An Alternative Approach to Defending The Hong Kong Dollar

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Abstract

The paper reviews the circumstances under which speculative attacks on the currency board of Hong Kong occurred during the Asian financial turmoil. It argues that interest rate arbitrage as a defense mechanism would not function properly unless the risk premium of holding Hong Kong dollar could be reduced by restoration of confidence. A proposal to issue structured notes, or put options to strengthen the currency board is made. Arguments for and against the proposal are reviewed. We show that the "technical" measures eventually undertaken by the Hong Kong Monetary Authority are analytically equivalent to issuing the structured notes. Empirical tests indicate that interest rate arbitrage had been working properly until the rule-bound currency board had been eroded by discretion introduced by the Monetary Authority. However, after implementing the structured notes proposal, interest rate arbitrage appeared to be effective again.

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1. Introduction

Although currency board has been adopted for more than seventy times in different places since its inception in Mauritius in 1849, the importance of this form of monetary institution has often been neglected in mainstream economics. This may be due to the fact that economies having experimented with the currency board tend to be small and lack global influences. A second reason is that systematic data rich enough to support serious empirical research on currency board are typically unavailable.

The global financial turmoil that started in Asia in 1997 may have changed many people’s attitude towards the currency board arrangement. While its adoption in Argentina, Estonia and Lithuania during the early 1990s almost went unnoticed, recommendations to use it as a cure-all medicine in such troubled economies as Indonesia and Russia have attracted widespread attention. These policy proposals would be on stronger grounds if they were supported by experiences in other places. The long history of Hong Kong’s currency board can contribute significantly to the research because it provides us with a rare source of information.

Hong Kong’s example is attractive for a number of reasons. First, its dominant monetary institution since 1935 has been the currency board, with episodes of abolition and re-adopti...
context of Hong Kong’s currency board, the ideas are more general. In principle, the mechanism is applicable to any economy with reasonably good fundamentals that is committed to a fixed exchange rate.²

The paper is divided into eight sections. The next section discusses the pros and cons of maintaining the Hong Kong currency board when it came under speculative attacks in 1997 and 1998. Section 3 describes the policy response of the Hong Kong Monetary Authority (HKMA), Hong Kong’s de facto central bank, and evaluates its effectiveness. Section 4 outlines an approach that has been proposed as a defense mechanism for Hong Kong’s currency board. Criticisms by skeptics of the approach and arguments in its defense are presented in Section 5. In September 1998 the HKMA drastically changed its policy and introduced new “technical” measures to strengthen the currency board. Section 6 analyses these measures and discusses their implications. In Section 7, we implement an empirical test on a central issue of the policy debate, namely, whether higher interest rate would be conducive to greater exchange rate stability. The final section concludes.

2. **Should the Hong Kong Dollar be Devalued?**

Hong Kong’s currency board is locally called “the linked exchange rate,” or more commonly known as the “peg.” During the weekend of October 18, 1997, the government in Taiwan decided to devalue its currency. That immediately initiated a series of speculative attacks on the Hong Kong dollar. Many people, including some politicians, exporters and economic commentators, argued that Hong Kong should seriously consider giving up the peg because the economy had already lost its international competitiveness after many years of high inflation. On the other hand, when the Financial Secretary of the government of the Hong Kong Special Administrative Region (HKSAR) summoned ten academic economists to express their views on November 14, 1997, the consensus was that there should be no

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² The mechanism may be applicable to maintaining stability of the Chinese currency, RMB. Zhu Rongzhi, the Premier of China, stated in a televised press conference at the White House on April 8, 1999 that he would consider issuing put options, which resemble the proposal discussed in this paper, to strengthen the RMB.
devaluation. This section evaluates the pros and cons of maintaining the peg and discusses the institutional changes that might have weakened the market’s confidence in the system.

Hong Kong’s first currency board was introduced in 1935 when the government decided to abandon the silver standard. From then to 1967, with the exception of four years of interruption during World War II, the Hong Kong dollar was pegged to the pound sterling at the rate of sixteen to one. Before issuing bank notes of sixteen HK dollars, the authorized note-issuing private banks were obligated to pay the Exchange Fund one pound to purchase the Certificate of Indebtedness (CI). The exchange rate was appreciated from 16 to 14.55 in 1967. From 1972 to 1974, it was pegged to the US dollar instead. On November 25, 1974, the government decided to let the currency float. However, the financial crises induced by the Sino-British negotiations over the future of Hong Kong caused great volatility and considerable downward pressure on the Hong Kong dollar. Eventually the government re-established the currency board system, but this time, the Hong Kong dollar was pegged to the US dollar at the fixed rate of 7.8. In other words, the government promised to buy bank notes at the rate of 7.8 per US dollar, but the actual exchange rate in the market generally differed from the parity. The peg lasts until today.

Figure 1 shows that before May 1992, the market exchange rate fluctuated within a narrow band around 7.8, and afterwards around and below 7.75. In terms of achieving exchange rate stability, the system appears to be successful because the volatility of 1974 to 1983 has disappeared. That is hardly surprising, for exchange rate stability is by design an outcome of the currency board. However, it is unclear a priori, on theoretical ground alone, whether the output level and inflation would be more stable. In fact, one can even argue that losing the exchange rate as a buffer to external shocks will make the economy more volatile.

(Insert Figure 1 here: Graph of time series of spot exchange rate.)

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3 The media widely covered the events. See Chan and Kwan (1998, p. 221-225) for a chronological summary.

