995. Hence, if an economy has a weak banking system, it has to be cautious in choosing the AEL model. At least, it should devise measures to strengthen or to protect the banking system, including a viable lender-of-last-resort facility.

The governments of the three AEL countries have tried to contain the market perception of systemic risk by legal means (Tsang 1996a; 1996b; Baliño and Enoch 1997). Argentina and Estonia have parliamentary or regulatory provisions that the central bank in effect may allow a stronger but not weaker domestic currency. In Lithuania, according to the Law on

Litas Credibility of 1994, the exchange rate can only be changed by the Bank of Lithuania, in consultation with the government, under extraordinary circumstances.

Enshrining the link in law may reduce systemic risk and lead to an even higher degree of interest rate and spot-forward exchange rate convergence. Nevertheless, the convergence will never be perfect as the law itself is still open to some residual doubts. Moreover, the exit cost will increase, if it is deemed optimal to abolish the fixed-rate regime and re-float the home currency in the future (Tsang 1998b).[9] Alternatively, in the case of Hong Kong, China, when all conditions mature sometime in the 21st century, it may become advisable to peg the Hong Kong dollar to the then freely convertible PRC currency, the renminbi, instead of sticking to the US dollar.[10]

The same problem of exit cost also applies to any scheme under which HKMA issues insurance instruments (e.g., put options) to market participants to foster confidence that the linked rate will not be changed, as well as to the proposal of "dollarization," i.e., replacing the Hong Kong dollar with the US dollar. Compensations might be huge for a permanent insurance scheme, irrespective of its actual contribution to exchange rate stability, about which the government expressed strong reservations in its *Report on Financial Market Review* (FSB 1998). On the other hand, the re-introduction of a Hong Kong currency could be a troublesome affair after "dollarization." The government needs to strike a balance between the conflicting considerations of eliminating the systemic risk for the link and reducing the cost of exiting from it, as must any other government adopting a CBA.

Indonesia as an Example

Although Indonesia has shelved the plan to establish a CBA after strong objections by IMF and the US, we can illustrate the dilemma facing an Asian economy in the midst of a currency crisis. After all, CBAs do have a good record of holding off speculative attacks and keeping the spot rate stable or fixed, although the cost could be considerable. Again, we can look at the matter on the basis of the twin concepts of efficiency risk and systemic risk.

- What kind of CBA is Indonesia going to adopt? The classical currency board based on specie flow and cash arbitrage? Hong Kong, China's idiosyncratic version of "linked exchange rate"? Or the AEL model of cashless/electronic arbitrage? In other words, can the Indonesian CBA even keep the spot exchange rate firmly in line? This is the first defense. If it is not secured, the second question would be irrelevant. It appears that the country should choose the AEL model of convertible reserves, which binds the whole banking system through electronic arbitrage to quote narrowly around the official exchange rate. But is the Indonesian banking system ready for the model, in terms of the hardware and software requirements, as well as its financial viability at the pegged rate eventually chosen?
- Granted that the Indonesian CBA, whatever form it takes, can hold the spot exchange rate of the rupiah firmly through an efficient arbitrage mechanism, hence eliminating the efficiency risk, how could it inspire confidence in market participants that the CBA (especially regarding the specific fixed rate of the rupiah against the designated anchor currency, the US dollar) would not be abandoned in the future, out of economic or political considerations? This constitutes a systemic risk that must be carefully addressed, with a view to balancing short-term stability concern and long-term exit cost calculation.

OVERALL COMMENTS ON RELEVANCE

Overall, there are four technical varieties of CBAs:

- the classical currency board system as practiced by many former British colonies, which relied on cash arbitrage as well as the patronage of London to fix the exchange rate;

- the Hong Kong CBA in the 1980s under which there were no effective currency board or central banking defense mechanisms;
- the Hong Kong CBA as presented in the *Report on Financial Market Review* (FSB 1998); and
- the AEL model of Argentina, Estonia, and Lithuania.

