

# **T**he East Asian crisis: investigating causes and policy responses

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# **The East Asian Crisis: Investigating Causes and Policy Responses**

by

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## *Abstract*

We use a forward looking modeling framework to capture some of the major interactions between asset markets and trade involved in the East Asian crisis and its aftermath. We take the primary cause of the crisis to be a fundamental reassessment of the profitability of investment in the region, and add secondary shocks resulting from the financial implications of responses to the initial shock. In this way, we can generate time profiles for the return of the countries of the region to economic health, and consider issues of contagion and policy response.

## **The East Asian Crisis: Investigating Causes and Policy Responses<sup>†</sup>**

The East Asian crisis of 1997-8 is different from most of the earlier structural adjustment crises that have affected developing countries. Unlike the Latin American crisis of the 1980s, it does not reflect either commodity price shocks or large changes in world interest rates. Nor does it reflect the fiscal imbalances and inflationary shocks that have been central to many other crises. It involved large-scale borrowing abroad, but by the private sector rather than the government, and for the normally well-regarded purpose of funding capital investment.

Since the early 1990s, the pattern of financial flows between developed and developing countries has changed significantly, with private flows to developing countries expanding six-fold between 1990 and 1996 (World Bank 1997). These flows have had an enormously positive impact on the world economy, facilitating very rapid growth in East Asia and lifting millions out of poverty. Unfortunately, it is now clear that these financial flows are more complex to manage than has previously been realized, and new techniques are needed to deal with the instability with which they can be associated.

Some of the conventional shocks that require structural adjustment can be seen on economic radar screens. We know, for example, that excessive government spending will lead to disaster, and can offer suggestions for dealing with the inevitable turbulence when it hits. Some shocks, such as commodity price shocks, are difficult to see on the economic radar, but we have well-defined flight rules for dealing with them. The shocks that hit East Asia are like Clear Air Turbulence—the shocks are invisible and we don't have good flight plans for dealing with them.

Given the increasing integration of world capital markets, it seems likely that more shocks like the ones that hit East Asia lie in store for both developed and developing countries. It is therefore particularly important that we learn from the current crisis and use the experience to develop better techniques for identifying and dealing with shocks of this type.

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<sup>†</sup> We wish to thank Francis Ng for his excellent assistance with this study.

Our first objective in this paper is to identify some of the key shocks that affected the East Asian crisis countries. We consider shocks that are external to the region, and those that are internal to the affected countries. Once the initial shocks hit, the situation changed substantially and there were important responses by both the private sector and the government. These responses, in turn, had important second-round impacts. We use the Asia-Pacific G-Cubed model to assess the impacts of both the primary and secondary shocks on these economies. After forming an assessment of these impacts, we examine some possible policy responses.

To keep the analysis manageable, we focus on the three most severely affected of the crisis countries—Thailand, Indonesia and Korea<sup>1</sup>.

### ***Shock Identification***

An extensive literature has now emerged on the causes of the East Asian crisis. While extremely informative, much of this literature focuses on relationships between endogenous variables, such as domestic interest rates, exchange rates, and current account imbalances rather than on exogenous shocks that set off or exacerbated the crisis. We first consider the shocks that could plausibly be regarded as exogenous to the crisis countries, and only then turn to the responses in policies and by financial institutions that may have compounded the initial shock. The three main types of primary shocks considered are: terms of trade shocks; appreciation of the US dollar under a currency peg; and downward revisions in the anticipated profitability of investment.

A key question in examining a crisis of this nature is whether the crisis was purely the result of a financial shock such as a bank run or disorderly workout (Radelet and Sachs 1998), or from a change in economic fundamentals. While the causes of a purely financial panic are typically difficult to observe, at least some changes in economic fundamentals can be observed and used to identify potential causes, and hence to focus the analysis.

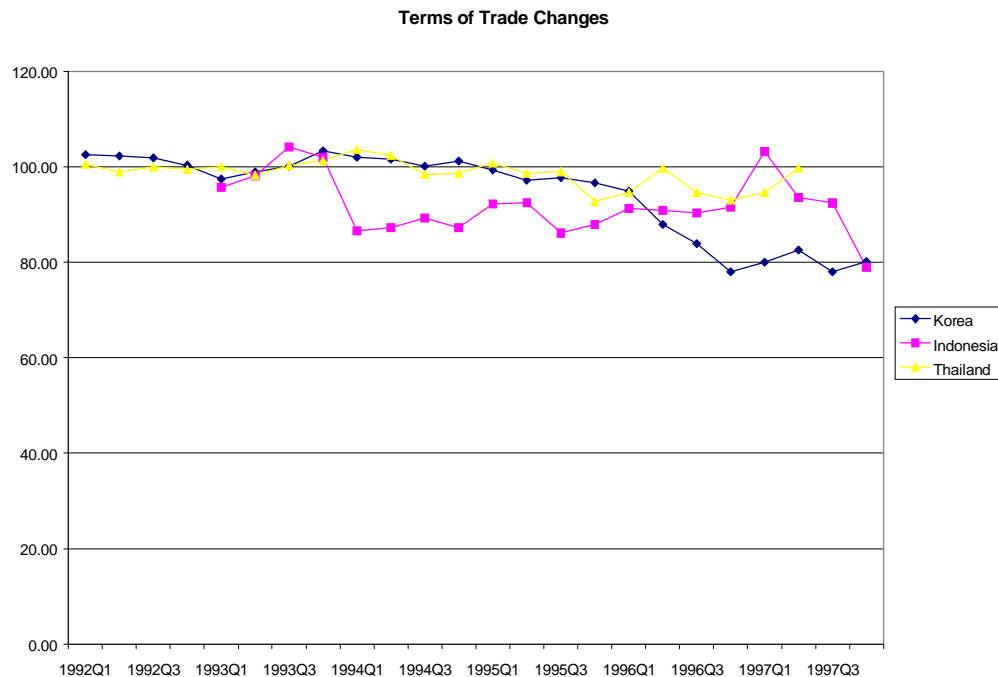
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<sup>1</sup> For an overview of the conditions leading up to the crisis in each of these countries see Warr (1998) on Thailand, McLeod (1998) on Indonesia and Smith (1998) on Korea.

## Potential Shocks to Fundamentals

Examination of the data for the affected countries does not reveal major terms of trade shocks that might plausibly have created a need for structural adjustment in all of the affected countries (Hoekman and Martin 1998). In Korea there was a substantial fall in the terms of trade during the lead up to the crisis, a deterioration of 27 percent in the three years up to late 1997. While this is a large decline, it seems likely to have been due in large part to improvements in the production technology for goods such as semiconductors. If we were able to make adequate adjustments for these improvements in technology, it seems likely that the adverse impact of this deterioration in the terms of trade would be substantially smaller than would be suggested by the raw terms of trade numbers. In Indonesia, the terms of trade appear to have deteriorated in 1994, but appeared to recover by early 1997, and only fell substantially below trend in the third quarter of 1997, following the onset of the crisis.

Figure 1. Terms of trade changes in the three crisis countries.



Sources: South Korea (International Financial Statistics); Indonesia (Bank Indonesia); Thailand (Bank of Thailand).

Another external shock that has been widely viewed as a potential contributing factor to the crisis was the major shift in the yen/dollar exchange rate since 1995. The depreciation of the yen has greatly increased the competitiveness of Japanese exports, and raised the cost within Japan of imports from the East Asian developing countries. Given the pattern of export similarities, this shock might have been expected to have a disproportionately large impact on Korea, which competes with Japan in a range of manufactured goods. The depreciation of the yen was also associated with a large expansion in Japan's trade surplus that might have compounded the impact on the East Asian countries. However, if the change in the yen dollar exchange rate were large enough to be the primary cause of the shock, then one would generally expect it to have had a major adverse impact on the terms of trade of the affected countries.

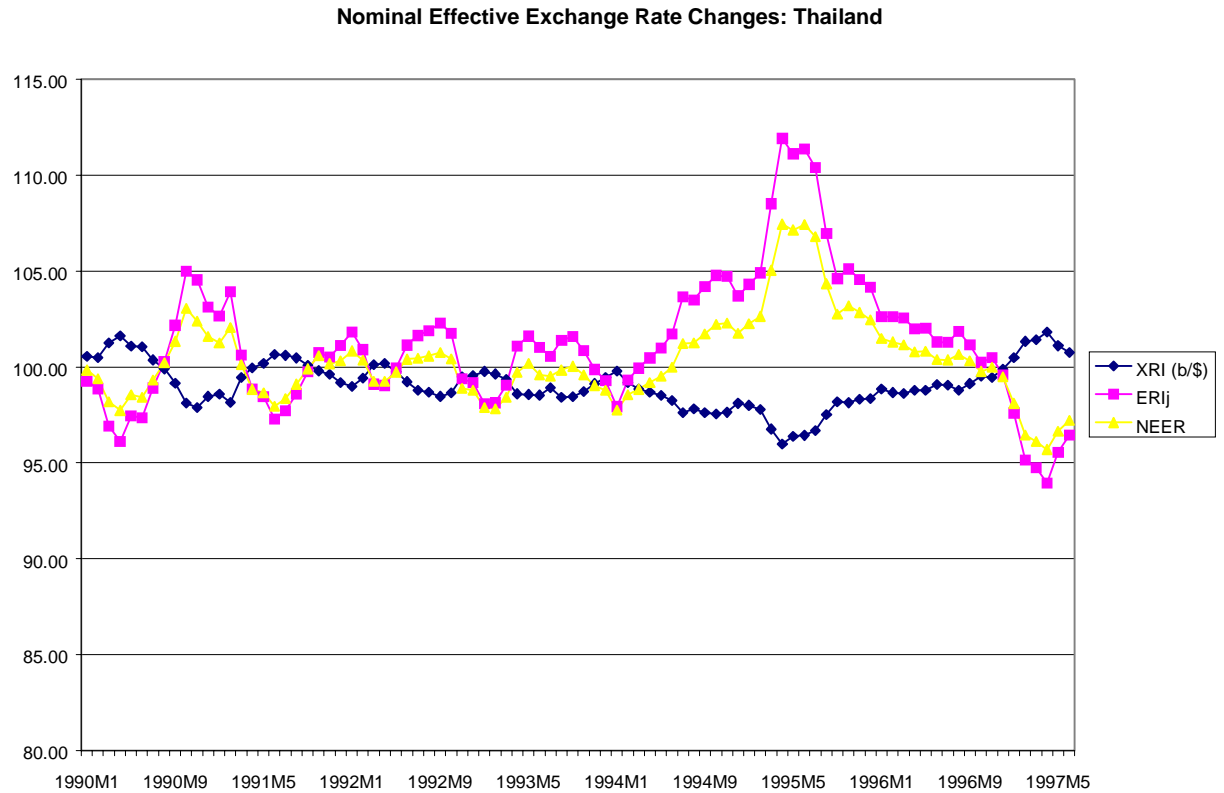
The *de facto* pegging of the exchange rates of these countries to the US dollar has widely been viewed as a source of adjustment pressures and a catalyst for the crash. A useful framework for assessing the potential importance of a pegged exchange rate is provided by Montiel (1997). This consists of decomposing the nominal effective exchange rate into a component due to movements of the country's currency against the reference currency (in this case the US dollar), and a second component measuring changes in the value of the dollar against the currencies of the country's trading partners<sup>2</sup>. The CPI for each country was used as the price indicator for that country. The two components of exchange rate changes are written as local currency per US\$ (XRI) and US\$ per unit of trading partner currency (ERI). Thus, a fall in either index is an appreciation. In decline in ERI would indicate an appreciation of the dollar against the currencies of the country's main trading partners and, hence, a potential competitiveness problem.

The results of this decomposition are presented for Thailand in Figure 2 for the period from 1990 to June 1997, immediately prior to the onset of the crisis.

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<sup>2</sup> The calculations were done using the trade weights for the largest 20 trading partners in 1995 and follow the methodology set out in Appendix A.

Figure 2. Changes in Thailand's Nominal Effective Exchange Rate.

