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ECONOMIC GROWTH IN EAST ASIA BEFORE AND AFTER THE FINANCIAL CRISIS

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Economic Growth in East Asia Before and After the Financial Crisis

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ABSTRACT

In 1997-98, 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 crisis countries in 1999-2000 were strong in most cases, but it is unclear whether the pre-crisis growth paths 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, compared with 3% per year for the 1997-98 crisis in east Asia. The broader analysis found no evidence that financial crises had effects on growth that persisted beyond a five-year period.

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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 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, I 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 1997-98. The first group of five countries--Indonesia, South Korea, Malaysia, the Philippines, and Thailand--experienced nominal currency depreciations of more than 50% 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% at some point between June 1997 and January 1998. Subsequently, I refer to this group as Asian-crisis countries. The other five east Asian economies experienced nominal depreciations of less than 25%, and nominal interest rates remained below 20%.¹

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

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 two years' of economic data are available after the ends of the financial crises in 1998. However, I get some information first by looking at recent 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.

I. Recent Economic Performance in the East Asian Economies

A. Economic Growth

Figures 1-4 show the annual growth rate of real per capita GDP for each of the east Asian economies from 1960 to 2000.² The sharp economic contractions in 1998 for the five Asian-crisis countries are evident from Figures 1 and 2: real per capita GDP fell by 16% in Indonesia, 12% in Thailand, 10% in Malaysia, and 8% in South Korea, but only 3% in the Philippines. Figures 3 and 4 show that the other five east Asian economies were less affected: per capita growth during 1998 was -5% in Hong Kong, -3% in Singapore, -1% in Japan, 4% in Taiwan, and 6% 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% in South Korea, 5% in Malaysia, 3% in Thailand, and 1% in the

² The underlying data, in most cases through 1992 (1991 for South Korea, 1990 for Taiwan), are the purchasing-power adjusted values from Summers and Heston (1991 and later years). I updated the Summers-Heston data through 2000 by using information on real GDP from the World Bank, *World Development Indicators*, and the Economist Intelligence Unit, *Country Data*.

Philippines and Indonesia. For the other five economies, the rates were 7% in China, 5% in Hong Kong and Taiwan, 4% in Singapore, and 1% in Japan.

A central issue is whether these recoveries signal a return to the previous patterns of growth. More precisely, 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

Figures 5-8 depict the investment ratios for the east Asian economies from 1960 to 2000.³ Figures 5 and 6 indicate that four of the Asian-crisis countries--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. For the four countries in which investment declined sharply, the failure to see substantial recoveries in 1999-2000 suggests that something permanent may have occurred. 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.

³ The ratios are for real investment (private plus public) relative to real GDP. The underlying data, in most cases through 1992 (1991 for South Korea, 1990 for Taiwan), are the purchasing-power adjusted values from Summers and Heston (1991). Since 1992, the values were estimated from information on real investment and real GDP from the World Bank, *World Development Indicators*, and the Economist Intelligence Unit, *Country Data*. These numbers were linked to the Summers-Heston values based on a comparison in the overlapping year 1992 (1991 for South Korea, 1990 for Taiwan).

Figures 7 and 8 show that the other five east Asian economies exhibited milder decreases or no decreases in investment ratios during 1998. Hong Kong and Singapore had small reductions from their peak ratios, and little or no decline was seen for China, Japan, 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 financial crisis.

C. Stock-Market Prices

Figures 9-12 examine 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.⁴ 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 2000 fall far short of those from early 1997. The ratios of values for December 2000 to those for January 1997 are 0.16 for Indonesia, 0.18 for Thailand, 0.22 for the Philippines, 0.37 for Malaysia, and 0.52 for

⁴ 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. GDP deflator. The natural logs of these values were calculated, the values in January 1998 were normalized to zero, and all

South Korea.⁵ For the five other east Asian economies, the declines in stock-market valuation are less dramatic or did not appear. The ratios of values for December 2000 to those for January 1997 are 0.60 for Taiwan, 0.74 for Singapore, 0.75 for Japan, 1.00 for Hong Kong, and 2.21 for China.⁶ It seems reasonable to infer that the sharper declines in real stock market valuation for the Asian-crisis countries reflect effects from the financial crisis itself.

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 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.

The main conclusion from the analysis of stock-market data is that, from the perspective of the financial markets, events from 1997 through 2000 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 and Hong Kong. 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

values were divided by the natural log of two (to obtain convenient units for the graph). The resulting numbers are plotted in Figures 9-12, with the values for January 1998 labeled as 1.

⁵ Parts of these declines reflect the weak overall stock-market performance during 2000. If the comparisons are between January 2000 and January 1997, then the ratios are 0.34 for Indonesia, 0.38 for Thailand, 0.42 for the Philippines, 0.43 for Malaysia, and 1.12 for South Korea.

⁶ In these cases, the ratios for January 2000 relative to January 1997 are 1.02 for Taiwan, 1.04 for Singapore, 1.06 for Japan, 1.23 for Hong Kong, and 1.59 for China.

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.

II. 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 other variables to assess the effects of the Asian financial crisis. My recent analysis of the determinants of economic growth has considered a panel of over 80 countries observed over the ten-year periods 1965-75, 1975-85, and 1985-95. See, for example, Barro (2000). For the present study, I updated this sample to include information on growth rates and other variables for 1995-2000. I found the necessary data for 67 countries.

To apply the framework to the period 1995-2000, I modified the panel to consider growth rates over the seven five-year periods 1965-1970, ..., 1995-2000. Thus, 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, 2000-2005.

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 (such as Barro [1997]) and is likely to be familiar, I 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.

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 -0.030 (s.e. $= 0.003$).⁷ Also included are two measures of initial human capital, each of which has a positive effect on growth. The coefficient on the average years of school attainment of males aged 25 and over at the secondary and higher levels is marginally significant, 0.0025 (0.0016),⁸ and that on the log of life expectancy at birth is significant, 0.054 (0.013). The log of the total fertility rate is significantly negative: -0.021 (0.005).

The next four 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, -0.094 (0.021). A subjective measure of the extent of maintenance of the rule of law (an indicator of property rights enforcement) is significantly positive, 0.015 (0.005). Increased openness to international trade also has a

⁷ 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.

⁸ Other measures of school attainment lack significant explanatory power for economic growth.

significantly positive effect on growth, 0.012 (0.004).⁹ Higher inflation, an indicator of macroeconomic instability, is significantly negative for growth, -0.027 (0.008).¹⁰

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 still has a significantly positive effect on growth, as indicated by the coefficient 0.074 (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) is also expansionary for growth, with the coefficient 0.064 (0.020).

Columns 2-4 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 nine east Asian economies. (China is excluded because of missing data on some of the explanatory variables.) The five crisis countries grew during 1995-2000 at about 4% per year below the rate that would otherwise have been predicted by the set of explanatory variables. This growth shortfall is highly significant. For the four other east Asian economies, the estimated growth shortfall was somewhat less than 2% per year, and this value is only marginally significant.

Columns 5-7 of Table 1 add the corresponding dummy variables for the six other five-year periods (where the coefficient of the dummy is constrained to be the same for

⁹ 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, and the system also included effects from import duties and the black-market premium on the foreign exchange. The estimated coefficient of the trade variable on growth arises when the trade variable was included in the instrument list. If only lagged values of the trade variable are included as instruments, the estimated coefficient remains positive but is reduced in size by about 50 percent.

