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Causes of the 1997 Asian Financial Crisis: What Can an Early Warning System Model Tell Us?

Juzhong Zhuang
Malcolm Dowling

Asian Development Bank
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Asian Development Bank
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0980 Manila
Philippines

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Juzhong Zhuang is Senior Economist, Regional Economic Monitoring Unit, Asian Development Bank. Malcolm Dowling is Senior Fellow, Department of Economics, Melbourne University. A full version of this brief is appearing in the ERD Working Paper Series.

Causes of the Crisis: Two Hypotheses

In the last few years there has been considerable discussion of the causes of the 1997 Asian financial crisis. Two main views have emerged. The first attributes the initial financial turmoil in some Asian countries in 1997 and its spread over time mainly to investor panic followed by regional contagion (Radelet and Sachs 1998). The second argues that the crisis occurred primarily as a result of structural and policy distortions and fundamental weaknesses (Corsetti, Pesenti, and Roubini 1998).

It is important to establish which of these hypotheses is more plausible. If the Asian crisis was caused more by weak fundamentals, policy and institutional reforms should be designed mainly to address these weaknesses. If the crisis was caused more by investor panic, policy reform should perhaps focus more on ways to prevent and contain investor panic. Therefore, discriminating between the two hypotheses could have important policy implications.

A number of studies have attempted to provide empirical evidence of economic and financial fragility in the affected Asian countries prior to the 1997 crisis. Some studies have compared indicators of fragility in the affected countries at the onset of the crisis with those in nonaffected or less affected emerging economies (see, for example, Corsetti, Pesenti, and Roubini 2000). These types of study, however, cannot discriminate between the two hypotheses described above. To do this requires testing not only whether there was fragility in the affected countries, but also whether such fragility had reached some "crisis-triggering level."

This brief summarizes major findings of an empirical study that attempts to test the two hypotheses to determine what actually happened in Asia in 1997 using an early warning system (EWS) model (Zhuang and Dowling 2002). EWS models are useful in discriminating between the two hypotheses because they establish "crisis-triggering" threshold values for economic and financial indicators using historical data. Strong warning signals of a heightened probability of a financial crisis prior to the 1997 crisis from such models would suggest that there are good reasons to believe the crisis was caused more by weak fundamentals than by investor panic.

A Nonparametric EWS Model for East Asia

The EWS model used by the study[1] follows the signaling approach pioneered by Kaminsky and Reinhart (see Goldstein, Kaminsky, and Reinhart 2000) and is constructed using monthly data from 1970 to 1995 for Indonesia, Republic of Korea (henceforth Korea), Malaysia, Philippines, Singapore, and Thailand. The model is then applied to data from 1996 to 1997 to test, out-of-sample, whether there were warning signals in each of the six countries prior to the 1997 crisis.

The model can predict, for each country and on a monthly basis, the likelihood of a currency crisis, defined as an episode of monthly nominal depreciation against the US dollar exceeding the sample mean by two standard deviations, occurring within a 24 month time horizon.

The model uses 38 economic and financial indicators, also called leading indicators, and each is examined to determine whether it has crossed its threshold that has historically been associated with the onset of currency crises. When an observed outcome of an indicator crosses its threshold, it is considered to be issuing a warning signal. A warning signal is associated with a certain conditional probability, that is, the probability of a crisis occurring within 24 months. The threshold of a leading indicator is set such that the so-called noise-to-signal ratio is minimized.

The results show that seven out of the 38 indicators have a conditional probability greater than 50 percent. These are, in order of the probability value, the deviation of the real exchange rate against the US dollar from its trend, the deviation of the real effective exchange rate from its trend, the ratio of short-term debt to foreign reserves, the ratio of residents' deposits in Bank of International Settlement (BIS) banks to foreign reserves, the ratio of M2 to foreign reserves, the ratio of foreign liabilities to foreign assets of the banking sector, and the ratio of current account balance to gross domestic investment (GDI). The conditional probability for the rest of the indicators ranges from 30 to 49 percent.

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[1]The EWS model was developed by the Regional Economic Monitoring Unit under a regional technical assistance.