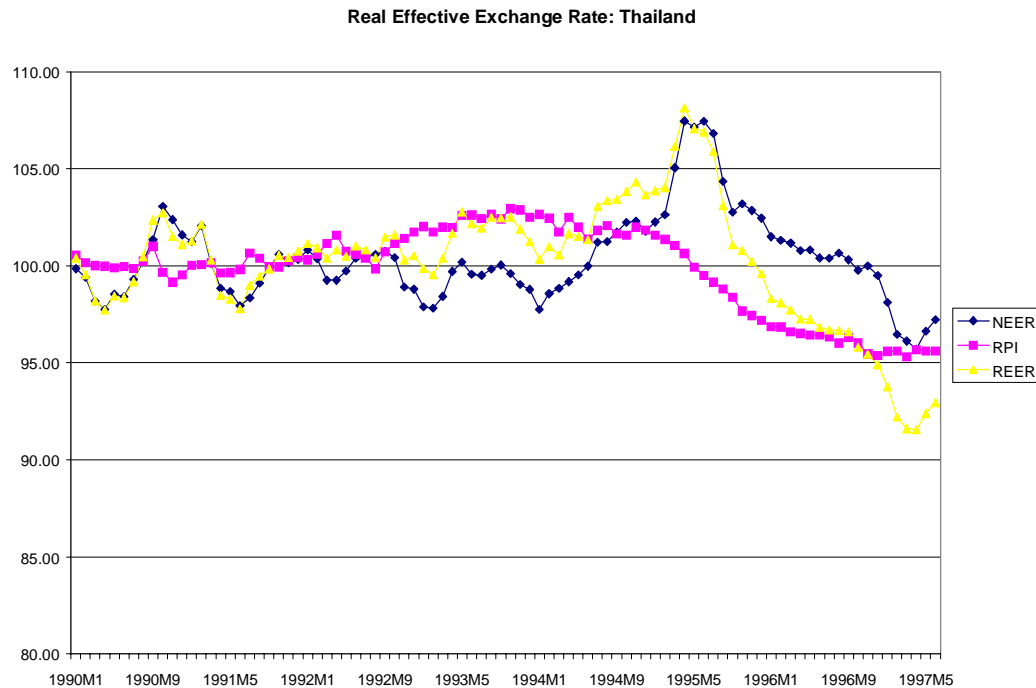


Source: *International Financial Statistics* and authors' calculations.

For Thailand at least, Figure 2 makes it clear that pegging to the US dollar caused some appreciation of the nominal effective exchange rate between 1995 and the middle of 1997. The modest increase in the Baht price of US dollars was far smaller than the fall in the price of trading partner currencies in terms of dollars. However, the resulting depreciation of the nominal effective exchange rate from a peak of 107 to a low of 96 is less than ten percent. Further, the 1995 peak was so short-lived that it hardly seems likely to have formed a base from which appreciation would constitute a problem. The real appreciation of the Baht shown in Figure 3 was somewhat larger than the nominal appreciation, because of the higher rate of inflation in Thailand than in its trading partners, but the appreciation from peak to trough was still only 13 percent. From the base value of 100 it was only eight percent. Since only part of this increase could be attributed to the policy of pegging to the dollar, this much-heralded factor does not appear to have been

particularly important as a source of shocks, although it could still have been important as a source of rigidity after some other shock hit the Thai economy.

Figure 3. Changes in Thailand's Real Effective Exchange Rate.



For Indonesia, the corresponding changes in nominal and real effective exchange rates were extremely small, as is evident from Figures 4 and 5. The appreciation of the US dollar weighted by Indonesia's trade after 1995 was relatively small, and was largely offset by the continuing nominal depreciation of the rupiah against the dollar. From a brief peak of 109 in mid 1995, the real effective exchange rate appreciated to 96 in June of 1997. However, this was only five percent stronger than the average of 101 prevailing over the period from 1990 to mid-1997. It seems implausible that rigidity of the peg to the US dollar was a major source of shocks to the Indonesian economy, although it could have been very important for the nature of the nature and severity of the adjustment after the economy was hit by another shock.



Figure 4. Changes in the Nominal Effective Exchange Rate: Indonesia.

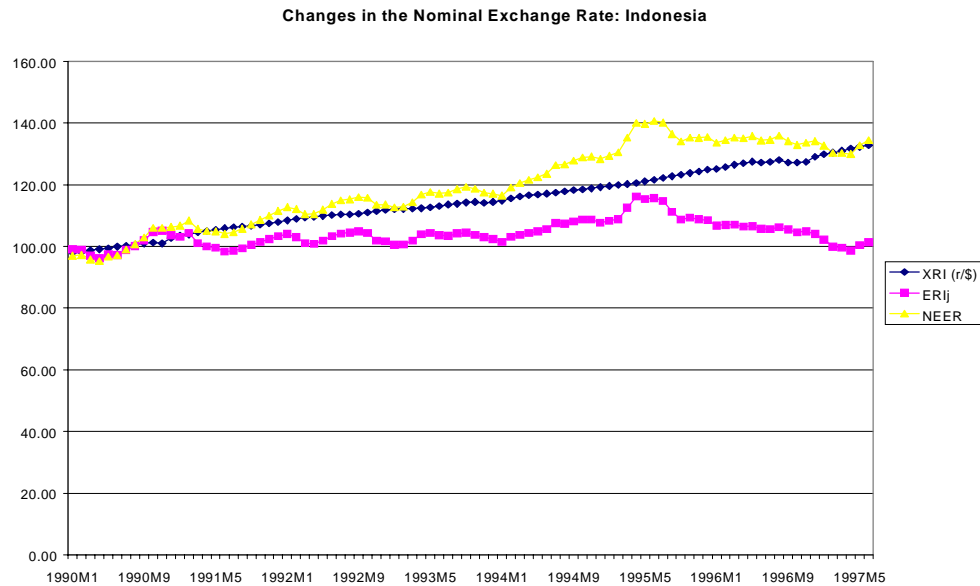
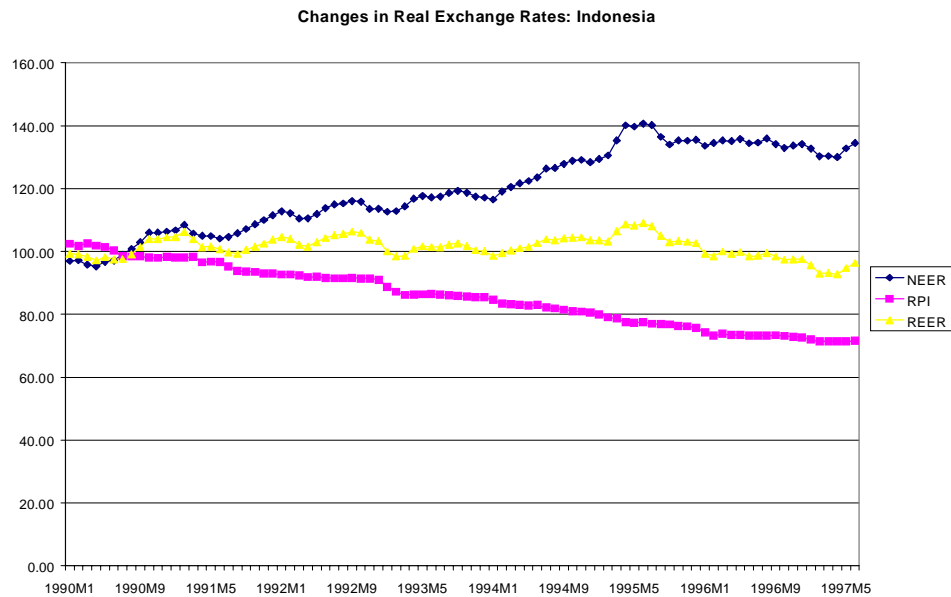


Figure 5. Changes in the Real Effective Exchange Rate: Indonesia.



In Korea, a peg to the US dollar would have resulted in appreciation, as is evident from the behavior of the nominal exchange rate indicator (ERI) series. However, the continual depreciation of the won against the dollar resulted in a continuing increase (depreciation) of the nominal effective exchange rate. This depreciation of the nominal

exchange rate outweighed the inflation differential, causing the real effective exchange rate to depreciate from 95 to 108 during the year prior to the crisis. Clearly, exchange rate pegging does not appear to have been the source of the problems that emerged in Korea.

Figure 6. Changes in the Nominal Effective Exchange Rate: Korea

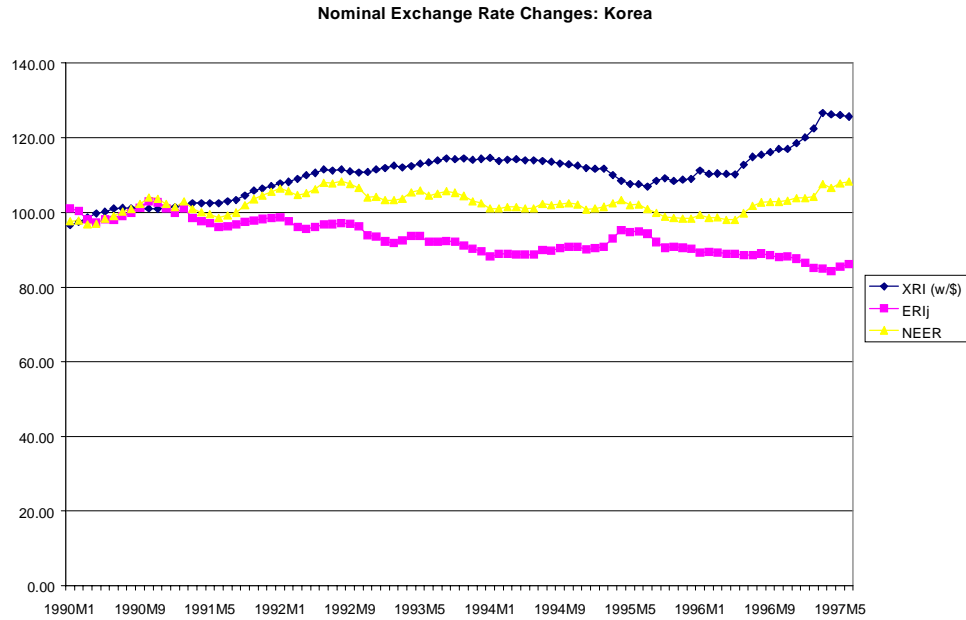
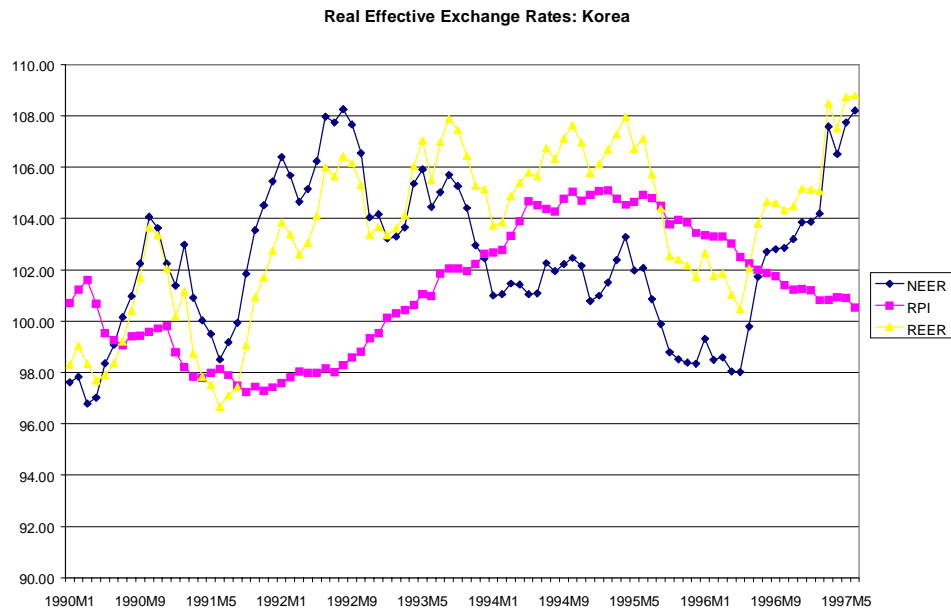