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

each of these periods). These additional dummy variables have positive coefficients but are only marginally significant. With these variables included, the estimated shortfall of growth during 1995-2000 for the five Asian-crisis countries was a little over 3% per year and is still highly significant. The estimated shortfall for the four other east Asian economies was by about 1.5% per year and is again only marginally significant.

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 1960-95 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 3.3% per year, compared to the 6.6% average growth rate experienced for 1960-95.¹¹ The model predicts similar retardations of growth for the other

¹¹ This estimated growth rate for South Korea in 1995-2000 exceeds the average value in the sample (0.018) by 0.015. This deviation from the sample mean can be broken down into contributions from the ten

previously high growing east Asian economies: Hong Kong is 3.8% versus 5.9%, Singapore is 4.7% versus 6.4%, Taiwan is 2.3% versus 6.1%, and Thailand is 3.1% versus 4.8%. The cutback for Japan, 2.5% versus 4.7%, is also notable. The only economy in which a growth slowdown was not projected is the Philippines, which has 4.3% versus 1.3%.¹² However, the main element in this case is the greatly disappointing growth performance during the 1960-95 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 South Korea, for which the actual growth rate of 3.7% beat the model estimate of 3.3%, and Taiwan, for which the actual value of 4.8% was well above the estimate of 2.3%. The other seven countries with the available data showed shortfalls of varying sizes, including gaps of 4.6% per year for Indonesia and 3.7% per year for Thailand.

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 1965-69, ..., 1995-99. 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

explanatory variables shown in Tables 3 and 4. The results, all expressed as deviations from the sample mean, are as follows: -0.021 for the log of per capita GDP, 0.007 for schooling, 0.001 for openness, 0.008 for government consumption, 0.002 for life expectancy, -0.003 for the terms of trade, 0.000 for the rule of law, 0.008 for fertility, 0.001 for inflation, and 0.010 for investment.

Table 2, the estimated coefficient of this variable is in the neighborhood of 0.8 and is highly significant.¹³ From the perspective of a partial-adjustment model, the investment ratio can be viewed as adjusting about 20% 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 education and life expectancy have positive coefficients, though the one on education is statistically insignificant. The fertility rate has a significantly negative effect.

In terms of the policy variables, the main results are negative effects from government consumption and inflation (which is statistically insignificant) and significantly positive effects from the rule of law and international openness. Changes in the terms of trade have a positive effect that is marginally significant.

Columns 2-7 add dummy variables for the five Asian-crisis countries and the four other east Asian countries (with China again excluded because of missing data). The results show that, for given values of the other explanatory variables, the investment ratios in the five Asian-crisis countries were significantly *higher* than the rest of the sample in the intervals before 1995-99. However, these investment ratios became significantly lower in the 1995-99 period. In contrast, for the four other east Asian economies, the investment ratios did not deviate significantly from those elsewhere in the periods before 1995-99 or in the 1995-99 period. Thus, the Asian-crisis countries differed from the other

¹² The estimated growth rate for China is unavailable because of missing data on some of the explanatory variables.

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: 0.013 (s.e. = 0.040).

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 1995-99. Among the five Asian-crisis countries, only Malaysia had an investment ratio above the estimated value (by two percentage points). The largest negative gap was the six percentage point value for Thailand. In contrast, for the four other east Asian economies, most of the gaps were small, with the largest being the positive two percentage point value for Singapore.

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 2000-05 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 (2001), is to regard the Asian financial crisis of 1997-98 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.

Park and Lee (2001) view the Asian financial crises as currency crises. To get a broader perspective on currency crises, they followed the general approach of Frankel and Rose (1996), who identified these kinds of crises with large nominal depreciations of a country's currency over a short period. Specifically, Park and Lee 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. They also use a window of two years to isolate independent crises. According to these criteria, the five Asian-crisis countries all experienced currency crises during 1997-98.

In my analysis, I follow Park and Lee's approach to identifying currency crises, and I use the data for 1970-97 that they kindly provided. I used Economist Intelligence Unit, *Country Data*, to update these figures to 1998-2000 for most of the countries in my sample. I 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.¹⁴ I considered the contemporaneous effects of this variable on economic growth and investment, and I 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, I followed the approach of Caprio and Klingebiel (1996) and Eichengreen and Rose (1998). These

¹⁴ I used the interval 1970-74 for currency devaluation to correspond to growth for 1970-75 and to the average investment ratio for 1970-74 and similarly for the other periods. As an alternative procedure, I defined the currency-crisis variable to equal 1 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.

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 variable I use is a dummy for whether a banking crisis occurred for each country during any five-year period. I again considered the contemporaneous and lagged effects of these crises on economic growth and investment. The underlying data are from Caprio and Klingebiel (1996), as reported on the website of Andrew Rose. These data were supplemented with information in Demirguc-Kunt and Detragiache (1997) and Glick and Hutchison (1999). The resulting data apply from 1975 to 1997. According to these data, the five Asian-crisis countries all experienced banking crises in 1997.

The results from adding the currency-crisis and banking-crisis variables to the systems for economic growth and investment are in Table 5. In column 2, a contemporaneous currency crisis (occurring sometime within the applicable five-year period) is associated with lower per capita growth--by 1.3 percent per year. The corresponding effect for a banking crisis is a retardation of growth by 0.6 percent per year. These effects are statistically significant, and the difference between the two growth effects is significant at the 8% level. The results also show that the contractions of growth do not persist into the next five-year period. The estimated coefficients here are *positive*: 0.6 percent per year for a currency crisis and 0.9 percent per year for a banking crisis.¹⁵

¹⁵ 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. For instance, if a currency crisis lowers the growth rate of per capita GDP by 0.014 per year for five years, then the log of per capita GDP at the start of the next period would be decreased by 0.070. With a convergence coefficient of 0.021, this change implies a higher growth rate in the next period by 0.001 per year. 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.

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 perspective, the recent economic contractions in the Asian-crisis countries look more severe than average. In those cases, reflected in the dummy variables contained in Table 1, growth rates for 1995-2000 were reduced by about 3 percent per year.

For the investment ratio, column 4 of Table 5 shows that a currency crisis is associated with a reduction by about 0.4 of a percentage point, an estimate that is not statistically significant. A banking crisis is associated with a decrease by 0.9 of a percentage point, and this result is statistically significant. The difference between the two effects is not statistically significant--the p-value is 0.36. In any event, although a currency crisis seems to be quantitatively more important than a banking crisis for economic growth, there is no evidence for this pattern with respect to investment.

Column 4 of Table 5 shows that the lagged effect from a currency crisis on the investment ratio is around zero. In contrast, the effect from a banking crisis is a significantly negative 0.8 of a percentage point. 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).

From the perspective of the broad cross-country analysis, the sharp contractions of investment in the Asian-crisis countries in 1998 were larger than average. In the Asian-crisis cases, reflected in the dummy variables in Table 2, average investment ratios for 1995-2000 were decreased by about 3 percentage points. The broader analysis suggests

that a combined currency and banking crisis would typically have been accompanied by a contraction of the investment ratio by about 1-1/2 percentage points.

