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15 Hong Kong's Currency Board and Changing Monetary Regimes

Yum K. Kwan and Francis T. Lui

15.1 Introduction

A currency board, first introduced in the British colony of Mauritius in 1849, is a rule-based monetary institution that is rather different from a central bank. Although there are variations, a typical currency board has two essential characteristics. First, the board has the obligation to exchange on demand local currency for some major international currency, which is often called the reserve currency, and vice versa, at a fixed exchange rate stipulated in the legislation. Second, local currency is issued based on at least 100 percent reserve of securities denominated mainly in the reserve currency.

Since the nineteenth century, dozens of currency boards had been established in British colonies and other places, often in response to monetary or exchange rate disturbances.[1] However, when these colonies became independent nations after World War II, most decided to replace the currency board with a central bank. Very few currency boards survive today. Some people may be inclined to believe that this form of monetary institution has already lost its practical importance. This judgment is premature. Recently, Argentina and Estonia have enacted laws to establish currency boards, which have also been

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1. For more detailed discussion of the history of currency boards, see Schwartz (1993) and Hanke and Schuler (1994). See also Walters and Hanke (1992).

recommended for Russia, Bulgaria, and other nations in Eastern Europe (see Hanke, Jonung, and Schuler 1993). The currency crisis of Mexico in 1995 has further stimulated people to consider the system seriously. If this renewed interest could be sustained and these countries were to adopt currency boards eventually, then as Schwartz (1993) has commented, "a watershed would have been reached in the annals of political economy."

Do the potential benefits of currency boards outweigh their costs in these countries? Some of the theoretical advantages and disadvantages of currency boards are well known.[2] For example, convertibility of currency is guaranteed and there is little or no uncertainty about the exchange rate. On the other hand, in times of domestic liquidity crisis, a currency board arrangement cannot act as a lender of last resort. In theory, its reserve currency can only be used to buy local currency or foreign securities. It would be a violation of its basic principle if the reserve were to be used to purchase the assets of a domestic bank suffering from a run.[3] Moreover, since a currency board is a rule-based arrangement, active discretionary monetary policies are precluded. Whether this macroeconomic self-discipline is regarded as an advantage, however, is more controversial.

To assess the viability of adopting currency boards as monetary institutions, we should not satisfy ourselves with theoretical discussions alone. Since they have been in existence for almost one and a half centuries, a more fruitful approach is to analyze rigorously the empirical data generated from actual experience. This literature is generally lacking. In this paper, we shall analyze the macroeconomic implications of a currency board regime using Hong Kong data and methods developed by Blanchard and Quah (1989) and Bayoumi and Eichengreen (1993, 1994). The viability of the regime is also discussed.

In section 15.2 we shall briefly discuss the historical background of Hong Kong's currency board and argue why its experience provides us with a unique natural experiment to evaluate some aspects of the system. In section 15.3 we shall outline the structural vector autoregressive model implemented in this paper. Section 15.4 presents the quantitative results and their interpretations. Section 15.5 summarizes some general properties and implications about currency boards that we have learned from the Hong Kong experience.

2. Williamson (1995) provides a useful summary of the advantages and disadvantages of currency boards.

3. The currency board of Hong Kong is an exception to this rule. There is no formal legislation prohibiting the board from using its foreign exchange to purchase domestic assets, although the board has so far refrained from doing so in a significant way. See the balance sheet in table 15.7. One interpretation is that the legislature provides an "escape clause" under which the board can act as a lender of last resort during financial crises. As long as the escape clause is only invoked in truly exceptional and justifiable situations, it will not jeopardize the credibility of the currency board. See Persson and Tabellini (1990) for an illustration and discussion of escape clause models. See also n. 13 below.

15.2 Historical Background of Hong Kong's Currency Board

The currency system of Hong Kong, following that of China, was based on the silver standard in the nineteenth and early part of the twentieth centuries.[4] In 1934, the United States decided to buy silver at a very high fixed rate, and that led to large outflows of silver from Hong Kong and China. As a result, both governments abandoned the silver standard. In December 1935, Hong Kong enacted the Currency Ordinance, later renamed the Exchange Fund Ordinance, and purchased all privately held silver coins. At the same time, the note-issuing banks, which were private enterprises, had to deposit their silver reserves with the newly created Exchange Fund and received certificates of indebtedness (CIs) in return. The Exchange Fund sold the silver in the London market for sterling. From then on, if an authorized bank wanted to issue more notes, it was obligated to purchase more CIs from the Exchange Fund with sterling at a fixed rate of HK$16 per pound. The Exchange Fund would also buy the CIs from the banks if the latter decided to decrease the money supply. Thus the monetary system had all the features of a currency board, with the exception that legal tenders were issued by authorized private banks rather than directly by the board.

The peg to sterling lasted for more than three decades, despite four years of interruption during World War II. In 1967, because of devaluation of sterling, the HK$16 peg could no longer be sustained. In July 1972 further pressure from the devaluation of sterling forced the eventual abolition of the link between sterling and the HK dollar. The latter was pegged to the U.S. dollar at a rate within an intervention band. This also did not last long. Again devaluation of the U.S. dollar and an inflow of capital to Hong Kong led to the decision to free-float the HK dollar against the U.S. dollar. The currency board system was no longer operating.

Under the free-floating system from 1974 to 1983, authorized banks still had to purchase CIs, which at this time were denominated in HK dollars, from the Exchange Fund if they wanted to issue more notes. The fund maintained an account with these banks. The payment for the CIs was simply a transfer of credit from the banks to the account of the Exchange Fund. Starting from May 1979, the note-issuing banks were required to maintain 100 percent liquid asset cover against the fund's short-term deposits. This cover did not imply that the Exchange Fund could effectively limit the creation of money because the banks could borrow foreign currency to obtain the liquid assets. Money growth in this period was higher and more volatile than before. In 1978, the government also decided to transfer the accumulated HK dollar fiscal surplus to the Exchange Fund, which has since then become the government's de facto savings account.

4. For more details on the historical development of the monetary regime in Hong Kong, see Greenwood (1995), Nugee (1995), and Schwartz (1993).

During the initial phase of the free-floating period, the HK dollar was very strong. However, from 1977 onward, it was subject to considerable downward pressure. The trade deficit was growing. Money supply, M2, increased at the rate of almost 25 percent a year, mainly because of even faster growth in bank credit. The start of Sino-British negotiations over the future of Hong Kong in 1982 led to a series of financial crises: stock market crash, real estate price collapse, runs on small banks, and rapid depreciation of the HK dollar. On 17 October 1983, the government decided to abolish the interest-withholding tax on HK dollar deposits and, more important, to go back to the currency board system. The exchange rate was fixed at U.S.$1 = HK$7.8. Banks issuing notes had to purchase CIs with U.S. dollars at this rate from the Exchange Fund. The reserves accumulated were invested mainly in interest-bearing U.S. government securities. Table 15.1 summarizes the historical evolution of Hong Kong's monetary institutions.

Several new changes to the currency board system of Hong Kong, now popularly known as the "linked exchange rate system," were introduced. In 1988, the Exchange Fund established new "accounting arrangements," which in effect empowered it to conduct open market operations. Legislative changes also allowed the government more flexibility in manipulating interest rates. Since March 1990, the fund was permitted to issue several kinds of "Exchange Fund bills," which were similar to short-term Treasury bills. In 1992, a sort of discount window was opened to provide liquidity to banks. The Hong Kong Monetary Authority (HKMA) was established in December 1992 to take over the power of the Exchange Fund Office and the Commissioner of Banking. The HKMA has since been active in adjusting interbank liquidity in response to changes in demand conditions.

Several remarks should be made here. First, the monetary institution in Hong Kong has not been a static system. In less than half a century, it has evolved from the silver standard, to a currency board with sterling being the reserve currency, then to a free-floating regime, and finally back to a currency board with a U.S. dollar link. More recently, as Schwartz (1993) has observed, there has been some "dilution" of the features that distinguish a currency board. Given historical hindsight, one can hardly believe that the present system will last forever, despite persistent assurances by the Hong Kong government that the linked exchange rate is there to stay permanently. This view is supported by the observation that historically no fixed exchange rate could be sustained for a very long period.[5] This motivates us to simulate in section 15.4.4 the conditions under which the Hong Kong currency board may collapse.

Second, from 1974 to now, Hong Kong has used two polar cases of mon-

5. Eichengreen (1994) casts doubt on the future of any pegged exchange rate regime in the twenty-first century. He predicts that only the two extremes of flexible exchange rate and monetary unification will survive.

Table 15.1 Exchange Rate Regime for the Hong Kong Dollar

Date	Exchange Rate Regime	Reference Rate
Until 4 Nov 1935	Silver standard	
6 Dec 1935	Pegged to sterling	£1 = HK$16
23 Nov 1967		£1 = HK$14.55
6 July 1972	Fixed to U.S. dollar with ±2.25% intervention	U.S.$1 = HK$5.65
14 Feb 1973	band around a central rate	U.S.$1 = HK$5.085
25 Nov 1974	Free float	
17 Oct 1983	Pegged to U.S. dollar	U.S.$1 = HK$7.80

Source: Nugee (1995).

etary systems, namely, free floating (1974–83) and currency board (1983–present). There have been no other economic institutional changes of a comparable order of magnitude. The government still follows the "positive non-interventionism" policy formulated more than two decades ago. It has been persistently keeping the size of the government small and leaving small budgetary surpluses in most fiscal years. It has also refrained from using fiscal policy as a fine-tuning tool. The legal system has remained intact, and Hong Kong's economic freedom has always been rated at the highest level by international agencies. These similarities between the two periods provide us with a relatively homogeneous setting in which to conduct a natural controlled experiment to compare the implications of the two systems.

