Growth and Investment in East Asia Before and After the Financial Crisis

Robert J. Barro and Jong-Wha Lee*

In 1997-8, five East Asian countries – Indonesia, Malaysia, South Korea, the Philippines, and Thailand – experienced sharp currency and banking crises. The contraction of real GDP was severe in relation to the previous history and in comparison with five East Asian countries that were less affected by the financial crisis. Recoveries in the five countries were strong in some cases, but it is unclear whether the pre-crisis growth rates will be reattained. Indications for permanently depressed prospects come from the sharp reductions in investment ratios, which have recovered only slightly, and the lowered stock-market prices. A panel analysis for a broad group of economies shows that a combined currency and banking crisis typically reduces economic growth over a five-year period by 2% per year. The East Asian experience over the 1997-8 crisis is in general consistent with this stylized pattern. The broader analysis found no evidence that financial crises had effects on growth that persisted beyond a five-year period.

Keywords: East Asia, Financial crisis, Growth, Panel regression

JEL Classification: O4, O1, F4

I. Introduction

The Asian financial crisis began with the floating of the Thai baht in July 1997. The crisis then spread rapidly to the Philippine peso and the Malaysian ringgit. In August, the Indonesian rupiah

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devalued, ultimately by more than any other Asian currency. Relatively small depreciations occurred in the Singaporean dollar, starting in August, and the New Taiwan dollar, starting in October. The South Korean won depreciated substantially starting in November. Japan also had a moderate devaluation between July 1997 and January 1998. No significant devaluations took place in China, which has remained relatively insulated from world financial markets, and Hong Kong, which maintained a currency board linked to the U.S. dollar.

This study focuses on the immediate and long-term effects of the Asian financial crisis on economic performance in East Asia. Specifically, we consider the behavior of economic growth and investment in China, Hong Kong, Indonesia, Japan, South Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand.

These ten economies break down naturally into two groups depending on the extent to which they were impacted by the financial crisis of 1997-8. The first group of five countries– Indonesia, South Korea, Malaysia, the Philippines, and Thailand– experienced nominal currency depreciations of more than 50 percent from July 1997 to early 1998. In these countries, offshore nominal interest rates (determined primarily by forward exchange rates) or onshore rates reached at least 25 percent at some point between June 1997 and January 1998. Subsequently, we refer to this group as Asian-crisis countries. The other five East Asian economies experienced nominal depreciations of less than 25 percent, and nominal interest rates remained below 20 percent.[1]

One objective is to assess whether the Asian financial crisis had a long lasting effect on growth prospects and other dimensions of economic performance for the two groups of Asian economies. This task is difficult because only limited data are available after the ends of the financial crises in 1998. However, we get some information first by looking at post-crisis behavior within the group of East Asian economies, second by imbedding this behavior within a panel analysis of a large number of economies, and finally by using the panel to take a broader view of the impact of currency crises.

[1]Offshore interest rates in late 1997 reached 18 percent in Hong Kong and 17 percent in Singapore. Meaningful data on interest rates are unavailable for China, but the official exchange rate remained virtually unchanged.

II. Recent Economic Performance in the East Asian Economies

A. Economic Growth

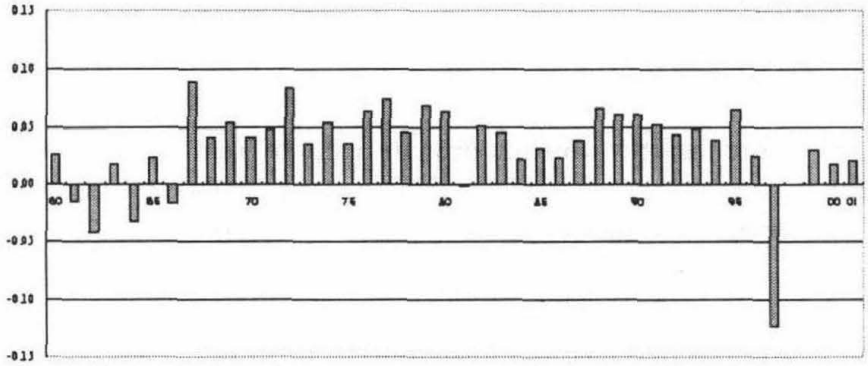
Figure 1 shows the annual growth rate of real per capita GDP for each of the East Asian economies from 1960 to 2002.[2] The sharp economic contractions in 1998 for the five Asian-crisis countries are evident: real per capita GDP (as the purchasing-power adjusted value) fell by 12 percent in Indonesia, 11 percent in Thailand, and 10 percent in South Korea, but only 3 percent in the Philippines and 1 percent in Malaysia.[3] The other five East Asian economies were less affected: per capita growth during 1998 was −9 percent in Hong Kong, −4 percent in Singapore, −2 percent in Japan, 4 percent in Taiwan, and 5 percent in China.

In 1999-2000, economic recoveries occurred, and the per capita growth rates were positive in all ten economies. Among the five crisis countries, the annualized per capita growth rates were 8 percent in South Korea, 4 percent in Thailand, 3 percent in Malaysia and the Philippines, and 2 percent in Indonesia. For the other five economies, the rates were 7 percent in China and Singapore, 5 percent in Hong Kong and Taiwan, and 1 percent in Japan.

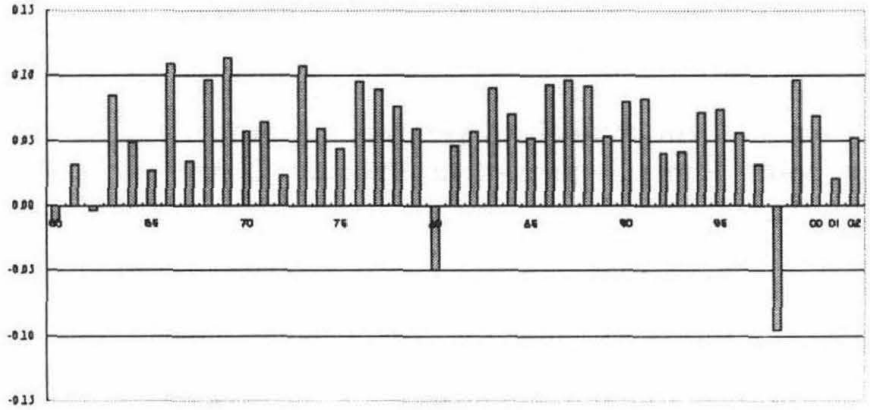
A central issue is whether the East Asian economies will be able to return to the pre-crisis trend rate of growth. It is not clear if the recoveries in the post-crisis period signal a return to the previous patterns of growth for the crisis-hit East Asian economies. In fact, the rebound of growth for 1999-2000 slowed down in the subsequent period. In 2001-2, the annualized per capita growth rates were 4 percent in South Korea, 3 percent in Thailand, 2 percent in Indonesia and the Philippines, and 0 percent in Malaysia.

[2]The underlying GDP data are the purchasing-power adjusted values from Penn-World Tables 6.1, as described in Summers and Heston (1991) and Heston, Summers, and Aten (2002). We updated the Summers-Heston data for 2001 and 2002 by using information on real GDP from the International Monetary Fund, *World Economic Outlook*.

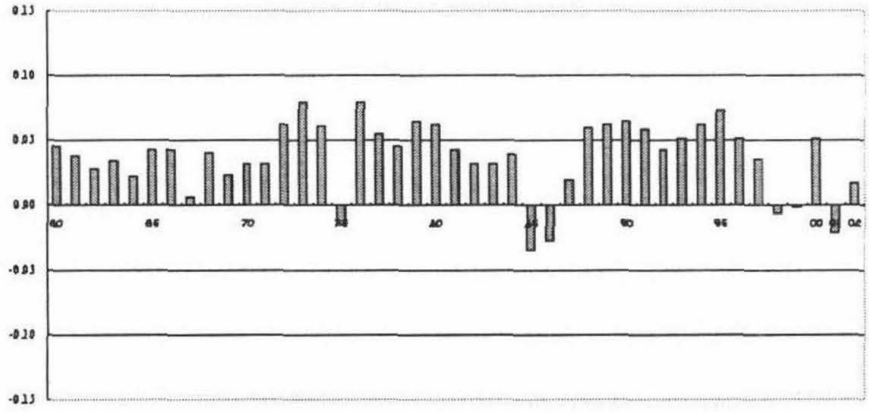
[3]According to the Penn-World Tables 6.1, per capita GDP growth rate in 1998 was −0.6% for Malaysia. This estimate based on the PPP adjusted GDP series seems too low. For instance, the conventional national account data from the IMF source was −9.7%. For other East Asian countries, the discrepancies between two sources are less significant.



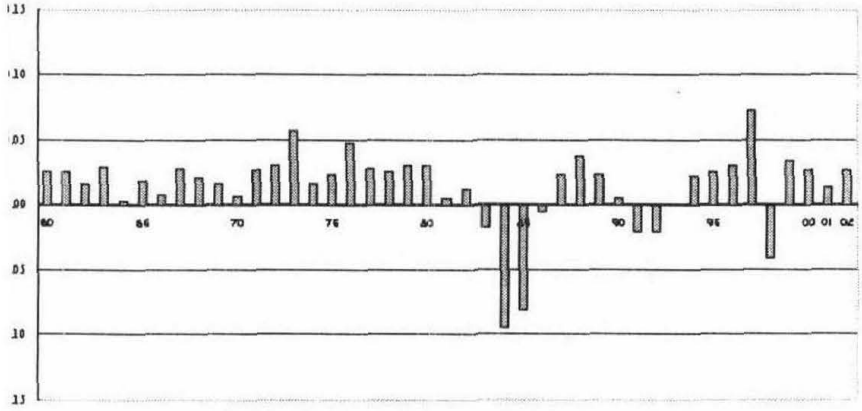
Growth Rate of Per Capita GDP in Indonesia