4 For more details of the history of Hong Kong’s currency board, see Nugee (1995) and Kwan and Lui (1999a).
The changes in Hong Kong’s monetary regime can be regarded as natural experiments for testing the performance of the currency board as measured by these macroeconomic variables. Applying the method of Blanchard and Quah (1989) to quarterly data before and after the adoption of the US dollar peg, Kwan and Lui (1999a) show that the currency board has contributed to the stability of Hong Kong’s macro-economy. In particular, three-fourths of the reduction in observed output volatility and two-thirds of that in inflation volatility could be explained by the adoption of the currency board. The paper also demonstrates that for the stabilizing effects to occur, predictable and consistent fiscal policy must be followed.

The benefits of the currency board go beyond a reduction in the volatility of exchange rate, output, and inflation. It has an important policy advantage as well. One of the objectives widely shared in Hong Kong is for it to become the national financial center of China. The huge capital inflows from China are based not only on Hong Kong’s well developed legal framework and financial system, the opportunity it offers to bypass sub-optimal regulatory constraints in the mainland, and the Chinese government’s desire to boost the Hong Kong economy, but also on the stability of the Hong Kong dollar vis-à-vis the world’s key currency, the US dollar. There are worries that if the peg is abandoned, Hong Kong’s attractiveness to China as a financial center will significantly decline. The same argument also applies to capital from other countries.

Although there are compelling advantages of the currency board for the small and open economy of Hong Kong, an unavoidable question is whether it is sustainable. This is a sensible question because average inflation rate in Hong Kong since the peg’s inception in 1983 to the onset of the speculative attacks in 1997 had been persistently higher than that in the US. Has Hong Kong become so expensive that it must devalue its currency to restore international competitiveness? It should be pointed out that high inflation occurred mainly in the non-tradable sector, and was due largely to rising real estate prices. Because the world market determines the prices of tradables, it is not surprising that inflation of Hong Kong’s

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5 Average inflation rate in Hong Kong from the October 1983 to October 1997 was 7.6 percent, greatly exceeding the US counterpart’s 3.4 percent. If prices in 1983 in the two economies were the same initially, then in 1997, Hong Kong would be 73 percent more expensive than the US. Data are from CEIC Database.
tradable goods is comparable to the inflation in the US.\textsuperscript{6} Inflation occurs when money supply increases. Under a currency board system, money supply goes up usually because there is surplus in the balance of payments. The high inflation before 1997, induced by the net capital inflow, therefore can be interpreted as a sign that Hong Kong was competitive. However, it does not imply that adjustment would be unnecessary. When asset prices are high enough, capital stops coming in and goes away. This may cause devaluation in the long run and perhaps speculative attacks in the short term.

However, devaluation pressure can be alleviated if prices adjust downwards. If wages and prices are flexible enough, no devaluation is necessary. However, if the speeds of adjustment are not the same across different sectors, then their relative prices will change, possibly causing inefficiency in resource allocation. This can create painful adjustment that would be unnecessary under a flexible exchange rate regime. Indeed, as part of the cost of maintaining the currency board, a period of deflation in Hong Kong started in 1998.\textsuperscript{7}

It is sometimes argued that Hong Kong’s large amount of foreign reserves makes devaluation highly unlikely. As of October 1998, foreign reserves amounted to US$88.7 billion, which was the world’s third largest. In the same month, Hong Kong’s M3 (excluding foreign currency) was more than HK$1813 billion. In other words, the foreign reserves could back up 38 percent of M3.\textsuperscript{8} Under normal circumstances, the HKMA would appear to be very strong when facing speculative attacks. However, if people for some reasons suspect that a devaluation will occur and decide to exchange their deposits for foreign currency, the 38 percent will be far from enough to satisfy the demand for self-fulfilling currency substitution. Thus, whether the peg can be maintained depends critically on the public’s confidence in it.

The confidence issue is a crucial one. Hong Kong’s currency board system has undergone a series of institutional changes initiated by the HKMA. Are these changes

\textsuperscript{6} See Hawkins and Yiu (1995) for evidence on the inflation rates of tradables and non-tradables.

\textsuperscript{7} From May to November 1998 the composite price index declined by around 2.6 percent. See official figures released on the web pages of the Census and Statistics Department of the Hong Kong SAR government.

\textsuperscript{8} See the homepage of the Hong Kong Monetary Authority (1998a) for statistics on foreign reserves and money supply.
conducive to strong confidence? In 1988 some new “Accounting Arrangements,” which in effect made open market operations possible, were introduced. “Exchange Fund Bills” similar to short-term US Treasury bills have been issued since March 1990. A liquidity adjustment facility (LAF) was also opened in 1990 to provide liquidity to banks, and the HKMA was active in utilizing the LAF. It seems that the HKMA, with these new tools in hand, has become more effective in intervening the market.

However, one must remember that the currency board is supposed to be a rule-based monetary system. The gradual “dilution” of the rules, as noted by Schwartz (1993), means greater reliance on discretion. An example that illustrates the implications of using discretion is the change in HKMA’s line of defense from 7.8 to 7.75. As mentioned earlier, the official parity is 7.8. But to give it a greater sense of security, the HKMA chose a “first-line of defense” at 7.75, i.e., it would intervene at 7.75 instead of 7.8. Figure 1 indicates that beginning in around April 1992 the exchange rate could rarely move above the 7.75 line of defense. However, this has created a new problem. Whenever the exchange rate went above 7.75, the market might fear that the HKMA would choose not to defend the peg. To restore confidence, the HKMA was forced to intervene at 7.75. In a sense the HKMA has become the slave of its own discretion. Furthermore, the rationale for a first-line defense is dubious. If the HKMA fails to maintain its defense of 7.75, it is doubtful that it will be able to maintain the ultimate defense of 7.8.