Third, while structural homogeneity is needed for a controlled experiment on the one hand, sufficiently rich data variation is necessary for statistical purposes on the other. If the economic conditions of the two periods had remained perfectly stable, the data would hardly contain enough information for inferring the macroeconomic performance of the two systems. We need to observe how the two regimes respond to external shocks. Indeed, Hong Kong as a small open economy is extremely sensitive to external shocks, which may overshadow the "treatment effect" of a currency board system. Fortunately, by adopting the approach in Blanchard and Quah (1989), it is possible to isolate the supply and demand shocks during the two periods. Counterfactual simulations can be performed to identify the effects of the change in monetary regime.

Fourth, Hong Kong has gone through a number of major economic shocks from 1974 to now. This period covers the time span of several business cycles. There have also been big swings in real estate and stock markets. The quarterly data available are reasonably rich in variations that allow us to make meaningful inferences.

Last, the economic health and significant financial strength of Hong Kong provide an almost ideal situation to test the vulnerability of a currency board system when it is confronted with a crisis. At the end of 1996, foreign currency assets in the Exchange Fund amounted to U.S.$69.55 billion, the world's seventh largest reserve. The ratio of foreign currency assets in the Exchange Fund to currency in circulation was almost six. The value of the government's accumulated fiscal reserve was also substantial. In fact, it was contributing 27 percent of the Exchange Fund (see HKMA 1997). If simulations show that Hong Kong's currency board will face a crisis when it is subject to shocks of specified magnitude, it is hard to imagine that the currency board in a country with poorer economic health can survive in the same scenario.

15.3 Empirical Model

In this section, we discuss a framework that will be used to compare the macroeconomic performances of the flexible and linked exchange rate regimes when they are subject to exogenous shocks. To properly take into account the heterogeneity induced by these shocks, we adopt Blanchard and Quah's (1989) approach to identify them explicitly.

Our empirical framework is the structural vector autoregression (VAR) model initiated by Blanchard and Watson (1986), Sims (1986), and Bernanke (1986). Following Blanchard and Quah (1989) and Bayoumi and Eichengreen (1993, 1994), we formulate a bivariate model in output growth and inflation rate to identify two series of structural shocks: (1) those that have only transitory effects on the output level and (2) those that have permanent effects on the output level. Shocks of the first type are interpreted as demand shocks originating from innovations in the components of aggregate demand, while the second type are supply shocks originating from innovations in productivity and other factors that affect aggregate supply. This distinction is crucial for solving the identification problem discussed below. We now briefly describe the model and refer the reader to the above references and the surveys in Giannini (1992) and Watson (1994) for details.

Let $X_t = (\Delta y_t, \Delta p_t)'$, where y_t and p_t denote the logarithms of output and price level, respectively. X_t is assumed to be covariance stationary and have a moving average representation of the form

$$(1) \qquad X_t - \mu = B_0 e_t + B_1 e_{t-1} + B_2 e_{t-2} + \cdots \equiv B(L)e_t,$$

where $e_t = (e_{dt}, e_{st})'$ is a bivariate series of serially uncorrelated shocks with zero mean and covariance matrix Ω, $B(L) = B_0 + B_1 L + B_2 L^2 + \cdots$ is shorthand notation for the matrix polynomial in backshift operator L, and μ is the mean of X_t. Equation (1) is taken to be structural in that e_{dt} and e_{st} have behavioral interpretations as the demand shock and supply shock, respectively. The coefficient matrices in $B(L)$ capture the propagation mechanism of the dynamic system. In particular, the (i, j) element of B_k is the kth-step impulse response of the ith endogenous variable with respect to a one unit increase in the jth shock.

Equation (1) is not directly estimated. We proceed in the following steps. First, we estimate a VAR in X_t:

$$(2) \qquad A(L)(X_t - \mu) = u_t,$$

where $\{u_t\}$ is a bivariate series of serially uncorrelated errors with zero mean and covariance matrix Σ and $A(L)$ is a matrix polynomial in L. Second, we invert the estimated autoregressive polynomial in equation (2) to obtain the Wold moving average representation, which is the reduced form of equation (1):

$$(3) \qquad X_t - \mu = u_t + C_1 u_{t-1} + C_2 u_{t-2} + \cdots \equiv C(L)u_t.$$

Again, $C(L) = I + C_1 L + C_2 L^2 + \cdots$ is shorthand for the matrix polynomial as stated. In our implementation the reduced form VAR is estimated with six lags and the Wold representation in equation (3) is expanded up to 200 lags, which is more than adequate. Given estimates of the reduced form parameters $C(L)$ and Σ and the reduced form residuals u_t, is it possible to recover the structural parameters $B(L)$ and Ω and the structural residuals e_t? This is a classical identification problem in simultaneous equations models, and the answer is yes provided that enough a priori restrictions have been placed on the structural parameters. By comparing equations (1) and (3) it can be checked that the structural and reduced forms are related by the following relationships:

$$(4) \qquad B_0 e_t = u_t, \quad \text{for all } t,$$

$$(5) \qquad B_j = C_j B_0, \quad j = 0, 1, 2, \ldots,$$

$$(6) \qquad B_0 \Omega B_0' = \Sigma.$$

Equations (4) and (5) imply that the structural form in equation (1) can be recovered from the reduced form in equation (3) once B_0 is determined. Thus the identification problem boils down to imposing sufficiently many restrictions so that B_0 can be solved from equation (6).

In our bivariate system, there are seven structural parameters in B_0 and Ω, but only three reduced form parameters in Σ; we thus need four restrictions to just-identify the structural model. The first three restrictions come from assuming Ω to be the identity matrix. The zero-covariance restriction dictates that the two structural shocks are uncorrelated, implying that any cross-equation interaction of the two shocks on the dependent variables is captured by the lag structure in $B(L)$. The two unit-variance restrictions imply that B_0 is identified up to multiples of the two standard deviations. Thus B_j has the interpretation of being the jth-step impulse response with respect to a one standard deviation innovation in the structural shocks. The last restriction comes from Blanchard and Quah's (1989) idea of restricting the long-run multiplier. Since demand shocks are assumed to have no permanent effects on output level, this translates into the restriction that the long-run multiplier (i.e., the sum of impulse responses) of demand shocks on output growth must be zero; that is,

$$(7) \qquad B_{11}(1) \equiv B_{11,0} + B_{11,1} + B_{11,2} + \cdots = 0,$$

where $B_{11}(1)$ and $B_{11,j}$ are the upper left-hand corners of $B(1)$ and B_j, respectively.

To see how equation (7) can be translated into a restriction on B_0, let J be the lower triangular Cholesky factor of Σ and notice that equation (6) can be written as (after assuming Ω = I)

(8) $$B_0 B_0' = \Sigma = JJ'.$$

Thus B_0 can be determined from J up to an orthogonal transformation S; that is,

(9) $$B_0 = JS, \qquad SS' = I.$$

Orthogonality implies that S (up to one column sign change) must be of the form

(10) $$S = \begin{bmatrix} a & \sqrt{1 - a^2} \\ \sqrt{1 - a^2} & -a \end{bmatrix}.$$

Equations (5) and (9) imply

(11) $$B(1) = C(1)B_0 = HS, \qquad H = C(1)J.$$

Equation (7) then implies a restriction

(12) $$H_{11}a + H_{12}\sqrt{1 - a^2} = 0,$$

which determines a and hence S. Once S is found, B_0 can be determined by equation (9). Given B_0, the structural parameters and the structural shocks can then be recovered from the reduced form via equations (4) and (5).

The output and price data are quarterly Hong Kong real per capita GDP (in 1990 prices) and the corresponding GDP deflator from 1975:1 to 1995:3, taken from various issues of *Estimates of Gross Domestic Product* and *Hong Kong Monthly Digest of Statistics,* published by the Hong Kong government.[6] Both output and price series exhibit strong seasonality, and they are deseasonalized before use by a spectral method by Sims (1974) and implemented in Doan (1992, sec. 11.7). The full sample is divided into two halves corresponding to the two exchange rate regimes: the free-floating period straddles 1975:1–83:3 and the currency board period covers 1983:4–95:3.

15.4 Results and Interpretations

In this section, we present the empirical results and interpret them. In particular, we use these results to compare the macroeconomic performance of the free-floating and currency board regimes from several perspectives.

6. Hong Kong Census and Statistics Department (1995, various issues-b). Quarterly population figures are obtained by log-linearly interpolating the annual data.

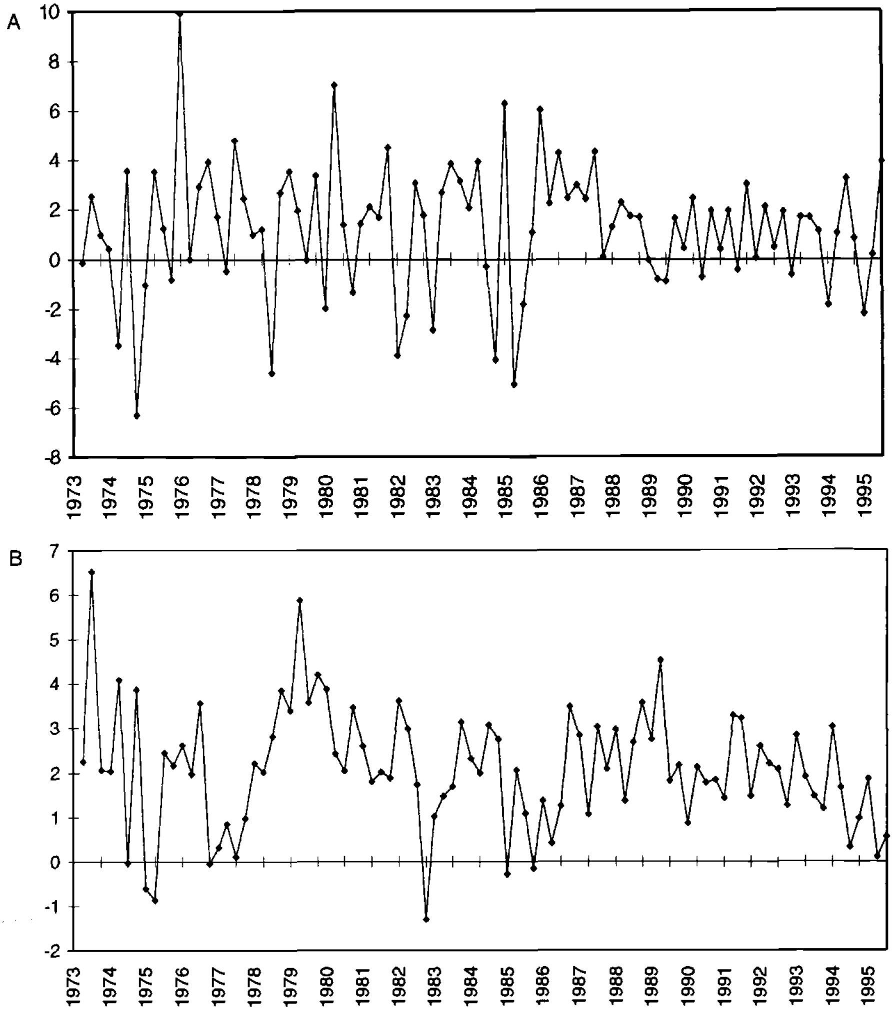

Fig. 15.1 Macroeconomic performance data

Note: *A*, per capita real GDP growth rate (percent). *B*, inflation rate (percent).

