Measures of Currency Crises: A Survey

by

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1. Introduction

In order to determine the degree of vulnerability to financial contagion or the severity of crisis, an operational definition of crisis is needed. A currency crisis is defined as speculative pressures in the foreign exchange markets. To identify periods of a currency crisis, constructed crisis indices need to reflect both successful and unsuccessful speculative attacks on domestic currency. The basic idea is that when there are speculative runs on currency, the government has three policy choices. First, it can let the exchange rate depreciate. This is successful currency attack since the monetary authority gives up a pegged exchange rate system after a series of speculative attack. Second, it can intervene in the foreign exchange markets by selling international reserves. Lastly, it can increase interest rates to entice capital inflows in order to offset the speculative pressures on domestic currency. Some countries may use a combination of these three policy options to absorb speculative pressures.

Girton and Roper (1977) made the first effort in combining exchange rate depreciation with international reserve loss to measure exchange market pressure (EMP). Eichengreen, Rose, and Wyplosz (1994) use this concept to define the onsets and episodes of currency crises. They construct EMP indices from a weighted average of the depreciation of the nominal exchange rates, the percentage change in international reserves, and the change in interest rate. Then, periods of a currency crisis are identified from a large value of these EMP indices, or when they exceed particular thresholds such as two or three standard deviations above their means. This approach has been commonly used in recent currency crisis studies and generally acknowledged

as the best method for currency crisis identification. However, there are a number of cases concerning the specific implementation of indices including the selection of the components of EMP indices, how to weigh the importance of changes in reserves versus changes in exchange rates (and interest rates where included), and identifying of crisis thresholds or the cut-off points.[1]

In the following section, we review the criteria used to construct currency crisis indices. The survey of recent currency crisis literature, which is described in the next section, shows that dates of currency crises used across studies are substantially different from each other. In section 4, we replicate the calculation of currency crisis indices by using all possible combinations of criteria including different components to construct EMP indices, weighting schemes, and crisis thresholds. This exercise allows us to specify the important conditions that should be taken into account for a better measure of currency crises.

2. Exchange Market Pressure and Currency Crisis Indices

Following Eichengreen, Rose, and Wyplosz (1994,1995), recent studies on currency crises construct crisis indices from exchange market pressure (EMP), which is a weighed average of the depreciation rate of nominal exchange rates ($\%\Delta E$), the percentage change in international reserves ($\%\Delta R$), and the change in interest rate (ΔI). A period of currency crisis is identified when an EMP index exceeds a particular threshold such as two or three standard deviations (σ) above its mean (μ). For European countries, German Deutschmarks (subscript G)[2] is used as the

[1] We focus on these three aspects in this paper. For other aspects, please see Nitithanprapas and Willett (2000), Angkinand (2005), Li et al. (2006).
[2] Euro currency is used after 1999.

benchmark and U.S. dollars are used for other countries. That is, currency crises are defined as follow.

$$EMP_{i,t} = [(\alpha\%\Delta E_{i,t}) + (\beta\Delta(I_{i,t} - I_{,G,t})) - (\gamma(\%\Delta R_{i,t} - \%\Delta R_{G,t}))]$$

$$Crisis_{i,t} = 1 \text{ if } EMP > 3\sigma_{EMP} + \mu$$

where α, β, γ are weights, which equalize the conditional volatilities of each component. For instance, given σ_E, σ_R,σ_I = the standard deviation of %ΔE, %ΔR, ΔI, α equals to:

$$\alpha = \frac{1/\sigma_E}{1/\sigma_E + 1/\sigma_R + 1/\sigma_I}$$

The limitation of this approach is the calculation of weights attaching each component of EMP. As Eichengreen, Rose, and Wyplosz argue, ideally the weights should be derived from the excess demand for foreign exchange from an empirical model of the exchange rate, i.e. by the slope coefficient that reflects how much official intervention (change in reserves and/or interest rate) would be required to avoid a one percentage point change in the exchange rate. The problem is that, as they note, there is little agreement within the profession about the most appropriate theoretical model of the foreign exchange market and none of our models fit well empirically. Alternatively, they suggest that weights attached to each component, which should equalize the conditional volatilities of each component, can be computed from the inverse of each component's variance from the entire sample. This weighting technique is called a "precision weight."