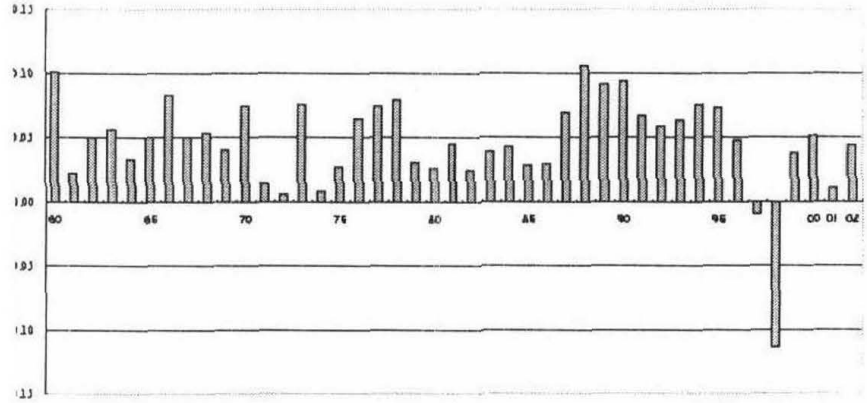
Growth Rate of Per Capita GDP in Korea



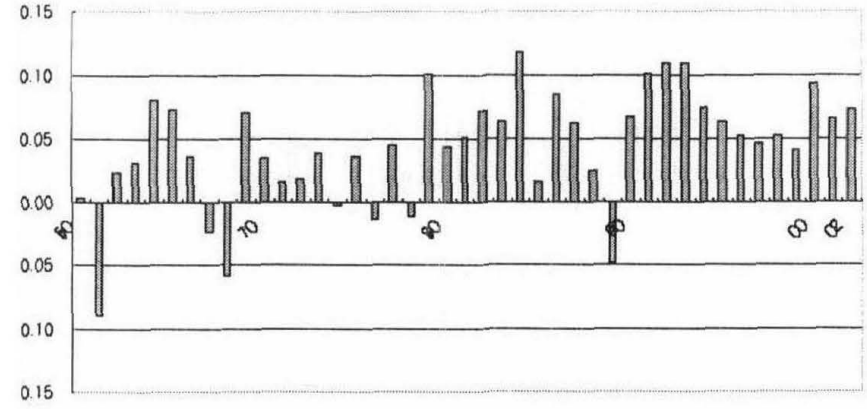
Growth Rate of Per Capita GDP in Malaysia



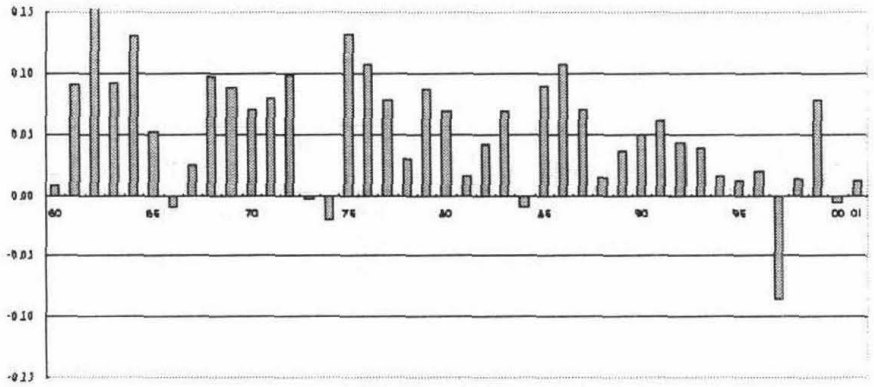
Growth Rate of Per Capita GDP in the Philippines



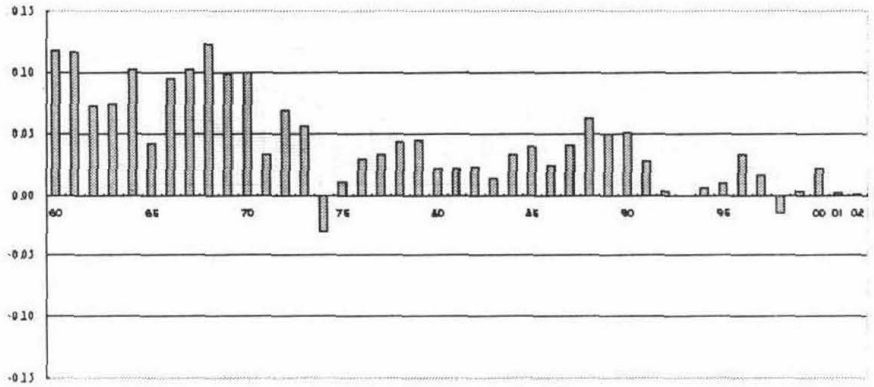
Growth Rate of Per Capita GDP in Thailand



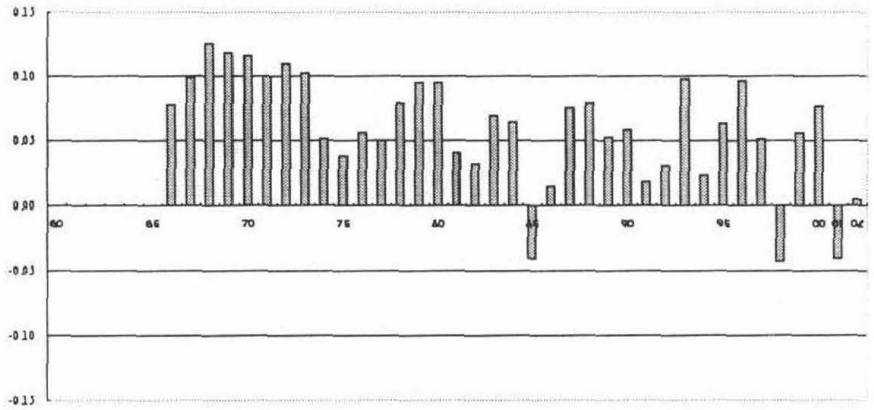
Growth Rate of Per Capita GDP in China



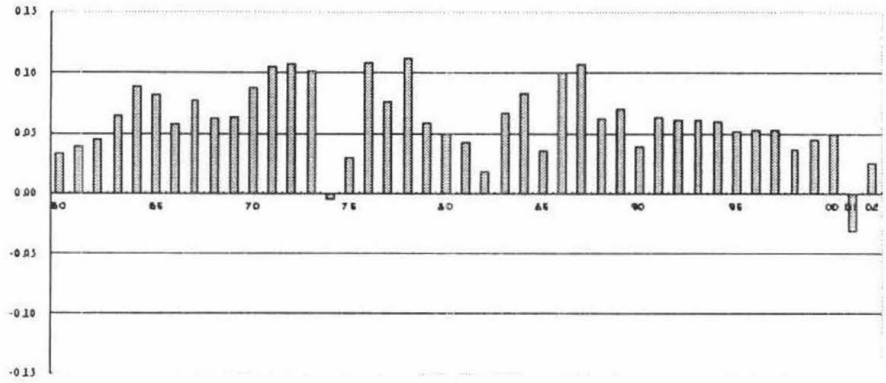
Growth Rate of Per Capita GDP in Hong Kong



Growth Rate of Per Capita GDP in Japan



Growth Rate of Per Capita GDP in Singapore



Growth Rate of Per Capita GDP in Taiwan

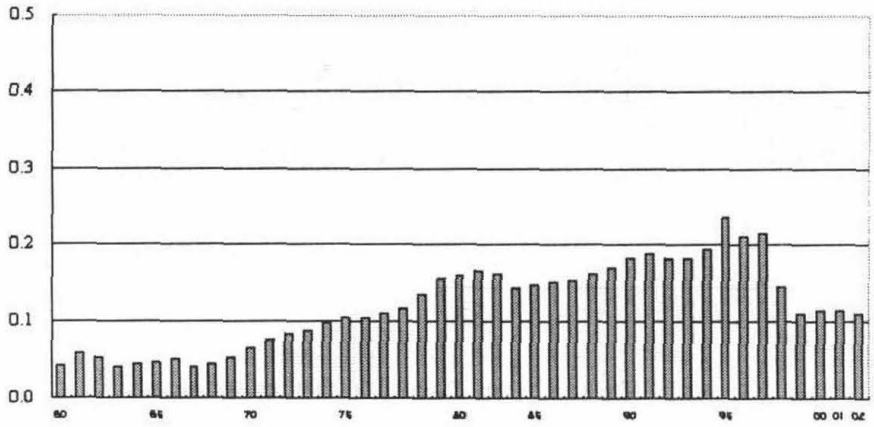
FIGURE 1

Thus, it looks likely that the financial crisis in 1997-8 had persisting effects on growth. However, the subsequent downturn over the period 2001-2 may have come from the global recession. During the same period, the non-crisis East Asian economies also experienced a drastic fall in per capita growth rates: the annualized per capita growth rates were −2 percent in Singapore and 0 percent in Hong Kong and Taiwan. Furthermore, even without the Asian financial crisis, projected growth rates in East Asia would have differed from historical ones, partly because the various economies had become so much richer than they were in 1960. Therefore, the question is whether growth forecasts would revert to those that would have been made before the Asian financial crisis. The subsequent analysis quantifies these growth projections and tries to reach some conclusions about the long-term outlook.

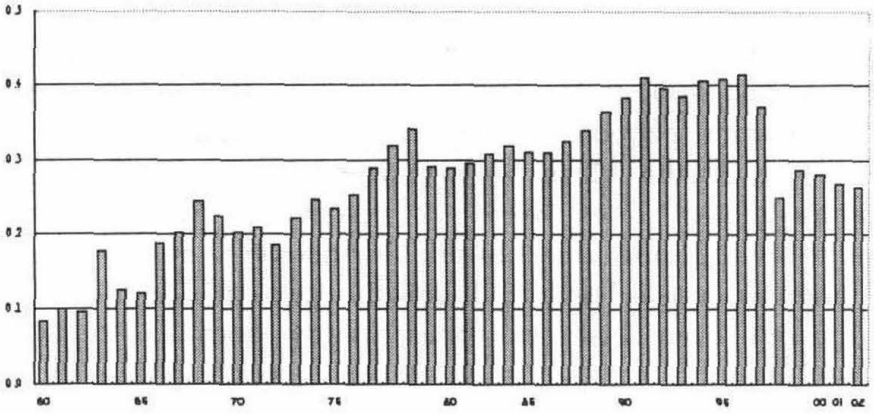
B. Investment Ratios

Figure 2 depicts the investment ratios for the East Asian economies from 1960 to 2002.[4] Four of the Asian-crisis countries—

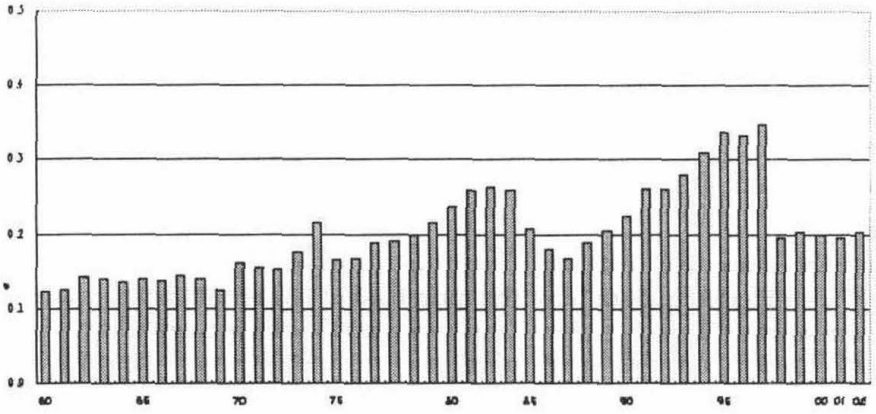
[4]The ratios are for real investment (private plus public) relative to real GDP. The underlying data are the purchasing-power adjusted values from the Penn-World Table 6.1. For 2001 and 2002, the values were estimated from information on real investment and real GDP from the International Monetary Fund, *World Economic Outlook* and the Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries*. These numbers were linked to the Penn-World Tables values based on a comparison in the overlapping year 2000 (1996 for Singapore, 1998 for Taiwan).