III. Summarizing the Findings

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 1999-2000, 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 somewhat different 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. However, the magnitude of the typical effect is smaller than that seen in the recent period in the Asian crisis countries. More importantly, the broader evidence fails to detect a persisting adverse influence of currency and banking crises on economic growth. (There is some indication of a persisting adverse effect of a banking crisis on investment.) 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.

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Table 1**Panel Regressions for Growth Rate**

<i>Explanatory variables</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log (per capita GDP)	-0.0302 (0.0031)	-0.0309 (0.0031)	-0.0303 (0.0031)	-0.0306 (0.0031)	-0.0293 (0.0032)	-0.0275 (0.0032)	-0.0281 (0.0032)
Male upper-level schooling	0.0025 (0.0016)	0.0030 (0.0016)	0.0033 (0.0016)	0.0033 (0.0016)	0.0025 (0.0016)	0.0026 (0.0016)	0.0026 (0.0016)
Log (life expectancy)	0.0541 (0.0126)	0.0523 (0.0126)	0.0502 (0.0126)	0.0506 (0.0126)	0.0513 (0.0125)	0.0475 (0.0125)	0.0485 (0.0125)
Log (total fertility rate)	-0.0207 (0.0050)	-0.0198 (0.0050)	-0.0194 (0.0050)	-0.0193 (0.0050)	-0.0203 (0.0049)	-0.0198 (0.0049)	-0.0198 (0.0049)
Government consumption/GDP	-0.094 (0.021)	-0.099 (0.021)	-0.099 (0.021)	-0.100 (0.021)	-0.092 (0.021)	-0.088 (0.021)	-0.090 (0.021)
Rule-of-law index	0.0153 (0.0054)	0.0153 (0.0054)	0.0146 (0.0054)	0.0149 (0.0054)	0.0157 (0.0054)	0.0134 (0.0054)	0.0144 (0.0055)
Openness measure	0.0118 (0.0039)	0.0148 (0.0040)	0.0162 (0.0041)	0.0163 (0.0041)	0.0140 (0.0039)	0.0128 (0.0042)	0.0138 (0.0044)
Inflation rate	-0.0274 (0.0076)	-0.0221 (0.0074)	-0.0208 (0.0073)	-0.0199 (0.0073)	-0.0222 (0.0073)	-0.0220 (0.0072)	-0.0208 (0.0072)
Investment/GDP	0.074 (0.022)	0.081 (0.022)	0.082 (0.022)	0.083 (0.022)	0.076 (0.022)	0.073 (0.022)	0.075 (0.022)
Growth rate of terms of trade	0.064 (0.020)	0.066 (0.020)	0.065 (0.020)	0.067 (0.020)	0.063 (0.020)	0.061 (0.020)	0.062 (0.020)
Group of 5 Asian financial crisis countries (dummy for 95-00)	--	-0.0371 (0.0098)	--	-0.0216 (0.0137)	-0.0318 (0.0100)	--	-0.0182 (0.0140)
Group of 9 East Asian economies (dummy for 95-00)	--	--	-0.0302 (0.0077)	-0.0186 (0.0108)	--	-0.0237 (0.0081)	-0.0146 (0.0114)
Group of 5 Asian fin'l crisis countries (dummy for other periods)	--	--	--	--	0.0109 (0.0059)	--	0.0057 (0.0086)
Group of 9 East Asian economies (dummy for other periods)	--	--	--	--	--	0.0099 (0.0050)	0.0059 (0.0074)

Notes to Table 1

Dependent variables: The dependent variable is the growth rate of real per capita GDP. Data through 1992 are from Summers and Heston. Figures were updated through 2000 from the World Bank, *World Development Indicators*, and the Economist Intelligence Unit, *Country Data*. The growth rate is the average for each of the seven five-year periods 1965-1970, ..., 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, 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 nine east Asian economies are Hong Kong, Indonesia, Japan, South Korea, Malaysia, 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, lagged values of the other variables aside from inflation, and dummy variables for prior colonial

status (which have substantial explanatory power for inflation). 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.

Table 2**Panel Regressions for Investment Ratio**

<i>Explanatory variables</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged ratio of investment to GDP	0.809 (0.022)	0.810 (0.023)	0.811 (0.023)	0.810 (0.023)	0.821 (0.021)	0.823 (0.021)	0.823 (0.021)
Log (per capita GDP)	-0.0132 (0.0036)	-0.0138 (0.0036)	-0.0133 (0.0036)	-0.0138 (0.0037)	-0.0098 (0.0034)	-0.0087 (0.0035)	-0.0094 (0.0035)
Male upper-level schooling	0.0021 (0.0016)	0.0021 (0.0017)	0.0022 (0.0017)	0.0021 (0.0017)	0.0012 (0.0015)	0.0012 (0.0015)	0.0011 (0.0015)
Log (life expectancy)	0.037 (0.015)	0.035 (0.015)	0.035 (0.015)	0.035 (0.015)	0.031 (0.014)	0.030 (0.014)	0.031 (0.014)
Log (total fertility rate)	-0.0115 (0.0054)	-0.0120 (0.0055)	-0.0118 (0.0055)	-0.0120 (0.0055)	-0.0104 (0.0050)	-0.0090 (0.0051)	-0.0099 (0.0049)
Government consumption/GDP	-0.100 (0.023)	-0.108 (0.024)	-0.104 (0.023)	-0.108 (0.023)	-0.077 (0.022)	-0.073 (0.023)	-0.073 (0.022)
Rule-of-law index	0.0177 (0.0062)	0.0173 (0.0062)	0.0171 (0.0062)	0.0173 (0.0062)	0.0177 (0.0058)	0.0142 (0.0059)	0.0171 (0.0059)
Openness measure	0.0077 (0.0037)	0.0089 (0.0038)	0.0090 (0.0038)	0.0089 (0.0039)	0.0070 (0.0033)	0.0027 (0.0037)	0.0058 (0.0038)
Inflation rate	-0.0099 (0.0086)	-0.0093 (0.0086)	-0.0094 (0.0087)	-0.0092 (0.0086)	-0.0038 (0.0081)	-0.0075 (0.0083)	-0.0037 (0.0081)
Growth rate of terms of trade	0.055 (0.028)	0.054 (0.028)	0.054 (0.028)	0.054 (0.028)	0.056 (0.028)	0.058 (0.028)	0.057 (0.028)
Group of 5 Asian financial crisis countries (dummy for 95-00)	--	-0.0352 (0.0125)	--	-0.0344 (0.0177)	-0.0265 (0.0125)	--	-0.0271 (0.0177)
Group of 9 East Asian economies (dummy for 95-00)	--	--	-0.0165 (0.0101)	-0.0009 (0.0139)	--	-0.0103 (0.0101)	0.0012 (0.0141)
Group of 5 Asian fin'l crisis countries (dummy for other periods)	--	--	--	--	0.0263 (0.0048)	--	0.0231 (0.0071)
Group of 9 East Asian economies (dummy for other periods)	--	--	--	--	--	0.0182 (0.0044)	0.0041 (0.0062)

Notes to Table 2

The dependent variable is the ratio of real investment (private plus public) to real GDP. Data through 1992 are from Summers and Heston. Figures were updated through 1999 from the World Bank, *World Development Indicators*, and the Economist Intelligence Unit, *Country Data*. The measure used is the average of the ratio over the seven periods 1965-69, ..., 1995-99. 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.