Despite their widespread use, precision weights are inappropriate for use in the calculation of indices of currency crisis. They would be entirely appropriate for the calculation of indices of volatility or crisis based on averages of free market variables such as stock market indices for a number of different countries. The idea is to capture the degree of volatility in a

particular market at a particular time in relation to its normal volatility. If, for example, one variable is normally much more volatile than another, then an unweighted average would be excessively heavily driven by the behavior of the more volatile series. Many foreign exchange markets, however, are managed by governments. The relative variance of exchange rate changes and reserve changes will be heavily influenced by the exchange rate regime being followed and precision measures will reflect the government's reaction function, not the slope of the excess demand schedule in the foreign exchange market.

As a consequence, precision weights will substantially understate the severity of unsuccessful speculative attacks under fixed exchange rates such as crisis that hit Argentina following both the Mexican and Thai crisis and hit Hong Kong during the Asian crises. This is easy to see. Under a regime of narrow band fixed exchange rates, almost all of the effects of incipient payments imbalances will fall on changes in reserves rather than changes in exchange rates. Since reserve changes will have a much higher variance, precision weights will give reserve changes little weight. Thus as long as the speculative attacks were unsuccessful, their magnitude would be understated. By the same token, if a country were successfully knocked off a narrow band peg, the heavy weight given to the subsequent currency depreciation would overstate the magnitude of speculative pressure.[3]

We also believe that despite the difficulties of getting good data it is important to include interest rates when constructing EMP indices. Indeed, looking first in changes in reserves and exchange rates the major speculative attacks on Hong Kong in October 1997 would be entirely missed in the standard emerging market crisis episodes, since its government chose to defend speculative attack by hiking interest rates (see figure 1). The speculative pressures also had much

[3] See Li et al. (2006) for more discussions about the limitation of precision weights.

larger effects on financial markets outside of Asia than did the Thai crisis, thus showing up as crisis in published statistics only in interest rate increases and stock market declines.

Another difficulty in constructing currency crisis indices is how to compute and select the crisis thresholds. Based on Eichengreen, Rose, and Wyplosz's methodology, periods of currency crisis are defined from the extreme value of EMP index. While the extreme value is defined from a large deviation of EMP index from its mean, it is unclear whether two or three standard deviations should be used to identify the appropriate level of crises. In most studies, the cut-off point of a crisis threshold is selected arbitrarily, and we can simply think that these different levels of crisis thresholds distinguish between mild and severe crises, where the higher the values of thresholds reflecting the more the severity of currency crises. Pozo and Amuedo-Dorantes (2003) and Siregar et al. (2005) argue that the construction of crisis thresholds from this method is inappropriate because of the non-normality distribution of the EMP index. They suggest an alternative technique based on the extreme value theory to find crisis episodes. They find that the number of crisis episodes identified by these two methods differ and more sensitive when using their extreme value method.

3. Survey of Crisis Literature: Do Measures of Currency Crises Matter?

To illustrate the contributions of the empirical research on currency crises and understand the impact of, for instance, early warning indicators and exchange rate regimes, we review the existing literature that defines currency crises. We find that criteria used to construct currency crisis indices vary substantially across studies and many reported currency crisis episodes in

existing studies such as Glick and Hutchison (2001), Bordo et al. (2001), Edison (2003), and Kamin et al. (2001) are different.[4]