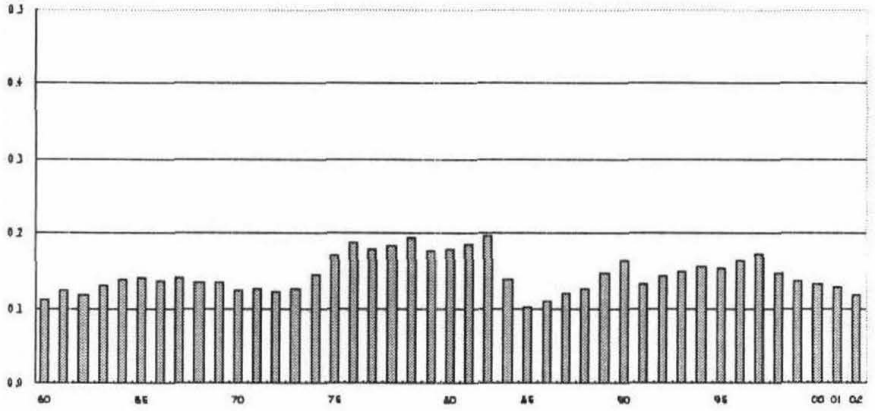
Investment Ratio in Indonesia



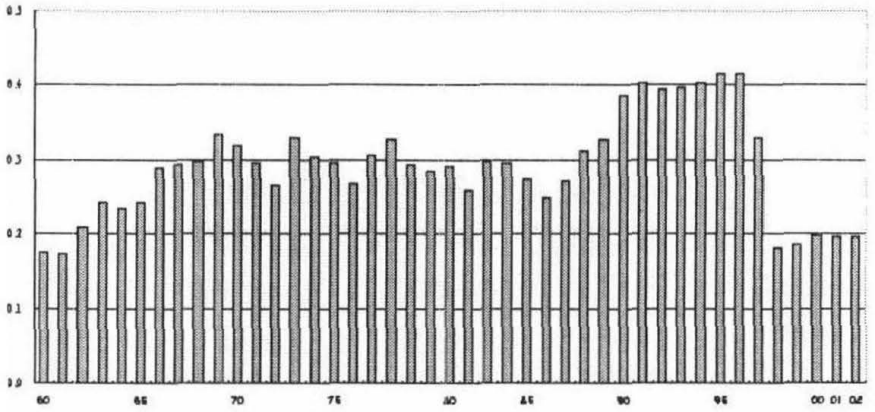
Investment Ratio in South Korea



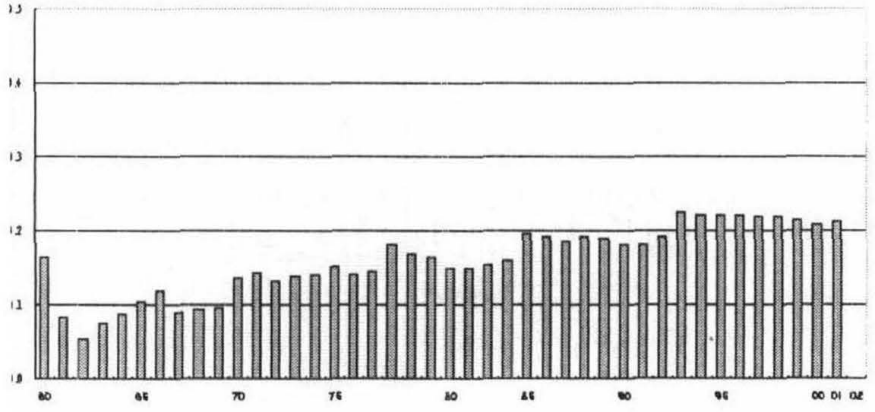
Investment Ratio in Malaysia



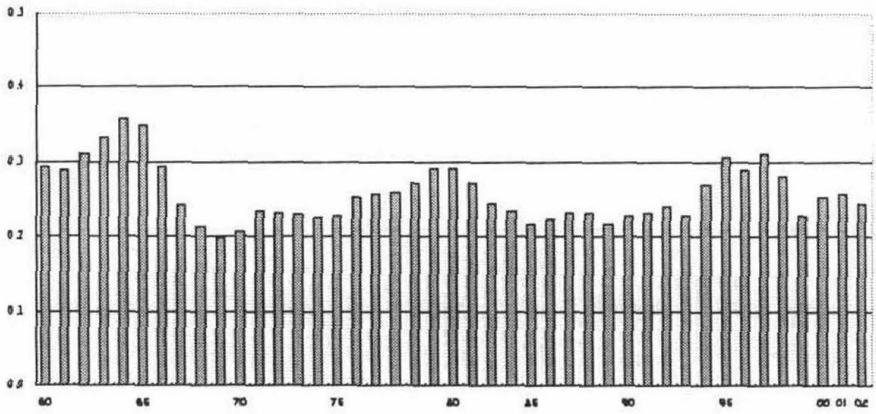
Investment Ratio in the Philippines



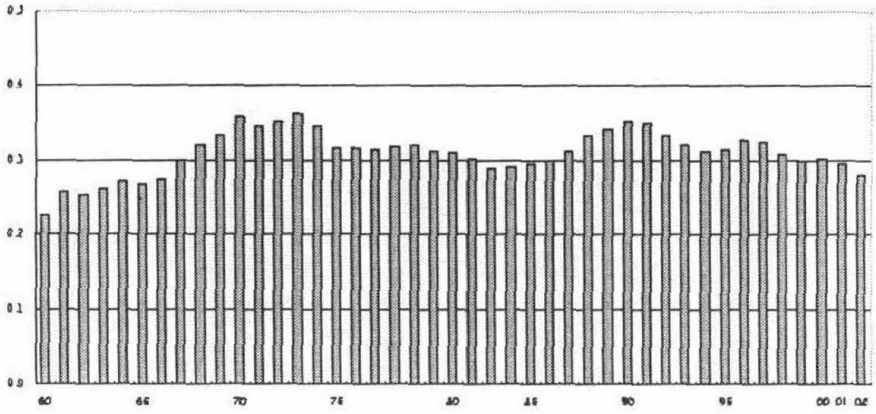
Investment Ratio in Thailand



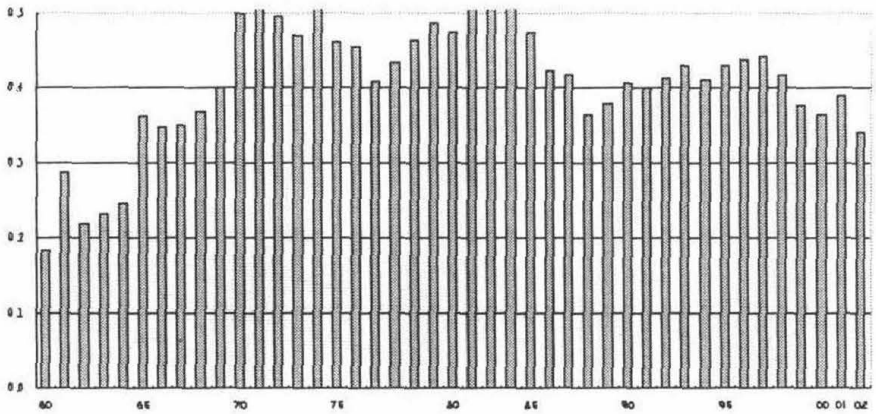
Investment Ratio in China



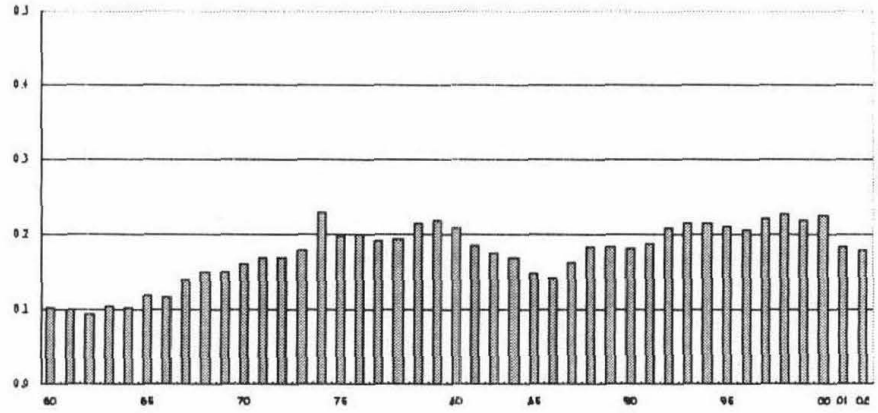
Investment Ratio in Hong Kong



Investment Ratio in Japan



Investment Ratio in Singapore



Investment Ratio in Taiwan

FIGURE 2

Indonesia, South Korea, Malaysia, and Thailand—showed dramatic declines in 1998, by well over ten percentage points. For the Philippines, which historically had a low investment ratio, the reduction in 1998 was comparatively small, amounting to about 2 percentage points. For the four countries in which investment declined sharply, the failure to see substantial recoveries in 1999-2002 suggests that something permanent may have occurred.[5] However, it is also possible that investment ratios tend generally to recover more slowly than rates of economic growth, and the subsequent cross-country analysis supports this viewpoint.

The other five East Asian economies exhibited milder decreases or no decreases in investment ratios during 1998. Hong Kong, Japan and Singapore had small reductions from their peak ratios, ranging from 2 to 3 percentage points. There was little or no decline for China and Taiwan. Thus, there is reason to believe that the dramatic falls in the investment ratios in Indonesia, South Korea, Malaysia, and Thailand were specifically related to the Asian

[5]Although parts of the sharp declines in real investments are attributed to the increase in investment prices due to currency crashes, there must be other factors that have caused the permanent slump of investment. In Korea, for example, after the nominal exchange depreciation of 40% in 1997, domestic price of investment goods on average increased by 19% in 1998. However, since then the price continue to have dropped by 13% over the period of 1999-2002.

financial crisis.