15.4.1 Institutional Effect or Environmental Effect?

Figure 15.1 displays the data for the full sample period, covering both the free-floating and currency board regimes. It can be seen that both inflation and output growth are somewhat more stable during the currency board years than in the free-floating years. More precisely, the standard deviations of output growth rates during the free-floating and currency board years are 2.94 and 2.23, respectively, and those of the inflation rates are 1.55 and 1.05, respectively.

Table 15.2 Summary Statistics of Vector Autoregression Estimation

	VAR 1: (Free Floating)		VAR 2: Currency Board	
Statistic	Output Growth Rate	Inflation Rate	Output Growth Rate	Inflation Rate
R^2	0.35	0.53	0.35	0.43
D.W.	1.7	1.58	2.01	1.97
Ljung-Box Q	[0.42]	[0.88]	[0.86]	[0.12]
Overall significance[a]	[0.01]		[0.001]	
Data range	1975:1–83:3		1983:4–95:3	

Note: Numbers in brackets are p-values.

[a]Reports the p-value of a likelihood ratio test for the null hypothesis that all regressors in the system (except the constant terms) are zero.

What is behind the observed reduction in volatility in both output growth rates and inflation rates? Some believe that this simply reflects a more congenial international environment during the 1980s than in the 1970s. On the other hand, advocates of fixed exchange rates and currency boards, including the Hong Kong government, sometimes argue that this is due to the inherent superiority of the linked exchange rate regime over the free-floating system (e.g., see Sheng 1995). Granted that both arguments are reasonable and neither can be rejected a priori, it is then necessary to disentangle the "institutional effect" from the "environmental effect." In our structural VAR model, the structural parameters B_j play the role of institution, and the structural shocks u_t represent the external environment. By estimating two separate structural models for the two exchange rate regimes, we obtain two sets of structural parameters representing two institutions and two sets of shocks representing two different external environments. We show below that both the parameters and the shocks have changed.

Table 15.2 reports the summary statistics of the estimations for equation (1) in section 15.3 under the free-floating and currency board regimes. It can be seen that they are statistically significant at the 0.01 and 0.001 levels, respectively. The estimated parameters for the structural equation (1) are different across the two regimes. This is evident from a likelihood ratio version of the Chow test, which rejects the null hypotheses of no structural change at the 5 percent level.[7] The result supports the Lucas critique. We need to use a different set of structural parameters to capture the institutional effect due to a change in the monetary regime. It is assumed, however, that these parameters are invariant under exogenous shocks.

Figure 15.2 presents the quarterly demand and supply shocks (1975–95) that

7. The likelihood ratio statistic LR $= -2(\ln L_0 - \ln L_1 - \ln L_2) = -2(699.76 - 291.85 - 428.66) = 41.5$ rejects the null hypothesis of no structural change at the 5 percent level according to a chi-squared distribution with 26 degrees of freedom. The terms $\ln L_0$, $\ln L_1$, and $\ln L_2$ are the log likelihood values of the VARs estimated by using the full sample (1975:1–95:3), the free-floating period (1975:1–83:3), and the currency board period (1983:4–95:3), respectively.

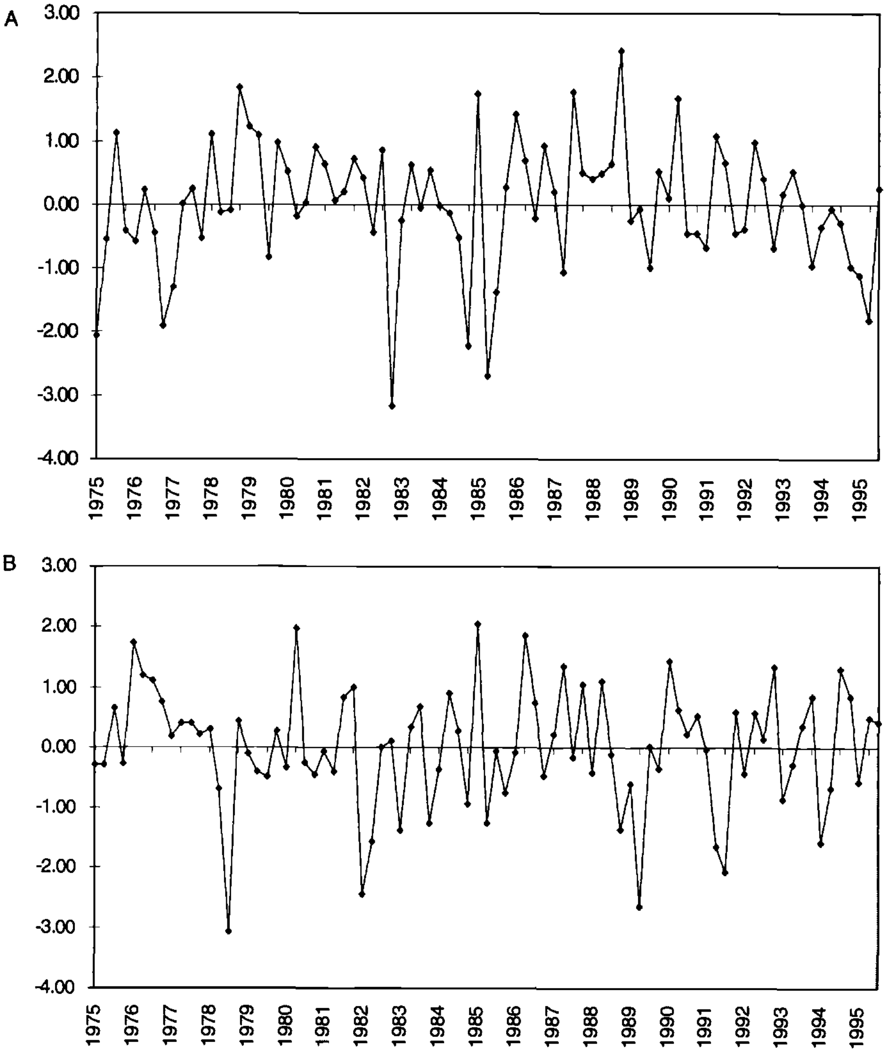

Fig. 15.2 Demand (*A*) and supply (*B*) shocks

are identified by using the econometric framework in section 15.3. Table 15.3 reports summary statistics for the shocks. By the skewness and kurtosis tests, one can observe that both types of shocks during the free-floating period exhibit substantial nonnormality, which can be attributed to a few large negative shocks. The skewness of the shocks can be clearly discerned from their empirical distributions, depicted in figure 15.3.[8] Shocks during the currency board

8. The empirical distribution is obtained by matching the first four sample moments with a Gram-Charlier expansion. See Johnson and Kotz (1970, 15–20).

Table 15.3 Characteristics of Structural Disturbances

	Demand Shocks		Supply Shocks	
Characteristic	Free Floating	Currency Board	Free Floating	Currency Board
Skewness	−1.01 [0.003]	−0.18 [0.57]	−0.91 [0.008]	−0.31 [0.34]
Kurtosis	4.50 [0.03]	3.47 [0.38]	4.69 [0.01]	2.91 [0.95]
Maximum	1.84	2.40	1.97	2.04
Minimum	−3.17	−2.69	−3.06	−2.64

Notes: Skewness $(b_1^{1/2}) = m_3/m_2^{3/2}$ and kurtosis $(b_2) = m_4/m_2^2$, m_k is the *k*th sample moment around the mean. Numbers in brackets are *p*-values for testing either population skewness = 0 (symmetry) or kurtosis = 3 (normal shape).

For testing symmetry, Fisher's test statistic $\xi = x\,(1 + 3/n + 91/4n^2) - (3/2n)(1 - 111/2n)(x^3 - 3x) - (33/8n^2)(x^5 - 10x^3 + 15x)$ is approximately distributed as $N(0,1)$ under the null hypothesis, where $x = b_1^{1/2}(n - 1)/[6(n - 2)]^{1/2}$ and n is the sample size. The approximate normality is very accurate even in a small sample, see Kendall and Stuart (1958, 298).

For testing kurtosis = 3, the test statistic $z = y[(n - 1)(n - 2)(n - 3)/24n(n + 1)]^{1/2}$ is approximately distributed as $N(0,1)$ under the null hypothesis, where $y = [n^2/(n - 1)(n - 2)(n - 3)][(n + 1)m_4 - 3(n - 1)m_2^2]/s^4$ and s is the sample standard deviation (with divisor $n - 1$). See Kendall and Stuart (1958, 305–6).

period, on the contrary, show no strong evidence against normality, as is clear from the skewness and kurtosis tests and their empirical distributions.

This indicates that the two exchange rate regimes are subject to exogenous shocks of different characteristics. Simply comparing the macroeconomic performance in the two periods without properly controlling for the environmental effect can be misleading. This forces us to use better methods.