The difference of identified crisis dates could result from the selection of EMP's components. For instance, many studies on currency crises in emerging market economies exclude the change in interest rate from the exchange market pressure (EMP)'s components due to the lack and unreliability of market-determined interest rate data (e.g. Aziz, et al., 2000; Kaminsky and Reinhart, 1999; Glick and Hutchison, 2001). Other studies exclude the percentage change in international reserves by arguing that the reserve data are noisy measures of exchange market intervention (Glick and Moreno, 1999 and Bubula and Otker-Robe 2003). Leaving out the element of changes in either international reserves or interest rates will underplay the role of government interventions in foreign exchange market. For instance, a government can choose to defend its currency by hiking interest rates (the case of the currency crisis in Hong Kong in 1998) or selling international reserves (crises in Argentina and Russia in 1995). The exclusion of international reserve and/or interest rate components will fail to detect currency crises, which are unsuccessful speculative attack, in these countries.

The calculation of precision weights attaching each component of the EMP index also differs. The weights are sometimes calculated from an entire sample (pooled precision weights) or from each individual country sample (individual precision weights). Eichengreen et al. (1994, 1995), IMF (1998), Aziz et al. (2000) use pooled weights, whereas Kaminsky and Reinhart (1999), Glick and Hutchison (2001), and Edison (2000) use country-specific weights. Perry and Lederman (1999) and Nitithanprapas and Willett (2000) assign equal weights to each component of the EMP index.

[4] See table 2B and Angkinand (2005) for the comparison of currency crisis episodes reported by these four studies.

The selection of a crisis threshold is substantially different across studies. The selected cut-off points, which are generally identified from a large deviation of the EMP index from its mean, vary from 1.5 (IMF, 1998; Aziz, et al., 2000; Ahluwalia 2000, Bordo, et al., 2001), 1.645 (Caramazza, et al., 2000), 1.75 (Kamin, et al., 2001), 2.0 (Eichengreen, et al., 1995; Glick and Hutchison, 2001), 2.5 (Edison, 2000) and 3.0 standard deviation above its mean (Kaminsky and Reinhart, 1999; Berg and Pattillo, 1999; Bubula and Otker-Robe, 2003). Some studies use more than one criterion to identify the crisis threshold. For instance, Moreno (2000) identifies a currency crisis if the depreciation of exchange rate exceeds 2.0 standard deviations above its mean, given that it is also larger than 25% from the previous year. Frankel and Rose (1996) define a currency crash when the exchange rate depreciates by at least 25% in a year and at least 10% from the previous year. Zhang (2001) identifies a currency crisis from two separate thresholds, i.e. 3.0 standard deviations above the mean of exchange rate changes, and those of reserve changes.

Since periods of currency crisis episodes are sensitive to criteria selected to construct currency crisis indices, it is important to check the sensitivity of the results when crisis indices are employed in the empirical tests. Unfortunately, among a large number of studies in the currency crisis literature, only a few of them employ different criteria to construct crisis indices to check for the sensitivity of their results.

In both the 1994 and 1995 studies, Eichengreen, Rose, and Wyplosz conducted the sensitivity analysis by employing a number of different weighting scheme, such as the doubled weight, which is assigned to attach the change in reserves, and use 3, 6, and 12 months for crisis window.[5] They do not find that the results are sensitive to these criteria. Nitithanprapas and

[5] Crisis window defines whether periods of the extreme value of the EMP index should be identified as a new crisis or the part of the previous crisis.

Willett (2000) also consider other different weights including equal weights and find that major results were robust with respect to substantial changes in the weights in the crisis index. Galindo and Maloney (2002) calculate EMP indices by both including and excluding interest rates to test the robustness of their results. They note that interest rate changes could be excluded, since the sharp movement of interest rates in Latin American countries is often unrelated to speculative attacks.