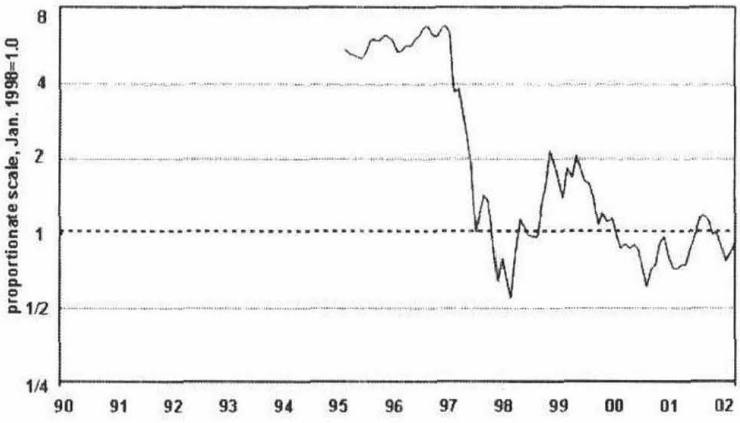
C. Stock-Market Prices

Figure 3 examines patterns in real stock-market prices. The general idea is that a fall in an economy's stock market likely reflects the market's belief that long-term growth prospects have diminished. In the figures, the real stock-market values are computed by converting local currency values of stock-market indexes to U.S. dollars and then dividing by a measure of the U.S. price level.[6] An alternative procedure would deflate the local currency stock-market indexes by measures of local prices. Shifts in real exchange rates cause the two concepts to diverge.

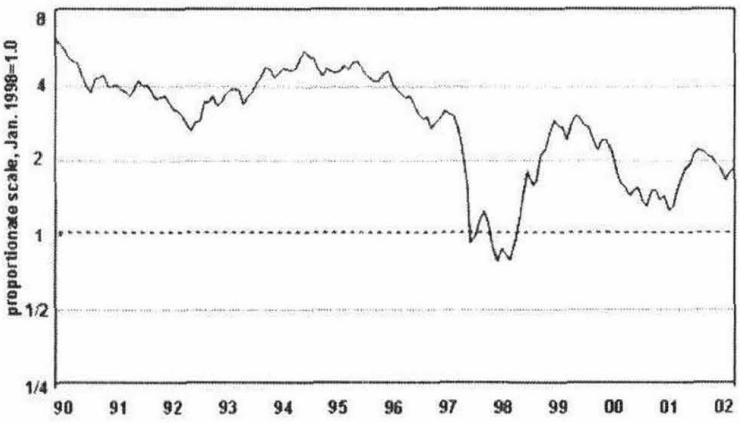
The five Asian-crisis countries saw sharp declines in real stock-market valuations from the start of the financial crisis in summer 1997 until the fall of 1998 (For Thailand, the drop in the stock market clearly precedes the financial crisis). For present purposes, an important observation is that valuations at the end of 2002 fall far short of those from early 1997. The ratios of values for December 2002 to those for January 1997 are 0.10 for the Philippines, 0.14 for Indonesia, 0.31 for Malaysia, 0.43 for Thailand, and 0.65 for South Korea. For the five other East Asian economies, the declines in stock-market valuation are less dramatic. The ratios of values for December 2002 to those for January 1997 are 0.42 for Taiwan, 0.51 for Singapore, 0.55 for Japan, 0.63 for Hong Kong, and 1.24 for China.

Parts of these declines reflect the weak overall stock-market performance during 2000-2. The ratios of real stock prices index for January 2000 to those for January 1997 are 0.28 for Indonesia, 0.57 for Thailand, 0.82 for the Philippines, 0.46 for Malaysia, and 1.01 for South Korea. For the five other East Asian economies, the ratios for January 2000 relative to January 1997 are 1.12 for Taiwan, 0.88 for Singapore, 1.29 for Japan, 1.10 for Hong Kong, and 1.59 for China.

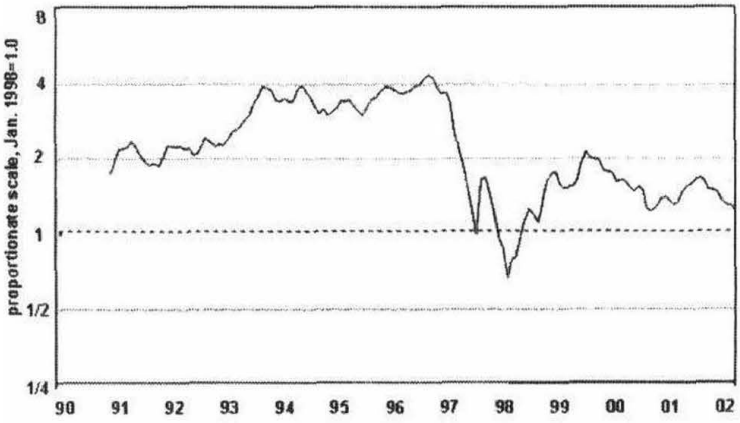
[6]The stock-market indexes, reported in domestic currency units, were converted into U.S. dollars using market exchange rates. These values were converted into real terms by dividing by the U.S. CPI. The natural logs of these values were calculated, the values in January 1998 were normalized to zero, and all values were divided by the natural log of two (to obtain convenient units for the graph). The resulting numbers are plotted in Figure 3, with the values for January 1998 labeled as 1.