15.4.2 Variance Decomposition and Impulse Response Functions

The relative importance of demand and supply shocks changes dramatically across the two exchange rate regimes. This is demonstrated by the results on variance decomposition of the shocks and the estimated values of the impulse responses.

Table 15.4 shows the percentages of variance in output growth rate and inflation that can be explained by the demand shocks in the last n quarters, where n is the number in the extreme left-hand column. The percentages explained by the supply shocks are given by 100 minus the table entries. Table 15.5 is similar to table 15.4 but shows the variance in output level and price level explained. As can be readily seen, during the free-floating regime, demand shocks explain little of the variations in output growth and level, but a substantial fraction of inflation or price movements.[9] On the other hand, supply shocks can account for most of the output changes, but little of the price fluctuations.

9. The values in the "output level" columns of table 15.5 decline when n becomes larger. This is because the variance of output level explained by demand shocks must converge to zero in the long run. Readers are reminded that in section 15.3, we have built in the identifying restriction that demand shocks have no long-term effects on output level.

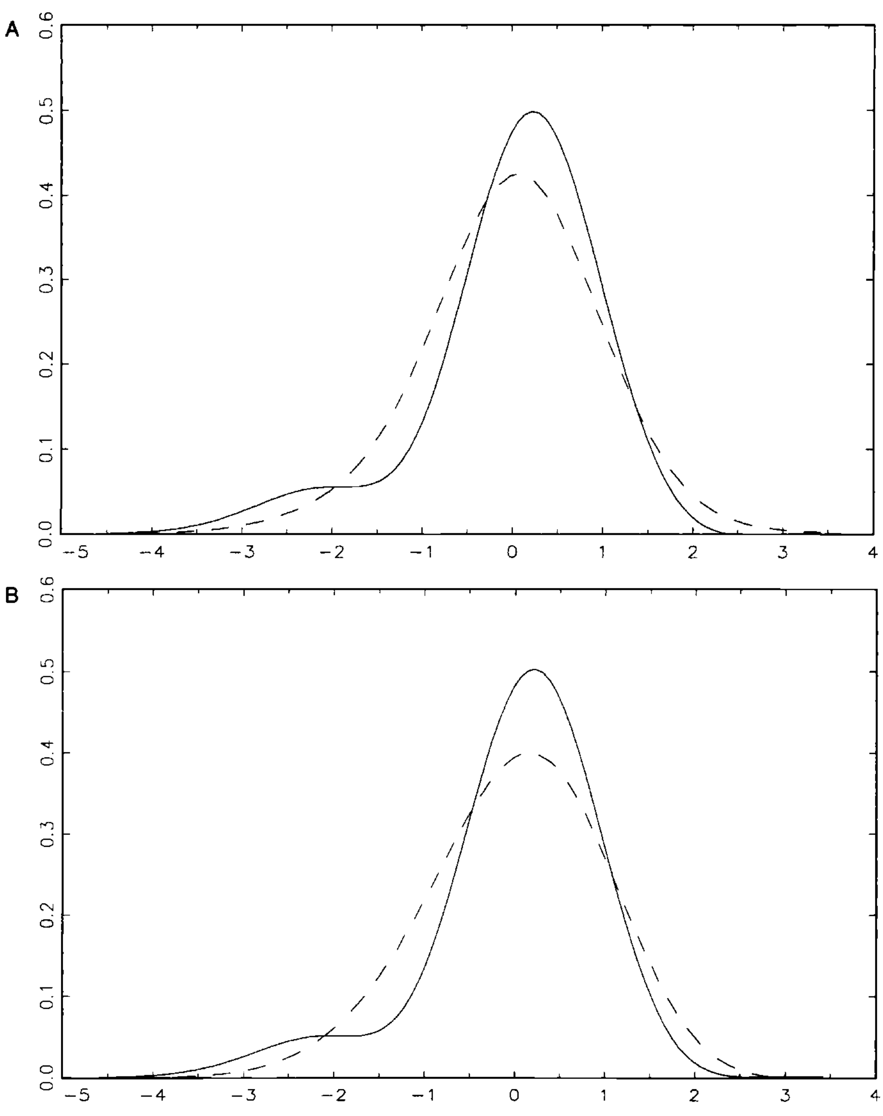

Fig. 15.3 Density functions of demand (*A*) and supply (*B*) shocks
Note: Free-floating period (*solid line*) and currency board period (*dashed line*).

In the currency board regime, the results are different. Demand shocks can explain much of the variations in the output and price series, at least in the short run. The movements explained by the supply shocks are also substantial.

The dynamic impulse responses of output and price with respect to demand shocks are consistent with the variance decomposition results above. In figure 15.4, the impulse responses, or cumulative effects of demand shocks on output

Table 15.4 Percentage of Forecast Error Variance Explained by Demand Shocks

	Output Growth Rate		Inflation Rate	
Quarter	Free Floating	Currency Board	Free Floating	Currency Board
1	0.66	67.16	96.57	16.71
4	9.62	57.71	86.40	37.79
8	9.25	62.61	82.38	37.52
12	9.63	63.65	82.05	38.78
16	9.76	62.70	81.83	39.10
20	9.75	62.78	81.83	39.21
24	9.76	62.80	81.79	39.27
28	9.77	62.81	81.79	39.28
32	9.77	62.81	81.79	39.29

Note: The corresponding percentages explained by supply shocks are given by 100 minus the table entries.

Table 15.5 Percentage of Forecast Error Variance Explained by Demand Shocks

	Output Level		Price Level	
Quarter	Free Floating	Currency Board	Free Floating	Currency Board
1	0.002	80.44	99.94	8.28
4	0.124	73.51	99.99	74.38
8	0.050	33.06	99.87	86.20
12	0.024	16.18	99.45	84.55
16	0.013	9.21	99.20	83.16
20	0.008	5.65	99.12	83.45
24	0.005	3.79	99.00	83.37
28	0.004	2.72	98.88	83.09
32	0.003	2.03	98.80	83.02

Note: The corresponding percentages explained by supply shocks are given by 100 minus the table entries.

and price during the last n quarters, are plotted against n.[10] The response of output is both smaller and shorter in duration under the flexible exchange regime. On the other hand, the response of price level under the currency board regime is smaller than that under the free-floating system.

Figure 15.5, depicts the impulse responses of output and price to supply shocks, respectively. The effects of supply shocks on price level across the two regimes are negative, a result consistent with simple economics. The impact of supply shocks on price level in the currency board regime appears to be bigger than that under the free-floating regime. Supply shocks, however, have smaller effects on output during the currency board years. These results are also consistent with the patterns in variance decomposition.

10. The magnitude of the demand shock in each period is one standard deviation.

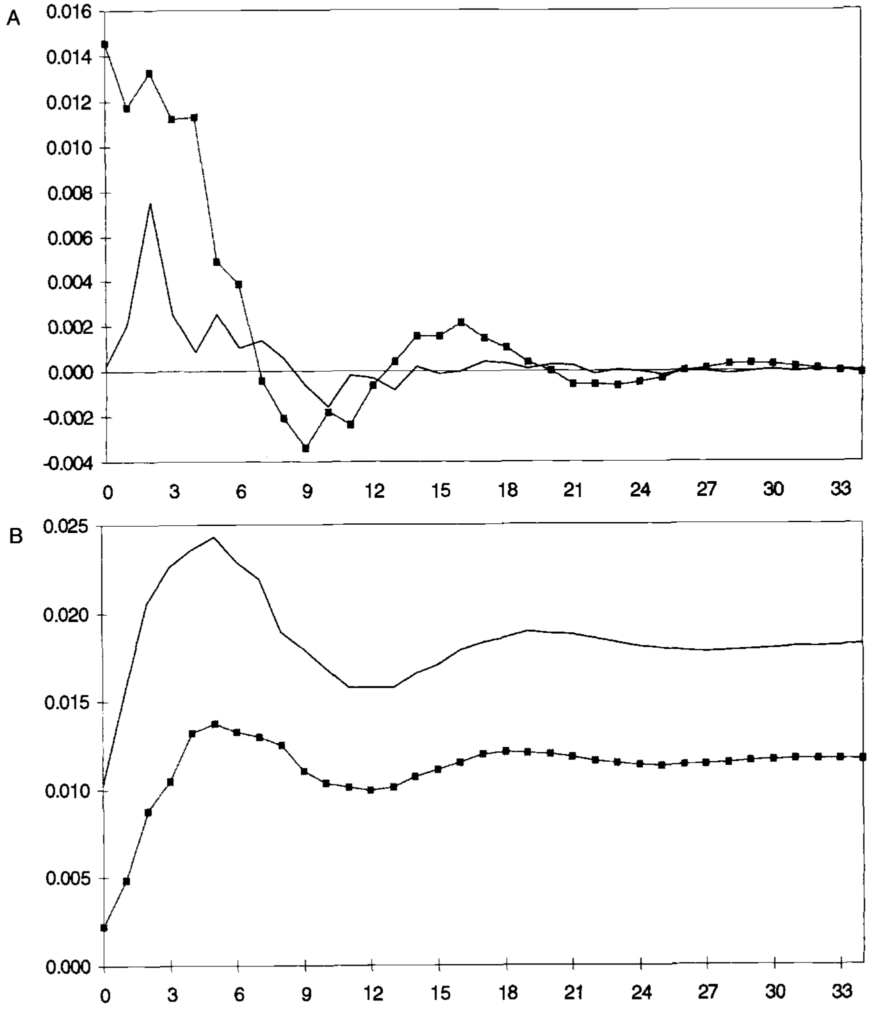

Fig. 15.4 Response to demand shocks: output (*A*) and price (*B*)
Note: Free-floating period (*plain line*) and currency board period (*boxed line*).

What can we draw from the variance decomposition and impulse response exercises? In fact, the results can be interpreted in a convenient way. The aggregate supply curve during the free-floating years is very steep. It flattens in the subsequent period. The aggregate demand curve, on the other hand, has a relatively flat slope under the free-floating regime. It steepens in the currency board years. These changes in the slope explain why the Chow test detects a structural shift in the model.