Figure 7. Changes in the Real Effective Exchange Rate: Korea



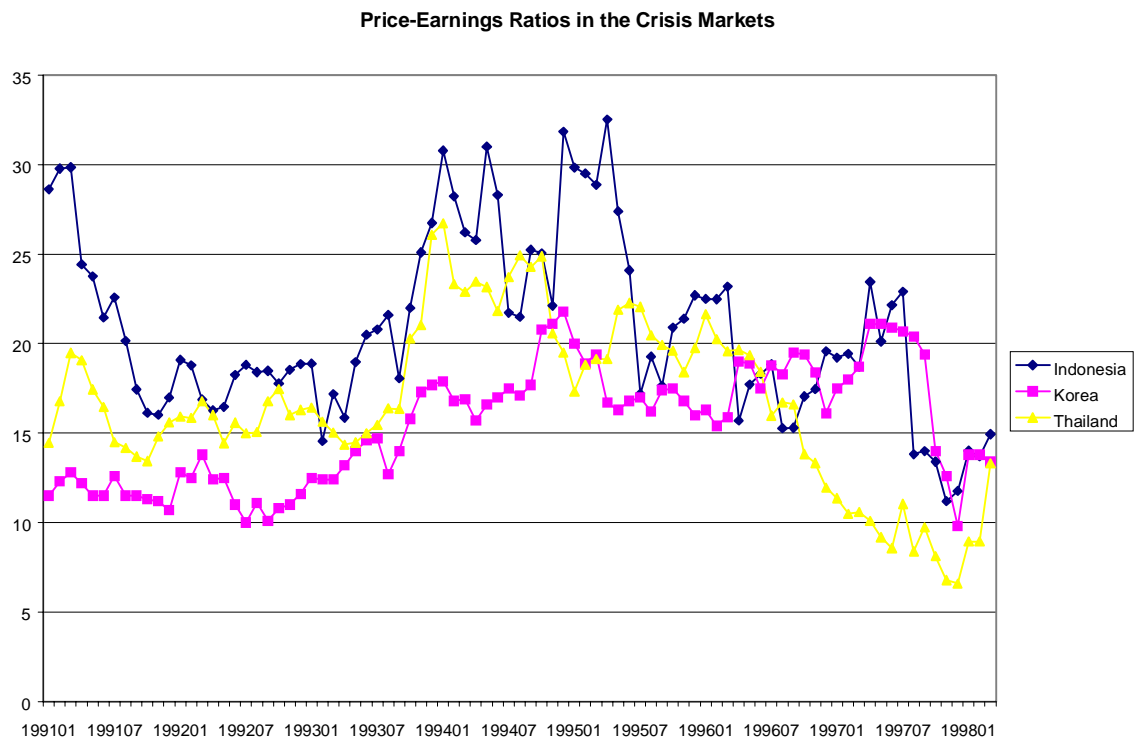
Our results on real exchange rate appreciation are similar to those obtained using the standard IMF *International Financial Statistics* measures of real effective exchange rates. They differ from those of Radelet and Sachs (1998, p13), who find evidence of real appreciation exceeding 25 percent between 1990 and 1997 in the three countries we consider. The difference seems to arise from Radelet and Sach's use of only developed-country trading partners. Some such long term appreciation relative to mature, slow growing economies would be expected because of the long term trend rise in the prices of nontraded goods in growing economies (Falvey and Gemmell 1991). Further, a rise over such a long period is unlikely to constitute a shock.

The fact that the pegged exchange rate regimes do not appear to have been a primary source of shocks does not mean that they did not play a role in the transmission of the crisis. If a large shock elsewhere in the economy required a large adjustment in the exchange rate, then the fixed rate system may have lacked the flexibility to respond sufficiently rapidly.

Within the affected countries, a potentially important shock appears to have been a sharp downturn in expectations about the future profitability of investments in these

countries. This downturn in expectations might have had a range of sources. Krugman (1998) attributes earlier, higher, expectations to an expectation that investment failures would be bailed out. Others have argued that investment has been excessive, and that investment returns have therefore been declining, perhaps following the profile of diminishing returns to capital outlined in Young (1994) and Krugman (1994). While possible, such a decline in the efficiency of investment would have tended to push down both the return on capital and the price of capital. In Thailand, the ratio of the price of capital to its return (as proxied by the price-earnings ratio for the stock exchange) began to decline well around the beginning of 1996, a full year and a half before the crisis. In Indonesia and Korea, however, the fall was more or less contemporaneous with the onset of the crisis in Thailand.

Figure 8. Changes in Price-Earnings Ratios in the Stock Markets of Crisis Countries



Source: International Finance Corporation, Emerging Markets Database.

A decline in the price of capital relative to its earnings might have a number of causes. It might, for example, be due to an increase in the expected rate of inflation. As

Feldstein (1980) has shown, such an increase might be expected to reduce the after-tax return on capital because it reduces the real value of the tax depreciation allowances associated with capital investment. Another obvious potential cause of this reduction would be a reduction in the rate of growth in returns to capital. Consider the standard capitalization formula for an infinitely-lived asset,

$$V = A/(r - g)$$

where  $V$  is the capital value,  $A$  is the annual return to the capital;  $r$  is the discount rate; and  $g$  is the growth rate of the return to capital. From this formula, it is very clear that the valuation of the capital stock is potentially very sensitive to the expected growth rate of returns.

The apparently robust Price-Earnings ratios in pre-crisis Korea depicted in Figure 8. are potentially misleading. In fact, stock prices in both Korea and Thailand began falling more or less contemporaneously from the beginning of 1996 (McKibbin 1998). However, the overall rate of real growth in Korea remained over 7 percent in 1996, implying that the decline in corporate earnings was a leading indicator for the subsequent decline in the growth rate of the economy as a whole. Only in Indonesia did corporate earnings and stock prices remain robust until the onset of the crisis.

## **Secondary Shocks**

Once the crises began in these countries, other factors that could have exacerbated the impact of the initial shock came into play. These shocks included: (i) the emergence of risk premia on loans to the affected countries, and the related reluctance of creditors to roll over short term credits, (ii) expectations that governments would loosen monetary policy to reduce the impact of the shock on output and employment, and (iii) negative productivity shocks resulting from a lack of availability of credit as banks tried to restore their balance sheets.

Concerns about the ability of firms and governments to repay their debts given the devaluations of their domestic currencies can give rise to sometimes substantial risk premia. These risk premia raise domestic interest rates, and lead to exchange rate

depreciation (McKibbin 1998). The impact of the emergence of a risk premium in country i is most readily seen using the uncovered interest parity condition:

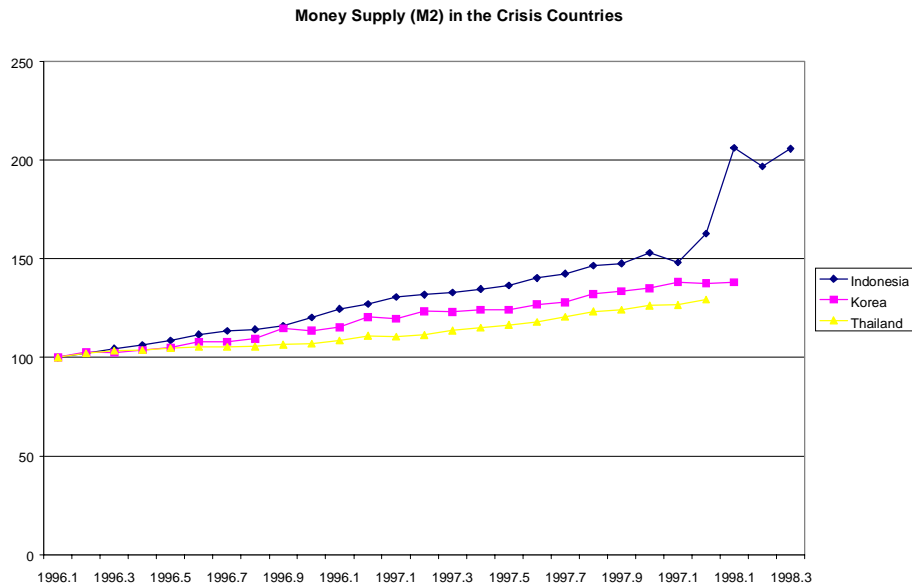
$$(1) \quad r_t^i = r_t^u + E_t \Delta e_t + \gamma_t^i$$

where  $r_t^i$  is the rate of return on government securities in country i;  $r_t^u$  the interest rate on comparable securities in the United States (or some other reference country);  $E_t \Delta e_t$  is the expected depreciation of the nominal exchange rate in time t; and  $\gamma_t^i$  is the risk premium reflecting the market's perceptions of the risk differential associated with the securities issued by country i's government.

Clearly, when the economy reaches an equilibrium in which expected depreciation of its currency is zero, its interest rate will be higher by the risk premium associated with its securities. During the transition path from the initial shock to the final equilibrium, the domestic interest rate and the risk premium will together determine the expected path of the exchange rate. If  $r_t^u + \gamma_t^i$  exceeds the domestic interest rate, then the exchange rate will undergo an anticipated appreciation.

Another important factor in the aftermath of the initial crashes appears to have been uncertainty about the response of monetary policy. Given the weak state of the banking sectors in a number of the countries, and the shock to the accounts of banks from devaluation, governments were under strong pressure to, at least partly, validate the shock resulting from the initial devaluation. Even if governments plan to maintain a tight monetary policy, they are likely to have low credibility in this situation, as in the case of disinflation, where high interest rates frequently emerge (Kaminsky and Leiderman 1998). With forward-looking expectations and a freely floating rate, even expectations of monetary expansion can be expected to cause a jump depreciation of the exchange rate (Wilson 1979). Where monetary policy was, in fact, loosened to deal with the crisis in the banking sector, an even larger depreciation of the rate would be expected. As Figure illustrates, the increase of 50 percent in the money supply in Indonesia in late 1997 and early 1998 is in quite strong contrast with the relatively tight control of monetary policies maintained in the other crisis countries.

Figure 9. Money supply growth in the three crisis countries



Radelet and Sachs (1998), Chang and Velasco (1998), Corsetti, Pesenti and Roubini (1998) and McLeod and Garnaut (1998) all focus on the nature of the financial meltdown, and draw out its potential consequences. From this work, it is clear that a great deal depends upon whether the shocks are viewed as rational responses to adverse shocks, or as the consequence of blind panic. If the financial meltdown is the result of an asset grab by creditors, rather than a fundamental problem of insolvency, then it is likely to have only a short-term impact on productivity as long as an orderly workout can be put in place. The short term adverse impact on the productivity of the economy might, however, be substantial if profitable firms are denied credit by the capital adequacy problems of the banks.

There is a serious simultaneity problem in capturing the interaction of the financial and macroeconomic impacts of the financial sector crisis. A rise in interest rates, for instance, will have an adverse impact on the balance sheets of borrowing firms and may throw some of them into default. If this, in turn, leads to a rise in the risk premium on lending to this country, this is likely to have two adverse second-round impacts on the balance sheets of these firms. The first adverse impact would be through a rise in interest rates resulting directly from the rise in the risk premium. The second possible adverse

impact—affecting only those firms with unhedged foreign currency borrowings—would follow from the devaluation induced by the rise in the risk premium.

Perhaps the best that we can do within the framework of our analysis is to assign rough orders of magnitude to the direct impacts of the second-round financial sector shocks, and assess their impacts for the macroeconomic adjustments needed to emerge from the crisis. With the forward-looking macroeconomic framework that we utilize, we can form some assessment of the size of the adjustments required over the medium-term recovery horizon.