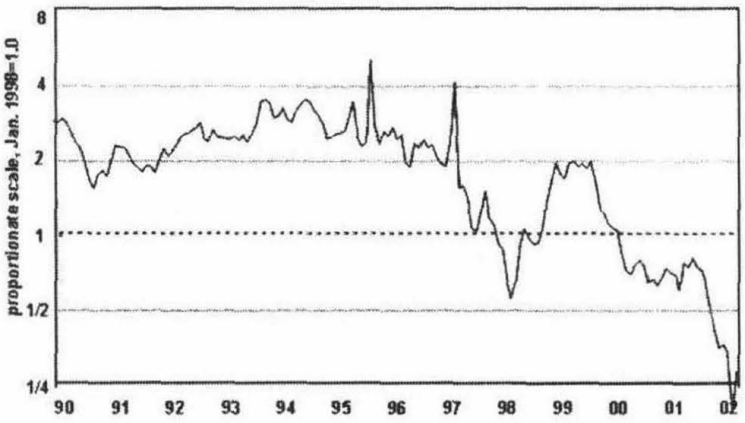
Stock Market Index in Indonesia



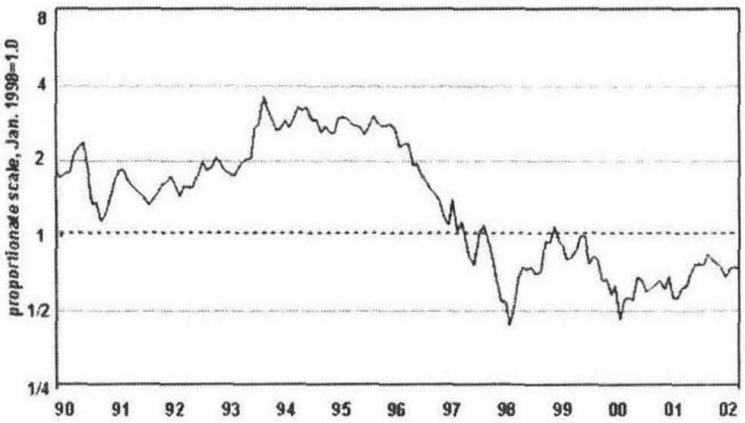
Stock Market Index in Korea



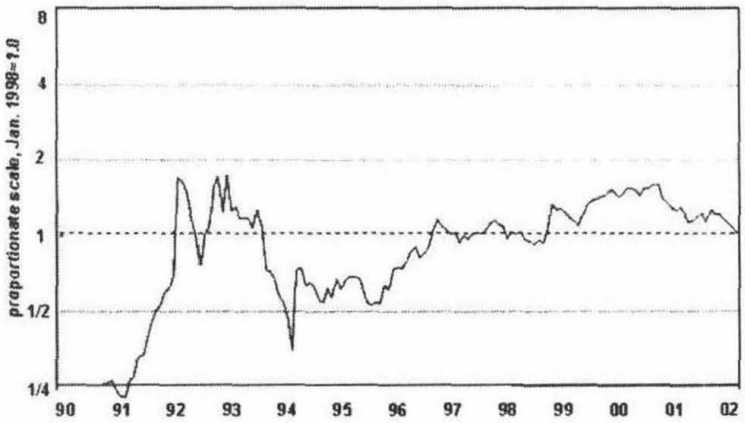
Stock Market Index in Malaysia



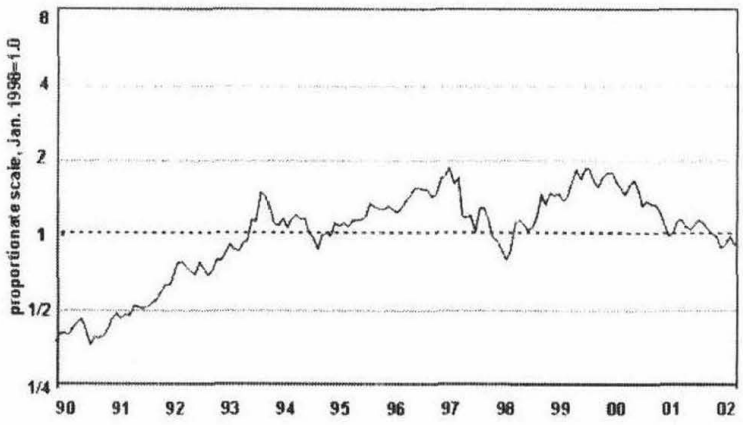
Stock Market Index in the Philippines



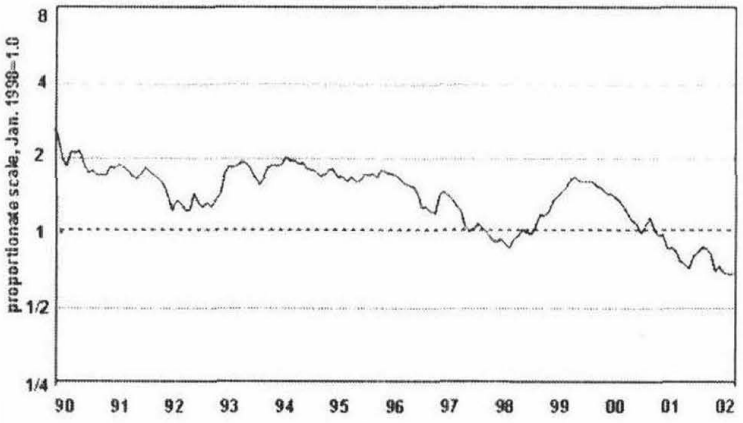
Stock Market Index in Thailand



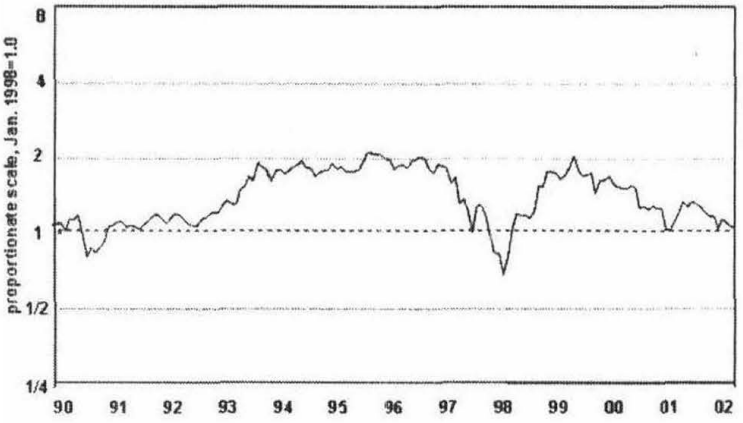
Stock Market Index in China



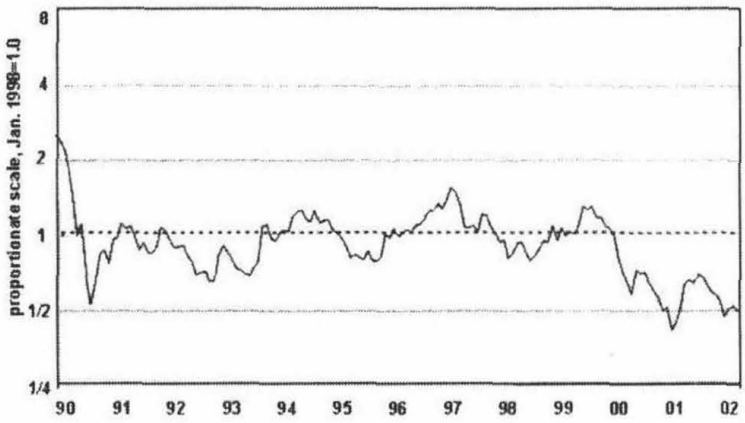
Stock Market Index in Hong Kong



Stock Market Index in Japan



Stock Market Index in Singapore



Stock Market Index in Taiwan

FIGURE 3

It seems reasonable to infer that the most parts of the sharper declines in real stock market valuation for the Asian-crisis countries after the financial crisis of 1997 reflect effects from the financial crisis itself.[7]

The main conclusion from the analysis of stock-market data is that, from the perspective of the financial markets, events from 1997 through 2002 had permanent negative consequences for the economic outlook of the five Asian-crisis countries. The adverse impacts were less significant for the five other East Asian economies and were not present for China. The financial crises that began in summer 1997 were part of the environment that would be reflected in stock-market prices but were, of course, not the entire story. However, the differential market responses in the two groups of economies suggest that the financial crises—and, more specifically, changing perceptions about the long-term consequences of these crises—were significant parts of the story.

[7]Parts of the declines in real stock-market values, as measured, reflect depreciations of real exchange rates. If the real stock-market values are calculated by dividing nominal stock-market indexes by local consumer price indexes, then the ratios for December 2000 to those for January 1997 are 0.31 for Indonesia, 0.32 for Thailand, 0.34 for the Philippines, 0.52 for Malaysia, and 0.69 for South Korea. For the other non-crisis Asian countries, the ratios are 0.68 for Taiwan, 0.93 for Singapore, 0.76 for Japan, 1.10 for Hong Kong, and 2.40 for China.

III. Cross-Country Analyses of Economic Outcomes

The general approach in this section is to modify existing work on cross-country analyses of economic growth and investment to assess the effects of the Asian financial crisis. We begin with a study of economic growth, using an empirical framework that has been widely used in previous studies. See, for example, Barro and Lee (1994), Barro (1997), and Barro and Sala-i-Martin (2004, Ch. 12). Our regression applies to a panel data set of 85 countries over seven five-year periods from 1965 to 2000, corresponding to the periods 1965-70, ···, and 1995-2000. We include in this analysis a representative set of the explanatory variables that have been used in previous work. Thus, controlling for other important explanatory variables, any effects of the Asian financial crisis would show up as deviations of economic performance during the final five-year interval from those observed in the earlier intervals. When the data are available, it will be interesting to assess persisting effects on performance in the next five-year period, 2000-5.

A. Economic Growth

The framework for determining the growth rate of real per capita GDP is indicated by the baseline system, shown in column 1 of Table 1. Since the general approach has been described elsewhere and is likely to be familiar, we include here only a brief discussion.

The dependent variables are the five-year growth rates of real per capita GDP. Estimation is by three-stage least squares, using mostly lagged values of the independent variables as instruments—see the notes to Table 1. Individual constant terms are included for each period; hence, the system does not explain the evolution of world economic growth over time. No country fixed effects are introduced, because this procedure tends to eliminate the bulk of the information in the data, that is, the cross-sectional dimension of the panel.

TABLE 1

CROSS-COUNTRY PANEL REGRESSIONS FOR GROWTH RATES

Explanatory variables	(1)	(2)	(3)	(4)	(5)
Log (per capita GDP)	-0.0233	-0.0242	-0.0240	-0.0227	-0.0207
	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0031)
Log (total fertility rate)	-0.0178	-0.0167	-0.0166	-0.0168	-0.0157
	(0.0050)	(0.0050)	(0.0050)	(0.0049)	(0.0049)
Male upper-level schooling	0.0018	0.0064	0.0026	0.0017	0.0015
	(0.0016)	(0.0042)	(0.0016)	(0.0015)	(0.0015)
Log (life expectancy)	0.0633	0.0651	0.0649	0.0636	0.0587
	(0.0168)	(0.0167)	(0.0167)	(0.0165)	(0.0165)
Government consumption/GDP	-0.057	-0.060	-0.058	-0.054	-0.047
	(0.022)	(0.022)	(0.023)	(0.021)	(0.021)
Rule-of-law index	0.0183	0.0177	0.0169	0.0191	0.0165
	(0.0062)	(0.0061)	(0.0061)	(0.0061)	(0.0060)
Inflation rate	-0.0297	-0.0258	-0.0247	-0.0280	-0.0277
	(0.0070)	(0.0069)	(0.0069)	(0.0067)	(0.0067)
Democracy index	0.0460	0.0482	0.0470	0.0452	0.0415
	(0.0162)	(0.0161)	(0.0161)	(0.0161)	(0.0161)
Democracy index Squared	-0.0407	-0.0423	-0.0418	-0.0403	-0.0366
	(0.0149)	(0.0148)	(0.0148)	(0.0148)	(0.0149)
Openness measure	0.0049	0.0064	0.0071	0.0052	0.0031
	(0.0041)	(0.0042)	(0.0042)	(0.0041)	(0.0043)
Investment/GDP	0.079	0.087	0.089	0.083	0.084
	(0.022)	(0.022)	(0.022)	(0.022)	(0.023)
Growth rate of terms of trade	0.033	0.036	0.037	0.033	0.032
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Group of 5 Asian financial crisis countries (dummy for 95-00)	-	-0.0234	-0.0254	-0.0166	-0.0158
		(0.0091)	(0.0090)	(0.0095)	(0.0095)
Group of 5 Other East Asian economies (dummy for 95-00)	-	-	-0.0121	-	-0.0048
			(0.0091)		(0.0099)
Group of 5 Asian fin'l crisis countries (dummy for other periods)	-	-	-	0.0114	0.0132
				(0.0056)	(0.0056)
Group of 5 Other East Asian economies (dummy for other periods)	-	-	-	-	0.0105
					(0.0068)
Number of countries	85	85	85	85	85
Observations	535	535	535	535	535

Notes: **Dependent variables**: The dependent variable is the growth rate of real per capita GDP. Data are from the World Tables 6.1, as described in Summers and Heston (1991) and Heston, Summers, and Aten (2002). The growth rate is the average for each of the

seven five-year periods 1965-70, ···, 1995-2000.

Independent variables: Individual constants (not shown) are included for each period. The log of real per capita GDP and the average years of male secondary and higher schooling are measured at the beginning of each period. The log of life expectancy at birth is an average for the previous five years. The ratios of government consumption (exclusive of spending on education and defense) and investment (private plus public) to GDP, the inflation rate, the total fertility rate, the democracy index, and the growth rate of the terms of trade (export over import prices) are period averages. The rule-of-law index is the earliest value available (for 1982 or 1985) in the first four equations and the period average for the other equations. The openness measure is the ratio of exports plus imports to GDP, filtered for the estimated effects on this measure of the logs of population and area. The ten East Asian economies are China, Hong Kong SAR, Indonesia, Japan, South Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand (China is omitted because of missing data). The five Asian-crisis countries are Indonesia, South Korea, Malaysia, the Philippines, and Thailand.

Estimation: Estimation is by three-stage least squares. Instruments are the actual values of the schooling, life-expectancy, openness, and terms-of-trade variables; dummy variables for prior colonial status (which have substantial explanatory power for inflation)); lagged values of the log of per capita GDP, the government consumption ratio, and the investment ratio; and the initial values for each period of the rule-of-law index and democracy index. The earliest value available for the rule-of-law index (for 1982 or 1985) is included as an instrument for the first four equations, and the value at the start of each period is included for the other equations. Standard errors are shown in parentheses.

The first explanatory variable, the log of per capita GDP at the start of each period, reveals the familiar conditional convergence effect: the estimated coefficient is −0.023 (s.e.=0.003).[8] The log of the total fertility rate is significantly negative: −0.018 (0.005). Also included are two measures of initial human capital, each of which has a positive effect on growth. The coefficient on the log of life expectancy at birth is significant, 0.063 (0.017). However, the

[8]The instrument list excludes the log of per capita GDP at the start of each period but includes earlier values of the log of per capita GDP. If the square of the log of per capita GDP is added as an explanatory variable, there is some indication that the rate of convergence (the magnitude of the marginal effect of the log of per capita GDP on the growth rate) increases as an economy gets richer.

educational attainment variable, which is measured by the average years of school attainment of males aged 25 and over at the secondary and higher levels is statistically insignificant, 0.0018 (0.0016).[9]

The next five variables capture aspects of government policies and institutions. The ratio of government consumption (measured exclusively of outlays on education and defense) to GDP is significantly negative, −0.057 (0.022). A subjective measure of the extent of maintenance of the rule of law (an indicator of property rights enforcement) is significantly positive, 0.018 (0.006). Higher inflation, an indicator of macroeconomic instability, is significantly negative for growth, −0.027 (0.008).[10]

The regression results confirm the non-linear relationship between democracy and growth, as found by Barro (1997). The coefficients on the indicator of democracy and its square terms are positive and negative respectively and both coefficients are statistically significant. The pattern of coefficients indicates that the growth rate increases with political freedom at low levels of democracy but decreases with democracy once the society has attained a certain level of political freedom.

Increased openness to international trade has a positive effect on growth, but the estimated coefficient, 0.005 (0.004) is not statistically significant.[11]

Many of the variables just discussed also affect an economy's propensity to invest, as discussed below. However, given the other explanatory variables, a higher ratio of real investment to real GDP

[9]Other measures of school attainment lack significant explanatory power for economic growth. Barro and Sala-i-Martin (2004) show that the quality of schooling—measured by scores on internationally comparable tests of educational achievement in the subjects of science and mathematics—is statistically significant. However, data on the quality of schooling cover only about 40 countries.