Other studies such as Kamin et al. (2001) and Angkinand, Chiu, and Willett (2006) find their models being dependent on the measures of currency crises that are used in the empirical tests. In the study of the early warning system, Kamin et al. calculate different currency crisis indices using different crisis thresholds and windows. They find that the estimated coefficients of their set of early warning indicators are significantly robust with expected signs when selecting a crisis threshold of 1.75 standard deviations above the mean of EMP and the two-month crisis window. Angkinand, Chiu, and Willett examine the unstable middle hypothesis of exchange rate regimes and find that the conclusion of only the two corners of hard fixes or floating rates being stable in a world of high capital mobility are sensitive to how currency crisis indices are constructed. They use currency crisis episodes from Bubula and Otker-Robe (2003), which identified from the components of only exchange rates and interest rates, and find that the obtained results are different from the alternative indices that include international reserves.

4. Dating Currency Crises Across Some Crisis-hit Countries: Comparison and Misidentification

In this section, we replicate the calculation of the currency crisis indices based on the various definitions in the literature using the same country set and time period in order to compare the effectiveness of indices in detecting crisis episodes. As discussed in the previous

section, the dates of currency crises could depend on EMP's components (exchanges rates, reserves, and/or interest rates), the weighting schemes of these components, and the selection and calculation of crisis threshold. Without individually justifying the specific use of the EMP's components and other criteria, we try all possible combinations to construct crisis indices, which give us 30 different crisis indices. This exercise allows us to check the inconsistency among different indices and reminds researchers to test the robustness of any particular index as suggested in Eichengreen et al. (1994, 1995) and Nitithanprapas and Willett (2000).

In terms of the components of crisis indices, there is a great deal of disagreement in the literature. Some studies used the exchange rate as the single component to capture the "Currency Crash"[6]. Some studies like Glick and Moreno (1999) and Bubula and Otker-Robe (2003) argued that the reserves data was very noisy and excluded it in the EMP. Due to lack of reliable market-determined interest rate data, many studies[7] did not include the interest rate as a component of the EMP. Therefore, with all possible combinations we construct currency crisis indices by including all the three-, two-, and single components of EMP indices and compare the results across the different indices. Column (2), table (1), describes the components of each constructed EMP index.

Next, we take into account the weighting schemes used to weigh EMP components. As indicated in column (3), the first 14 indices are calculated based on the equal weights scheme. The rest of the indices use precision weights scheme among which there are two kinds of precision weights: individual and pooled. The individual precision weights scheme means that we take the inverse of the volatilities of the components in each individual country as the weight. Thus, each country has its own weights based on the volatilities of three components. The pooled

[6] See Edwards (1989), Frankel and Rose (1996), Rose and Messe (1998), Esquivel and Larrain (1998) and Kumar et al. (1998) for the applications.
[7] See Aziz, et al. (2000), Kaminsky and Reinhart (1999); Glick and Hutchison (2001)

precision weights scheme means that we pool all countries and use the inverse of the components' volatilities as the common weights. Therefore, all countries share the same weights in the case. The fourth column shows the different thresholds used in identifying the extreme values of the EMP[8]. The observations with extreme values of the EMP are identified as crisis periods.

Periods of currency crises detected by each of 30 currency crisis indices are reported in table (2). We can see that crisis dates detected by each index are different in many cases. We discuss below about exchange market pressures and the episodes of currency crises in selected emerging market countries and how different indices detect different periods of crises.

4.1 Hong Kong

Hong Kong has been keeping the currency board system throughout our sample period (1989-2003). The successful sustaining of the hard-peg system in Hong Kong makes it immune from potential currency collapses. However, there were still a great number of attacks at Hong Kong dollar during Asian Financial Crises. The substantial exchange market pressure was not reflected by the changes of nominal exchange rates but the sudden hikes of domestic interest rates in the defense of Hong Kong dollar in 1997 and 1998. Thus, the crisis indices involving no interest rates component might not be able to capture the exchange market pressure properly. Among the 30 crisis indices for Hong Kong in year 1997 and 1998, all 9 indices (ci1, ci2, ci6, ci8, ci9, ci13, ci22, ci26, and ci30) not detecting crisis included no interest rate component no matter what weighting schemes are. The significant movement of interest rates in year 1998

[8] See Hartmann et al. (2003) and Siregar et al. (2005) for discussions about the inappropriate use of conventional ways to identify crisis periods because of non-normality distribution of the EMP. They employed extreme value theory to find crisis episodes.

dominated the crisis indices so that they were not sensitive to the different weighting schemes. All the indices including interest rate component caught the crisis in year 1998.