A more serious implication of greater reliance on discretion is the erosion of the public’s belief that the HKMA will always keep the peg. One can speculate that the attacks on the Hong Kong dollar could have been milder if the HKMA had not earlier introduced the tools of intervention.

3. **The Government’s Initial Response to Speculative Attacks**

The discussion in Section 2 shows that there are important advantages for keeping the peg. With historical hindsight, it seems that the HKMA also held this position, as there is no evidence to indicate that the HKMA had any intention to abandon the peg. The worsening economic situation in other Asian countries had probably convinced the social majority that competitive devaluation was not a viable solution to the financial crisis. The remaining question was about ways to strengthen the defense of the peg.
The HKMA’s primary tool of defense was the so-called “automatic adjustment mechanism,” or equivalently, interest rate arbitrage. The HKMA posits that when there is capital outflow, the resulting drain in Hong Kong dollar liquidity will push up the latter’s interest rate, which in turn will restore stability in the exchange rate. Capital outflow will stop if the interest rate is sufficiently high. Allowing the interest rate to go up was seen as a necessary consequence of the defense against speculation. However, to understand better what actually happened, we need to discuss two issues, namely, the implications of the “real time gross settlement” (RTGS) system and what the HKMA did on October 23, 1997.

On December 9, 1996, the HKMA introduced a new inter-bank payment system, the RTGS. The “Aggregate Balance” of the banking system, the lubricant for inter-bank settlements, has also become directly subject to the monetary rule of a currency board. Because the RTGS is very efficient, the aggregate balance typically stays at a low level of around, say, HK$ 2 billion. As the HKMA has recognized, the small size of the balance is conducive to high interest rate volatility. In other words, even a minor capital outflow can cause the interest rate to shoot up significantly. To illustrate the mechanics of how the interest rate goes up, we use the following example.

Suppose that the aggregate balance is equal to HK$ 2 billion, but there is a capital outflow of HK$ 3 billion. Some clients instruct their banks to sell this amount of HK dollar for, say, US dollar. If the US dollar cannot be purchased within the banking system, then the banks must buy from the HKMA by using their own clearing balances. If a bank does not have enough money in its clearing balance for purchasing the US dollar ordered by its clients, it may borrow from the clearing balances of other banks. However, since the total outflow of capital exceeds the aggregate balance, the banks simply cannot settle their committed transactions, and thus, the interest rate may go up without limit.

This process is not necessarily independent of HKMA’s discretion. After buying HK dollars in the aggregate balance, the HKMA can delay the injection of HK dollar liquidity back into the system. In such a situation, the aggregate balance will shrink in size until the interest rate is squeezed up to such an extent that the banks find it attractive to use their foreign currency to buy back the HK dollar from the HKMA to square their accounts. However, since these Hong Kong dollars will not be delivered until one or two days later, the

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9 For details of the RTGS, see Hong Kong Monetary Authority (1998b).
banks still need to borrow from the HKMA at any interest rate set by the latter for clearing purposes.

There was another source of discretion that could raise the interest rate. In the morning of October 23, 1997, the HKMA surprisingly sent a memorandum to all the licensed banks in Hong Kong, warning them that they might have to pay penalty interest rate if they used the LAF repeatedly. Receiving this memo after several days of volatile interest rate, the banks began to panic. There were even rumors that the penalty rate could be as high as a thousand percent. The inter-bank interest rate shot up. At its peak, the rate was close to 300 percent.

Thus, the monetary system in Hong Kong was such that interest rate was very sensitive to capital flows. In addition, the HKMA might choose to magnify interest rate volatility through various kinds of discretionary measures. For a long time, the prevailing paradigm of the HKMA’s policy making was that high interest was a necessary instrument for dealing with speculative attacks against the Hong Kong dollar. Moreover, lowering interest rate volatility was seen as contradictory to the ultimate policy of maintaining stable exchange rate. Unfortunately, these beliefs were seriously misguided.

First, high interest rate is no longer an effective way to deter or punish speculators. Knowing that a small run on the Hong Kong dollar can trigger the monetary mechanism to push up the interest rate, which can be further amplified by the discretion of the HKMA, speculators can either short the Hong Kong dollar forward or short the stock futures index before launching an attack on the spot market of the Hong Kong dollar. It can be shown that losses in the spot market can easily be outweighed by profits from the currency forward and stock futures if speculators engage in this double or even triple play.¹⁰

Second, volatile and high interest rate can cause a credit crunch in the banking system. In fact, Hong Kong’s real GDP experienced a 5 percent decline in 1998, mainly as a result of the credit crunch. As the harmful effects persist, and if people accept the government view that high interest rate is a necessary evil of the currency board, they will begin to question the wisdom of keeping it, thus creating further pressure on the currency. In retrospect, it is clear that the government grossly under-estimated the scope of the financial turmoil and consequences of the high interest rate. In the beginning, it thought that the Asian financial turmoil would be over by the Christmas of 1997. As late as May 1998, it still insisted that real

GDP growth for 1998 would be +3.5 percent. Had the Hong Kong government accurately anticipated the depth of the 1998 recession, it might have refrained from using the high interest rate strategy.

(Insert Figure 2 here: HIBOR and LIBOR.)

Third, high interest rate does not guarantee that interest arbitrage will occur to bring in capital. The automatic adjustment mechanism would work well only if people have enough confidence in the Hong Kong dollar. Figure 2 shows that Hong Kong’s interest rate, as represented by HIBOR, had been persistently higher than that of the US dollar after the onset of the financial crisis. Why hadn’t the arbitrage occurred? A plausible explanation is that the interest rate differential represented a risk premium for holding the Hong Kong dollar. If confidence deteriorates, the risk premium, and consequently, the interest differential, will simply go up without initiating a process of arbitrage. To restore the proper functioning of the automatic adjustment mechanism, the perceived risk of the peg must be lowered.