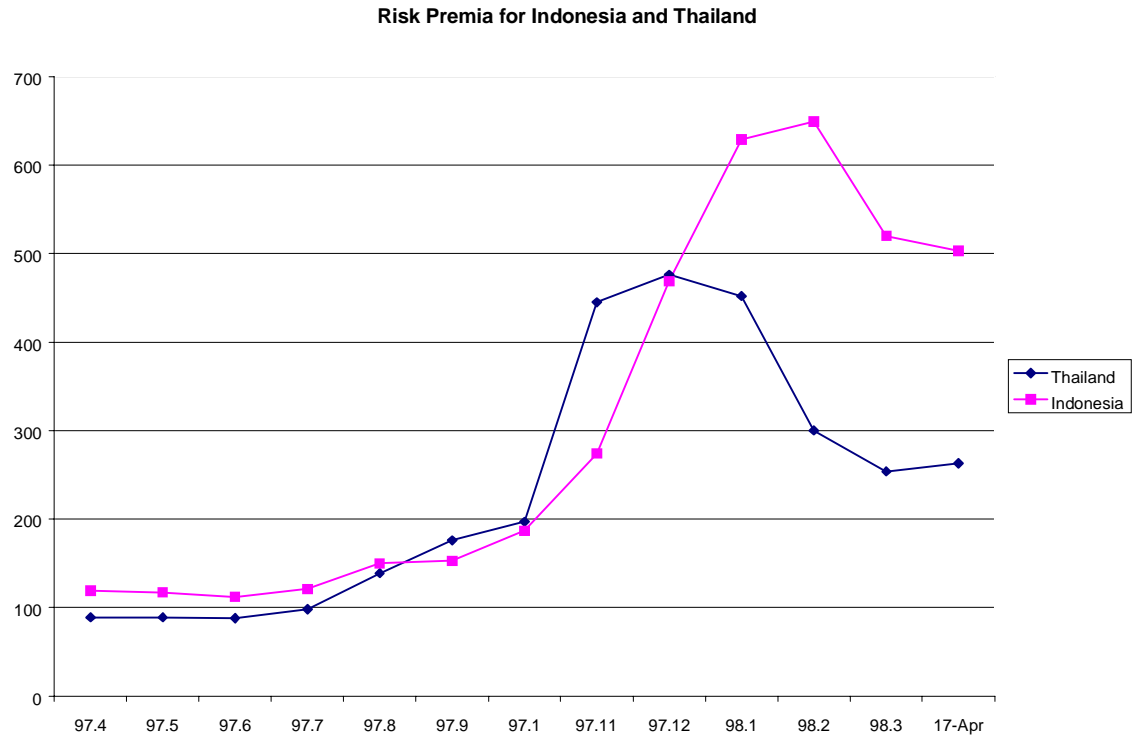
One measure of the size of the risk premium associated with the financial crisis is provided by the changes in the prices of US dollar denominated bonds issued by the governments in the crisis countries. Changes in the prices of these bonds can be translated into changes in the internal rate of return demanded by international investors from government securities in the crisis countries. Comparison of the internal rate of return on bonds with the internal rate of return on US bonds of similar maturity yields a measure of the risk premium on financial assets in the crisis countries<sup>3</sup>. This measure of the risk premium seems likely to be much more reliable than one generated by adjusting the yield on domestic securities for anticipated exchange rate depreciation—simply because we have no reliable series for anticipated exchange rate depreciation. Estimates of changes in the risk premia for the two crisis countries for which data are available were kindly supplied by Himmat Kalsi of the World Bank. These estimates are shown in Figure 10.

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<sup>3</sup> The risk premium associated with the financial assets of particular companies will differ from that on government securities. These additional risk premia over that on government securities will generally be positive.



Figure 10. Risk premia on 10 year government bonds



Source: World Bank.

The initial analysis in this paper focuses on the impact of the shocks identified. We consider first the impact of reductions in the expected profitability of investments in the country. We then consider the impacts of the financial sector shocks that result from the initial shocks—the emergence of a risk premium; monetary policy responses and anticipated monetary policy responses; and productivity losses associated with financial sector turmoil. To trace through the impacts of these shocks, we use a general equilibrium multi-country framework that can take into account the impacts of financial market shocks on the real economy, including impacts for exchange rates, trade balances, GDP, consumption and investment.

## ***A General Equilibrium Multi-Country Framework***

The crisis appears to involve shocks emanating from the financial markets, transmitted to the real sector through changes in exchange rates and macroeconomic balances. Thus, the analysis needs to incorporate both asset and product markets. Because so much depends on expectations about future returns, and changes in variables like exchange rates that depend on expectations of future developments in asset and goods markets, it is desirable to be able to include forward-looking expectations. Because the impacts of the shocks are likely to be very different across sectors, it is desirable that the analysis be able to distinguish impacts on different sectors.

The G-Cubed (Asia Pacific ) multi-country model was used for the analysis. It is based on the G-Cubed model developed in McKibbin and Wilcoxon (1992, 1995). It combines the intertemporal macroeconomic approach taken in the MSG2 model of McKibbin and Sachs (1991) with the disaggregated, econometrically-estimated, intertemporal general equilibrium model of the US economy by Jorgenson and Wilcoxon (1989). By using an intertemporal general equilibrium model, we are able to build on the analysis of the trade shocks undertaken by Liu, Noland, Robinson and Wang (1998) using a static computable general equilibrium model.

The G-Cubed model was constructed to contribute to the current policy debate on global warming, trade policy and international capital flows, but has many features that make it useful for answering a range of issues in environmental regulation, microeconomic, macroeconomic and trade policy questions. It is a world model with substantial regional disaggregation and sectoral detail. In addition, countries and regions are linked both temporally and intertemporally through trade and financial markets. The explicit treatment of financial flows has been shown to be important for analyzing the response to trade liberalization (see McKibbin(1996)) but it is absolutely crucial for analyzing the consequences of financial shocks such as the re-evaluation of risk. G-Cubed contains a strong foundation for analysis of both short run macroeconomic policy analysis as well as long run growth consideration of alternative macroeconomic policies.

Intertemporal budget constraints on households, governments and nations (the latter through accumulations of foreign debt) are imposed. To accommodate these constraints, forward looking behavior is incorporated in consumption and investment decisions. Unlike the MSG2 model, the G-Cubed model also contains substantial sectoral detail. This permits analysis of environmental and trade policies which tend to have their largest effects on small segments of the economy. By integrating sectoral detail with the macroeconomic features of the MSG2 model, G-Cubed can be used to consider the long run costs of alternative environmental regulations and trade policy changes yet at the same time consider the macroeconomic implications of these policies over time. The response of monetary and fiscal authorities in different countries can have important effects in the short to medium run which, given the long lags in physical capital and other asset accumulation, can be a substantial period of time. Overall, the model is designed to provide a bridge between computable general equilibrium models and macroeconomic models by integrating the more desirable features of both approaches. The G-Cubed (Asia Pacific) model differs from the G-Cubed model because of the focus on the Asia-Pacific region as well as having 6 sectors compared to 12 for G-CUBED. The theoretical structure is essentially the same.

The key features of the G-Cubed (Asia Pacific) model are summarized in Table 1. The country and sectoral breakdown of the model are summarized in Table 2. The model consists of eighteen economic regions (the new version (29) used in this paper also includes India and New Zealand) with six sectors in each region (there are also two additional sectors in each region that produce the capital good for firms and the household capital good). The regions in the model can be divided into two groups: 15 core countries/regions and three others. For the core regions, the internal macroeconomic structure as well as the external trade and financial linkages are completely specified in the model.

Each core economy or region in the model consists of several economic agents: households, the government, the financial sector and the 6 production sectors listed in table 2. Each of these economic actors interact in a variety of markets, both domestic and foreign.

The eighteen regions in the model are linked by flows of goods and assets. Flows of goods are determined by import demands for final consumption as well as for intermediate inputs. Trade imbalances are financed by flows of financial assets between countries. It is assumed (based on calibrating the model to a 1996 base year) that existing wedges between rates of return in different economies are generated by various restrictions that generate a risk premium on country denominated assets. These wedges are calculated using a technique outlined in section 4 below. They are assumed to be exogenous during the simulations. Thus in general when the model is simulated, the induced changes in expected rates of return in different countries generate flows of financial capital reacting to return differentials at the margin.

International capital flows are assumed to be composed of portfolio investment, direct investment and other capital flows. These alternative forms of capital flows are perfectly substitutable ex ante, adjusting to the expected rates of return across economies and across sectors. Within an economy, the expected return to each type of asset (i.e. bonds of all maturities, equity for each sector etc.) are arbitrated, taking into account the costs of adjusting physical capital stock and allowing for exogenous risk premia. Because physical capital is costly to adjust, any inflow of financial capital that is invested in physical capital (i.e. direct investment) will also be costly to shift once it is in place. The decision to invest in physical assets is based on expected rates of return. However, if there is an unanticipated shock then ex-post returns could vary significantly. Total net capital flows for each economy in which there are open capital markets are equal to the current account position of that country. The global net flows of private capital are constrained to zero.

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*Table 1: Summary of the Main Features of AP-G-CUBED*

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- Specification of the demand and supply sides of economies;
  - Integration of real and financial markets of these economies with explicit arbitrage linkage real and financial rates of return;
  - Intertemporal accounting of stocks and flows of real resources and financial assets;
  - Imposition of intertemporal budget constraints so that agents and countries cannot forever borrow or lend without undertaking the required resource transfers necessary to service outstanding liabilities;
  - Short run behavior is a weighted average of neoclassical optimizing behavior based on expected future income streams and Keynesian current income;
  - The real side of the model is dis-aggregated to allow for production of multiple goods and services within economies;
  - International trade in goods, services and financial assets;
  - Full short run and long run macroeconomic closure with macro dynamics at an annual frequency around a long run Solow/Swan/Ramsey neoclassical growth model.
  - The model is solved for a full rational expectations equilibrium at an annual frequency from 1996 to 2070.
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*Table 2: Overview of the AP-G-CUBED Model*

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<b><i>Regions:</i></b>	<b><i>Sectors:</i></b>
United States	Energy
Japan	Mining
Australia	Agriculture
New Zealand	Non Durable Manufacturing
Rest of the OECD	Durable Manufacturing
India	Services
Korea	
Thailand	
Indonesia	
China	
Malaysia	
Singapore	
Taiwan	
Hong Kong	
Philippines	
Oil Exporting Developing Countries	
Eastern Europe and the former Soviet Union	
Other Developing Countries	
<b><i>Agents</i></b>	<b><i>Markets:</i></b>
Households	Final Goods
Firms	Services
Governments	Factors of production
	Money
	Bonds
	Equities
	Foreign Exchange

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## ***Experiments and Results***

Since we remain fundamentally uncertain about the magnitudes of the shocks involved, we use the model in experimental mode, examining the impact of each type of shock on the economy, with a view to making some qualitative assessment of the nature of its impacts. We consider first the asset market shock which appears to have contributed heavily to the crisis. Then, we consider the risk premia and monetary policy shocks that appear to have contributed to exacerbating it. Finally, we consider the adverse impacts of the financial meltdown on the performance of the crisis economies through factors such as a lack of available credit for production, or inadequate institutions for speedy resolution of problems created by firm illiquidity through either workouts or liquidation (Goldstein, Rogoff and Johnson 1998).

### **An Anticipated Decline in Profitability of Investments in Thailand**

The first experiment is an anticipated reduction in the return on investment resulting from a fall in total factor productivity in the country concerned. Because of the requirement that the model reach a long run steady state solution, we are unable to implement a permanent change in the rate of productivity growth. For this reason, we introduce the shock as a decline in expected productivity that is 0.5 percent in 1997, 1.0 percent in 1998, and then declines by 1 percent per year until, in 2002, the level is 5 percent below what it would otherwise have been. In terms of the growth rate of productivity, this is a fall in the growth rate of productivity of 0.5 percent in 1997 and 1998, and 1 percent per year until 2002, when the growth rate of productivity returns to baseline. This experiment seems most appropriate for Thailand, where the fall in asset prices preceded the fall in returns. However, with some adjustment to the time path, it would seem to be reasonably appropriate in Korea and Indonesia.

The experiment is undertaken relative to a benchmark growth path for the model. The rate of growth of the money supply is treated as exogenous in the simulation, assuming that the government does not respond to shocks to the price level resulting from the shock.

Some key results for the impacts of the productivity shock in Thailand alone on key variables in Thailand are presented in Figures 11(a) to 11(d). A useful way to understand the results is to begin with the sharp initial depreciation of the exchange rate. The nominal exchange rate undergoes a jump depreciation of 20 percent in the first year, and continues to depreciate for the next five years, after which it begins to appreciate towards a long run equilibrium that is around 5 percent below the benchmark rate. Nominal and real interest rates rise in the first few years because the exchange rate depreciation raises the prices of tradable goods. With the money supply unchanged, this reduces the real money supply, and leads to higher interest rates in the short term, despite the decline in real incomes. After several years of adjustment, however, the combination of the decline in real income, and a higher rate of inflation associated with continuing exchange rate depreciation result in real interest rates that are as much as 3 percentage points below the baseline levels.

The decline in current and expected future returns to capital causes a fall in the prices of capital goods. This decline in capital goods prices, and in the Tobin's  $q$  measure of the incentive to invest, causes a 10 percent decline in investment in the first year. This initial decline in investment is sharper than the long-run reduction because the capital stock before the shock is larger than that required after the shock. As the adjustment process proceeds, investment picks up, led by investment in the sectors more oriented to traded goods production that benefit from the real devaluation. In the new steady state, investment is 2.3 percent below its baseline level.

The decline in wealth resulting from the decline in productivity leads to a sharp decline in consumption in the model. The model contains a combination of forward-looking agents whose consumption decisions are based on expected future wealth, and others whose decisions are based on their income levels (see McKibbin and Sachs 1991 for a detailed discussion). For both groups, the shock reduces consumption levels sharply in the early periods of the adjustment process. Over time, the reductions in consumption and investment decline until, in the new steady state, they are reduced by roughly the same amount as Gross National Product.