The first option is hopelessly outdated, and is of no relevance to any economy with a substantial degree of monetization. The second option was a fluke for Hong Kong. It was sustainable because at that time speculators did not notice the territory or did not find it to be a vulnerable target. Hence US$2.7 billion in 1987 and US$3.1 billion in 1988 were enough to keep the link intact. In the contemporary context, the third option is a choice only for a strong economy with very large reserves. Yet the cost of defense could be huge if speculators hold the view that the fixed exchange rate is out of line with the rapidly changing external environment. The final option therefore appears to be the only relevant model for any aspiring economy in the region. In any case, it could reduce or even eliminate the efficiency risk of a peg, but not the systemic risk.

If any Asian economy wants to adopt the AEL model, its government has to make sure that the appropriate infrastructure for arbitrage, and preferably also the LOLR facility, is there. Moreover, the government must think very carefully about the level of the peg that it wants to lock in. In a world of uncertainty and dramatic exchange rate realignments, such as the one that we are facing in the present financial crisis, that is not an easy task at all. The difference between internal and external crises is crucial here. Of course, if a central bank regards the fall in its home currency as totally unjustified, far beyond the calculation based on economic fundamentals, then fixing the spot exchange rate by adopting the electronic arbitrage mechanism of the AEL model could generate a turnaround effect that might help to stabilize the system.

Notes

[1]Coins are issued by the government.

[2]Top officials did talk about the interest rate consequences of the lack of total confidence in the link. Interest rates would have to go up to make people want to take advantage of the "fixed" exchange rate and turn their Hong Kong dollar holdings into US dollar balances. However, at a certain point, this phenomenon would stop as rates of return on local monetary assets looked attractive, even adjusted for exchange rate risk. It is important to note that interest rate movements in such a case only equilibrated the balance of payments, or more precisely the capital account. It did not "fix" the exchange rate; arbitrage must do the job.

[3]This ratio, small enough as it is, is still an exaggeration, because a significant amount, popularly estimated at 20 to 30 percent of Hong Kong dollar notes, have been circulating in the southern part of the PRC.

[4]This game-theoretic setup must be the basis of the gold standard and the currency board, which rely on the self-interested activities of market participants to cancel each other out, thereby holding the exchange rate. (See Tsang 1984.)

[5]This arrangement would be similar to the pre-1994 situation, although commercial banks at that time passed their US dollar reserves on to NIBs rather than to any central monetary authority. (See Tsang 1996a.)

[6]The *Report on Financial Market Review*, in fact, criticized and rejected proposals from academics that intended to "achieve both exchange rate and interest rate stability" and attempted to avoid "interest rate pain," including the US dollar LAF/Hong Kong dollar put option facility of the Hong Kong University of Science and Technology, and the insurance scheme of Nobel Laureate Professor Merton Miller of Chicago University. (See FSB 1998, paras. 3.47–3.63.)

[7]Indonesia maintained an implicit real peg to the US dollar before the crisis, allowing the rupiah to depreciate to keep the real exchange rate more or less constant.

[8]Note that at the time the link began, Hong Kong was not a strong economy. It was in a shaky political and economic situation, with much lower fiscal and foreign exchange reserves (relative to the size of government expenditure, the money supply, and GDP).

[9]It is interesting to note that both Estonia and Lithuania have started the process of applying to join the European Economic and Monetary Union (EMU). A prerequisite for eventual membership is giving up their CBAs, no matter how perfect they are, because the EMU hosts a central banking system. Lithuania has announced that it is exiting from its CBA in stages during 1997–1999. See Bank of Lithuania, *The Monetary Policy Programme for 1997-99*. This shows the importance of considering the issue of exit cost for CBAs.

[10]An example will illustrate the simplicity of such a scenario of currency realignment. Suppose we are in a period when the exchange rate of the freely convertible renminbi against the US dollar has stayed at and is expected to continue to be around Rmb7.80 to the US dollar for some time, and HKMA decides that the Hong Kong dollar should be linked to the renminbi instead of the US dollar. Given the linked rate of HK$7.80 versus the US dollar, HKMA can declare that the link is changed to HK$1.00/Rmb1.00. This "horizontal" change of track will have no implications with regard to foreign exchange gains or losses for any party involved, at the time of the realignment. Farther down the road, it will be up to everyone to make the necessary adjustments, should the renminbi/US dollar exchange rate fluctuate.

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