[10]The instrument list excludes inflation but includes measures of colonial heritage. These colony variables have substantial explanatory power for inflation.

[11]The independent variable is the ratio of total trade, exports plus imports, to GDP filtered for the typical effect of country size on this trade measure. This last effect was estimated from a system in which the trade-GDP ratio over various periods was the dependent variable. Country size was represented by the logs of population and area. The trade variable was included in the instrument list.

still has a significantly positive effect on growth, as indicated by the coefficient 0.079 (0.022). The inclusion of the lagged, but not contemporaneous, investment ratio in the instrument list may allow a causal interpretation of this effect. A higher growth rate of the terms of trade (export relative to import prices) has also an expansionary effect on growth, but the estimated coefficient, 0.033 (0.020), is not statistically significant.

Columns 2-5 of Table 1 show the effects on growth in the period 1995-2000 from dummy variables for being one of the five Asian financial crisis countries and from being one of the five other east Asian economies. In column 2, the estimated coefficient on the dummy variable for the five Asian financial crisis countries for the period 1995-2000 is significantly negative, −0.023 (0.009), indicating that the five crisis countries grew during 1995-2000 at about 2.3 percentage points per year below the rate that would otherwise have been predicted by the set of explanatory variables.

Column 3 of Table 1 adds the dummy variable for the five other east Asian economies for the period 1995-2000. The estimated effect of the five Asian financial crisis countries remains similar to that in column 1. For the five other east Asian economies, the estimated coefficient is insignificantly different from zero, −0.012 (0.009). Thus, only the five crisis-hit Asian economies experienced the significant shortfall of growth in the period 1995-2000 from the rate that would have been predicted by the growth regression.

Column 4 of Table 1 includes two dummy variables for the five crisis-hit Asian economies- one for the period 1995-2000, and the other for the six other five-year periods (where the coefficient of the dummy for these six periods is constrained to be the same for each period). The estimated coefficient on the dummy for the period 1995-2000 is negative and marginally significant, −0.017 (0.010), whereas the estimated coefficient for the other six periods is significantly positive, 0.011 (0.006). Thus, the five Asian crisis countries had higher growth by about 1.1 percentage point per year in the intervals before 1995 whereas they had lower growth by about 1.7 percentage point per year during 1995-2000, compared to the rest of the sample in the corresponding period.

Column 5 adds the corresponding dummy variables – for the period 1995-2000 and for the six other five-year periods – for the five other Asian economies. With these variables included, the estimated effects of the five Asian crisis countries are similar to

those in column 4; that is, significantly positive for the six other five-year periods and marginally significantly negative for the period 1995-2000. The estimated coefficient for the five other Asian economies for the period 1995-2000 is insignificant, −0.005 (0.010). The estimated coefficient for these economies for the other six periods was 0.011 (0.007) and is also statistically insignificantly different from zero.

Table 3, columns 1 and 2, details the growth shortfall during 1995-2000 for each of the East Asian economies. Column 1 contains the actual growth rates of per capita GDP. Column 2 shows the estimated values from the baseline system in column 1 of Table 1. Note that this system excludes all of the dummy variables for the East Asian economies. In most cases, the estimated values fall substantially short of the historical growth rates, which are shown for 1965-95 in column 3 of Table 3. The main reason for these shortfalls is that most of the economies have become much richer over time, and the convergence effect predicts a reduction in growth rates. This effect is partially offset by the generally favorable and, more pertinently, improving nature of the other explanatory variables that determine economic growth in the system shown in column 1 of Table 1 (The values of the explanatory variables for the East Asian economies are shown in Table 4). However, the net effect is to predict growth rates below the historical average for most of the East Asian economies. These lowered growth projections would also apply for future periods and would have applied even in the absence of the Asian financial crisis.

As an example, for South Korea, the model's estimated growth rate of per capita GDP for 1995-2000 is only 3.7 percent per year, compared with the 6.7 percent average growth rate experienced for 1965-95.[12] The model predicts similar retardations of growth for the other previously high growing East Asian economies: Hong Kong is

[12]This estimated growth rate for South Korea in 1995-2000 exceeds the average value in the sample (0.022) by 0.015. This deviation from the sample mean can be broken down intro contributions from the ten explanatory variables shown in Tables 3 and 4. The results, all expressed as deviations from the sample mean, are as follows: −0.017 for the log of per capita GDP, 0.005 for schooling, 0.004 for government consumption, 0.001 for life expectancy, −0.002 for democracy, −0.001 for the terms of trade, 0.000 for the rule of law, 0.000 for openness, 0.007 for fertility, 0.001 for inflation, and 0.013 for investment.

4.2 percent versus 5.4 percent, Singapore is 5.0 percent versus 6.6 percent, Taiwan is 2.6 percent versus 6.7 percent, and Thailand is 4.6 percent versus 5.4 percent. The cutback for Japan, 2.9 percent versus 4.1 percent, is also notable. The only economy in which a growth slowdown was not projected is the Philippines, which has 3.2 percent versus 1.0 percent. However, the main element in this case is the greatly disappointing growth performance during the 1965-95 period.

A comparison of the actual growth rates for 1995-2000 with the model's estimates shows that two of the East Asian countries actually exceeded expectations. These are China, for which the actual growth rate of 5.7 percent beat the model estimate of 4 2 percent, and Taiwan, for which the actual value of 4.8 percent was well above the estimate of 2.6 percent. The other eight countries showed shortfalls of varying sizes, including gaps of 4.3 percent per year for Thailand and 4.1 percent per year for Hong Kong.

B. Investment Ratios

Table 2 contains the results from cross-country estimation of the determinants of the ratio of real investment (public plus private) to real GDP. The dependent variables are the averages of the investment ratios over the seven five-year periods 1965-9, ···, 1995-9. The specification follows the form of Table 1, except that the contemporaneous investment ratio is replaced in the group of explanatory variables by the lagged value of this ratio. Since the investment ratio displays a high degree of serial dependence, this lagged dependent variable has a lot of explanatory power. In the equations shown in Table 2, the estimated coefficient of this variable is in the neighborhood of 0.7 and is highly significant.[13] From the perspective of a partial-adjustment model, the investment ratio can be viewed as adjusting about 30 percent of the way over a five-year period to the target value determined by the other explanatory variables in the system.

The baseline model in column 1 of Table 2 shows a significantly negative effect on the investment ratio from the initial level of per capita GDP. The initial quantities of human capital in the forms of

[13]In contrast, if a lagged dependent variable is added to the system for the growth rate in Table 1, column 1, the estimated coefficient differs insignificantly from zero.

TABLE 2

CROSS-COUNTRY PANEL REGRESSIONS FOR INVESTMENT RATIOS

Explanatory variables	(1)	(2)	(3)	(4)	(5)
Lagged ratio to investment to GDP	0.711 (0.002)	0.712 (0.023)	0.712 (0.023)	0.721 (0.021)	0.072 (0.021)
Log (per capita GDP)	-0.0082 (0.0036)	-0.0086 (0.0037)	-0.0086 (0.0037)	-0.0062 (0.0034)	-0.0049 (0.0035)
Log (total fertility rate)	-0.0178 (0.0058)	-0.0178 (0.0060)	-0.0177 (0.0059)	-0.0131 (0.0053)	-0.0113 (0.0054)
Male upper-level schooling	0.0028 (0.0016)	0.0029 (0.0017)	0.0028 (0.0017)	0.0021 (0.0015)	0.0018 (0.0015)
Log (life expectancy)	0.065 (0.020)	0.064 (0.020)	0.064 (0.020)	0.067 (0.019)	0.064 (0.019)
Government consumption/GDP	-0.062 (0.027)	-0.063 (0.027)	-0.063 (0.027)	-0.066 (0.025)	-0.061 (0.025)
Rule-of-law index	0.0204 (0.0082)	0.0202 (0.0082)	0.0201 (0.0082)	0.0208 (0.0077)	0.0192 (0.0077)
Inflation rate	0.0002 (0.0097)	-0.0004 (0.0097)	-0.0007 (0.0097)	0.0040 (0.0090)	0.0028 (0.0089)
Democracy index	0.0259 (0.0204)	0.0253 (0.0206)	0.0254 (0.0206)	0.0146 (0.0200)	0.0143 (0.0201)
Democracy index Squared	-0.0240 (0.0190)	-0.0229 (0.0192)	-0.0226 (0.0192)	-0.0140 (0.0186)	-0.0123 (0.0188)
Openness measure	0.0189 (0.0044)	0.0197 (0.0045)	0.0195 (0.0046)	0.0173 (0.0040)	0.0151 (0.0041)
Growth rate of terms of trade	0.076 (0.032)	0.077 (0.032)	0.076 (0.032)	0.077 (0.032)	0.074 (0.032)
Group of 5 Asian financial crisis countries (dummy for 95-00)	-	-0.0137 (0.0114)	-0.0131 (0.0115)	-0.0210 (0.0113)	-0.0186 (0.0115)
Group of 5 Other East Asian economies (dummy for 95-00)	-	-	-0.0035 (0.0118)	-	0.0079 (0.0117)
Group of 5 Asian fin'l crisis countries (dummy for other periods)	-	-	-	0.0329 (0.0055)	0.0345 (0.0055)
Group of 5 Other East Asian economies (dummy for other periods)	-	-	-	-	0.0071 (0.0066)
Number of countries Observations	85 535	85 535	85 535	85 535	85 535

Notes: The dependent variable is the ratio of real investment (private plus public) to real GDP. Data are from the World Tables 6.1. The measure used is the average of the ratio over the seven periods 1965-9, ···, 1995-9. The lagged value of the investment ratio is the average of the ratio over the previous interval. See the notes to Table 1 for other information.

education and life expectancy have positive coefficients, though the one on education is marginally significant. The fertility rate has a significantly negative effect.

In terms of the policy variables, the main results are negative effects from government consumption and significantly positive effects from the rule of law and international openness. The inflation rate has an insignificant effect. The effect from democracy is non-linear: the estimated coefficient on the linear term is positive, and that on the square of democracy is negative. However, neither coefficient is statistically significant. Changes in the terms of trade have a significantly positive effect.

Columns 2-6 add dummy variables for the five Asian-crisis countries and the five other East Asian countries. The results show that, for given values of the other explanatory variables, the investment ratios in the five Asian-crisis countries were significantly higher by about 3 percentage points than the rest of the sample in the intervals before 1995-9. However, these investment ratios became significantly lower by about 2 percentage points in the 1995-9 period. In contrast, for the five other East Asian economies, the investment ratios did not deviate significantly from those elsewhere in the periods before 1995-9 or in the 1995-9 period. Thus, the Asian-crisis countries differed from the other East Asian economies not only in terms of the adverse shocks to investment in the recent period but also in the sense of having abnormally high investment ratios at earlier times.