The effectiveness of the government’s policy depends on whether or not higher interest rate is conducive to greater exchange rate stability. This is a hypothesis that can be formally tested. In Section 7, we implement such a test for periods of different policy regimes.

4. **An Alternative Defense Mechanism for the Hong Kong Dollar**

Confidence in the Hong Kong dollar is key to the defense of the currency board during the financial crisis. The proposal made by Chen and Chan (1997) to establish a US Dollar Liquidity Adjustment Facility (US$ LAF), or equivalently, to issue Hong Kong dollar put options, was aimed at dealing with the confidence problem. The authors later refined the proposal, in collaboration with colleagues at the Hong Kong University of Science and Technology (Chan and Chen (1999), Cheng and Lui (1998), Chan and Kwan (1998), and Kwan and Lui (1999b)). Merton Miller further simplified it by proposing the issuance of “structured notes” to guarantee the Hong Kong dollar’s peg to the US dollar. These proposals attracted wide coverage in Hong Kong’s media and generated intense discussions. Here we shall only focus on one variant of the proposals, namely, the structured notes, by discussing
the latter’s properties. In the next section, we shall examine the criticisms that have been leveled against the notion of Hong Kong dollar put option, or exchange rate insurance.

The primary objective of the structured notes is to provide insurance for those holding Hong Kong dollar. There are different risks involved in holding the currency of a country, as for example, political risks, panic induced risks, and risks due to bad economic policy of that country. In the case of Hong Kong, it has a long tradition of prudent fiscal policy. The Government’s budget usually enjoys a surplus. It has the world’s third largest foreign reserves. The banking sector is robust. Therefore, Hong Kong’s fundamentals should hardly be regarded as very bad at the time when speculative attacks started. However, the high asset prices and wages at the time did pose a policy dilemma. The HKMA could choose to devalue to restore international competitiveness quickly, but all the advantages of the currency board system discussed in Section 2 would have been lost. Alternatively, the HKMA could keep the peg, but there would be a painful process of internal price adjustment.

The HKMA has stated many times that it will not abandon the peg. However, these statements have little information content, as every central bank will say the same thing until devaluation occurs. The fact that devaluation is a viable option for the HKMA must create some uncertainty as to what the HKMA will eventually do. This doubt can be significant. As shown in Cheng, Kwan and Lui (1999), the \textit{ex ante} market expectation of devaluation of the Hong Kong dollar was actually quite high during several episodes. An example is shown in Figure 3, which plots the \textit{ex ante} expected probability of a 10 percent devaluation of the Hong Kong dollar within the coming month, three months, six months, and 12 months. If the HKMA can make its determination credible, a large portion of the \textit{ex ante} perceived risks of holding Hong Kong dollar will disappear. The interest differential between Hong Kong dollar and US dollar, which reflects the risk premium, will narrow down.\footnote{Under a currency board arrangement, if there are no risks involved, Hong Kong interest rate should equal US interest rate.} The structured notes are a means to put the money where the mouth is.

(Insert Figure 3 here: Ex ante probability of devaluation.)
The proposal of structured notes has several features. First, the HKMA issues a certain amount of structured notes and sells them in the market. Banks or people who have acquired the notes are guaranteed that they can exchange with the HKMA a specified amount of Hong Kong dollar for US dollar at the fixed exchange of 7.8. The price of the notes should be market determined. The quantity of the notes, or equivalently, the amount of Hong Kong dollar to be guaranteed, is to be decided by the HKMA. Recommendations to cover HK$ 50 billion to HK$ 80 billion have been made. Second, the guarantee is legally binding. In case the HKMA devalues the Hong Kong dollar, it will be obligated to honor the exchange rate of 7.8 for the amount covered by the structured notes. Third, the guarantee period is finite. It can range from, say, three months to six months. At the end of the guarantee period, new structured notes can be issued to cover the subsequent period.

A number of implications can be derived from these features. First, if the HKMA decides to devalue the Hong Kong dollar by abandoning the peg, it will incur a cost because it has to compensate those who have the structured notes. By issuing the notes, the HKMA can send the signal that it is indeed putting money where the mouth is. In other words, its action reveals information of its determination not previously known to the market. Second, there is asymmetric information in the insurance. The HKMA knows that it will not devalue, but purchasers of the notes do not. As such, the HKMA is almost sure to make profit from selling the notes. It is insuring against an event, which, to a large extent, is under its own control. Third, the price of the notes depends on the risk premium. If people believe that there will be no devaluation, the price of the insurance embedded in the notes will tend to zero, which should be HKMA’s target. Fourth, even though the issued notes do not cover the entire M3 in Hong Kong, people who have not bought them can also benefit. If issuing of the notes can increase confidence in the Hong Kong dollar, then the chance of panic currency substitution will diminish. Fifth, a consequence of the notes is that interest rate would go down, since the risk premium is reduced by the exchange rate guarantee. This effect should be distinguished from artificial suppression of the interest rate without reducing uncertainty in the market. Given the uncertainty, resource allocation is sub-optimal because an insurance market is missing. The structured notes serve to “complete” the market and improve efficiency in resource allocation.

There are conditions under which the above proposal will not work. If the fundamentals of an economy are so bad that devaluation is inevitable, issuing the notes will
only add cost to the central bank, which has to compensate holders of the notes after the devaluation has taken place. In case the central bank has very little foreign reserves, its ability to guarantee will also be dubious. The issuance of structured notes then cannot increase confidence. This proposal, therefore, is only applicable to economies with sound fundamentals and ample reserves.