Why has the aggregate supply curve, or more properly, the short-run supply curve, flattened over time? Bayoumi and Eichengreen (1994) discovered a sim-

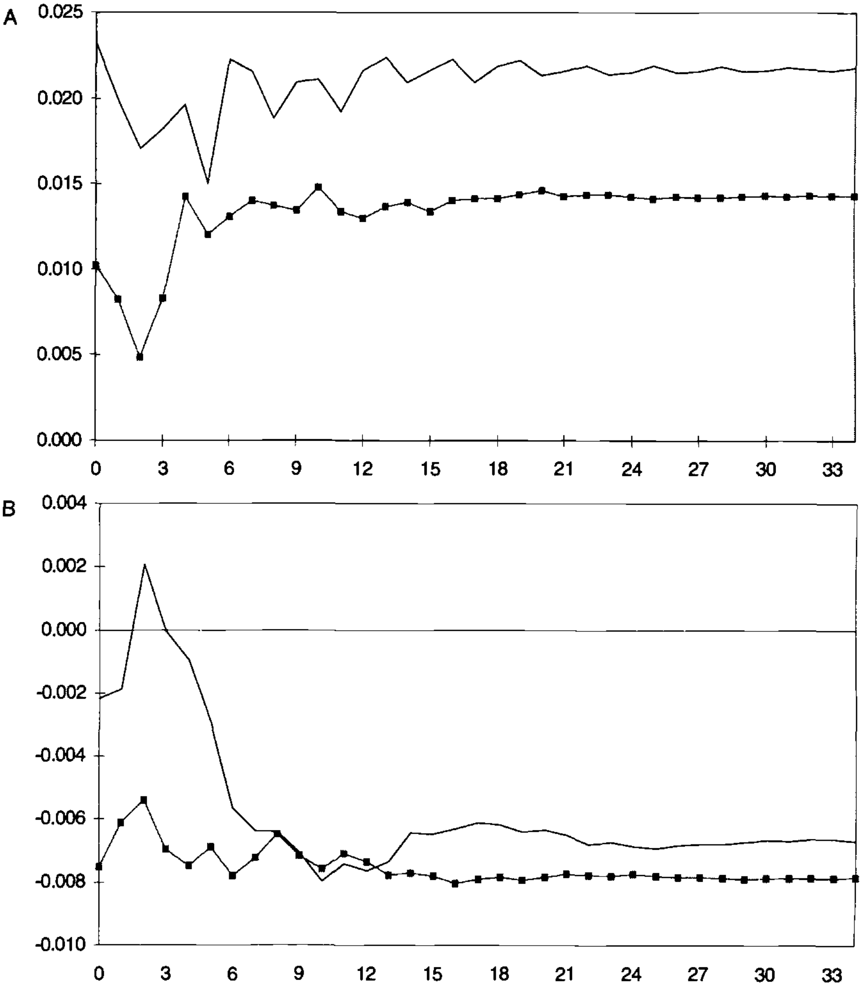

Fig. 15.5 Response to supply shocks: output (*A*) and price (*B*)
Note: Free-floating period (*plain line*) and currency board period (*boxed line*).

ilar pattern for the industrial countries over the past hundred years. The explanation does not necessarily lie in the adoption of a currency board. After all, during part of the sample period studied by Bayoumi and Eichengreen, countries were moving from fixed exchange to free floating, while Hong Kong was heading in the opposite direction. The flattening of the short-run aggregate supply curve indicates that there are more nominal rigidities. Probably the latter are due to increases in labor legislation and union influences in Hong Kong since the 1980s.[11]

11. A number of laws on labor protection have been introduced since the 1980s. These range from long-service payment, severance compensation, leaves for pregnant female workers, etc.

The steepening of the aggregate demand curve under the currency board can be usefully analyzed by a simple textbook model (Sachs and Larrain 1993, chaps. 13 and 14). In a fixed exchange rate regime, an increase in the domestic price will hurt exports and increase imports. The underlying *IS* curve of the economy will shift to the left. Since a small open economy has to face a given world interest rate, the *LM* curve will have to adjust endogenously so that it intersects the *IS* curve at the level equal to the world interest rate. The decline in output due to the increase in price, and hence the slope of the aggregate demand curve, is therefore completely determined by the magnitude of the movement of the *IS* curve. In the case of a free-floating regime, an increase in price causes the *LM* curve to move to the left. The changes in the exchange rate and price will then lead to an adjustment of the *IS* curve so that it intersects the *LM* curve at an interest rate equal to the prevailing world interest rate. This time the slope of the aggregate demand curve depends on how responsive the *LM* curve is to an increase in price. In general, the slope of the aggregate demand curve under a currency board can be either steeper or flatter than that under a free-floating system, depending on the relative responsiveness of the *IS* and *LM* curves to a change in price level. It appears that the *IS* curve in Hong Kong is not as sensitive to price change as the *LM* curve. Thus the aggregate demand curve is steeper under the currency board regime.[12]

We can draw the following conclusions from the results above. Output in Hong Kong under a currency board seems to be less susceptible to supply shocks, which are usually not induced by government short-term policies. However, demand shocks do cause greater short-term volatility in output under the currency board system. If a government with a currency board is able to discipline itself to pursue a stable and predictable fiscal policy, the volatility of the economy may be lower than that under a free-floating system. An explanation of why Hong Kong's economy has been less volatile after the adoption of the linked exchange rate is that stable fiscal policy has always been the philosophy of the financial branch of its government.

15.4.3 Counterfactual Simulations

As discussed in subsection 15.4.1, the two periods under consideration are subject to shocks with different properties. One way to compare the performance of the two regimes is to consider the following two cases:

Case 1. What would have happened to the economy if the currency board system were adopted from 1975 to 1983?

Case 2. What would have happened to the economy if the free-floating system were adopted from 1983 to 1995?

To answer the question in case 1, we apply the demand and supply shocks of 1975–83 to equation (1) estimated for the currency board regime and com-

12. It can be shown by a simple calibrated model that the *IS* curve in Hong Kong is not as responsive to price change as the *LM* curve.

Table 15.6 Counterfactual Simulations

	Output Growth Rate (%)		Inflation Rate (%)	
Case	Mean	Standard Deviation	Mean	Standard Deviation
Case 1: 1975–83				
Actual (free floating)	1.54	2.94	2.07	1.55
Simulated (currency board)	1.27	2.46	1.82	1.21
Case 2: 1983–95				
Actual (currency board)	1.22	2.23	1.94	1.05
Simulated (free floating)	1.51	2.79	2.13	1.36

pare the simulated results with the actual time path. To answer the question in case 2, we do the simulations in a similar way, but this time we apply the shocks of 1983–95 to equation (1) for the free-floating regime. The approach is based on the assumption that the supply and demand shocks identified in the estimation procedure of section 15.3 are invariant under change in exchange rate regime. This exogeneity assumption makes a lot of sense for Hong Kong. In this small open economy whose external sector is much larger than its GDP, most supply and demand shocks are external. The government has been following the same stable fiscal policy throughout the two periods under consideration. Moreover, there is no central bank in Hong Kong to determine the money supply, which is largely rule based in both regimes and automatically adjusts to external shocks. Thus there is no a priori reason to believe that the supply and demand shocks are regime dependent.

The counterfactual exercise amounts to replacing the structural residual e_t in equation (1) with a hypothetical residual e_t^* and then simulating a new data path X_t^*, given structural parameters μ and $B(L)$. For example, in case 1, e_t, μ, and $B(L)$ are the residual and structural parameters for the free-floating regime, while e_t^* is taken to be the residual for the currency board regime. In practice, however, the moving average representation in equation (1) is difficult to work with. We instead perform the simulation by equation (2) with a reduced form residual u_t^* constructed from e_t^* via equation (4). It is straightforward to check that our two-step procedure is equivalent to a direct simulation of equation (1).

Summaries of these counterfactual simulations are presented in table 15.6. The results show that if the currency board system were adopted in the first period, the average growth rate would have declined, but inflation would have gone down also. Since the standard deviations are also lower, we can say that both output growth and inflation would have been more stable. The patterns for the second period are similar. The cost of a currency board system is lower output growth. However, there are also benefits. The inflation rate decreases, and the economy is less volatile. The trade-off is transparent when the comparison is in terms of levels (rather than growth rates) as depicted in figures 15.6 and 15.7.

The counterfactual simulations disentangle the effects of regime shift and

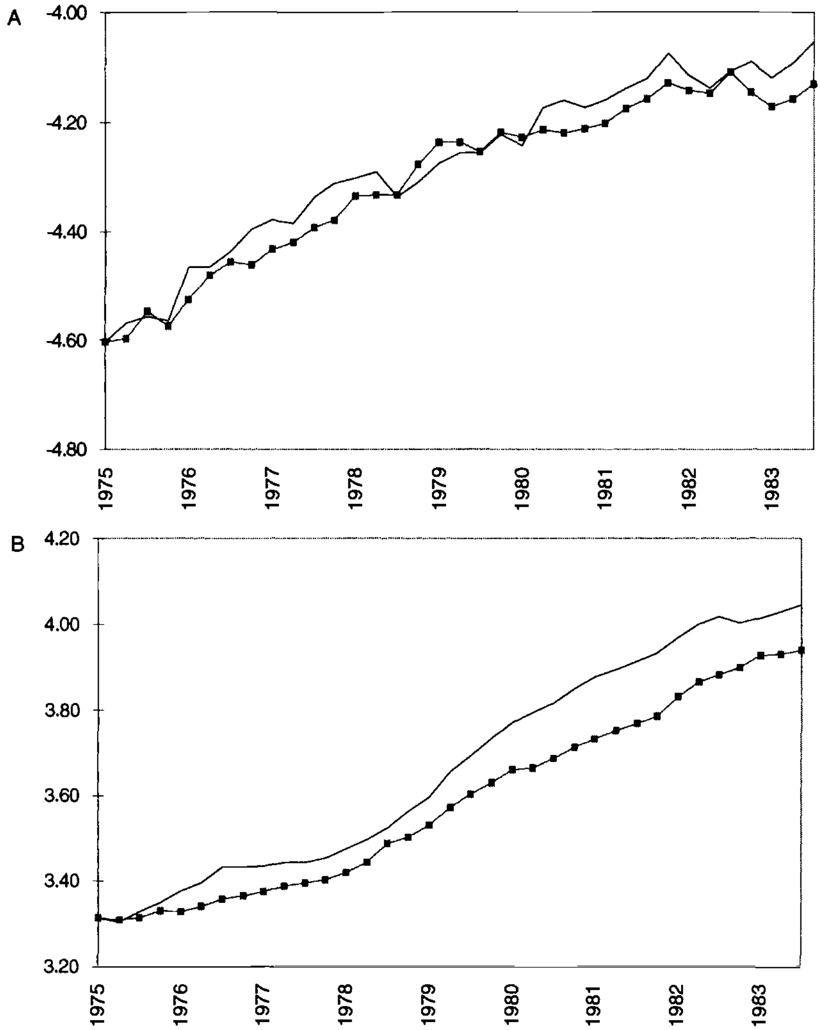

Fig. 15.6 Case 1: output (*A*) and price (*B*) levels (in log)
Note: Actual (free floating; *plain line*) and simulated (currency board; *boxed line*).