Table 3 gives details about the actual and estimated investment ratios in the East Asian economies for the period 1995-9. Column 1 presents the actual investment ratios. Column 2 shows the estimated values from the baseline system in column 1 of Table 2. Among the five Asian-crisis countries, only Malaysia had an investment ratio above the estimated value (by one percentage point). For the other four crisis economies, the actual ratios fell short of the estimated ratios. Thailand showed the largest negative gap of five percentage points and the other crisis economies had negative gaps ranging from one to two percentage points. In contrast, for the five other East Asian economies, most of the gaps were positive, with the largest being plus two percentage points for Singapore.

TABLE 3

GROWTH AND INVESTMENT IN EAST ASIAN ECONOMIES

Economy	(1) Growth rate 1995-2000	(2) Estimated growth rate, 1995-2000	(3) Growth rate 1960-95	(4) Investment ratio 1995-99	(5) Estimated investment ratio, 1995-9	(6) Investment ratio 1990-4
Indonesia	0.000	0.022	0.047	0.184	0.188	0.124
South Korea	0.032	0.037	0.067	0.346	0.353	0.287
Malaysia	0.026	0.033	0.042	0.283	0.271	0.199
Philippines	0.025	0.032	0.010	0.155	0.171	0.149
Thailand	0.003	0.046	0.054	0.305	0.357	0.310
China	0.057	0.042	0.043	0.219	0.209	0.157
Hong Kong	0.008	0.042	0.054	0.283	0.285	0.245
Japan	0.012	0.029	0.041	0.315	0.307	0.320
Singapore	0.029	0.047	0.066	0.421	0.406	0.440
Taiwan	0.048	0.026	0.067	0.217	0.216	0.179
Full sample (67 countries)	0.022	0.022	0.022	0.178	0.178	0.181

Notes: The growth rate refers to real per capita GDP. The estimated growth rate for 1995-2000 is from the panel regression shown in Table 1, column 1. The estimated value for the investment ratio for 1995-9 is from the panel regression shown in Table 2, column 1.

C. General Effects of Financial Crises

The methodology employed thus far is useful for assessing the contemporaneous effects of the Asian financial crisis on growth and investment for the Asian-crisis countries and for other East Asian economies. When data for 2000-5 and beyond become available, the methodology could also be applied to assess whether effects from the Asian financial crisis persisted beyond the contemporaneous five-year interval.

Another approach, pursued by Park and Lee (2002) and Barro (2001), is to regard the Asian financial crisis of 1997-8 not as a unique event but rather as an example of a broader class of crises that have affected numerous countries. The cross-country regression framework can be used to assess the contemporaneous and persisting influences of the universe of currency crises on economic

outcomes. The results from this exercise can then be extrapolated to the case of the Asian financial crisis. In this way, inferences can be made about the lasting economic effects of this crisis without waiting for additional data to materialize.

To get a broader international perspective on currency crises, we first need to define what a currency crisis is. A typical approach, following Frankel and Rose, (1996), is to identify the dates of crises with large nominal depreciations of a country's currency over a short period. However, severe speculative pressure does not always lead to large depreciations when the authorities successfully defend the currency by intervening in the foreign exchange market. Hence, Eichengreen, Rose, and Wyplosz (1995) and Kaminsky and Reinhart (1999) use an alternative indicator of currency pressure by combining depreciation rates with additional variables such as foreign reserve losses and domestic interest rates. Then, a currency crisis is considered to have occurred if the composite indicator increased above a threshold level in terms of the country-specific moments.

In our analysis, we combine the two approaches. We define a currency crisis as an episode identified by either the former or latter approach. For the former approach, as in Park and Lee (2002) and Barro (2001), we define a currency crisis as a circumstance in which the nominal depreciation of the currency was at least 25 percent during any quarter of the year and exceeded by at least 10 percentage points the depreciation of the currency in the previous quarter. In order to apply the criterion in the latter approach, we construct the indicator of currency pressure by a weighted average of monthly nominal depreciation rate and monthly percentage change of foreign reserve, with weights such that the two components of the indicator have an equal size in terms of sample volatilities. A currency crisis is then identified to have occurred in the specific year when the change in the indicator of currency pressure for any month of that year exceeded three standard deviations above the mean of the indicator over the sample period for each country, provided that either the monthly nominal depreciation rate or percentage change of reserve loss exceeds 10 percent.[14]

[14]We impose the condition of the monthly nominal depreciation rate or percentage change of reserve loss exceeding 10 percent. Otherwise, there

We apply a window of three years to isolate independent crises. That is, a currency crisis occurring in that year or three years following the initial crisis is counted as a continuation of the same crisis rather than a new episode. Applying this procedure, we identify 260 independent currency crises for 130 countries over the period from 1970 to 1999. According to these criteria, the five Asian-crisis countries all experienced currency crises in 1997.

We defined a currency-crisis dummy variable for each country during any five-year period to equal one if a crisis occurred during the period and to take on the value zero otherwise.[15] We considered the contemporaneous effects of this variable on economic growth and investment, and we also looked for effects from the presence of a currency crisis in the previous five-year period.

The Asian financial crises were not only currency crises but also involved severe distress for banking systems. To get a broad measure of banking crises, we followed the approach of Caprio and Klingebiel (1996) and Eichengreen and Rose (1998). These authors define a banking crisis as a situation in which bank failures or suspensions led to the exhaustion of much or all of bank capital. The data on banking crises are complied from Caprio and Klingebiel (1996), Demirguc-Kunt and Detragiache (1997), and Glick and Hutchison (2001). The resulting data apply from 1970 to 1998. We also use a window of three years to isolate independent crises. According to these data, the five Asian-crisis countries all experienced banking crises during 1997-8.

might occur a potential problem such that the expected number of crises would be the same for all countries, if the form of the distribution were equally normal but the mean and standard deviations varied across countries.

[15]We used the interval 1970-4 for currency devaluation to correspond to growth for 1970-5 and to the average investment ratio for 1970-4 and similarly for the other periods. As an alternative procedure, we defined the if the crisis occurred in the first year of the five-year interval, 0.8 if the crisis occurred in the second year, and so on. This approach might be preferable if the effect of a currency crisis tended to persist at least for several years. However, this alternative approach generated a poorer fit to the data, especially on economic growth. This finding suggests that the effects of currency crises on economic outcomes are short lived.

TABLE 4

EXPLANATORY VARIABLES FOR EAST ASIAN ECONOMIES

Economy	(1) Log (per capita GDP) 1995	(2) Log (total fertility rate) 1996	(3) Upper-level schooling 1995	(4) Log (life expectancy) 1995	(5) Government consumption/ GDP 1995-9
Indonesia	8.20	0.98	1.5	4.18	0.10
South Korea	9.51	0.56	5.5	4.26	0.01
Malaysia	9.07	1.23	3.4	4.27	0.09
Philippines	8.02	1.31	2.3	4.22	0.11
Thailand	8.82	0.60	1.5	4.26	0.06
China	7.94	0.65	2.2	4.27	0.17
Hong Kong	10.15	0.21	4.8	4.36	0.03
Japan	10.05	0.35	4.3	4.37	0.03
Singapore	10.03	0.54	3.4	4.31	0.01
Taiwan	9.60	0.58	3.9	4.31	0.05
Full sample (74 countries)	8.79	0.96	2.6	4.25	0.08

Economy	(6) Rule of Law 1995-9	(7) Inflation rate 1995-2000	(8) Democracy 1995-9	(9) Openness measure 1995-9	(10) Growth of terms of trade 1995-2000
Indonesia	0.57	0.16	0.13	0.19	0.035
South Korea	0.73	0.04	0.83	0.02	-0.047
Malaysia	0.77	0.03	0.43	1.26	0.000
Philippines	0.67	0.07	0.83	0.37	0.052
Thailand	0.83	0.04	0.73	0.34	0.006
China	0.83	0.02	0.00	0.18	0.000
Hong Kong	0.90	0.01	0.37	1.68	0.004
Japan	1.00	0.00	1.00	-0.37	-0.018
Singapore	1.00	0.01	0.37	2.04	-0.004
Taiwan	0.73	0.01	0.80	0.13	0.009
Full sample (74 countries)	0.73	0.08	0.71	-0.02	-0.011

Notes: Per capita GDP is the PPP adjusted value in 1996 U.S. dollars. Upper-level schooling is the average years of attainment of males aged 25 and over in secondary and higher education. Life

expectancy is at age 1. The total fertility rate is the number of live births for the average woman over her expected lifetime. The government consumption variable is the Summers-Heston ratio of real government consumption to GDP less the ratios for public spending on defense and education. The rule-of-law index, expressed on a zero-to-one scale, with one the most favorable, is based on the indicator from *International Country Risk Guide* for the maintenance of the rule of law. The inflation rate is the growth rate over each period of a consumer price index. The democracy index, expressed on a zero-to-one scale, with one the most favorable, is based on the indicator of political rights compiled by Freedom House. The openness variable is the ratio of exports plus imports to GDP less the estimated effect on this ratio from the logs of population and area. These effects were estimated in a panel system in which the dependent variable was the ratio of exports plus imports to GDP over various periods. The mean value of the openness variable was normalized to zero in each period. The terms-of-trade variable is the growth rate of the ratio of export to import prices.

The variable we use is a dummy for whether a banking crisis occurred for each country during any five-year period. We again considered the contemporaneous and lagged effects of these crises on economic growth and investment.

The results from adding the currency-crisis and banking-crisis variables to the systems for economic growth are in Table 5. In column 1, a contemporaneous currency crisis (occurring sometime within the applicable five-year period) is associated with lower per capita growth—by 0.9 percent per year. This effect is statistically significant.

Column 2 adds a lagged effect of a currency crisis. The result shows that the contraction of growth does not persist into the next five-year period. The estimated contemporaneous effect is significantly negative and quantitatively similar to that in column 1. However, the lagged effect is positive. The estimated coefficient on the lagged currency crisis variable is statistically significant: 0.006 (0.003). Hence, there is evidence that GDP growth rate tends to rebound by about 0.6 of a percentage point per year in the subsequent five-year period.