There is also the possibility that a speculative attack is so powerful that the amount covered by the notes is not big enough to withstand the pressure. In such a situation, the government can always resort to an ultimate weapon, dollarization. The latter is costly because Hong Kong will lose some seignorage. However, if this is done, there will be no more room for speculative attacks. The advantages of dollarization are discussed in Cheng and Lui (1998). Practical difficulties exist, however. Although these are not insurmountable, the details of implementation have to be worked out by the government for it to be a credible tool of deterrence against speculation. In fact, some argued that the existence of such an option, even without the actual implementation, is already sufficient to deter speculation.

The theory of speculative attack points out an important principle. A currency peg should not be viewed as a monetary arrangement in isolation; rather, it should be analyzed under the framework of regime transitions. That is, one has to consider what would happen if the peg were abandoned. The post-collapse regime will determine the stability of the pegged rate regime, a principle emphasized by Flood and Garber (1984a,b). This principle can be applied to the issue of dollarization. Usually dollarization and currency board are treated as two separate topics, but if the post-collapse regime is dollarization, then forward-looking speculators will think twice before raiding the currency board, because there will be no capital gains even if they succeed. On the other hand, if the post-collapse regime is depreciation, then there will be an incentive to mount an attack in anticipation of the post-collapse capital gains. In a colonial currency board, the ultimate dollarization is built in because circulating

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12 Speculative attacks on the Argentine *peso* in 1995 and 1999 offer good examples on the possible effects of dollarization plans. In 1995, public discussions and support of dollarization appeared to have helped to end the attacks. We owe this to discussions with Juan Llach, Argentina’s former Vice Minister of Economy. In January 1999, the crisis of the Argentine *peso* caused by attacks on the Brazilian *real* was contained, after Argentina had made dollarization an official plan.
the sovereign country’s currency is by default an ever-ready option. This expectation will stabilize the currency board regime and make the dollarization regime unnecessary to be exercised.

5. **Rebuttal of Criticisms**

At the initial stage of the proposal, the structured notes were not endorsed by the HKMA. In a letter sent to the HKMA, a member of the IMF staff, who believed that high interest was the only defense mechanism, also dismissed the proposal. As debates intensified, the proposal gained much public support. The HKMA was criticized by the media for its unwillingness to listen to the academics and therefore its making serious policy errors. As we shall see in the next section, the position of the HKMA has changed substantially in the later stage, even though officially it has not yet admitted.

In this section, we shall outline some of the more important criticisms against the structured notes proposal and refute them. Official views held by the HKMA before September 1998 are summarized in *Report on Financial Market Review*, which was published in April 1998, but written much earlier. Our more detailed rebuttal can be found in Cheng and Lui (1998) and Chan and Kwan (1998).

Some critics, notably the IMF staff, have correctly pointed out that the structured notes have the property of lowering interest rate, but have incorrectly argued that the resultant lower interest rate will weaken the defense mechanism for the following two reasons. First, exchange rate can be defended only by active use of high interest rate. Second, allowing interest to go down undermines HKMA’s image that it is determined to fight against the speculators even if doing so would cause great pain.

These arguments are faulty. First, it presupposes that high interest rate can punish speculators, and attract capital to flow in. Both assumptions are on shaky grounds. As discussed above in Section 3, speculators who anticipate a high interest rate defense strategy on the part of the HKMA can double play in the market. In principle, the higher is the interest rate, the more profit can they make. In fact, at the time when the HKMA intervened in the stock market in August 1998, it openly admitted to the media the existence of such double playing. It even presented calculations showing how profits could be made by this method.
Moreover, the sharp decline in currency in circulation in 1998 signals that there had been capital outflow rather than inflow during this period of high interest. As argued in the same Section, if an increase in the interest rate is due to a higher risk premium, then it cannot attract capital to come in because the mechanism of interest rate arbitrage will not function properly. In such a case, reducing the risks involved through a currency insurance scheme will lower interest rate and at the same time restore arbitrage.

Second, the determination to withstand pain makes sense only when high interest is a necessary evil. Artificially creating more pain for the economy to suffer cannot improve the toughness image of the HKMA. The critics’ logic amounts to saying that building any line of defense must be regarded as a sign of weakness and therefore it should not be done. Worse still, the medicine of high interest can possibly attract more speculators. In contrast, structured notes are pain relievers, in addition to their ability to strengthen confidence. Regarding the pain-relieving property of the structured notes that simultaneously restore confidence in the Hong Kong dollar as a drawback is beyond reason.

One of the complaints by the HKMA is that the structured notes will create contingent liabilities, thus weakening its reserves position in that it will have to earmark some reserves to back up the contractual commitment of the notes. Because the remaining “free” reserves must decrease, the ability to defend currency attacks will diminish so claimed the HKMA.

It may indeed be true that the HKMA should set aside some reserves. If this amount is larger than the total available reserves, then the public will realize that the guarantee commitment is not credible. However, since the actual amount of total foreign reserves in Hong Kong is more than ten times the recommended value to be covered by the structured notes, there is no question about the credibility of the commitment. More importantly, one has to recognize that the contingent liabilities do not actually deplete the reserves. It is only a matter of allocating HKMA’s resources to more strategic positions, i.e., these are used directly to improve confidence in the Hong Kong dollar. How can more effective use of reserves be equated to their depletion? Moreover, if the HKMA will never spend any reserves no matter how good the reason is, then the latter will effectively become useless.