Information on individual indicators was aggregated into composite leading indexes to provide summary measures of vulnerability in terms of crisis probability. In the model, there are six sector-specific composite leading indexes and one overall composite leading index. The results show that the overall composite leading index has a conditional probability at 77 percent, meaning that once it starts signaling, the probability of a crisis in the next 24 months is 77 percent. The overall composite leading index predicts 83 percent of the crisis episodes in the sample, suggesting that this index has significant predictive power.

Warning Signals Prior to the 1997 Asian Crisis

The overall composite leading index issued seven warning signals in Indonesia during the 24 months prior to the 1997 crisis, with a lead time of 11 months. The number of signals is nine in Korea, with a lead time of 10 months; 13 in Malaysia, with a lead time of 13 months; 10 in the Philippines, with a lead time of 11 months; and 10 in Thailand, with a lead time of 10. But there was no warning signal in the case of Singapore. The fact that there were strong and persistently early warning signals in all of the affected countries but Singapore lends overwhelming support to the "weak fundamentals" hypothesis.

Among the 38 individual indicators, almost half issued at least one warning signal in each of the five affected countries. The real exchange rates issued warning signals in all the six countries, suggesting that there were real appreciations in currencies of these countries prior to the crisis. The number of signals indicates that the real appreciation was more persistent and pronounced for the Thai baht, Malaysian ringgit, Korean won, and Philippine peso than for the Singaporean dollar and Indonesian rupiah. Real appreciation was accompanied by a worsening of current account positions, as indicated by warning signals from the trade balance/GDP ratio, the current account balance/GDI ratio, and export growth. These suggest that in all the five affected countries, not only were there apparent deteriorations in current account positions prior to the crisis, but the deteriorations also reached critical levels that historically have often been associated with the onset of currency crises.

There were also warning signals from the capital account indicators. The ratio of foreign liabilities to foreign assets of the banking sector issued persistent signals in Indonesia, Malaysia, and Thailand, suggesting that banks in these countries were borrowing heavily from abroad prior to the crisis, leading to serious currency mismatches. In Korea and the Philippines, although this ratio itself did not signal, a deviation from its trend was exhibited.

The ratio of M2 to foreign reserves measures a country's ability to withstand the pressure of substituting local currency for foreign currency by investors. This ratio issued signals in Indonesia and Malaysia, and its deviation from its trend signaled in Korea and Thailand. The ratio of short-term debt to foreign reserves, a measure of liquidity mismatch, issued warning signals in Indonesia and Malaysia. The ratio of residents' deposits in the BIS banks to foreign reserves issued warning signals in Korea, Philippines, and Singapore, suggesting that there was capital flight prior to the crisis. Finally, the foreign reserves position deteriorated in Korea, Malaysia, Thailand, and Singapore, as indicated by warning signals from the growth of foreign reserves.

Warning signals from the M2 money multiplier, the ratio of domestic credit to GDP, the ratio of the real M1 balance to its trend, and the ratio of central bank credit to the public sector to GDP suggest evidence of excessive growth of domestic credit prior to the crisis, particularly in Korea, Malaysia, Philippines, and Thailand.

There was also deterioration in the real sector in most countries prior to the crisis, except in Malaysia and Singapore. The growth of industrial production issued warning signals in Indonesia, Korea, Philippines, and Thailand. Stock prices also issued warning signals, reflecting perhaps bursts in asset prices bubbles, particularly in Korea and Thailand.

Finally, the real US dollar/Japanese yen exchange rate issued six warning signals during the 24 months prior to the 1997 crisis, suggesting that the yen's real depreciation against the US dollar contributed to some extent to the stress in many economies in East Asia.

Conclusion

Findings from an EWS model show that there were strong warning signals of heightened financial vulnerability in each of the five affected countries prior to the Asian crisis. This appears not to square well with the "investor panic" postulate. Instead, it lends strong support to the hypothesis that weaknesses in economic and financial fundamentals in these countries triggered the crisis, including real appreciations of domestic currencies, deteriorations in current account positions, excessive external borrowings by banks and currency mismatches in their balance sheets, excessive growth of domestic credit, economic slowdown, and burst of asset price bubbles.

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