changes in the external environment. As an example, consider the reduction in output growth volatility when the monetary system changes from free floating to currency board. The standard deviation of output growth rates goes down from 2.94 to 2.33, a roughly 32 percent reduction in volatility. From simulation case 1, we see that if the currency board system were adopted in the environment of the 1970s, output volatility would have declined to 2.46, a 20 percent reduction from 2.94. This implies that 62.5 percent of the reduction in output volatility that we actually observe from the data is due to the adoption of the

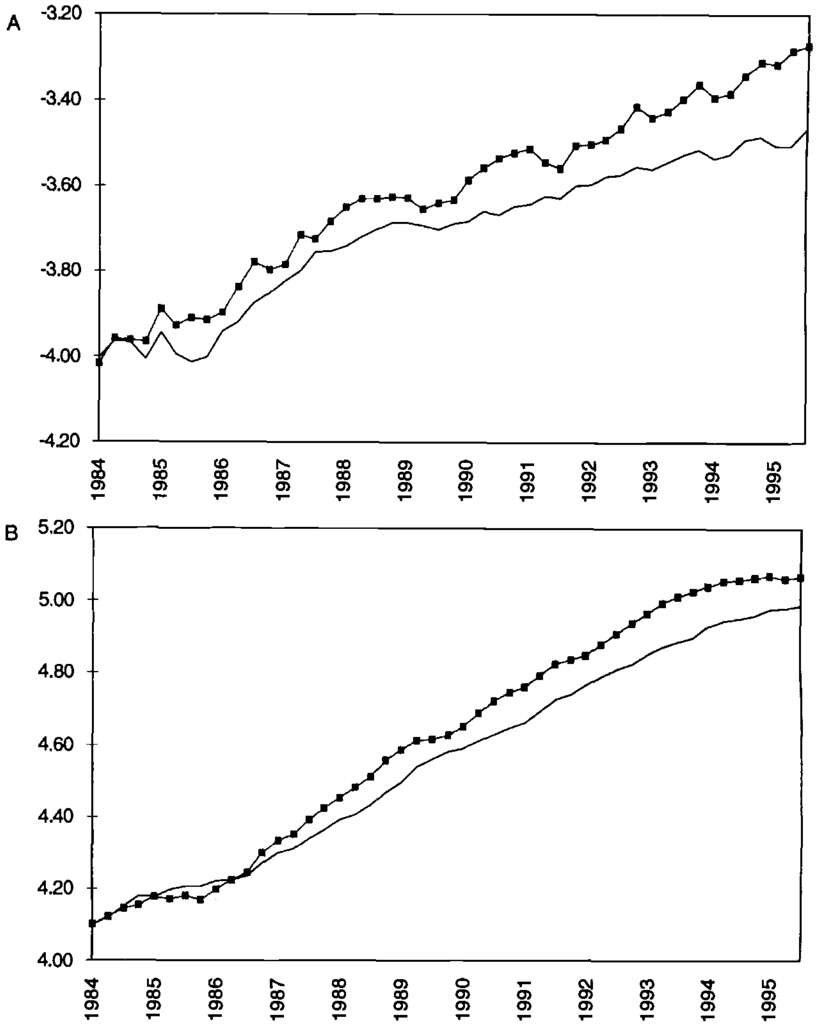

Fig. 15.7 Case 2: output (*A*) and price (*B*) levels (in log)
Note: Actual (currency board; *plain line*) and simulated (free floating; *boxed line*).

currency board, while the remaining 37.5 percent is due to a more tranquil external environment in the 1980s. Similarly, the marginal effect of the currency board on inflation volatility is to reduce it from 1.55 to 1.21, or about 28 percent. The observed reduction, however, is from 1.55 to 1.05, or a decline of 48 percent. One can then make the following decomposition. The difference in external environment during the 1970s and 1980s accounts for 42 percent of the reduction in inflation volatility, while the change in the monetary regime explains the remaining 58 percent of the reduction.

15.4.4 Currency and Banking Crises

The Hong Kong government has been vehemently claiming that the Exchange Fund is financially strong and the linked exchange rate will be defended. As can be seen from the balance sheet of the fund in table 15.7, Hong Kong indeed owns one of the largest foreign reserves in the world. Does it mean that the HK$7.8 link is immune to crisis? In theory, because of the 100 percent backup, a crisis would not occur even if people exchanged all the currency for foreign assets. However, one should note that at the end of 1996, total M3 equaled HK$2,586 billion, more than five times the foreign currency assets in the fund. Of this M3, 41.2 percent is in bank deposits denominated in foreign money (see HKMA 1997). Suppose people decide to change the portfolio of M3 by exchanging HK dollar deposits for foreign money. If the change is big enough, the banking sector must sell its domestic assets for foreign money to avoid bank runs. It is not clear whether the fund is willing to buy these domestic assets. However, the Exchange Fund Ordinance does allow the financial secretary the flexibility to do so even though Hong Kong's monetary institution is a currency board.[13] Suppose the Exchange Fund will indeed provide the foreign liquidity to avoid bank runs. If people decide to increase their foreign exchange holdings from 41.2 to 47.9 percent of M3, the accumulated earnings in the balance sheet of the fund will disappear. If the foreign deposits ratio goes up further to 53.5 percent, the entire fiscal reserve will also be used up.[14]

These rather simplistic calculations tell us that a run on the HK dollar could occur even when the change in people's portfolio holdings is not exceptionally big. We do not have an estimate of portfolio holdings as a function of other variables. However, one can reasonably speculate that the confidence in the HK dollar will suffer significantly and the link will face a crisis if the fiscal reserve is completely used up.

The amount of fiscal reserve is affected by shocks to the economy. Since the Hong Kong government has been following a reasonably stable fiscal policy, we focus our attention here on supply shocks. How big are the supply shocks if the fiscal reserve is to be eliminated? This can be answered by making use of the empirical estimates in this paper.

The long-run impulse response of the logarithm of $y(t)$ with respect to a supply shock of one standard deviation is 0.0143. This means that a one-

13. The Exchange Fund Ordinance, Section 3(2), states, "The Fund, or any part of it, may be held in Hong Kong currency or in foreign exchange or in gold or in silver or may be invested by the Financial Secretary in such securities or other assets as he, after having consulted the Exchange Fund Advisory Committee, considers appropriate" (HKMA 1994, 51). See also n. 3 above.

14. After 1 July 1997, the money accumulated in the Land Fund will be handed over to the Hong Kong Special Administrative Region Government. This fund, which amounts to roughly HK$120 billion, is generally regarded as part of the fiscal reserves of Hong Kong. Thus the financial strength backing up the Hong Kong dollar could be further enhanced. China also promises to use its own foreign reserves to support the HK dollar in case of emergency.

Table 15.7 **Exchange Fund Balance Sheet (millions of HK dollars)**

	1989	1990	1991	1992	1993	1994	1995	1996
Assets								
Foreign currency assets	149,152	192,323	225,333	274,948	335,499	384,359	428,547	493,802
HK dollar assets	9,625	3,874	10,788	12,546	12,987	24,126	32,187	40,715
Total	158,777	196,197	236,121	287,494	348,486	408,485	460,734	534,517
Liabilities								
Certificates of indebtedness	37,191	40,791	46,410	58,130	68,801	74,301	77,600	82,480
Fiscal reserve account	52,546	63,226	69,802	96,145	115,683	131,240	125,916	145,898
Coins in circulation	2,012	2,003	2,299	2,559	2,604	3,372	3,597	4,164
Exchange Fund bills and notes	0	6,671	13,624	19,324	25,157	46,140	53,125	83,509
Balance of banking system	978	480	500	1,480	1,385	2,208	1,762	474
Other liabilities	1,603	391	4,834	3,220	7,314	22,614	38,600	45,130
Total	94,330	113,562	137,469	180,858	220,944	279,875	300,600	361,655
Accumulated earnings	64,447	82,635	98,652	106,636	137,542	128,610	160,134	172,862

Sources: HKMA (1994, 1995, 1997).