The HKMA claims in the Report on Financial Market Review that the structured notes must be supplied free of charge and in unlimited amount in order to bring down interest rate. If the supply is limited, then a privileged class consisting of those having free access to the

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13 See Report on Financial Market Review, Annex 3.9 and 3.10 for views of the IMF.
notes will be created, and the notes will have no effect on the interest rate in Hong Kong. On the other hand, if the supply is unlimited, then the HKMA will not have enough reserves to back up the contingent liabilities. The problem with these confused arguments is that they are not based on any economic analysis or real world examples.

Interest rate goes down if the insurance provided by the notes can lower the risks of holding Hong Kong dollar. This is true even if the supply of structured notes is of finite quantity. Is there any theoretic reason to claim that for an insurance policy to be effective, it must be free of charge? We buy travel insurance before flying to the ASSA conference. The insurance makes us less nervous and increases the likelihood that we fly. It is costly and the quantity demanded is limited. People who want it can buy it in the market. How can they belong to a privileged class?

Some critics argue that the structured notes will increase the exit cost at the time when the currency board has to be abandoned. Since the possibility of devaluation cannot be ruled out, the notes cannot therefore be recommended.

It is true that the structured notes increase exit cost. But this is precisely the purpose of issuing them. If HKMA has the intention to devalue or if it believes that the Hong Kong dollar is in imminent danger, the notes should not be issued. On the other hand, if the perceived risks come from market’s uncertainty about what the HKMA will do, then raising exit cost will remove the ambiguity and help to restore confidence.

Another common concern is that the structured notes are derivatives, which can possibly create new sources of risks. For example, speculators can buy the structured notes and then attack. If the Hong Kong dollar falls, they can make profit from the compensation paid by the HKMA for the money covered by the notes. In other words, the structured notes may provide a convenient tool for speculators to attack the Hong Kong dollar.

There is a simple answer to this criticism. It does not pay for the speculators to do so when they already have the option of shorting Hong Kong dollar forward. In Chen and Chan (1997) and Chan and Chen (1999), it is shown that the competitive market price of structured notes, or equivalently, the Hong Kong dollar put option, must be more expensive than buying US dollar forwards at the delivery exchange rate of 7.8. This is because the Hong Kong dollar put option can be decomposed into a portfolio consisting of a US dollar forward plus a US dollar put option, both of which are costly. Speculators can indeed make use of the structured notes to attack if they want to. However, they can achieve exactly the same objective by just
buying the cheaper US dollar forwards in the market. The US dollar put option embedded in the structured notes is costly but useless to them. Thus, rational speculators will not use the notes as a tool of attack, and the notes will only be used for the purpose of insurance against the risk of the Hong Kong dollar’s devaluation.

6. The Eight “Technical” Measures

For most part of 1998, the HKMA had been adhering to the strategy of high interest rate defense. From Yam (1998), which was published in November, but written months earlier, one can see that a quiet change in the HKMA’s fundamental position. As the credit crunch finally dragged the economy into the deepest recession in Hong Kong’s modern history, whereas the high interest rate failed to stop the repeated occurrence of speculative attacks against the Hong Kong dollar, as predicted by us and other academics as early as the end of 1997, the general public had become increasingly critical of the high interest rate policy. The government of the HKSAR might have felt that something had to be done. Believing that there were speculators trying to double play in the stock and currency markets, the government decided to intervene in the stock market in August 1995. In an interview with the media, the Financial Secretary of the HKSAR revealed that according to the original estimation, HK$ 20 billion would be enough to keep the market up at a level high enough to deter speculation (Hong Kong Economic Times, 9/15/1998). But it turned out that HK$ 118.1 billion had to be used eventually. This probably reinforced a sense of crisis in the government, and the public was asking for changes. On September 5, the HKMA suddenly issued a press release outlining seven “technical” measures to strengthen the currency board (Hong Kong Monetary Authority, (1998c)). As we shall see below, these so-called “technical measures” reflect fundamental changes in thinking about how to defend the Hong Kong dollar. The seven measures basically contain the following two most important elements.

First, the HKMA provides a clear undertaking to all licensed banks in Hong Kong to convert Hong Kong dollars in their clearing accounts into US dollars at the fixed exchange rate of HK$ 7.75 per US$ 1. This Convertibility Undertaking will be moved to 7.8 when circumstances permit.

Second, a Discount Window is established to replace the LAF. Banks can use the Exchange Fund Bills and Notes, which are similar to Treasury Bills of the U.S., as collateral
to borrow overnight Hong Kong dollars from the HKMA. The interest rate of the Discount Window, or the Base Rate, is determined by a formula that reflects influences of the HIBOR and the Fed Fund rate.

These two elements imply that banks can increase liquidity in their clearing accounts up to an amount equal to the value of the Exchange Fund Bills and Notes that they own. Since the Convertibility Undertaking is applicable to the clearing balances, it is potentially also applicable to the entire Exchange Fund Bills and Notes. Previously, the money base consists of coins in circulation and the Certificate of Indebtedness (CI), which back up the bank notes. Now it includes also the aggregate balance and the outstanding Exchange Fund Bills and Notes held by banks. As of December 23, 1998, CI and coins amount to around HK$ 92 billion, aggregate balance 2.5 billion, and outstanding Exchange Fund Bills and Notes 81 billion (Hong Kong Monetary Authority (1998a)). Thus, the money base is almost doubled. If all the outstanding Exchange Fund Bills and Notes are used as collateral to borrow liquidity, the new aggregate balance can go up from 2.5 billion to more than 80 billion.