4.2 Indonesia

The crisis in Indonesia was so severe that all 30 crisis indices detected the crisis period either in year 1997 or year 1998. All 3 components of the indices displayed the significant fluctuations during the crisis time because all the single-component indices showed the crisis.

4.3 Korea

While most of the indices detected the crisis year in Korea as year 1997, the interest rate only index, ci3, showed the crisis period as year 1996. The monetary authority in Korea increased the interest rates significantly one year before the actual hit in 1997.

4.4 Malaysia

All 30 crisis indices consistently detected the crisis year in Malaysia in year 1997.

In year 1992 and 1994, the monetary authority sold a substantial amount of reserves in response to the speculative attacks as recorded in reserves-only indices, ci2, and ci9. Under the equally weighting scheme, both the three-component index (ci7) and the two-component index without interest rates (ci6) detected crises in these two years. But under the individual precision weighting scheme, neither of the two (ci15, ci18) showed the crisis in 1994. In 1992, the three-component index (ci18) did not appear to capture the crisis. Under the pooled precision weighting scheme, neither the three-component nor two-component without interest rates recorded the crisis in 1994. The pooled precision weighting scheme seems not so biased like the individual precision weighting scheme. Both the three-component and two-component indices (ci23, ci26) recorded the crisis in year 1992.

4.5 Philippines

In 1997, the crisis was detected by exchange rate changes and interest rate changes indices (ci1, ci3) but not by reserve changes indices (ci2). It means that the monetary authority in Philippines did not use the reserves to intervene the exchange market in crisis period. But it did increase the interest rates to strengthen the domestic currency.

4.6 Singapore

In 1997, all 30 crisis indices detected the crisis in Singapore no matter what the components of the EMP or the weighting schemes were.

In 1991, the exchange rates-only index (ci1) showed the crisis but not the reserves-only or interest rates-only indices. The three-component index with equal weights (ci7) successfully captured the crisis but not the counterpart index with individual precision weights (ci15). It seems that the individual weighting scheme underestimates the EMP from the changes of exchange rates when the exchange rates are relatively flexible.

4.7 Argentina

From the first three single-component crisis indices, we can tell the different timing of the central bank's behavior. At year 2001, the reserves-only index (ci2) detected the crisis. However, the exchange rate-only index (ci1) showed the crisis at year 2002 instead of 2001. The interest rate-only index (ci3) did not display any crisis in this period. The different timings of crisis reflect the fact that the monetary authority in Argentina tried to defend its currency by selling reserves at year 2001, but quitted defending at year 2002. It did not employ interest rate hikes to defend. That is the reason why the two-component index without interest rates (ci6) showed the year 2002 as the crisis year while the three-component index (ci7) with equal weights did not detect any crisis around that period.

Examining the indices using individual precision weights, we can see the dominant effect from the exchange rate movement in the indices. The currency board system in Argentina strictly limited the variability in the exchange rates, which led to the large weights for the exchange rate changes in precision weighting scheme. All the indices with the exchange rate component (ci15, ci17, ci18, ci19, ci21, ci22) showed the crisis at year 2002. The indices with no exchange rates either shows the crisis at year 2001 (ci16) or no crisis at all (ci20).

In the indices with pooled precision weights, the inactivity of interest rates was amplified so that all indices with the interest rate component (ci23, ci24, ci25, ci27, ci28, ci29) did not indicate any crisis in 2001 – 2002 periods. Only two indices without interest rates (ci26, ci30) detected the crisis at year 2002.