Table 3						
Growth and Investment in East Asian Economies						
<i>Economy</i>	(1)	(2)	(3)	(4)	(5)	(6)
	Growth rate 1995-2000	Estimated growth rate, 95-00	Growth rate 1960-95	Investment ratio 1995-99	Estimated investment ratio, 95-99	Investment ratio 1990-94
Indonesia	-0.012	0.034	0.041	0.242	0.262	0.265
South Korea	0.037	0.033	0.066	0.331	0.360	0.380
Malaysia	0.022	0.036	0.045	0.328	0.310	0.318
Philippines	0.013	0.043	0.013	0.171	0.186	0.162
Thailand	-0.006	0.031	0.048	0.222	0.283	0.288
China	0.070	--	0.039	0.268	--	0.236
Hong Kong	0.015	0.038	0.059	0.217	0.216	0.184
Japan	0.011	0.025	0.047	0.360	0.359	0.382
Singapore	0.029	0.047	0.064	0.366	0.350	0.352
Taiwan	0.048	0.023	0.061	0.247	0.237	0.231
Full sample (67 countries)	0.019	0.018	0.022	0.191	0.190	0.182

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 1995-99 is from the panel regression shown in Table 2, column 1.

	(1)	(2)	(3)	(4)	(5)
<i>Economy</i>	Log (per capita GDP) 1995	Upper-level schooling 1995	Log (life expectancy) 1995	Log (total fertility rate) 1996	Government consumption/GDP 1995-99
Indonesia	7.88	1.5	4.16	0.96	0.07
South Korea	9.12	5.5	4.27	0.54	0.01
Malaysia	8.85	3.4	4.27	1.21	0.04
Philippines	7.47	2.4	4.18	1.29	0.12
Thailand	8.52	1.5	4.23	0.58	0.07
China	7.71	2.2	4.24	0.65	--
Hong Kong	9.80	4.8	4.36	0.22	0.02
Japan	9.63	4.3	4.38	0.35	0.03
Singapore	9.65	3.4	4.34	0.54	0.02
Taiwan	9.27	3.9	4.32	0.58	0.03
Full sample (67 countries)	8.43	2.7	4.24	0.95	0.10

Table 4, continued				
	(6)	(7)	(8)	(9)
<i>Economy</i>	Rule of Law 1995-1999	Openness measure 1995-1999	Inflation rate 1995-2000	Growth of terms of trade 1995-2000
Indonesia	0.57	0.23	0.16	0.037
South Korea	0.73	0.06	0.04	-0.043
Malaysia	0.77	1.27	0.03	-0.009
Philippines	0.67	0.41	0.07	0.098
Thailand	0.83	0.37	0.04	-0.018
China	0.83	--	0.02	-0.026
Hong Kong	0.90	1.72	0.01	0.004
Japan	1.00	-0.32	0.00	-0.027
Singapore	1.00	2.08	0.01	-0.004
Taiwan	0.73	0.16	0.01	0.011
Full sample (67 countries)	0.73	0.01	0.08	-0.002

Notes to Table 4

Per capita GDP is the PPP adjusted value in 1985 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 birth. 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 values for 1995-99 are estimates based on EIU figures on government consumption and earlier data on the government consumption variable. The rule-of-law measure, from Political Risk Services, is a subjective indicator on a zero-to-one scale, with one the most favorable. 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 inflation rate is for consumer price indexes. The terms-of-trade variable is the growth rate of the ratio of export to import prices.

Table 5				
Regressions with Currency- and Banking-Crisis Variables				
	Economic Growth		Investment Ratio	
<i>Explanatory variables</i>	(1)	(2)	(3)	(4)
Lagged ratio of investment to GDP	--	--	0.763 (0.035)	0.732 (0.036)
Log (per capita GDP)	-0.0213 (0.0049)	-0.0220 (0.0048)	-0.0149 (0.0059)	-0.0146 (0.0060)
Male upper-level schooling	0.0020 (0.0020)	0.0024 (0.0020)	0.0019 (0.0023)	0.0021 (0.0023)
Log (life expectancy)	0.027 (0.022)	0.022 (0.022)	0.015 (0.026)	0.024 (0.026)
Log (total fertility rate)	-0.0265 (0.0069)	-0.0267 (0.0068)	-0.0191 (0.0093)	-0.0310 (0.0080)
Government consumption/GDP	-0.102 (0.029)	-0.095 (0.028)	-0.142 (0.034)	-0.145 (0.034)
Rule-of-law index	0.0091 (0.0089)	0.0086 (0.0087)	0.0107 (0.0106)	0.0127 (0.0105)
Openness measure	0.0127 (0.0041)	0.0131 (0.0041)	0.0034 (0.0049)	0.0050 (0.0050)
Inflation rate	-0.0118 (0.0081)	-0.0077 (0.0074)	-0.0191 (0.0093)	-0.0139 (0.0089)
Investment/GDP	0.005 (0.034)	0.038 (0.035)	--	--
Growth rate of terms of trade	0.081 (0.028)	0.087 (0.028)	-0.002 (0.038)	-0.008 (0.038)
Contemporaneous currency crisis	-0.0136 (0.0031)	-0.0134 (0.0030)	-0.0042 (0.0040)	-0.0043 (0.0040)
Lagged currency crisis	--	0.0064 (0.0030)	--	-0.0002 (0.0039)
Contemporaneous banking crisis	-0.0049 (0.0027)	-0.0062 (0.0026)	-0.0102 (0.0034)	-0.0092 (0.0034)
Lagged banking crisis	--	0.0090 (0.0029)	--	-0.0080 (0.0038)

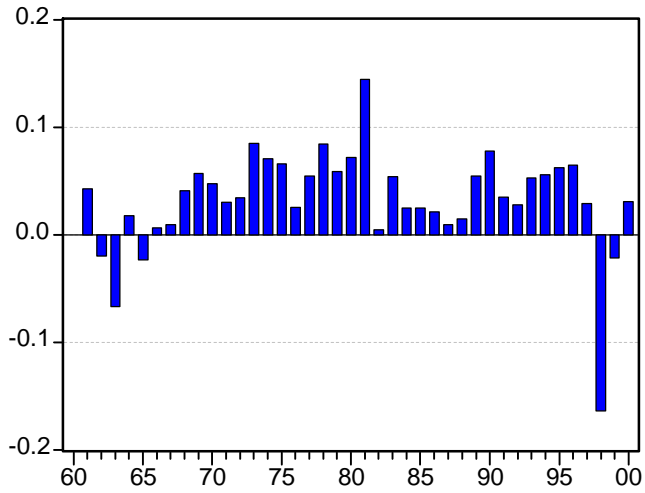
Notes to Table 5

Systems 1 and 2 have growth rates of per capita GDP as dependent variables. These systems apply to the periods 1980-1985, ..., 1995-2000. The earlier periods were deleted because of missing data on the currency-crisis and banking-crisis variables.

Systems 3 and 4 have average ratios of real investment to real GDP as dependent variables. These systems apply to the periods 1980-84, ..., 1995-99. The currency-crisis dummy variable equals one if at least one of the years in the five-year period features a currency devaluation of at least 25% in one of the quarters. Otherwise, the variable takes on the value zero. 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). (For the last period, this dummy variable is based on information only for the period 1995-97.) See the text for further details. See the notes to Tables 1 and 2 for additional information.