Table 15.8 **Postshock Output Level (percent of preshock output)**

Duration (quarters)	Size of Negative Supply Shock (in standard deviations)			
	1	2	3	4
1	98.6	97.1	95.7	94.3
2	97.2	94.4	91.6	88.9
3	95.8	91.7	87.7	83.8
4	94.4	89.0	83.9	79.0
5	93.1	86.5	80.3	74.5
6	91.7	84.0	76.9	70.2
7	90.4	81.6	73.6	66.2
8	89.1	79.3	70.4	62.4

standard-deviation shock will reduce output permanently by 1.43 percent, other things being equal. Thus we can calculate the postshock output level $y(t)^*$ by the formula

$$y(t)^* = (1 - 0.0143x)y(t)$$

for a supply shock of x standard deviations. Similarly, for K periods of negative supply shocks, each of size x, the postshock output level should be

$$y(t)^* = (1 - 0.0143x)^K y(t).$$

In table 15.8, we calculate the percentages, $100(y(t)^*/y(t))$, for $x = 1, 2, 3, 4$ and $K = 1, 2, \ldots, 8$. From data for 1985–94, the average ratios of total government expenditure and revenue to GDP are 16 and 16.8 percent, respectively (see Hong Kong Census and Statistics Department, various issues-a). We assume that the revenue ratio is fixed. Postshock revenue is

$$0.168y(t)^* = [0.168(1 - 0.0143x)^K]y(t).$$

Thus the effect of the supply shock on revenue is equivalent to a "tax cut," with the new effective tax rate being the term inside the brackets above. The effect is shown in table 15.9. From GDP data, we can infer that each percentage point decline in the revenue-output ratio will reduce revenue by HK$12 billion. Making use of table 15.8, one can come up with results in different scenarios. For example, if there are negative three-standard-deviation supply shocks lasting for two years, the loss in revenue every year will be approximately HK$51.6 billion. It only takes about three years for the fiscal reserve to be completely depleted if political pressures prohibit the government from reducing its expenditures accordingly. Since major historical changes in Hong Kong's future are upcoming, large negative supply shocks or perhaps even significant structural shifts in the transition period cannot be ruled out. The stability of the currency board system in the future has yet to be tested.

Currency crises can lead to bank runs. But bank runs can occur for other

Table 15.9 **Postshock Effective Revenue-Output Ratio (percent)**

Duration (quarters)	Size of Negative Supply Shock (in standard deviations)			
	1	2	3	4
1	16.6	16.3	16.1	15.8
2	16.3	15.9	15.4	14.9
3	16.1	15.4	14.7	14.1
4	15.9	15.0	14.1	13.3
5	15.6	14.5	13.5	12.5
6	15.4	14.1	12.9	11.8
7	15.2	13.7	12.4	11.1
8	15.0	13.3	11.8	10.5

reasons too. Since the typical currency board does not provide a lender of last resort, bank runs are often regarded as the Achilles' heel of the system. Indeed, banking crises did occur in Hong Kong a number of times, all during the currency board years. The government and the banking system resorted to several ways to deal with them.

In 1994 there were 180 licensed banks in Hong Kong, 16 of which were owned mostly by local shareholders (HKMA 1994, 90–91). Government policies toward runs on local banks and foreign banks seemed to be different. The government did not attempt to support Citibank in 1991 when rumors caused a short-lived run, nor did it try to rescue the Bank of Credit and Commerce International's Hong Kong branch before its collapse in the same year. However, it moved to take over two small local banks in the mid-1960s and three more in the period 1982–86. It also provided some emergency funds to support five banks in the same period, four of which were later acquired by others. The note-issuing banks also played an important role in cushioning the shocks from the runs. They supported one bank in 1961 and three in 1965–66, and took over three more in the same period. Thus, in the 1960s, the government relied mainly on the financially strong note-issuing banks to either lend to or take over troubled local banks. In more recent years, the government seemed to have resorted to the Exchange Fund for playing the role of lender of last resort.[15] This is another reason to say that some of the features of a currency board have been diluted in Hong Kong.

15.5 What Can We Learn from Hong Kong's Experience?

The performance of the currency board in Hong Kong has not been bad so far. Although it may have lowered output growth, inflation has also gone down.

15. See Jao (1991, chap. 13) and Ho, Scott, and Wong (1991, chap. 1) for more details about banking crises in Hong Kong.

In fact, the more revealing results from the counterfactual exercises concern stability. When both regimes are subject to the same exogenous shocks, output and prices are less volatile under a currency board.

The stability result is not general. Simulations on impulse responses show that output is less sensitive to supply shocks under a currency board than under a free-floating regime. On the other hand, demand shocks can cause stronger short-term volatility in output in a currency board system. The relative stability in output in Hong Kong to a large extent must have come from the government's self-discipline in fiscal policy, which is based on two rules: maintaining a balanced budget or small surplus and keeping government size small. Other countries without a stable rule-based fiscal policy may not succeed in reducing output volatility even if they have currency boards.[16]

The fiscal restraint affects not only output stability but also the credibility of the exchange rate system. A weakness of the currency board system is that people may doubt the determination and capability of the government to maintain perfect convertibility at the specified rate. The conservative fiscal policy has been instrumental in creating surpluses in almost every budgetary year. Without the significant fiscal reserve, confidence in the HK dollar may suffer. In recent years, since the Exchange Fund has been acting as if it could be a lender of last resort, its financial strength, which is partly supported by a large fiscal reserve, is all the more important. Perhaps one reason why fiscal policy in Hong Kong is coordinated with its monetary system is that the financial secretary has the authority to control both.

Despite the financial strength of the Exchange Fund, the HK dollar has occasionally been subject to considerable speculative pressure. For example, in mid-January 1995, the HK dollar depreciated 0.4 percent briefly. On all such occasions, the speculations have been effectively countered (HKMA 1995). Given the excellent track record, do people have enough confidence in the HK dollar? As mentioned in subsection 15.4.4, 46.2 percent of M3 is in deposits denominated in foreign currency. This large portion is an indication that people only have limited confidence in the future of the HK dollar, in spite of all the assurance the government has provided.

Should other countries adopt the currency board system? The above analysis indicates that the decent performance in Hong Kong has been due to a combination of favorable factors, and yet, the possibility of monetary collapse cannot be ruled out. It is doubtful that many countries have equal or better conditions.

16. The financial secretary of Hong Kong articulated his commitment to noninterventionist rule-based fiscal policy by referring to a story in Greek mythology. The half-bird, half-woman Sirens sang so beautifully that all sailors who heard them would dive into the sea and try to swim to them, only to drown and die at their feet. He said that he would tie himself to the mast of the ship when he heard them singing. See Tsang (1995).

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Comment Barry Eichengreen

Currency boards are at one end of the spectrum between monetary policy credibility and monetary policy flexibility. They maximize the commitment to stable policy at the expense of all ability to tailor monetary conditions to macroeconomic and financial circumstances. Governments that attach a high shadow price to credibility are attracted to this option. For example, at the beginning of the 1990s, Argentine policymakers, burdened by their country's succession of failed battles with inflation and prepared to take drastic steps to establish their anti-inflationary credibility, resorted to a currency board. Estonia, Lithuania, and eventually Bulgaria were attracted to the arrangement by the special monetary difficulties of the transition to the market and, in the first two cases, of proximity to an unstable Russia.

Whether their examples should be emulated by other countries is a contested issue. Although currency boards were advocated for Russia following the dissolution of the Soviet Union and for Mexico following its financial meltdown in 1995, in both cases there was also resistance to the proposal, and policymakers ultimately shunned the arrangement on the grounds that they could not afford the sacrifice of policy flexibility it entailed.[1]

Unfortunately, systematic empirical analysis of these issues is difficult. While all countries are special, the circumstances of those that have opted for currency boards tend to be so unusual as to render hazardous all attempts at generalization. Most modern currency boards are so recent or short-lived that there exist only a very few years of time-series data on their operation, affording little opportunity for systematic econometric work.

Here is where the case of Hong Kong's currency board comes in. Hong

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1. Prominent advocates of currency boards in these contexts are Hanke, Jonung, and Schuler (1993).

Kong operated a currency board vis-à-vis sterling from 1935 through the early 1970s, at which point the instability of sterling led it to sever that link. It then floated until 1983, when the turbulence associated with negotiations with China over the colony's future led to a confidence crisis, to which the government responded by reestablishing the currency board, this time with a peg to the U.S. dollar. Thus the last two decades divide into a pair of 10-year periods, one of floating and one featuring a currency board, over which the comparative performance of alternative monetary arrangements can be analyzed and compared.[2]

A logical starting point is to compare price, output, and interest rate behavior under the two regimes. But because global economic conditions also differ across periods, and a small, dependent economy like Hong Kong is especially sensitive to the external environment, such comparisons tell us little about the performance of Hong Kong's monetary arrangements narrowly defined. To address this problem, Kwan and Lui utilize a variant of the structural vector autoregression methodology of Blanchard and Quah, distinguishing macroeconomic disturbances, which they attribute to the global environment, from subsequent adjustments, which they interpret in terms of the structure of the Hong Kong economy.

The disturbances identified by their structural VAR approach are intuitively plausible and readily interpretable in terms of historical events. For example, there is a large permanent shock (a "negative supply disturbance") around the time of OPEC II. The 1983 crisis provoked by the negotiations with China shows up as a negative shock with both temporary and permanent components. The "tequila effect" in early 1995 shows up as a negative temporary shock. The presumption that temporary shocks should raise prices while permanent shocks should reduce them is not imposed in estimation but is supported by the results, consistent with the authors' interpretation of permanent and temporary disturbances in terms of aggregate supply and aggregate demand shocks, respectively.[3]

Still, one can question whether these estimates are in fact useful for distinguishing the effects of global economic shocks from the operation of Hong Kong's monetary regime. Domestic policy, and not just the external environment, is a source of shocks; and prominent among the potential sources of

2. Admittedly, Hong Kong's experience is special as well. Its currency board is permitted to engage in open market operations, and since 1992 a sort of discount window has been opened to provide liquidity to the banks. Neither feature is typical of currency boards. Moreover, Hong Kong's Exchange Fund holds massive excess foreign currency reserves, including the cumulated fiscal surpluses of the government. (A third of the Exchange Fund's foreign assets come from this source.) Together, these facts blunt the trade-off that typically exists between a currency board arrangement and lender-of-last-resort operations. I would have liked to see the authors discuss how distinctive they consider Hong Kong's currency board arrangements, and how far they think the lessons of its experience can be generalized.