The comparison among the three weighting scheme in the case of Argentina in 2001-2002 periods may lead to the following conclusions. First, the individual weighting scheme shows the most upward bias toward the changes in the exchange rates under a fixed rate system. Second, the pooled precision weighting scheme gives the upward bias toward interest rate changes. Third, taking the mean plus 2 or 3 standard deviations might seem to be too strict in defining crisis because even the ci7 does not point to crisis in years of 2001 or 2002.

In year 1995, Argentina got hit by the crisis originated from Mexico if measured by the reserves-only indices (ci2, ci9). This observation may support the way to define currency crises in Zhang (2001). Zhang (2001) proposed that the periods with either large depreciations OR large reserve loss could indicate crisis.

4.8 Brazil

The Brazilian responses to the speculative attacks in periods of years 1998-1999 were similar as the Argentinean in years 2001-2002. In year 1998, the central bank sold a significant

share of its reserve holding in order to defend of its currency. Therefore, the reserves-only indices (ci2, ci9) were coded as 1 in year 1998. The next year, the authority caved to the speculative attacks and let its currency depreciate. This event was captured by the exchange rates-only indices (ci1, ci8). The authority did not employ interest rate policy to defend as the interest rates-only indices (ci3, ci10) indicated no crisis.

Under pooled precision weighting scheme, each component across countries shares the same weight. We should expect the coding for Brazil in years 1998 and 1999 similar to the coding for Argentina in years 2001 and 2002. Due to the exaggerated effect of interest rates' inactivity, only the indices (ci26, ci30) without interest rates detect crisis for this period.

4.9 Mexico

The year 1994 in Mexico was coded as the crisis period from all crisis indices except the interest rate-only indices (ci3, ci10). The currency depreciation and reserve loss in the Tequila Crisis were so severe that the different weighting schemes made no difference in determining the crisis periods.

In year 1990, the monetary authority intervened the exchange market by selling a large amount of reserves. The reserves-only indices (ci2, ci9) detected the crisis, but not exchange rates-only (ci1, ci8) or interest rate-only indices (ci3, ci10). The reserve loss in 1990 was so substantial that even the three component index with equal weights (ci7) detected crisis as well. But the massive speculative attacks were not recorded in the index with individual precision weights (ci15). This is directly due to the small weight attached to reserve changes from individual weighting scheme. It is worth noticing that the three component index with pooled precision weights (ci23) successfully captures the crisis in 1990. We may be able to draw the

conclusion that the pooled precision weighting scheme tends to give less bias at estimating the exchange change market pressure from reserve loss.

4.10 Russia

While the EMP without interest rates might underestimate the magnitude of speculative attacks when the monetary authority increases the interest rates significantly to defend its currency. However, the EMP with interest rates might show a downward bias when the authority employs only reserves to intervene.

In year 1995 in Russia, the reserves-only indices (ci2, ci9) detected crisis but not the exchange rates-only or interest rates-only indices. Most of the two-component indices without interest rates (ci6, ci13, ci18, ci22, ci26) signaled the crisis while none of the three-component indices does that. This reflects the tradeoff of adding interest rates in the indices. If the monetary authority uses only reserves to defend, then the more components are in the EMP, the less impact the intervention would have on the whole EMP.

4.11 Turkey

In year 1991, the reserves-only indices (ci2, ci9) detected the crisis. But in all the multiple-component indices, only the two-component index without interest rates (ci6) successfully captured that. This is an equally weighted index. The observation confirms that the precision weighting scheme discounts the impact of reserve movement with an inappropriate degree. This is another example to see the costs of adding interest rates into the EMP since the three-component index (ci7) did not show the crisis.

From the simple exercises above, we can draw some conclusions regarding the coding of crisis indices and the weights of the EMP.

First, except the periods with the most severe crises, the different crisis indices based on the different definitions vary substantially.

Second, the coding regarding the severe crisis periods is very similar across the different indices in spite of the weighting schemes.

Third, under a fixed exchange rate regime, the indices with the precision weighting scheme underestimate the impact of reserves movement in the EMP. The individual precision weighting scheme is more biased than the pooled precision weighting scheme.