When an attack occurs and capital outflow exceeds the original aggregate balance, banks can take advantage of the Exchange Fund Bills and Notes to inject liquidity back into the aggregate balance. Thus, interest rate cannot go up as much as in the past. Thus, the HKMA has in effect abandoned its previous policy of using high interest to punish the speculators. This is a fundamental shift in position. The narrowing down of the interest rate differential between the US and Hong Kong dollars in recent months may well be due to the new measures. However, if the capital outflow is bigger than the Exchange Fund Bills and Notes, then the same problem of escalating interest rate seen in October 1997 may occur again, unless the HKMA is willing to accommodate the capital outflow by drawing down its foreign reserves, or equivalently, revising the process that took place when capital flowed in.

From the perspective of exchange rate insurance, the seven measures appear to be identical to the structured notes because the amount in the aggregate balance is guaranteed at the rate of 7.75. The Exchange Fund Bills and Notes also have the feature of structured notes because they can be used as collateral to borrow from the HKMA to augment their balance, which is covered by the Convertibility Undertaking.

However, there are legal problems with this interpretation. The Convertibility Undertaking is a policy announced by the HKMA, but is it a legally enforceable contract? If not, then it is unclear whether banks will actually be compensated by the HKMA in the event
that the latter decides to devalue the Hong Kong dollar. It should be noted that in its announcement of the seven “technical” measures, the HKMA did not specify how long it would honor the convertibility undertaking at the rate of 7.75. So there was indeed a legal loophole. Even if the HKMA decides to devalue, it can claim that the guarantee has already expired. After all, central banks typically can get away easily even if they have violated a previous announcement that there would be no devaluation.

The market quickly tested this ambiguity. On September 13, the Chief Executive of the HKMA told a reporter that it might change its Convertibility Undertaking on the Hong Kong dollar from 7.75 to 7.8 shortly because it would be unclean to have two exchange rates, one for the aggregate balance and Exchange Fund Bills and Notes (7.75) and the other for the bank notes (7.8). When the report appeared on the following day, banks became nervous. The Convertibility Undertaking of 7.75 would not stay for long, and there would soon be a 0.64 percent devaluation. This seemingly small “capital loss,” however, needs to be compensated by a rather substantial increase in Hong Kong interest rate if the devaluation is imminent. Moreover, if the devaluation could happen once, there would be no guarantee that it would not happen again. Interest rate shot up. The one-month HIBOR went up from the previous closing rate of 8.5 percent to the high of the day of 12.5 percent. Within hours there was a capital outflow of HK$ 9.3 billion (Hong Kong Economic Times, 9/15/1998). At the banks’ request, the HKMA announced at 3pm on that day that there would be no change in the 7.75 convertibility undertaking within the following six months. Interest rate fell from its height after the announcement.

The episode did not end here. On the following day, banks asked a second question. What would happen six months later? Without a clear signal, the six-month US dollar forwards continued to stay at a high level. A deputy Chief Executive of the HKMA was prompted to come out and say that at the end of the six months, the HKMA might consider extending the guarantee further. Later on, the HKMA made a more explicit statement. At the end of the six months, the rate of the convertibility undertaking would gradually move from 7.75 to 7.8 over a period of 500 working days. In other words, there would be a change of one basis point a day.

As documented in Cheng, Kwan and Lui (1999), the risk premium of the Hong Kong dollar immediately declined after these announcements, which removed the ambiguity of the time period of the Convertibility Undertaking. Legal experts believe that with these explicit
and specific details of the time period, the HKMA’s verbal guarantee has amounted to a legal contract under the Common Law, which Hong Kong practices (Lui (1998)). In other words, in case the HKMA devalues the Hong Kong dollar, it will be obliged by the Law to compensate the relevant losses of the banks. We call the guarantee of the time period the “eighth measure.”

With all the eight measures, the aggregate balance together with the amount covered by the Exchange Fund Bills and Notes satisfy all the basic features of the structured notes. In his testimony at the Hong Kong Legislative Council, Merton Miller (1998b) also voiced the opinion that the eight measures were equivalent to the structured notes, or put options, even if the forms they took might appear to be different.

In retrospect, it is unclear whether the HKMA ever had the intention of issuing the structured notes. The decision to announce the crucial six-month guarantee was made in an emergency situation of market panic. We believe that the structured notes emerged due to market pressure, not by design. The events on September 14 and 15 can be regarded as a natural experiment. Once the structured notes have been in place, the market reacted very positively. Risk premium, as predicted, has declined significantly. The volatility and crisis asserted by critics of the structured notes never materialized, which is not surprising because those assertions were based on flawed arguments rather than sound analysis. However, it would be prudent for us to say that more time and additional events would be needed to test the robustness of the structured notes as an effective mechanism to defend the peg.

7. **Does High Interest Rate Help to Stabilize Exchange Rate?**

For a long time, the HKMA had relied on interest arbitrage as the main instrument for defending the Hong Kong dollar against speculative attacks. In this Section, we test whether a

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14 In the tradition of Common Law, which Hong Kong practices, four conditions are necessary to constitute a contract, namely, offer of a promise, acceptance of it, intention to be binding, and consideration. Moreover, an agreement is void if its content is unduly uncertain. See, for example, Calamari and Perillo (1990). This is one of the reasons why the definiteness of the length of the period of Convertibility Undertaking is important.
larger differential between the HIBOR and the LIBOR will lead to an expected appreciation of the spot exchange rate in the future. The tests are applied to several periods corresponding to different policy regimes.