Figure 1

Growth Rate of Per Capita GDP in Indonesia



Growth Rate of Per Capita GDP in South Korea

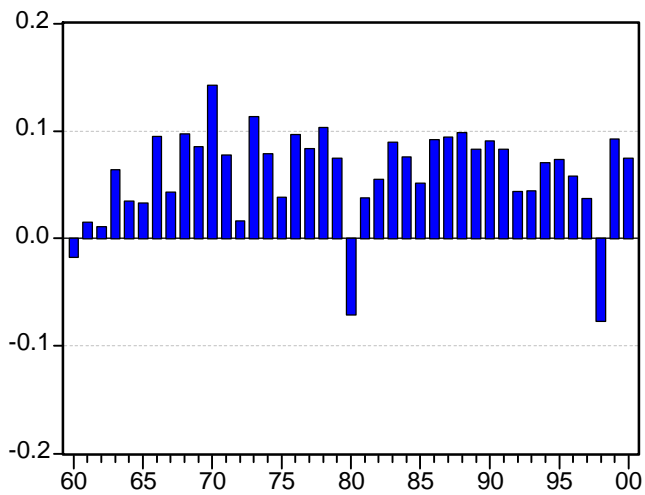


Figure 2

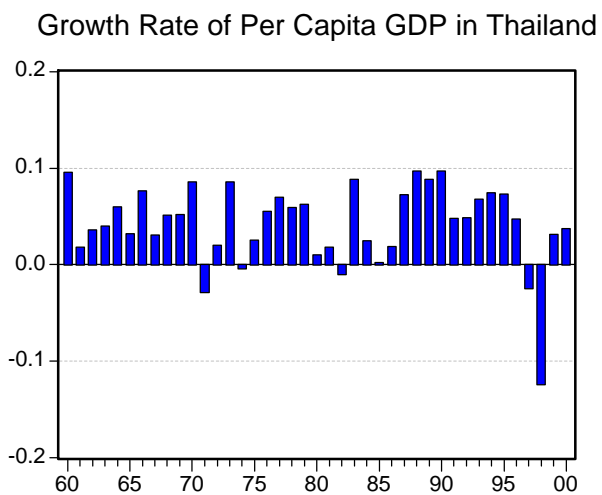
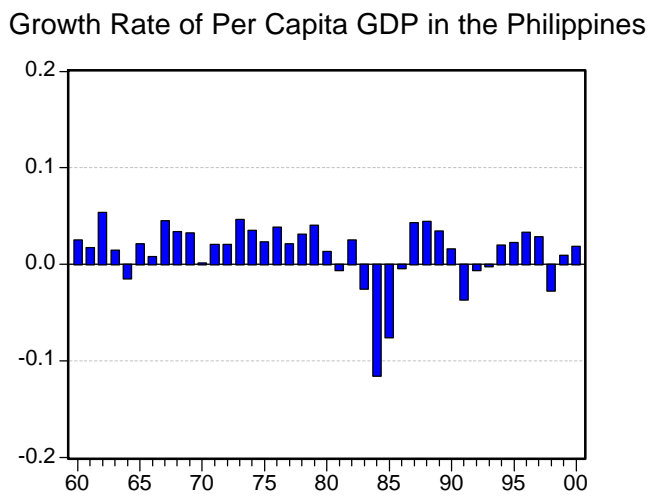
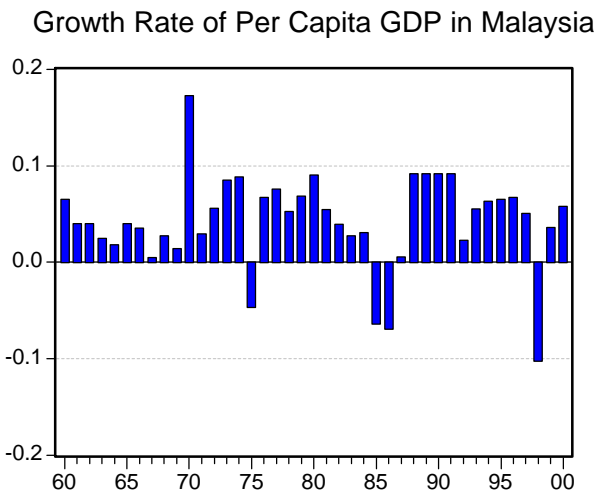


Figure 3

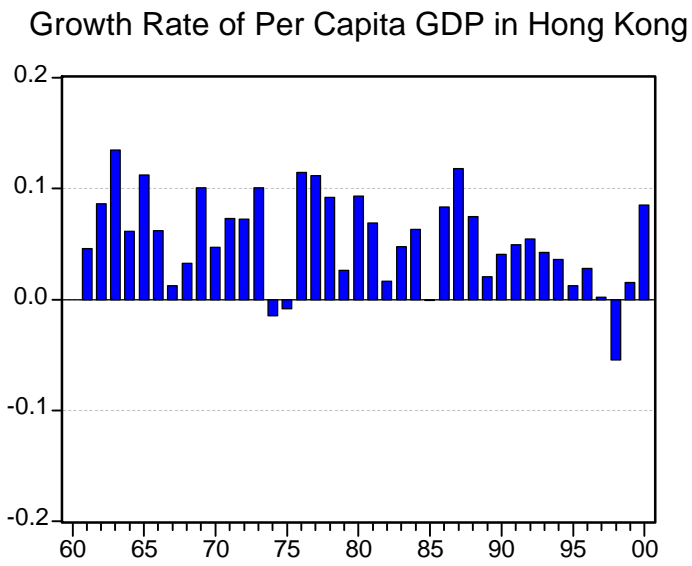
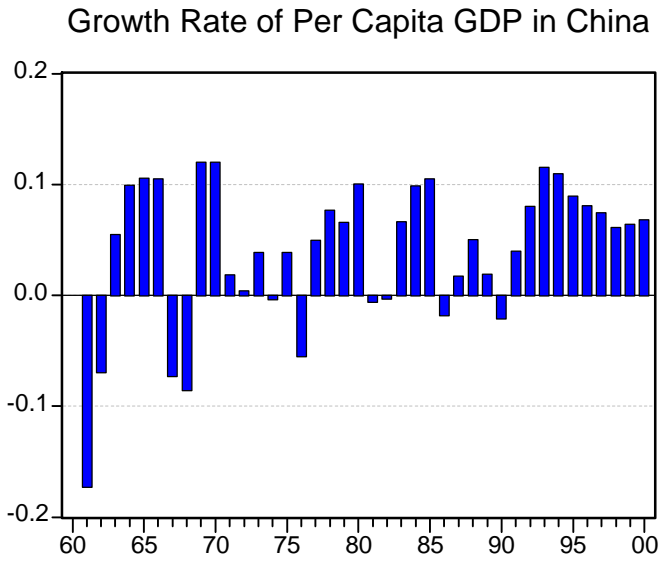