Column 3 shows that the corresponding effect for a banking crisis is a retardation of growth by 0.8 percent per year. This effect is statistically significant. In column 4, a lagged banking crisis variable is added. The result also shows that the contraction of

TABLE 5

IMPACT OF CURRENCY- AND BANKING-CRISES ON GROWTH RATES

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Log (per capita GDP)	-0.0287	-0.0276	-0.0270	-0.0274	-0.0290	-0.0281
	(0.0039)	(0.0039)	(0.0039)	(0.0039)	(0.0039)	(0.0039)
Log (total fertility rate)	-0.0159	-0.0161	-0.0177	-0.0171	-0.0164	-0.0159
	(0.0063)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)
Male upper-level schooling	0.0035	0.0035	0.0026	0.0028	0.0033	0.0033
	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)
Log (life expectancy)	0.0721	0.0634	0.0662	0.0666	0.0719	0.0641
	(0.0229)	(0.0231)	(0.0227)	(0.0226)	(0.0229)	(0.0229)
Government consumption/GDP	-0.010	-0.106	-0.093	-0.092	-0.100	-0.100
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Rule-of-law index	0.0171	0.0156	0.0172	0.0185	0.0175	0.0174
	(0.0082)	(0.0082)	(0.0082)	(0.0082)	(0.0082)	(0.0081)
Inflation rate	-0.0058	-0.0084	-0.0164	-0.0157	-0.0047	-0.0076
	(0.0084)	(0.0084)	(0.0082)	(0.0080)	(0.0082)	(0.0082)
Democracy index	0.0437	0.0420	0.0425	0.0439	0.0419	0.0427
	(0.0205)	(0.0202)	(0.0203)	(0.0202)	(0.0203)	(0.0199)
Democracy index Squared	-0.0274	-0.0259	-0.0279	-0.0293	-0.0257	-0.0266
	(0.0190)	(0.0187)	(0.0189)	(0.0188)	(0.0188)	(0.0184)
Openness measure	0.0120	0.0124	0.0104	0.0104	0.0116	0.0118
	(0.0048)	(0.0047)	(0.0047)	(0.0047)	(0.0047)	(0.0047)
Investment/GDP	0.058	0.064	0.071	0.074	0.068	0.076
	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)
Growth rate of terms of trade	0.059	0.054	0.051	0.054	0.055	0.053
	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.025)
Contemporaneous currency crisis	-0.0093	-0.0088	-	-	-0.0086	-0.0080
	(0.0031)	(0.0031)			(0.0031)	(0.0030)
Lagged currency crisis	-	0.0061	-	-	-	0.0057
		(0.0026)				(0.0025)
Contemporaneous banking crisis	-	-	-0.0077	-0.0079	-0.0076	-0.0073
			(0.0024)	(0.0025)	(0.0024)	(0.0024)
Lagged banking crisis	-	-	-	0.0035	-	0.0031
				(0.0027)		(0.0027)
Number of countries	85	85	85	85	85	85
Observations	396	396	396	396	396	396

Notes: The dependent variable is the growth rate of real per capita GDP. The growth rate is the average for each of the five five-year periods 1975-80, 1980-5, ···, 1995-2000. The earlier periods were deleted because of missing data on the currency-crisis and banking-crisis variables. The currency crisis is defined by combining two criteria. A currency crisis is judged to occur in the year when a country experienced a nominal currency depreciation of at least 25 percent

in any quarter of a specific year and the depreciation rate exceeded that in the previous quarter by a margin of at least a 10 percent. A currency crisis is also identified at the month of a year when an indicator of currency pressure, a weighted average of monthly nominal exchange depreciation and monthly foreign reserve loss, exceeds three standard deviations above the mean of the indicator over the sample period for each country, provided that either the monthly nominal depreciation rate or percentage change of reserve loss exceeds 5 percent. A crisis that is not apart at least 3 years from the nearest crisis is counted as a continuation of the initial crisis rather than an independent crisis. The banking-crisis dummy variable equals one if at least one of the years in the five-year period features a banking crisis, as defined in Caprio and Klingebiel (1996). Data on banking crises are compiled from Caprio and Klingebiel (1996), Demirguc and Detragiache (1998), and Glick and Hutchison (2001). See the text for further details. See the notes to Table 1 for additional information.

growth does not persist into the next five-year period. The estimated coefficient here is again positive but statistically insignificant: 0.004 (0.003).[16]

Columns 5 and 6 of Table 6 include both currency and banking crises variables together. In column 5, the contemporaneous effects from currency and banking crises are negative and statistically significant. The difference between the two effects from currency and banking crises is not statistically significant—the p-value is 0.78. Thus, currency and banking crises seem to have quantitatively similar impacts on economic growth.

The broad cross-country analysis indicates that a combination of a currency and a banking crisis would be associated with reduced growth contemporaneously by about 2 percent per year. From this

[16]Additional persistence would be implied through effects on the independent variables. For example, the reduced level of per capita GDP provides a channel whereby a currency or banking crisis would raise growth in the next period. These effects tend, however, to be small. Negative, but quantitatively even smaller, effects involve the persisting influences on investment. Other negative effects on subsequent growth would arise if, as examples, a currency or banking crisis reduces international trade or damages institutions that influence the rule of law. It is also possible that the occurrence of a currency or banking crisis alters the probability of a crisis in subsequent periods and thereby affects the expectation of future growth rates through those channels. These effects have not been investigated.

TABLE 6

IMPACT OF CURRENCY- AND BANKING-CRISES ON INVESTMENT RATIOS

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Lagged ratio to investment to GDP	0.631 (0.027)	0.626 (0.027)	0.622 (0.027)	0.607 (0.028)	0.626 (0.028)	0.610 (0.028)
Log (per capita GDP)	-0.0087 (0.0046)	-0.0086 (0.0037)	-0.0073 (0.0046)	-0.0068 (0.0047)	-0.0086 (0.0047)	-0.0086 (0.0048)
Log (total fertility rate)	-0.0210 (0.0070)	-0.0212 (0.0071)	-0.0208 (0.0071)	-0.0227 (0.0073)	-0.0209 (0.0071)	-0.0228 (0.0073)
Male upper-level schooling	0.0041 (0.0019)	0.0039 (0.0019)	0.0038 (0.0019)	0.0034 (0.0020)	0.0040 (0.0019)	0.0037 (0.0020)
Log (life expectancy)	0.066 (0.026)	0.067 (0.026)	0.067 (0.026)	0.068 (0.027)	0.066 (0.026)	0.069 (0.027)
Government consumption/GDP	-0.117 (0.033)	-0.119 (0.033)	-0.125 (0.033)	-0.132 (0.034)	-0.121 (0.033)	-0.129 (0.034)
Rule-of-law index	0.0124 (0.0111)	0.0112 (0.0106)	0.0109 (0.0105)	0.0101 (0.0105)	0.0122 (0.0104)	0.0113 (0.0106)
Inflation rate	0.0124 (0.0111)	0.0114 (0.0112)	0.0060 (0.0107)	0.0051 (0.0105)	0.0112 (0.0109)	0.0128 (0.0109)
Democracy index	-0.0058 (0.0249)	-0.0066 (0.0249)	-0.0109 (0.0250)	-0.0122 (0.0249)	-0.0055 (0.0248)	-0.0083 (0.0248)
Democracy index Squared	0.0090 (0.0231)	0.0103 (0.0231)	0.0124 (0.0233)	0.0140 (0.0232)	0.0091 (0.0231)	0.0125 (0.0230)
Openness measure	0.0234 (0.0050)	0.0235 (0.0050)	0.0236 (0.0051)	0.0241 (0.0052)	0.0234 (0.0051)	0.0240 (0.0051)
Growth rate of terms of trade	0.064 (0.038)	0.062 (0.038)	0.053 (0.038)	0.043 (0.037)	0.057 (0.037)	0.049 (0.037)
Contemporaneous currency crisis	-0.0083 (0.0041)	-0.0079 (0.0041)	-	-	-0.0073 (0.0041)	-0.0075 (0.0040)
Lagged currency crisis	-	-0.0021 (0.0033)	-	-	-	-0.0026 (0.0033)
Contemporaneous banking crisis	-	-	-0.0068 (0.0032)	-0.0063 (0.0031)	-0.0062 (0.0031)	-0.0062 (0.0031)
Lagged banking crisis	-	-	-	-0.0078 (0.0035)	-	-0.0077 (0.0035)
Number of countries, Observations	85 396	85 396	85 396	85 396	85 396	85 396

Notes: The dependent variable is the ratio of real investment (private plus public) to real GDP. The investment ratio is the average for each of the five five-year periods 1975-9, 1980-4, ···, 1995-9. The earlier periods were deleted because of missing data on the currency-crisis and banking-crisis variables. See the text for further details. See the notes to Tables 2 and 5 for additional information.

perspective, the recent economic contractions in the Asian-crisis countries look similar to the broader historical experience. In those cases, reflected in the dummy variables contained in Table 1, growth rates for 1995-2000 were reduced by about 2 percent per year.

Table 5 presents the results from adding the currency-crisis and banking-crisis variables to the systems for the investment ratio. Column 1 of Table 6 shows that a currency crisis is associated with a statistically significant reduction by about 0.8 of a percentage point. In column 2, the estimated lagged effect of a currency crisis on investment is negative but statistically insignificant. Hence, the investment contraction due to a currency crisis does not seem to persist into the next five-year period.

Column 3 shows that a banking crisis is associated with a decrease in the investment ratio by 0.9 of a percentage point, and this result is statistically significant. Column 4 of Table 5 shows that the lagged effect from a banking crisis is a significantly negative 0.8 of a percentage point. This finding contrasts with the statistically insignificant effect from a currency crisis on the investment ratio. Hence, a banking crisis seems to have a persisting negative effect on investment, although such a crisis does not appear to have a persisting negative influence on economic growth (for given values of the investment ratio and other variables).

Column 5 shows that when currency and banking crises variables are included simultaneously, there are significant negative effects from currency and banking crises on investment in the contemporaneous period. The difference between the two contemporaneous effects from currency and banking crises is not statistically significant—the p-value is 0.84. Thus, currency and banking crises have quantitatively similar impacts on investment as well as economic growth.

From the perspective of the broad cross-country analysis, the sharp contractions of investment in the Asian-crisis countries in 1998 were not exceptional. In the Asian-crisis cases, reflected in the dummy variables in Table 2, average investment ratios for 1995-2000 decreased by about 2 percentage points. The broader analysis also suggests that a combined currency and banking crisis would typically have been accompanied by a contraction of the investment ratio by about 2 percentage points.

IV. Concluding Remarks

The Asian financial crisis was associated with a sharp reduction of economic growth in East Asia, especially in the five countries that were most directly affected by the crisis. Investment ratios also fell sharply in these crisis countries, though not so much in other east Asian economies. Rates of economic growth in East Asia have rebounded in 1999-2002, but the permanence of this recovery is uncertain. The failure of investment ratios to rebound significantly in the crisis countries suggests that the crisis had a long-term adverse effect. This conclusion is reinforced by the observation that real stock-market prices in the crisis countries have failed to reattain their pre-crisis values.

A similar picture emerges from a broader study of currency and banking crises. This analysis documents the association of currency and banking crises with contemporaneously reduced values of economic growth and investment. The magnitude of the typical effect is quantitatively similar to that seen in the recent period in the Asian crisis countries. More importantly, the broader evidence does not indicate a persisting adverse influence of currency and banking crises on economic growth. Thus, if extrapolated to the Asian-crisis countries, the broad evidence predicts returns to the rates of economic growth that would have prevailed in the absence of the crisis. However, the broader international evidence shows some indication of a persisting adverse effect of a banking crisis on investment. Consequently, through the permanent depression of investment, the financial crisis would have a long-term adverse effect on growth in East Asia.

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