The empirical tests are based on the target zone model as in Bertola and Svensson (1993), which has been applied in Svensson (1993), Lindberg and Soderlind (1994), and Rose and Svensson (1994), among many others. Let the expected drift of the spot exchange rate at \( t \) be denoted by \( E_t \Delta x_{t+\tau}/\tau dt \), where \( x_{t+\tau} \) is the percentage deviation from central parity of the spot rate at time \( t + \tau \), and \( \Delta x_{t+\tau} \) is \( x_{t+\tau} - x_t \). We estimate the expected drift by using the fitted value of the following linear projection equation of \( \Delta x_{t+\tau}/\tau dt \),

\[
\Delta x_{t+\tau}/\tau dt = \alpha + \beta x_t + \gamma d_t(\tau) + \varepsilon_{t+\tau}
\]

where \( d_t(\tau) \) is the HIBOR – LIBOR interest differential of maturity \( \tau \). The projection standard error is computed from a Newey-West heteroskedasticity-autocorrelation consistent matrix of \( \tau \) lags. If the estimated \( \gamma \) is negative, then a large current interest differential is associated with an expected future appreciation of the spot rate. In this case, interest arbitrage, or the so-called automatic adjustment mechanism works. On the other hand, if \( \gamma \) is positive, higher interest rate is viewed by the market as a factor leading to depreciation of the Hong Kong dollar.

We apply equation (1) to the following regimes. Regime 1 (1987:3:4 to 1992:4:1) is called the “rule-bound” period because at that time, the HKMA relied mainly on rules in policy-making. Regime 2 (1992:4:1 to 1998:9:6) can be interpreted as the “discretion” period. During this time, the HKMA had already acquired most of the intervention tools (new accounting arrangements, exchange fund bills and notes, LAF, etc.). Moreover, the level shift in the spot rate (see Figure 1), or the second line of defense, also started roughly from the beginning of this period. Regime 3 refers to the period after adopting the new “technical measures” on 1998:9:7. Interest rates of 1-month and 3-month maturities are used in the estimation of the projection equations for all three regimes. Projection equations for 6-month and 12-month interest rates are estimated only for the first two regimes, because of data shortage (our sample ends at 1999:4:21).

(Insert Table 1 here: Projection equation.)
Table 1 reports the results, which lead to the following conclusions. First, the estimated $\beta$’s for all the maturity periods are statistically significant and negative, indicating that a weak Hong Kong dollar has the tendency to become stronger. This means that the exchange rate is mean reverting and the peg is basically a stable system. Second, $\gamma$ is negative in regime 1 for interest rates of all maturities, although in the one-month case, it is not statistically significant. This suggests that during the “rule-bound” period, the automatic adjustment mechanism worked well and the peg was most credible. Third, the sign of $\gamma$ is reversed to positive in Regime 2 for 1-month, 3-month, and 6-month maturities; and it is even strongly significant in the 6-month case. In the 12-month case, $\gamma$ remains negative in regime 2 but its magnitude has diminished by a factor of ten and is not statistically different from zero. Contrary to its own belief, the HKMA had in fact made the linked exchange rate system less credible, after acquiring all the new intervention tools during the discretion period. Fourth, there is some preliminary support that credibility of the peg improved again after adopting the new technical measures. In the 1-month and 3-month equations, $\gamma$ has changed back to negative territory, and it is strongly significant in the latter case. Our data series is too short for estimating reliably the projection equation for regime 3 for the 6-month and 12-month cases. We need more time for history to unfold in order to learn more reliably the effectiveness of the technical measures.

8. Concluding Remarks

The currency board system in Hong Kong has gone through some severe tests after the onset of the Asian financial turmoil. In the course of the events, the currency board arrangement appears to have been strengthened by the introduction of Hong Kong dollar put options, or equivalently, the structured notes. Yet unsettled issues such as the following remain.

The first is how the Base Rate of the Discount Window should be determined. Its value would reflect the cost of buying structured notes through borrowing at the Discount Window. Should the current formula used by the HKMA be reconsidered? Another issue is the supply of structured notes. How much is needed? This question is related to the scope of Hong Kong’s Monetary Base, and also to the optimal foreign reserves necessary for defending the currency board. A third question is dollarization. Although the market has calmed down
after the introduction of the structured notes and as the global financial crisis showed signs of abatement, the system is not fool-proofed, as their proponents will readily admit. Capital outflow exceeding the supply of structured notes could create a situation similar to the October attack of 1997. Should dollarization be used as a threat to end the crisis when it occurs again? Politically dollarization appears to be a much more viable option than what outsiders might believe. However, its legal and economic implications are complicated. Without more detailed studies, implementation would be difficult and the threat of using it would not be very credible. Studies of the above issues are worthwhile because the stakes are very high.
References


--------- (1999b). The Linked Exchange Rate System, Hong Kong: City University of Hong Kong Press, forthcoming.


### Table 1: Projection equations

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<th>constant</th>
<th>(x_t)</th>
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**Notes:**

1. T-values are in parentheses.
2. Dependent variable = \((x_{t+\tau} - x_t)/\tau dt\). \(dt = 1/261\) and \(\tau = 22, 65, 130\) and \(261\) days corresponding to the 1-month, 3-month, 6-month, and 12-month maturities, respectively. \(x_t\) = spot exchange rate (as percentage deviation from parity). \(d(\tau) = \text{HIBOR} - \text{LIBOR}\) interest differential of maturity \(\tau\), and \(t = 1987:3:4 - 1999:4:21\) (excluding holidays). Regime 1 = 1987:3:4 - 1992:4:1, Regime 2 = 1992:4:1 to 1998:9:6, and Regime 3 = 1998:9:7 to 1999:4:21.
3. All equations are estimated by OLS with Newey-West covariance matrix of \(\tau\) lags.
Figure 1: Spot exchange rate

Figure 2: HIBOR and LIBOR
Figure 3: Ex ante devaluation probability inferred from drift-adjusted interest differential