Figure 4

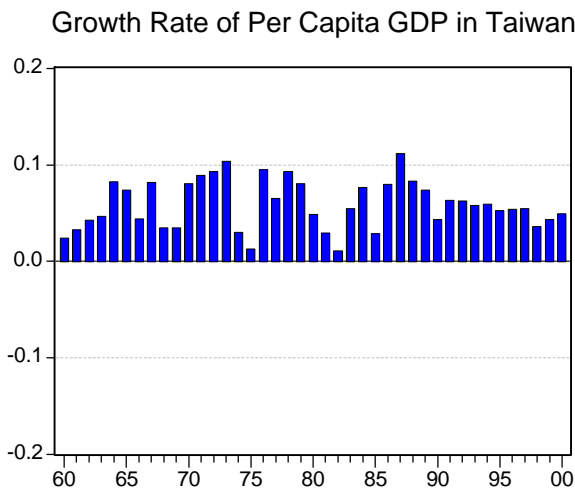
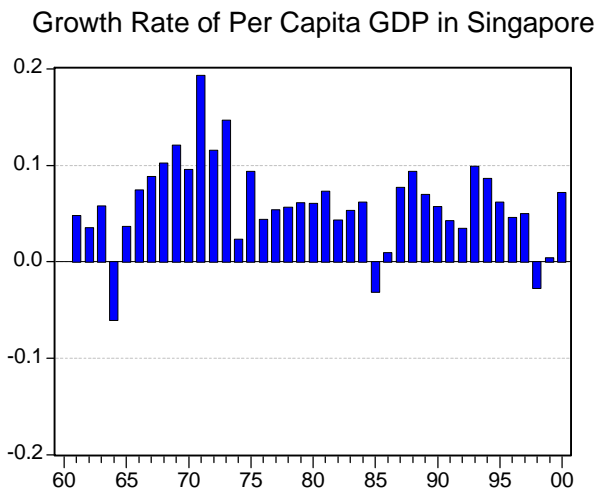
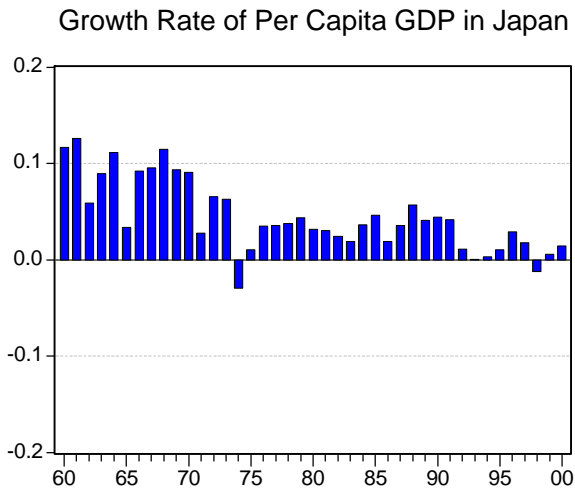
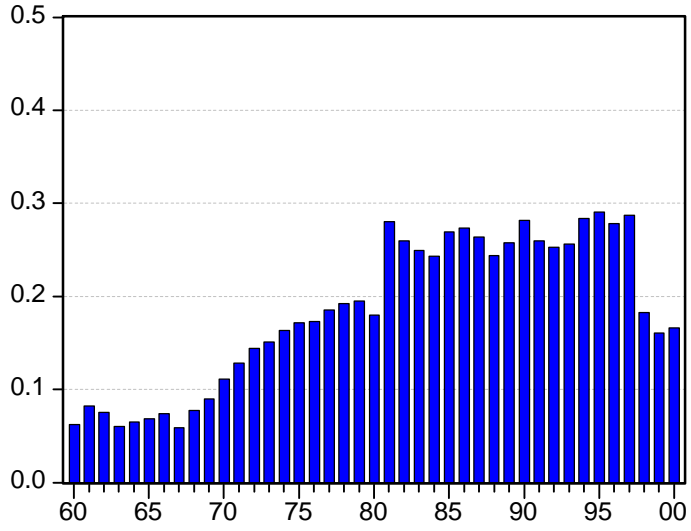


Figure 5

Investment Ratio in Indonesia



Investment Ratio in South Korea

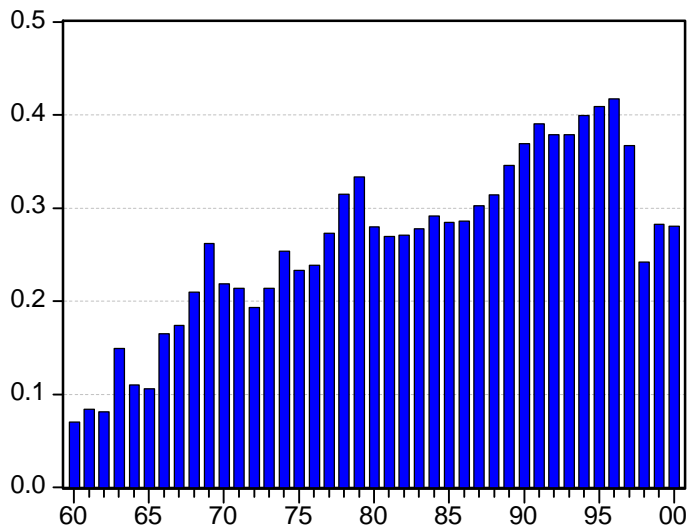
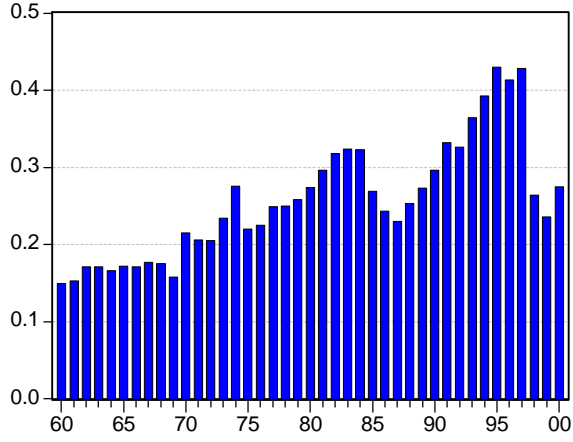
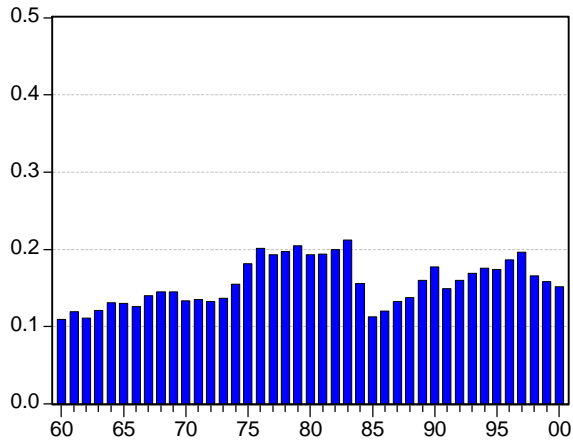