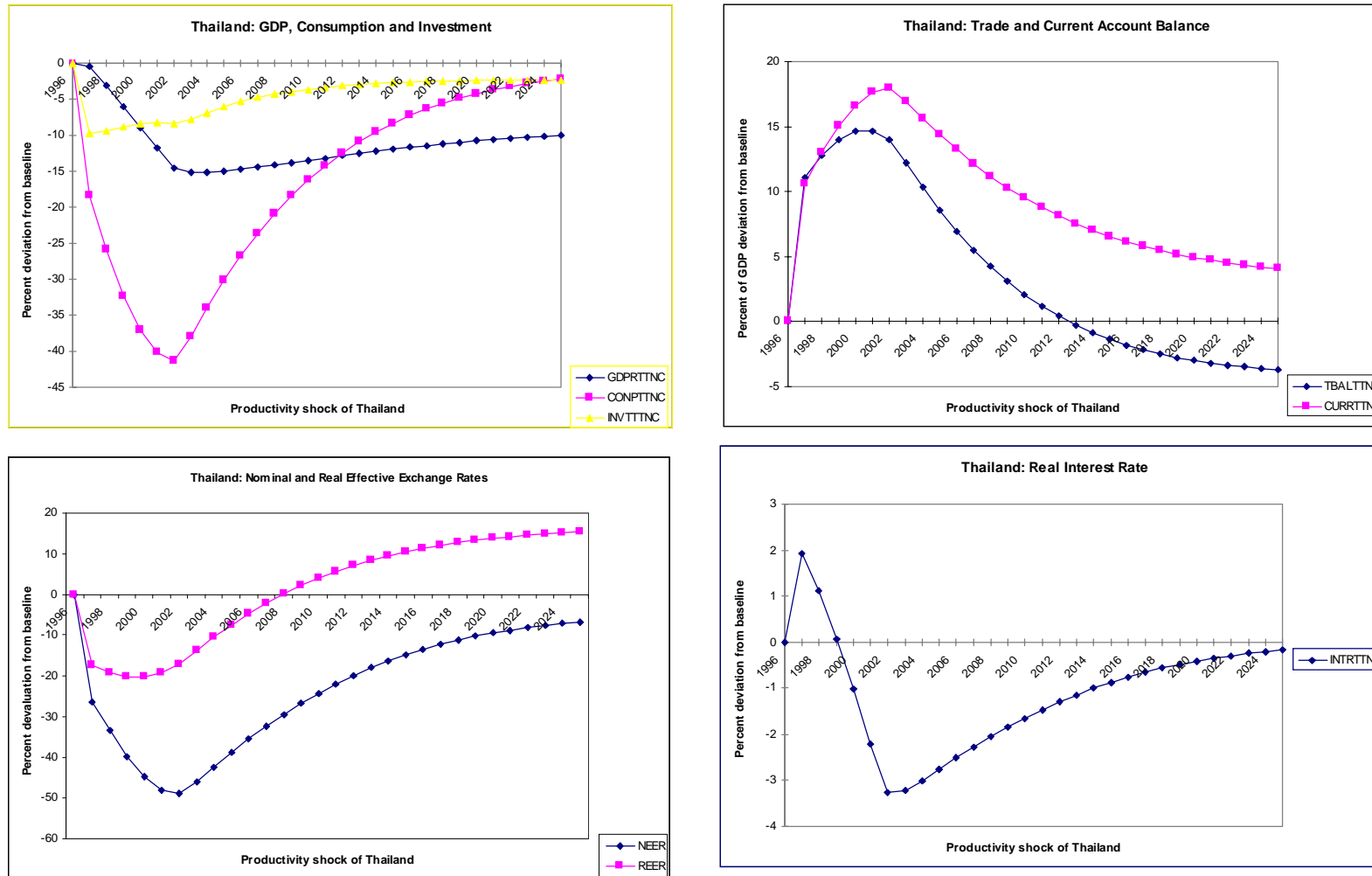


Real GDP falls substantially in the model. Part of the decline is due directly to the reduction in productivity, and part to an initial fall in employment which peaks at 8.2 percent in 2002. Because the labor market is assumed to be relatively flexible, unemployment levels fall relatively quickly after the shock has passed. Over time, however, the initial decline in real GDP is increased by the effects of the fall in investment. GDP continues to fall for as long as the decline in productivity occurs, and then begins to recover gradually, as investment returns to higher levels. In the long run, GDP is around 12 percent below the baseline level—a considerably larger fall than the decline in productivity that set off the adjustment. The much greater fall in GDP than in productivity reflects the reduction in the ability of the country to compete for international investment resources. The fall in GNP, and hence in real investment and consumption, is considerably smaller than the fall in GDP because of the reduction in the need to service international debt.

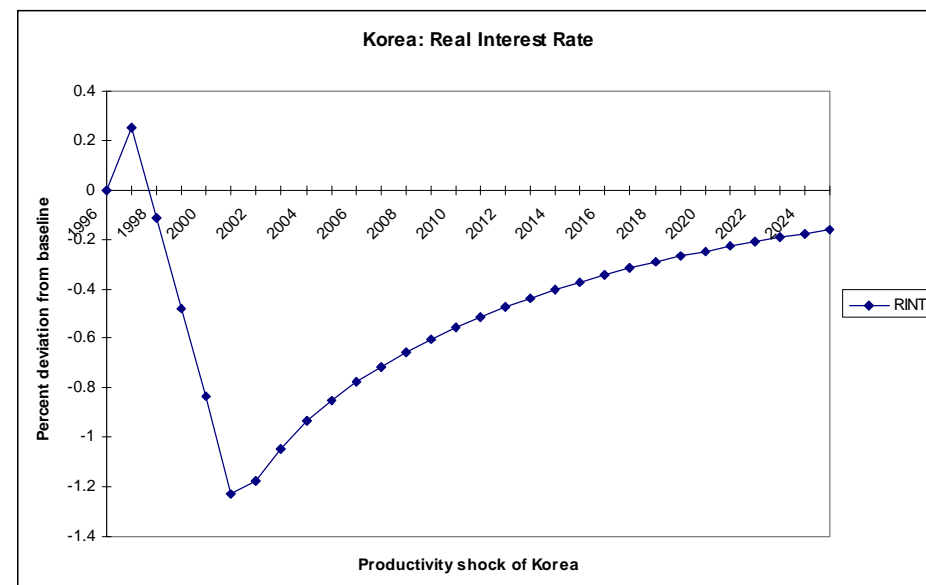
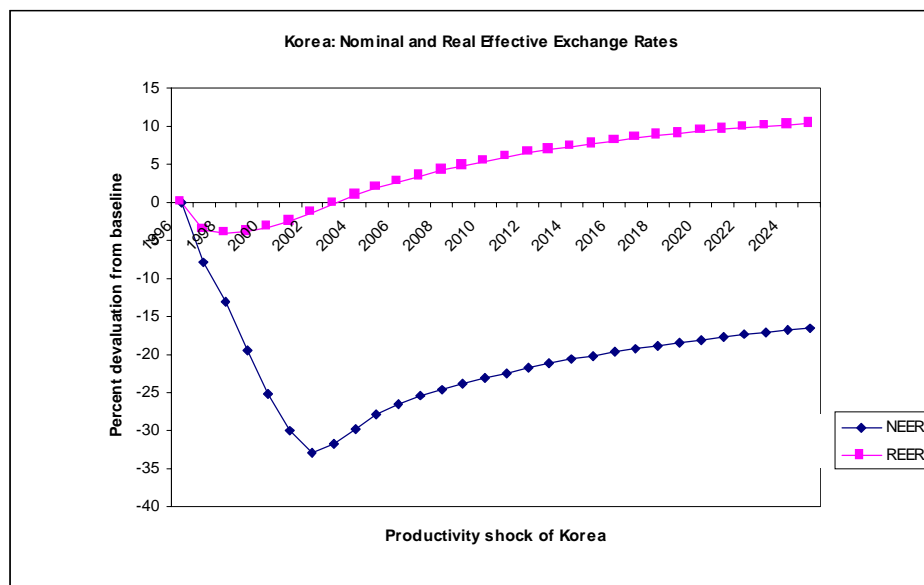
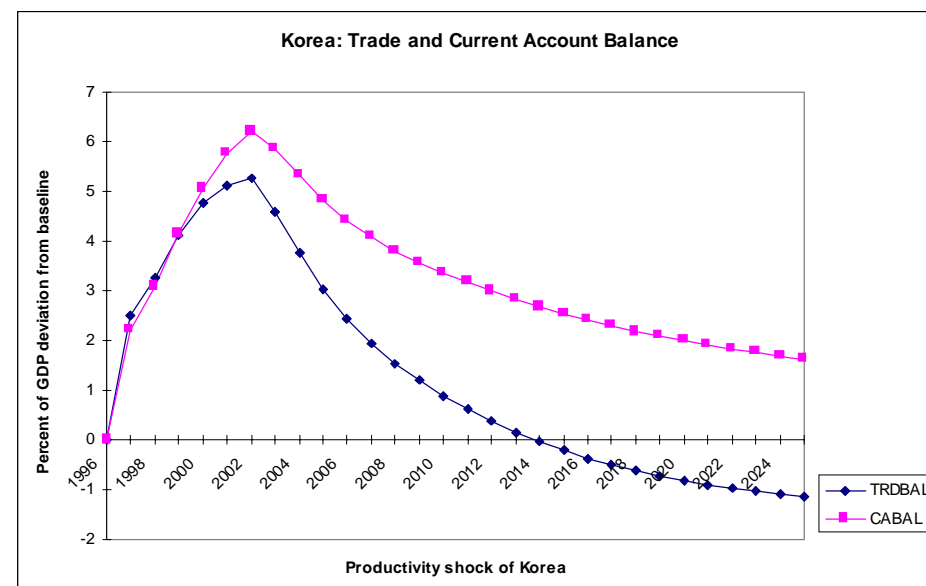
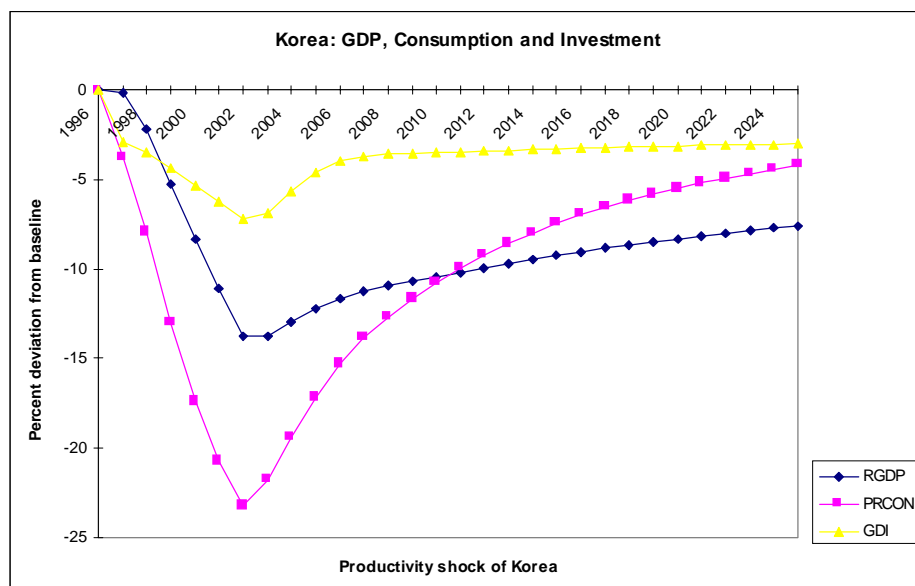
The real exchange rate variable reports the ratio of the prices of domestically produced goods relative to the price of imports from other countries. Since the Armington (1969) assumption employed in the model treats the prices of domestically-produced goods and exports as identical, this variable can also be interpreted as the terms of trade. This real exchange rate/terms of trade deteriorates substantially because the decline in domestic absorption (consumption plus investment) results in a sharp increase in net exports. Despite this decline in the terms of trade, the improvement in the balance of trade is very substantial, improving by around ten percent of GDP in the first year, and rising to 14 percent above the baseline after four years as the decline in consumption demand increases.