Fourth, the pooled precision weighting scheme seems to overestimate the EMP when the interest rates changes persist.

Fifth, the individual precision weighting scheme tends to underestimate the EMP from exchange rate changes when the exchange rate regime of a country is relatively more flexible.

Sixth, using different components in the EMP might lead to different timing of crisis. Monetary authorities tend to intervene the exchange market by selling reserves first, which is followed by depreciating their currencies.

Seventh, while the three-component indices with interest rates may be able to pick up the exchange market pressure from interest rate hikes, they might miss the crisis periods when authorities intervenes the market with reserves only. In terms of picking up the mild EMP from selling reserves, the two-component indices without interest rates seem to be superior to the three-component indices.

Eighth, even the mean plus 2 standard deviations might seem to be too strict to pick up some mild currency crises.

Last, but not the least, there is no universal standard to define currency crisis that could perfectly capture all the crises. In order to get a better measure of currency crisis, we may have to adopt different ways based on various behaviors of each component.

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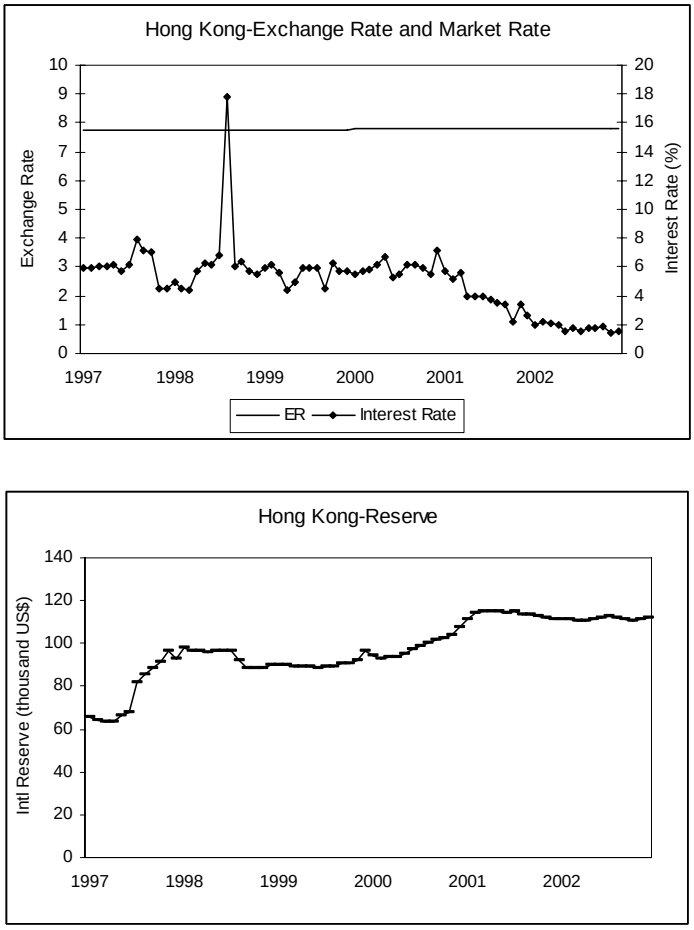
Figure (1) Changes in the exchange rate, international reserve, and interest rate in Hong Kong during the Asian crisis