Figure 6

Investment Ratio in Malaysia



Investment Ratio in the Philippines



Investment Ratio in Thailand

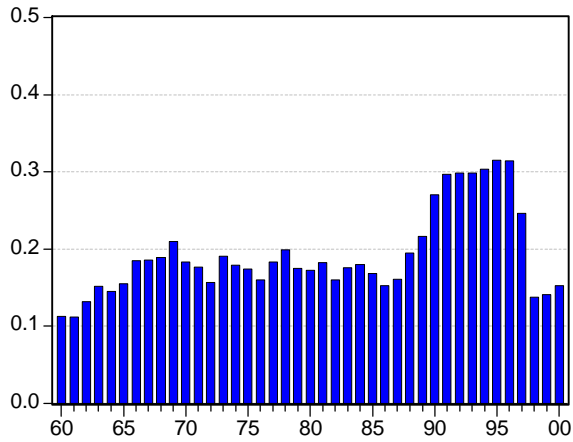
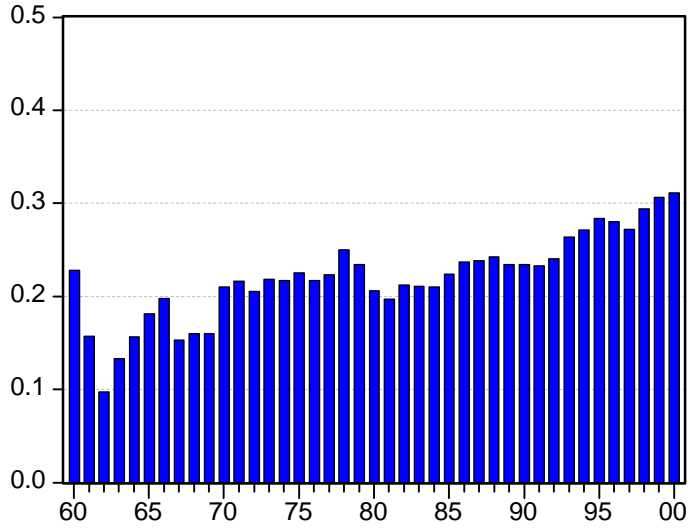


Figure 7

Investment Ratio in China



Investment Ratio in Hong Kong

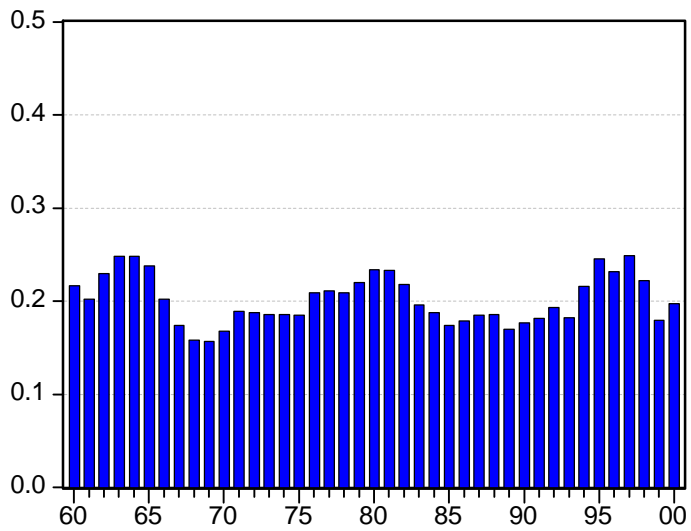
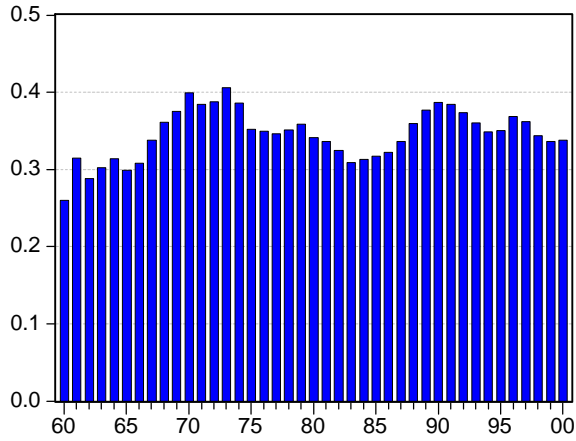
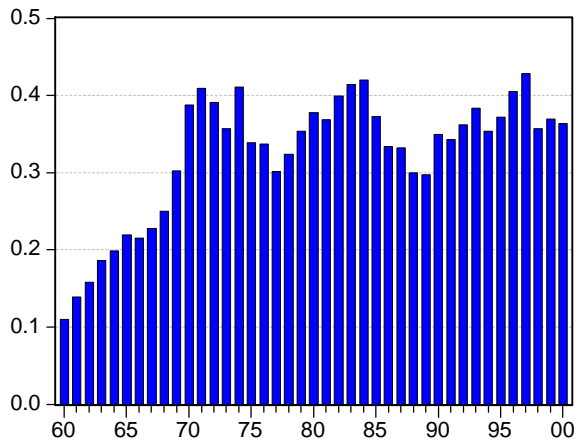


Figure 8

Investment Ratio in Japan



Investment Ratio in Singapore



Investment Ratio in Taiwan

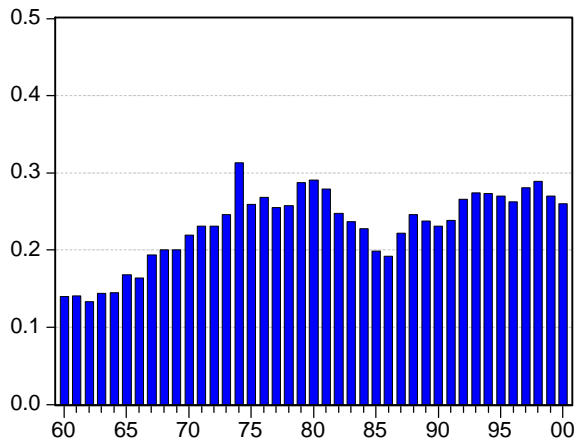
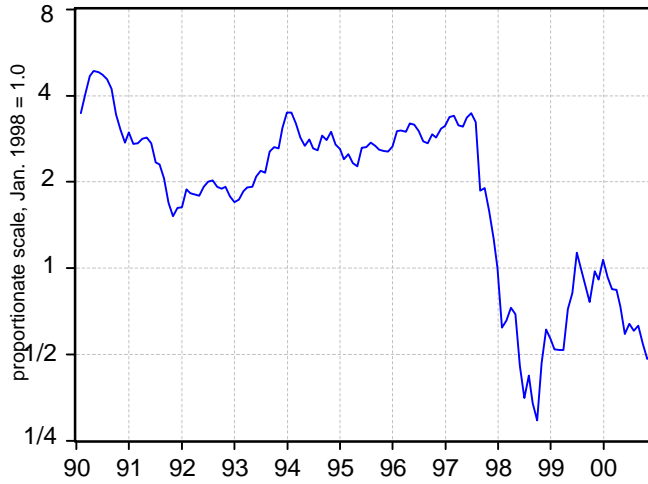