3. Note that this restriction is not imposed in estimation. It is a feature of the Bayoumi and Eichengreen (1993) implementation of the structural VAR approach, but not of the original Blanchard-Quah formulation, specified in terms of output and unemployment.

domestic disturbances is monetary policy, especially in the 1973–82 period when the Hong Kong dollar was floating. For this reason the attribution of shocks to external factors and responses to internal factors is unlikely to be strictly correct.[4]

Other authors have attempted to distinguish demand shocks of internal and external origin by estimating larger dimension systems identified by the imposition of additional long-run restrictions (see, e.g., Erkel-Rousse and Melitz 1995). The identifying restrictions required to render this exercise feasible are somewhat arbitrary, and cautious econometricians may be reluctant to impose them. Nonetheless, it is difficult to pass judgment on the operation of Hong Kong's currency board in the absence of such an analysis.

The authors interpret their impulse response functions in terms of the Mundell-Fleming model. This is a peculiar choice, since Mundell considered the behavior of output and interest rates, taking prices as fixed, while the authors' empirical analysis focuses on output and prices without considering interest rates. It would be more straightforward and informative to describe the results in terms of the textbook aggregate-supply–aggregate-demand model—that is, in terms of output and prices themselves. From this perspective, the authors' findings make intuitive sense. They suggest that supply shocks have had a smaller impact effect on prices and a larger impact effect on output in the currency board years. This of course is just what one would expect: shifts in the aggregate supply curve trace out the slope of the aggregate demand curve, and under fixed rates the latter will be very flat in price-output space, domestic prices being tied to foreign prices. Demand shocks, on the other hand, have larger short-run output effects in the currency board years than under a floating system. Since shifts in the aggregate demand curve trace out the short-run aggregate supply curve, the results suggest that the latter has become flatter over time, reflecting the growth of nominal rigidities.[5] This interpretation is consistent with recent commentary bemoaning the declining flexibility of Hong Kong's labor market.

An implication is that Hong Kong's decision to eliminate exchange rate

4. In fact, the authors are not entirely consistent in their attribution of shocks to the external environment and responses to policy. At one point they note that supply shocks are less prevalent in the currency board years and identify this as one of the advantages of a currency board. It is peculiar to identify supply shocks with government policy, however, especially insofar as they emanate from the monetary sector, in which case their effects should only be temporary. What they are likely to be picking up, obviously, is the effect of the two OPEC oil shocks and the commodity price boom of 1974–75—a more turbulent global economic environment prior to the reestablishment of the currency board, in other words.

5. Interestingly, this is precisely what Tam Bayoumi and I (Bayoumi and Eichengreen 1996) found on the supply side when estimating the same model using annual data for the industrial countries spanning the past hundred years: short-run aggregate curves grow flatter over time, as if nominal rigidities grow more important. But we also found that aggregate demand curves grew steeper, as more and more countries moved in the direction of greater exchange rate flexibility to facilitate the use of demand management policies to offset the effects of supply disturbances, which increasingly affect output as the short-run aggregate supply curve grows flatter.

flexibility (in terms of the U.S. dollar) may have had significant costs in terms of the sacrifice of monetary autonomy. As disturbances have come to increasingly affect output rather than prices, the government has acquired a growing incentive to use monetary policy to offset the effects of shocks, something for which greater exchange rate flexibility is required. Indeed, many other countries have moved in the direction of greater flexibility, as predicted.[6] Meanwhile, Hong Kong has moved the opposite way, with the government tying its hands precisely as the value of policy flexibility has grown. The implication is that Hong Kong has paid a price for its monetary policy credibility.

Next, Kwan and Lui challenge the view that Hong Kong's currency board is immune from attack because international reserves are five times the monetary base. As the authors note, although reserves are five times the base, M3 is five times reserves. (Here is one indication of Hong Kong's importance as a financial center: bank deposits are 25 times as large as currency in circulation!) It is entirely possible for a shift out of bank deposits, or even a relatively modest shift from HK dollar to U.S. dollar deposits, to deplete the Exchange Fund of reserves and cause the collapse of the currency peg.

Whether investors have an incentive to run on the Exchange Fund's reserves by shifting out of domestic currency deposits in favor of U.S. dollar deposits depends on the monetary policy they expect to be pursued in the aftermath of the event. If they think that policy will be more inflationary than before, they have an incentive to attack. This could be the case if they anticipate that the Chinese government will under certain circumstances compel the Hong Kong authorities to run more expansionary policies now that the colony has been returned to their jurisdiction. It could happen if an attack itself heightens the suspicions of the Chinese authorities about the advisability of the currency board arrangement and leads them to plump for a more expansionary policy.[7]

Thus only if the authorities can credibly commit to continuing to run the same monetary policies as the United States will Hong Kong's currency board be immune from attack. Given the questions that inevitably surround Beijing's policies toward Hong Kong, this is anything but certain. Just as Argentina's currency board was no guarantee of exchange rate and monetary stability when the tequila effect was felt in early 1995 (and the dilemma of having to chose between the stability of the exchange rate and the stability of the banking system was obviated only by the injection of $8 billion of assistance from the IMF), the existence of a currency board will be no guarantee of monetary stability.

All of the above was written in mid-1996 as a comment on the authors' conference draft and, in fairness to Kwan and Lui, left largely unchanged. But a commentator reading page proofs two years later cannot resist adding a few

6. As late as 1984 only a quarter of International Monetary Fund (IMF) member countries had gone over to floating rates. But by the end of 1994 the proportion operating systems of managed and independent floating rates had risen to more than 50 percent.

7. This last-mentioned situation is modeled by Obstfeld (1986).

thoughts suggested by the Asian economic and financial crisis. For one thing, those events have considerably accelerated the transition to greater exchange rate flexibility in the region, a transition that, I argued above, is an inevitable consequence of the multilateralization of trade and the rise in international capital mobility. For another, events in Asia have fanned the controversy over the merits of currency boards. In particular, academics and policymakers are deeply split over the advisability of a currency board for a country like Indonesia in the throes of an economic, financial, and political crisis. My own reading of the debate is that a currency board is appropriate only under the most exceptional economic and financial circumstances, as emphasized above, but also only when there exists broad-based political support for moving to one extreme on the trade-off between policy credibility and policy flexibility. Indonesia is not such a case. On the other hand, Hong Kong, where a return to managed money would raise uncomfortable questions about who is ultimately responsible for the management, qualifies on all these grounds. Finally, the events of 1997–98, which included a series of increasingly fierce attacks against the HK dollar by hedge funds and others, confirm that a currency board is no guarantee of insulation against speculative attacks.

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Comment Zhaoyong Zhang

It is a great pleasure for me to read and comment on Kwan and Lui's paper on Hong Kong's currency board and changing monetary regimes. In this paper,

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the authors attempt to assess the viability of adopting currency boards as the monetary institution by analyzing the macroeconomic implications of a currency board regime using Hong Kong data. They show that a currency board is less responsive to supply shocks but more to demand shocks than a floating rate system. The viability of the current exchange rate regime in Hong Kong relies on a stable fiscal policy.

It has widely been recognized that exchange rate policy plays a key role in determining economic performance in developing countries. While in principle exchange rates could be left to be determined by free market forces based on fundamentals, this has hardly been seen in the less developed economies in the past few decades. Most developing countries, especially the small and medium-sized countries, made a return in the 1980s to fixed exchange rates after the abandonment of the Bretton Woods system in the 1970s as a cornerstone of their monetary disinflation programs. This has raised some interesting issues concerning the selection of exchange rate regime. Kwan and Lui's paper thus draws a useful lesson from a study of Hong Kong's experience, enhancing our understanding of currency boards and the selection of exchange rate regime.

In less than half a century, the exchange rate regime in Hong Kong has evolved from the silver standard (since the last century till 1935), to a currency board with sterling being the reserve currency (1935–73), then to a floating system (1974–83), and finally back to a currency board with a U.S. dollar link since 1983. An interesting question associated with the evolution of the exchange rate regime will be how long the current system can last. In other words, what will be the future exchange rate regime in Hong Kong? Kwan and Lui have conducted some simulation exercises and conclude that a stable fiscal policy is the key to preventing the current exchange rate system from experiencing a crisis. Hong Kong's success in sustaining a pegged rate under a currency board arrangement depends on its specific conditions: it is small, open, and well integrated with the world economy, with a high degree of wage-price flexibility in which nominal magnitudes can adjust readily to exogenous shocks. But one has to recognize that a policy regime appropriate for ending high inflation may well be inappropriate for long-run economic management (see Sachs 1996). Examples are the 1992–93 European Exchange Rate Mechanism (ERM) crises and the 1994 Mexican peso crisis. Moreover, the effect of Hong Kong's return to China after 1997 on the credibility of the current system and on the confidence of people in Hong Kong's future prosperity cannot be undervalued.

The experience of some transition economies in Eastern Europe indicates that a pegged exchange rate is much more efficient at stabilizing the economy than a floating rate. Estonia stabilized with a pegged exchange rate under a currency board arrangement, while Latvia initially relied on a floating exchange rate. As a matter of fact, both countries succeeded in ending high inflation, but Latvia experienced a much deeper, longer recession, suffering from excessively high real interest rates and less confidence in the stability of the currency (Sachs 1996). Offsetting this observation, the simulation results from Kwan and Lui show that output growth under a currency board system is lower than under floating rates. Returning to the transition economies, it has been observed that in Estonia GDP in 1993, 1994, and 1995 grew −7, 6, and 6 percent, respectively, while Latvia's GDP growth rates for the same years were −15, 2, and 1 percent (see Sachs 1996). In fact, it is difficult from figures 15.4 and 15.5 in Kwan and Lui's paper to infer whether one exchange rate regime is superior to the other.

It seems that the eventual abolition of the first currency board system in the early 1970s was mainly caused by exogenous shocks such as the devaluation of sterling and the U.S. dollar, a large inflow of foreign capital to Hong Kong, and so on. This raises a question concerning the "permanency" of the current currency board system. If similar shocks happen again, could the current exchange rate regime be sustained even given the conditions described by Kwan and Lui? This issue deserves discussion in addition to the study of the viability of the regime.

Other concerns are related to generalizing the experience of Hong Kong in adopting the currency board system, drawing lessons and policy implications for countries adopting the currency board system, examining critically under what circumstances a "permanent" pegged rate is appropriate, and so on.

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