The results of the productivity shock for Thailand include many of the features of the actual outcome during the crisis. A sizable depreciation of the exchange rate, a fall in investment and consumption, a deterioration in the terms of trade, rises in nominal and real interest rates, and a rapid turnabout in the balance of trade have been important features of the Thai experience since the beginning of the crisis. Clearly, however, this combination of a small concurrent reduction in productivity and a larger anticipated reduction does not capture either the full extent of the reduction in output during the first year after the

**Figure 11: Impacts of an Anticipated Decline in Productivity on Thailand**



**Figure 12: Impacts of an Anticipated Decline in Productivity on Korea**



shock.

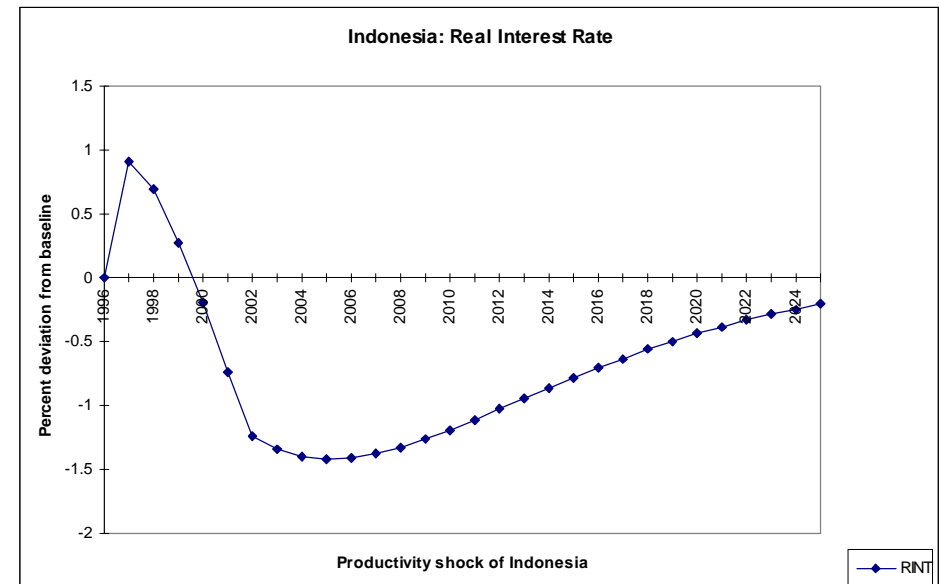
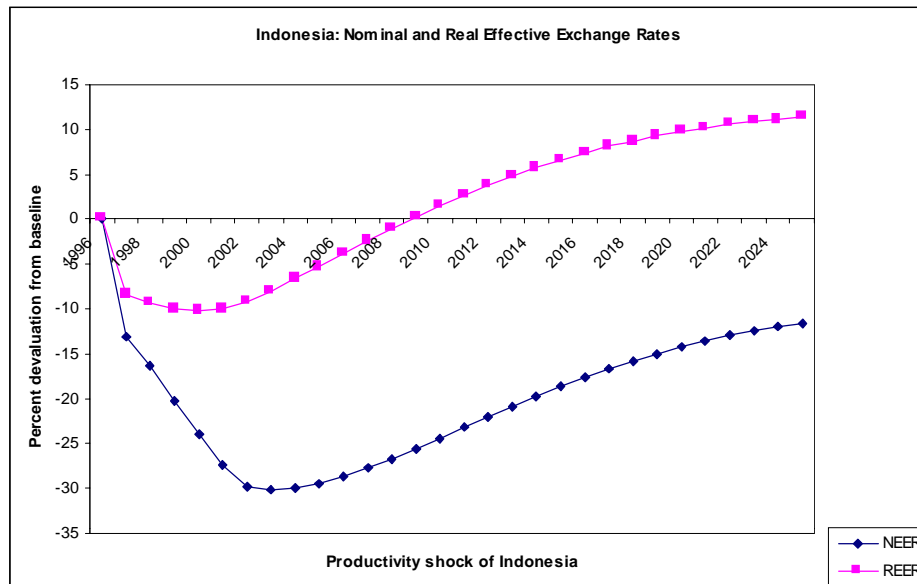
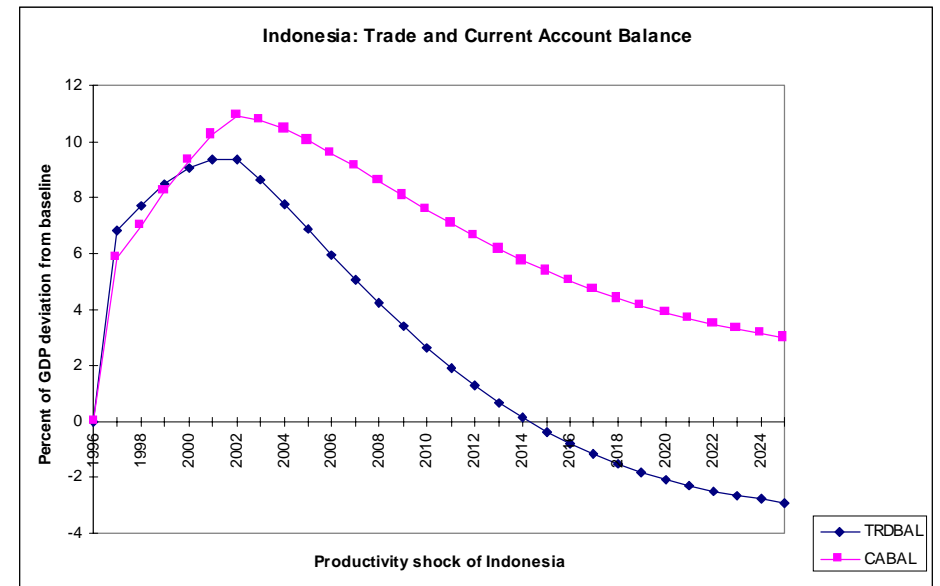
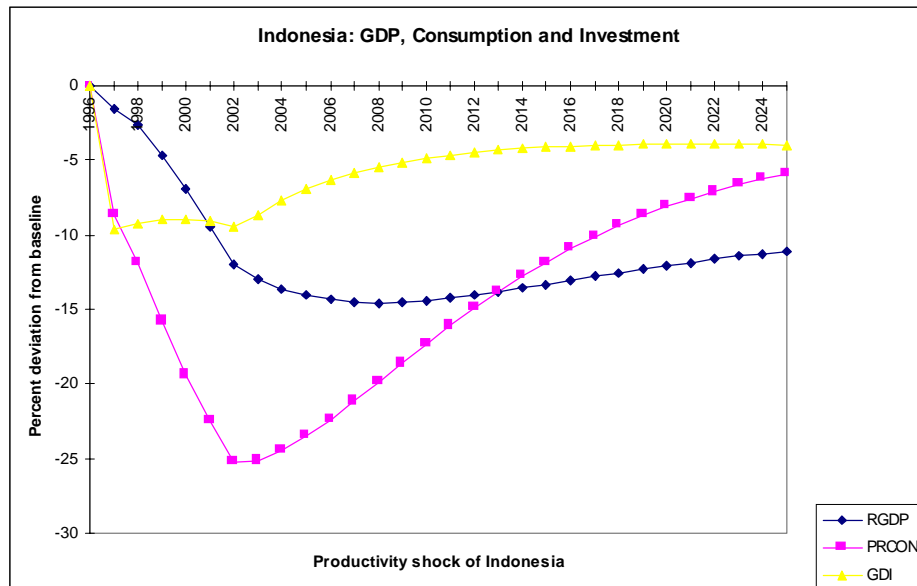
The model results for the impact of the anticipated productivity shock in Thailand provide interesting insights into the contagion issue. The shock considered produces an initial nominal depreciation of over 20 percent in Thailand, rising to almost 40 percent as the productivity decline actually occurs. The effects of this sizable shock on the (assumed floating) exchange rates of Korea and Indonesia are, however, extremely small. The Indonesian Rupiah depreciates by around 0.2 percent. The Korean currency actually appreciates-- initially by 0.2 percent, rising subsequently to 0.4 percent.

The explanation for these initially surprising results seem to lie in the dual nature of the response of the Thai economy to this shock. Within the current account, the trade impacts of the shock are adverse for its competitors. On the global capital account, however, Thailand is substantially reducing its demands for capital as its current account strengthens. In the case of Indonesia, the trade account effects dominate and the exchange rate depreciates. By contrast, in the case of Korea, the capital account dominates and the exchange rate strengthens.

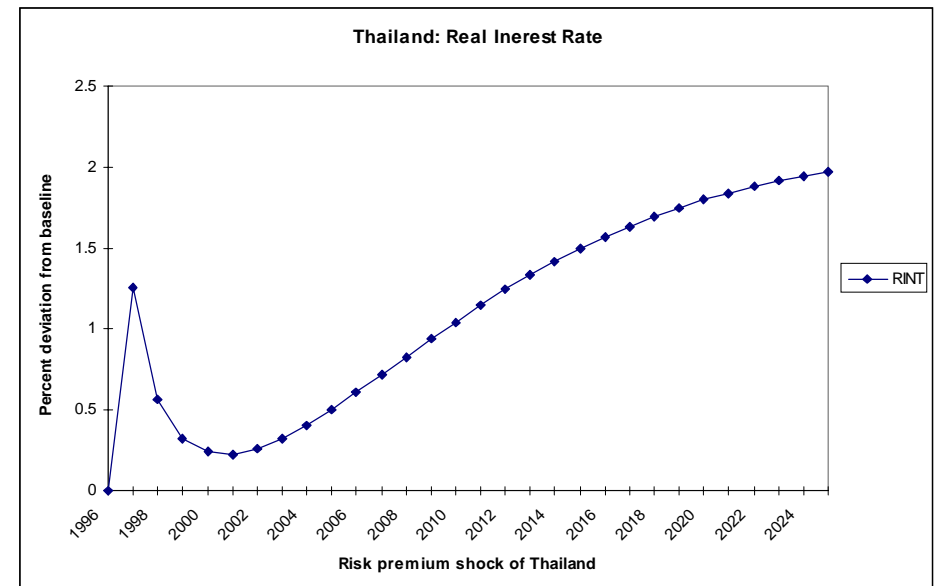
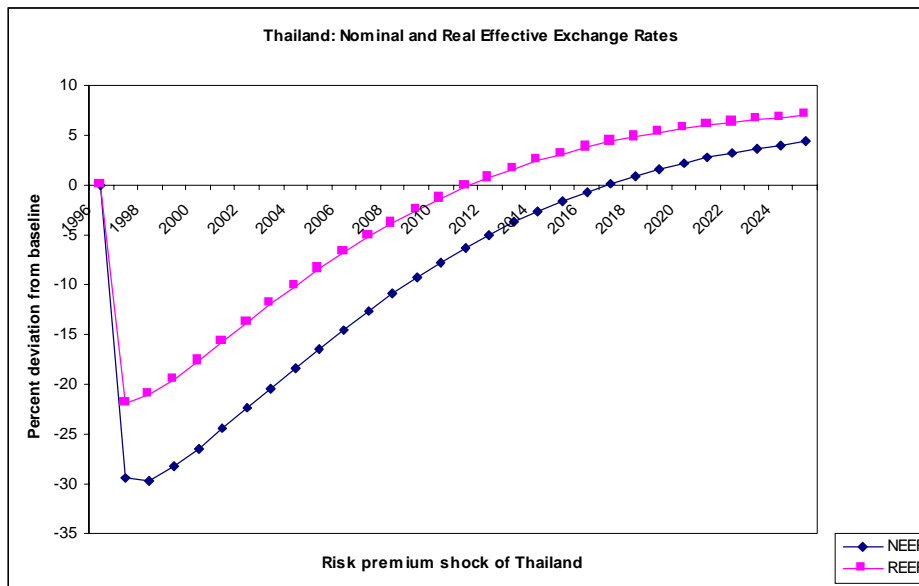
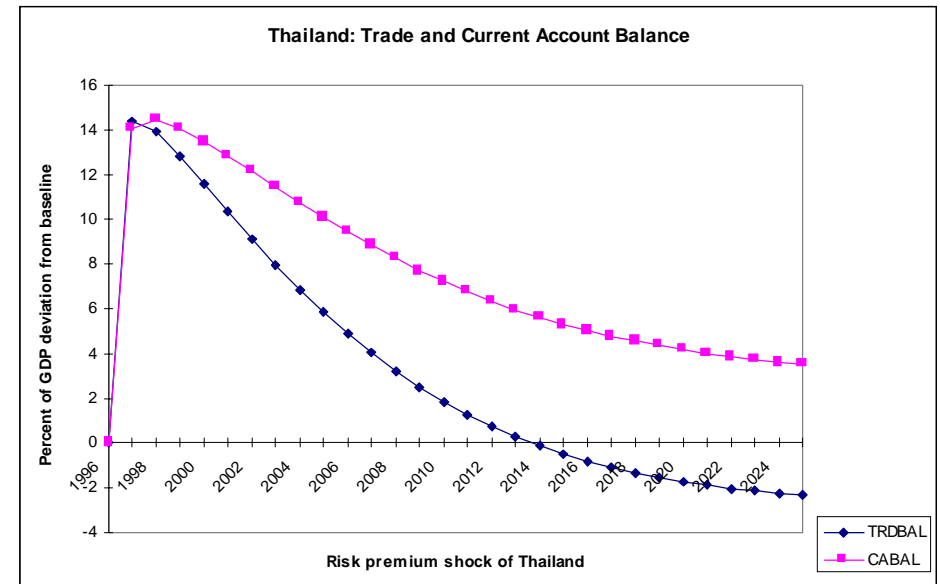
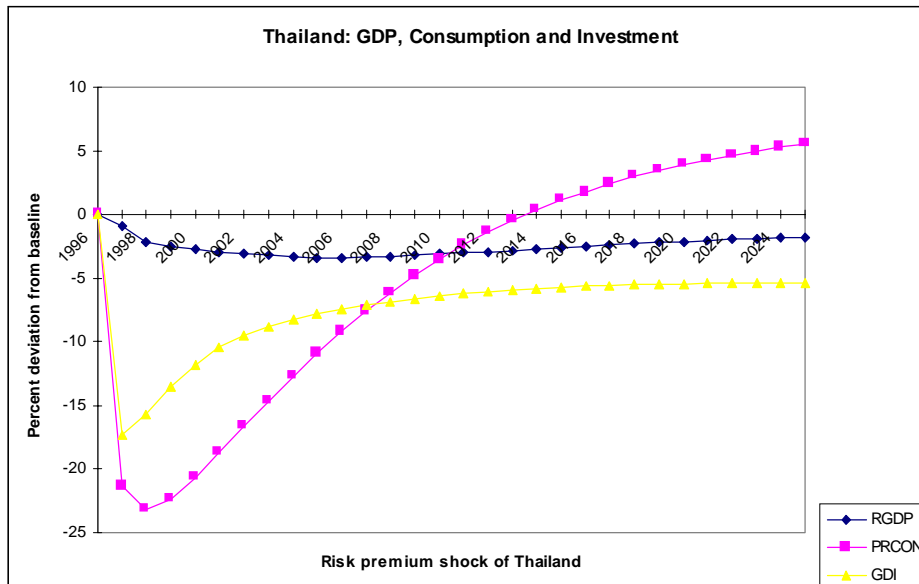
Clearly, however, these results suggest that the pure “contagion” effects operating through trade and capital market linkages were very weak. They suggest that the spread of the crisis from Thailand must have been due to changes in the perceptions of market participants about conditions in the other markets, rather than about domino effects resulting from the initial crisis.