Source: International Financial Statistics

Table 1: The Definitions of All Crisis Indices*

(1)	(2)	(3)	(4)
Crisis Indices	Components**	Weighting Schemes	Std. Dev.
ci1	E	Equal Weights	2
ci2	R	Equal Weights	2
ci3	I	Equal Weights	2
ci4	R+I	Equal Weights	2
ci5	E+I	Equal Weights	2
ci6	E+R	Equal Weights	2
ci7	E+R+I	Equal Weights	2
ci8	E	Equal Weights	3
ci9	R	Equal Weights	3
ci10	I	Equal Weights	3
ci11	R+I	Equal Weights	3
ci12	E+I	Equal Weights	3
ci13	E+R	Equal Weights	3
ci14	E+R+I	Equal Weights	3
ci15	E+R+I	Indi. Prec. Weights	2
ci16	R+I	Indi. Prec. Weights	2
ci17	E+I	Indi. Prec. Weights	2
ci18	E+R	Indi. Prec. Weights	2
ci19	E+R+I	Indi. Prec. Weights	3
ci20	R+I	Indi. Prec. Weights	3
ci21	E+I	Indi. Prec. Weights	3
ci22	E+R	Indi. Prec. Weights	3
ci23	E+R+I	Pooled Prec. Weights	2
ci24	R+I	Pooled Prec. Weights	2
ci25	E+I	Pooled Prec. Weights	2
ci26	E+R	Pooled Prec. Weights	2
ci27	E+R+I	Pooled Prec. Weights	3
ci28	R+I	Pooled Prec. Weights	3
ci29	E+I	Pooled Prec. Weights	3
ci30	E+R	Pooled Prec. Weights	3

*: The crisis window is 24 months. Once the first crisis is detected, the crises in the following 23 months will be regarded as the continuation of the same crisis as the first one.

**: E = exchange rate fluctuations; R = reserves changes; I = interest rate differentials

Table 2: Currency Crisis Indices

2A. Currency Crises Indices Constructed based on Different Definitions (from table 1) for Some Selected Emerging Market Countries

Ctry	Yr	ci1	ci2	ci3	ci4	ci5	ci6	ci7	ci8	ci9	ci10	ci11	ci12	ci13	ci14	ci15	ci16	ci17	ci18	ci19	ci20	ci21	ci22	ci23	ci24	ci25	ci26	ci27	ci28	ci29	ci30
Arg	95	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arg	01	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arg	02	1	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0	1	1	1	0	1	1	0	0	0	1	0	0	0	1
Brz	98	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Brz	99	1	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	1	0	1	0	1	1	0	0	0	1	0	0	0	1
HK	97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
HK	98	0	0	1	1	1	0	1	0	0	1	1	1	0	1	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0
Ind	97	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Ind	98	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Kr	96	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kr	97	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mal	92	0	1	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0	0	0	0
Mal	94	0	1	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Mal	97	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mal	98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mex	90	0	1	0	1	0	1	1	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	1	1	0	1	0	0	0	0
Mex	94	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Phil	97	1	0	1	1	1	1	1	1	0	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0
Rs	95	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0
Sing	91	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	0	0
Sing	97	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Turk	91	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

2B. Currency Crises Indices from Selected Studies

Country	Yr	Edison	Kaminsky	BEKM	GH	KSS	BOR
Argentina	95	0	0	1	0	0	
Argentina	01	0	0	1	0	0	1
Argentina	02	0	0	0	0	0	0
Brazil	98	0	-	1	0	1	0
Brazil	99	1	1	0	0	1	1
Hong Kong	97	-	-	0	-	-	0
Hong Kong	98	-	-	0	-	-	1
Indonesia	97	1	1	1	1	1	1
Indonesia	98	0	0	1	0	0	0
South Korea	96	0	0	0	0	0	0
South Korea	97	1	1	1	1	1	0
Malaysia	92	0	0	0	0	0	0
Malaysia	94	0	0	0	0	0	0
Malaysia	97	1	1	1	1	1	1
Malaysia	98	0	1	1	0	1	0
Mexico	90	0	0	1	0	0	0
Mexico	94	0	1	1	1	1	0
The Philippines	97	1	1	1	1	1	1
Singapore	91	0	-	0	0	-	0
Singapore	97	1	-	0	0	-	0
Turkey	91	0	0	1	0	1	0

Edison = Edison (2000), Kaminsky = Kaminsky (2003), BEKM = Bordo, Eichengreen, Klingebiel and Martinez-Peria (2001), GH = Glick and Hutchison (2001), KSS = Kamin, Schindler and Samuel (2001), BOR = Bubula and Otker-Robe (2003)