Figure 9

Stock-Market Index in Indonesia



Stock-Market Index in South Korea

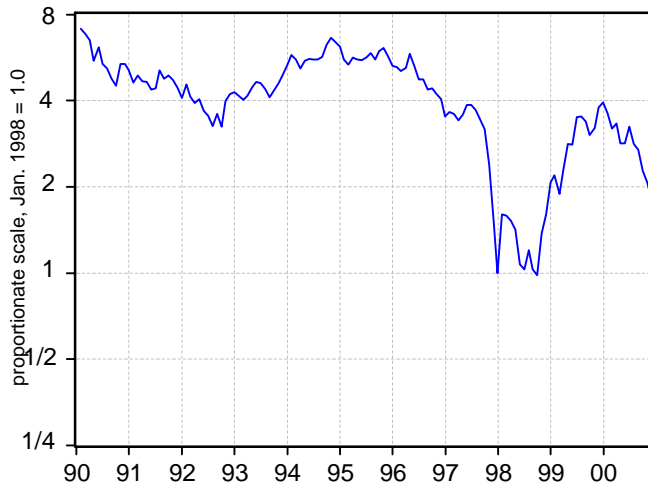
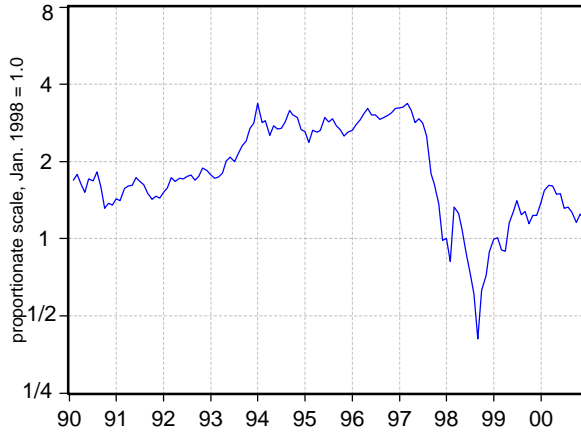
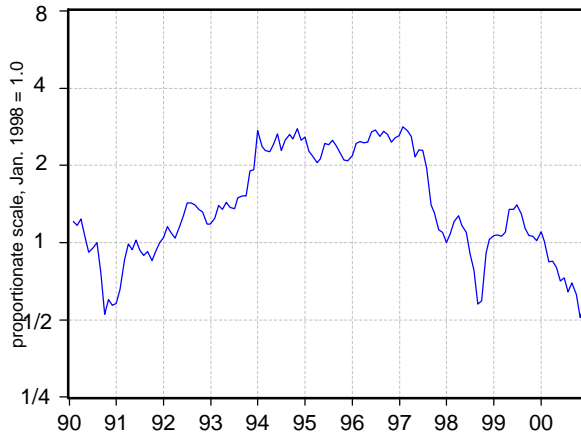


Figure 10

Stock-Market Index in Malaysia



Stock-Market Index in the Philippines



Stock-Market Index in Thailand

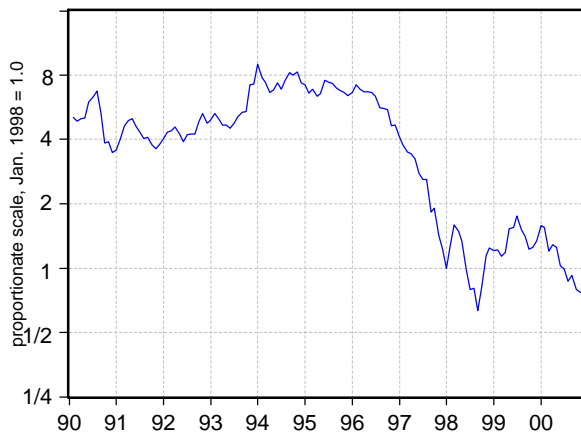
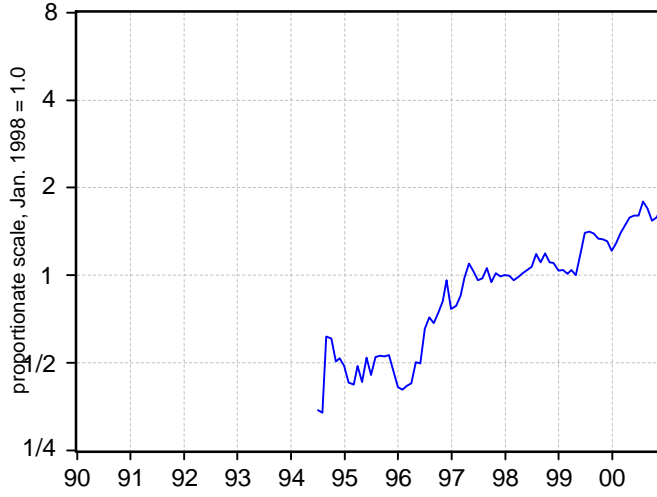


Figure 11

Stock-Market Index in China



Stock-Market Index in Hong Kong

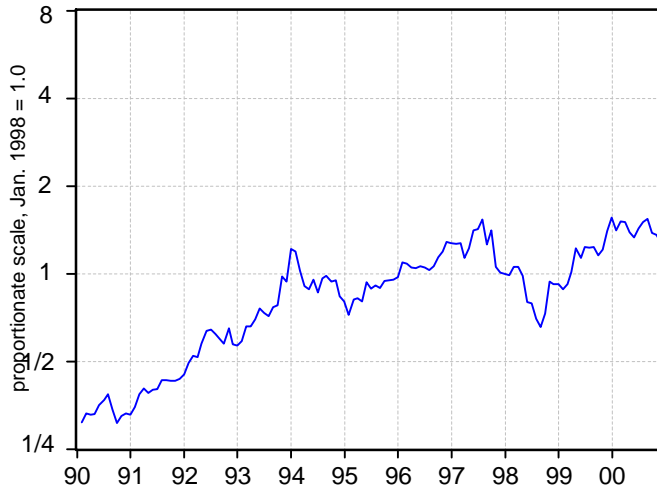
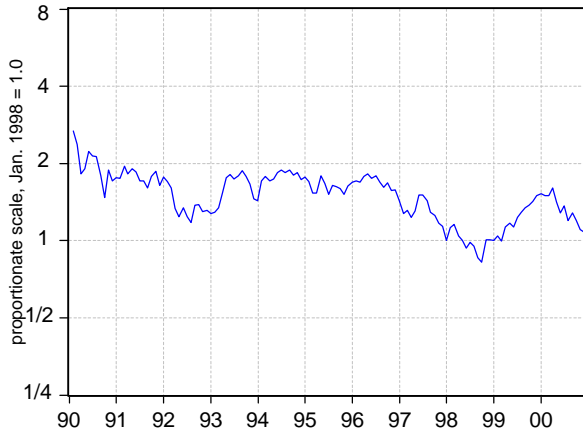
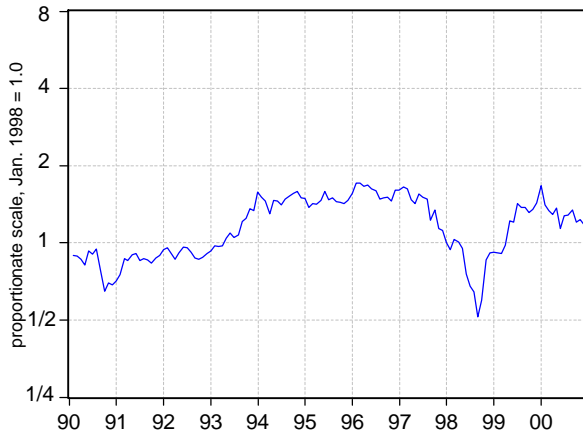


Figure 12

Stock-Market Index in Japan



Stock-Market Index in Singapore



Stock-Market Index in Taiwan