The impacts on Korea of the same profile of anticipated decline in productivity in Korea are presented in Figure 12. The qualitative nature of the adjustment to the shock is broadly similar to Thailand. However, the magnitudes of adjustment required are generally substantially lower for Korea than for Thailand. Part of this difference is probably due to the higher investment rates prevailing in Thailand than in Korea or Indonesia prior to the crisis. Another important source of difference is the heavier reliance of Thailand on foreign-currency denominated debt. Following the devaluation, the burden of this debt on Thailand rises substantially. The results for Indonesia presented in Figure 13 are closer to those for Korea than those for Thailand.

**Figure 13: Impacts of an Expected Decline in Productivity on Indonesia**



**Figure 14: Impacts of the Rise in the Risk Premium on Thai Bonds**



**Figure 15: Impacts of the Rise in the Risk Premium on Korea Bonds**

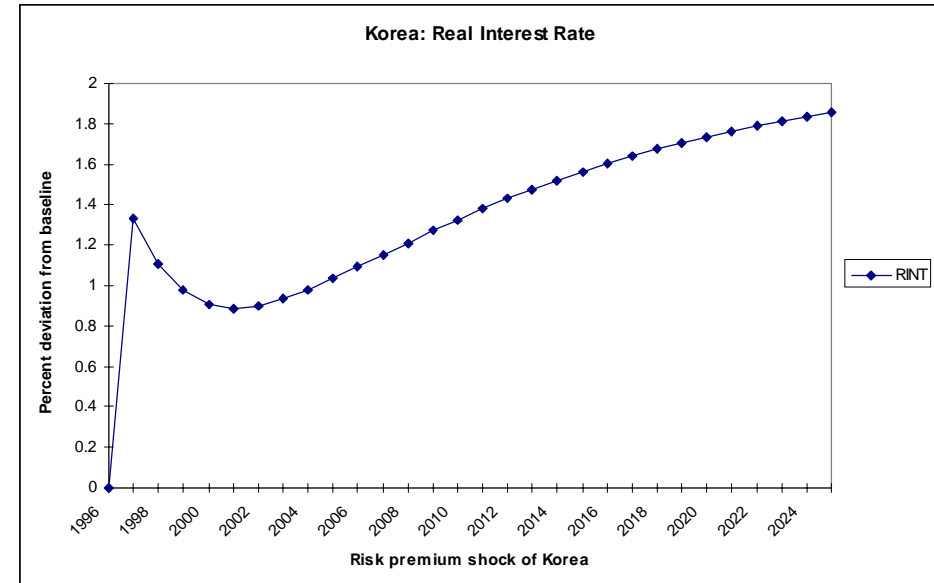
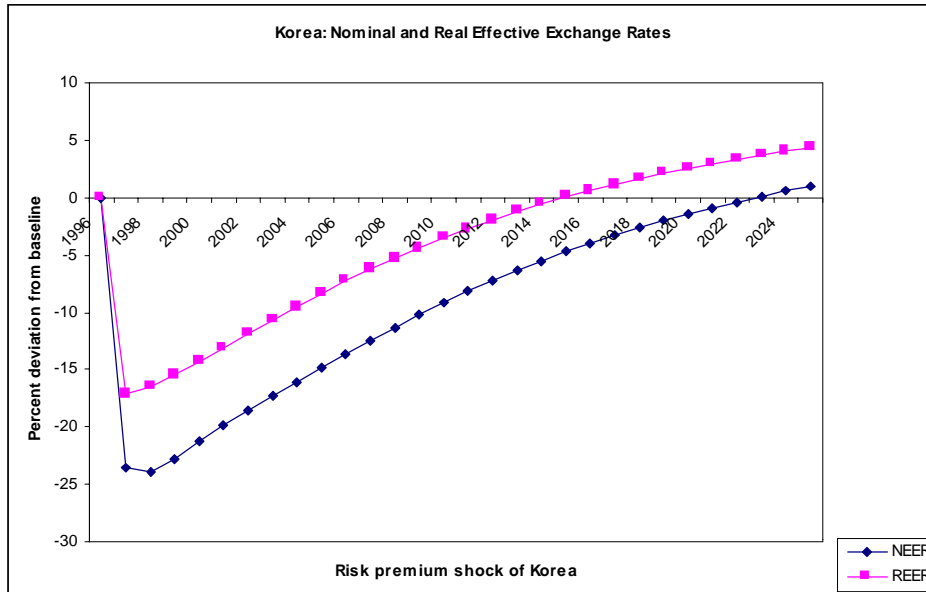
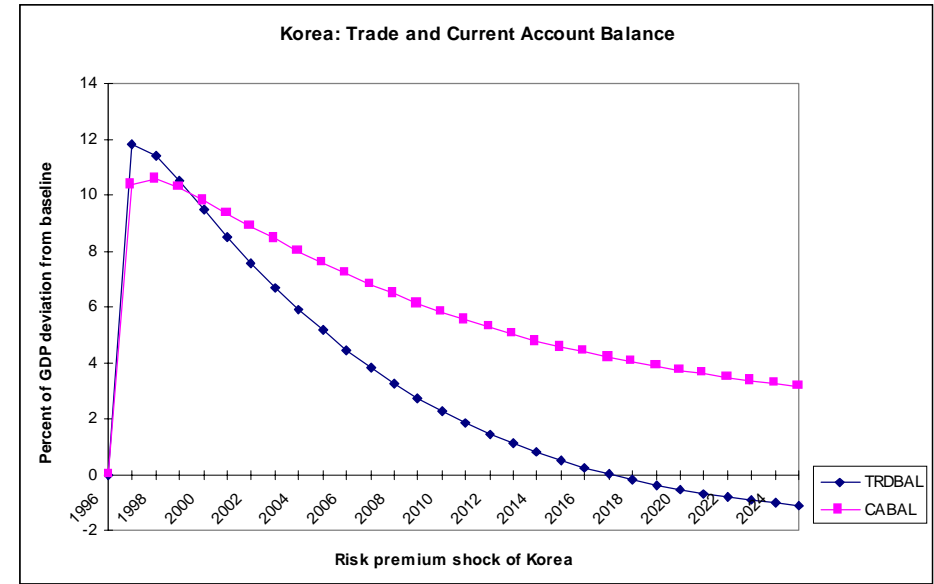
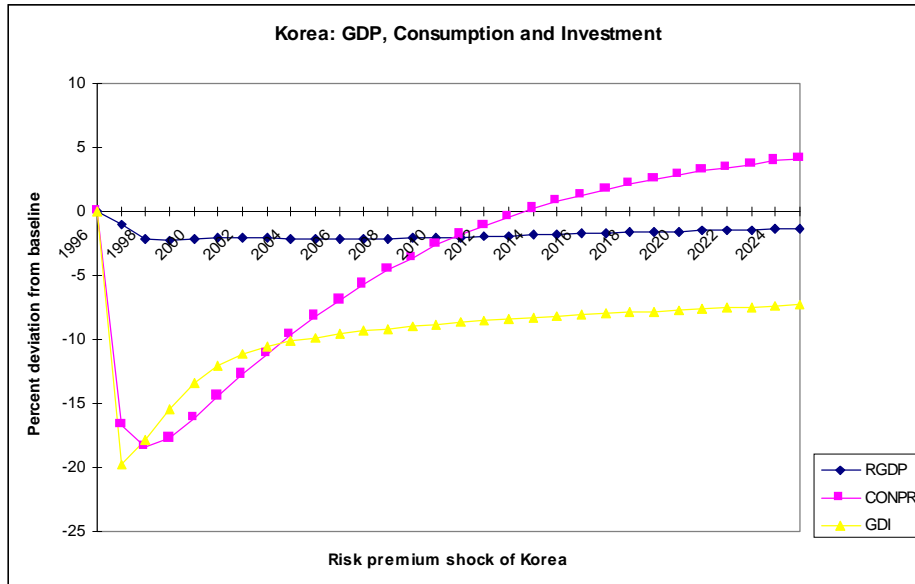
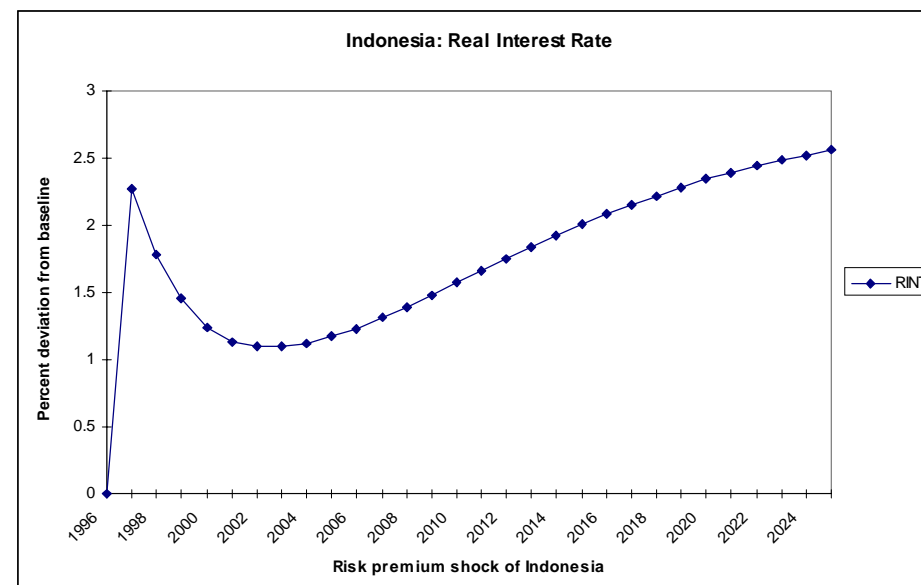
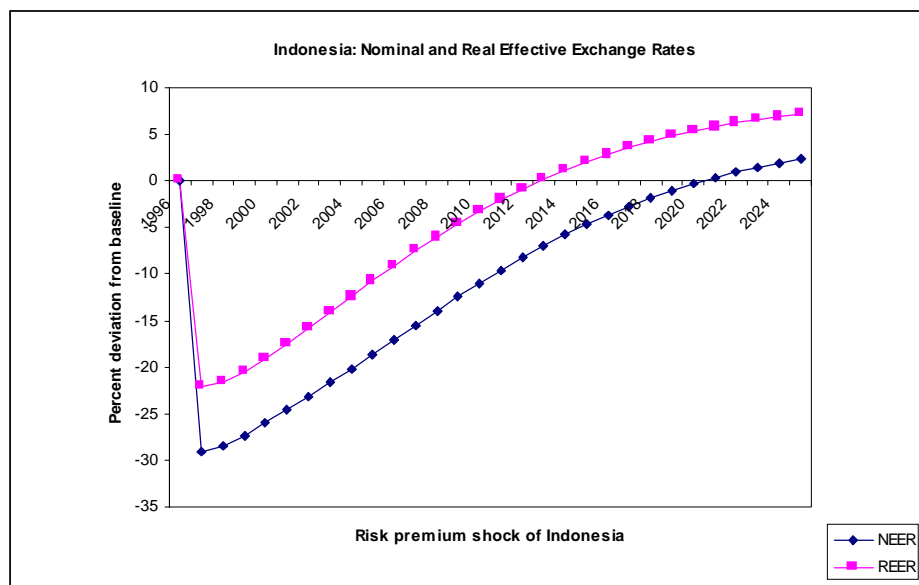
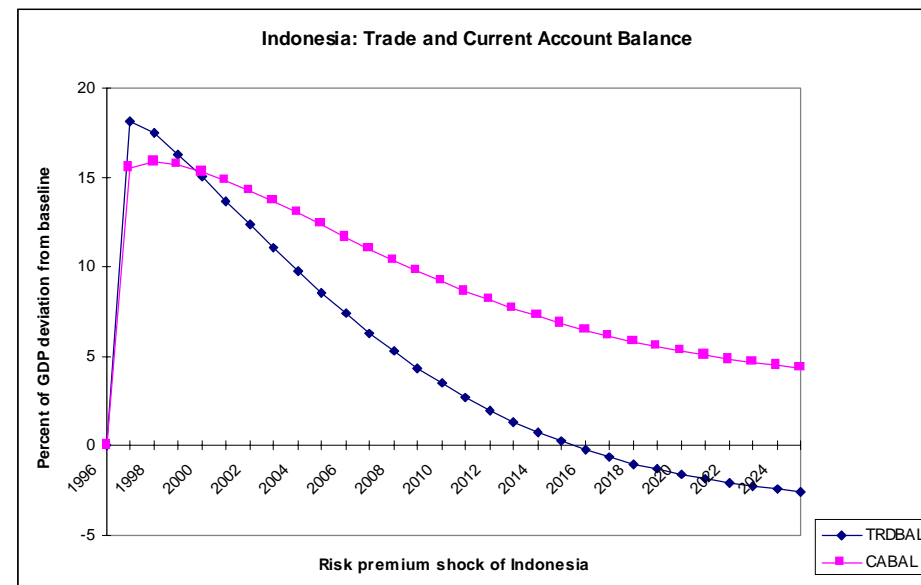
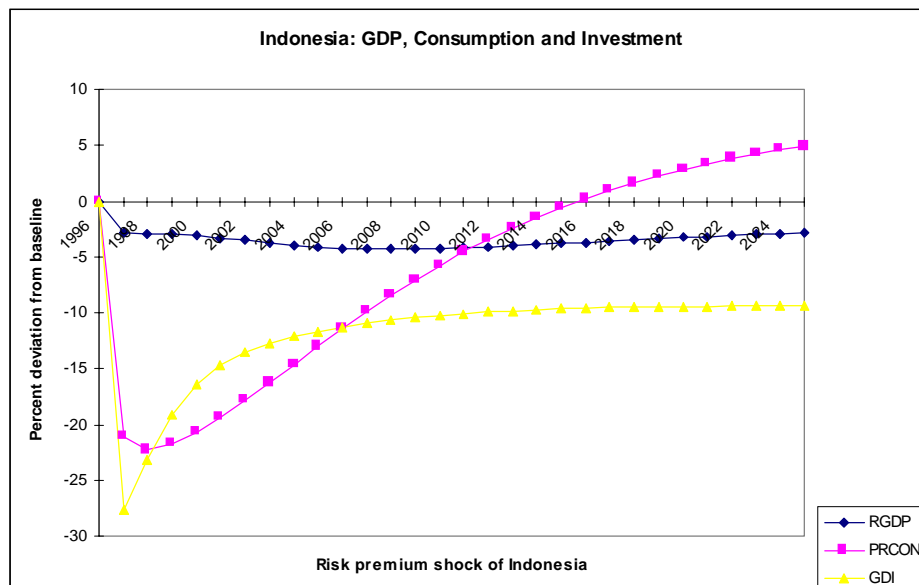


Figure 16: Impacts of the Rise in the Risk Premium on Indonesian Bonds





## Changes in Risk Premia

The size of the risk premium on Thai government bonds has varied considerably during the crisis, rising from around 0.9 percent before the crisis hit, to a peak of around 4.5 percent. Since we are using an annual model, we take an average and impose a shock of 2.5 percent. While the only available data are for bonds of ten years to maturity, it seems likely that bonds of other maturities would also be affected. Thus the shock is represented as a permanent change in expectations about the risk premium. Key results for the risk premium shock in Thailand are presented in Figure 14.

From the Figure, it is clear that many of the impacts are very similar to those for the anticipated decline in productivity considered above. The nominal exchange rate immediately depreciates, in this case by almost 25 percent. Investment falls sharply in response to the increase in the cost of investment. Consumption falls even more sharply because of the decline in wealth associated with the rise in interest rates. Real interest rates rise sharply in the first year-- by over two percent—but the increase then declines to a little over one percent after five years as higher inflation rates reduce the real interest rate. In the long run equilibrium, the real interest rate is 2.5 percent above its baseline level.

The sharp falls in consumption and investment result in a rapid turnaround on the trade and current account balances. The sharp increase in net exports causes a serious short-term deterioration in the terms of trade/real exchange rate measure. The improvement in the trade account is primarily due to reductions in the value of imports, rather than to increases in the value of exports.

The reduction in real GDP resulting from this shock is relatively small both in the short and the long run. This reduction is smaller than in the case of a fall in productivity because the physical productivity of inputs remains the same. While the country becomes less competitive in the market for investment capital, this has a smaller adverse impact on output than is the case for the productivity shock.

The recovery in the trade account is very rapid because of the sharp decline in consumption and investment relative to GDP. This improvement in the trade account

occurs despite the substantial deterioration in the real effective exchange rate/terms of trade index.

Nominal and real interest rates increase sharply in the first year. In subsequent years, however, the nominal interest rate declines as the nominal exchange rate begins to appreciate from its initially very depreciated level. During this adjustment period, real interest rates at first decline, and then rise towards their long run equilibrium as the exchange rate appreciation slows down.

The response of the Korean and Indonesian economies follow the same qualitative pattern as the Thai economy in their response to the risk premium shock. The shock to the Korean economy is specified to be the same size as that for the Thai economy, although data on the size of the risk premium during the crisis were not available.

### **Monetary Policy Responses**

Once a serious crisis emerges, and the exchange rate depreciates, the likely reaction of market participants is to anticipate that the authorities will, at some point, increase the money supply. The initial impact of the exchange rate depreciation associated with both the anticipated decline in productivity, and the heightened risk premium, is to raise prices. If this price shock is not validated by the monetary authorities, then interest rates will rise and output and employment are likely to fall, at least temporarily. If monetary policy is relaxed substantially, as happened in Indonesia, then, under floating rates, a substantial depreciation of the currency would be expected.

Anticipation of a future increase in the money supply will, however, lead to an immediate depreciation of the exchange rate (Wilson 1979). This will, in turn, result in a rise in the price level, and in wage rates. If the monetary policy shock does not, in fact, eventuate, there is a risk of a serious downturn in the economy, as the higher price level reduces the real money supply and drives interest rates up, and increased wages create competitiveness problems.

To analyze the issues involved in this case, we examine the case of an anticipated relaxation of monetary policy in Thailand. While hard evidence is not available, it seems

extremely likely that market participants anticipated that the authorities would respond to the crisis by increasing the money supply. This expectation presumably contributed to the initial depreciation of the Baht. The realization that monetary policy would remain firm may then have contributed to the substantial appreciation from February 1998.

Because of uncertainty about the extent of monetary policy relaxation anticipated by the market, we examine a purely hypothetical 10 percent anticipated increase in the money supply in Thailand. Figure 17(a) deals with the case where a monetary expansion is anticipated in year 3, the second year of the crisis and presents its impact on both the exchange rate and real GDP. Figure 17(b) then deals with the case where, during the first year of the crisis (year 2), a monetary expansion is anticipated, but does not, in fact, occur. This comparison uses the ability of the forward-looking G-Cubed model to deal with anticipated future shocks.

From Figures 17(a) and 17(b), it is clear that the anticipated relaxation of monetary policy causes a depreciation and stimulates output in the first year of the crisis. If the monetary policy relaxation is, in fact, carried out (Figure 17(a)), there is a further depreciation, and a further stimulus to output in the second year of the crisis. This expansion might potentially offset some of the adverse impacts of the original shock. If, despite expectations, the monetary policy expansion is not carried out in the second year of the crisis, then Figure 17(b) points to a decline in output that year that is roughly twice the size of the stimulus arising in the first year. Further, the contractionary effects of the unrealized relaxation of monetary policy persist for a number of years as the exchange rate appreciates and prices are bid down. The cumulative losses from an anticipated but unrealized policy of monetary relaxation substantially outweigh the gains in the first year. Further, they outweigh even the potential gains from an anticipated monetary expansion.

Figure 17(a): Effects of an Anticipated and Realized Money Supply Expansion in Year 3

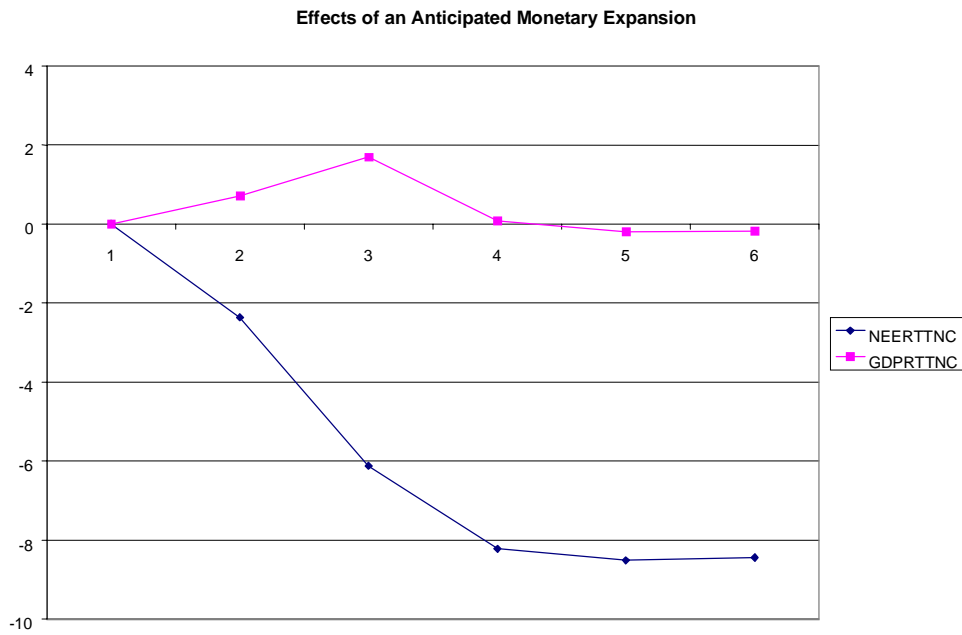
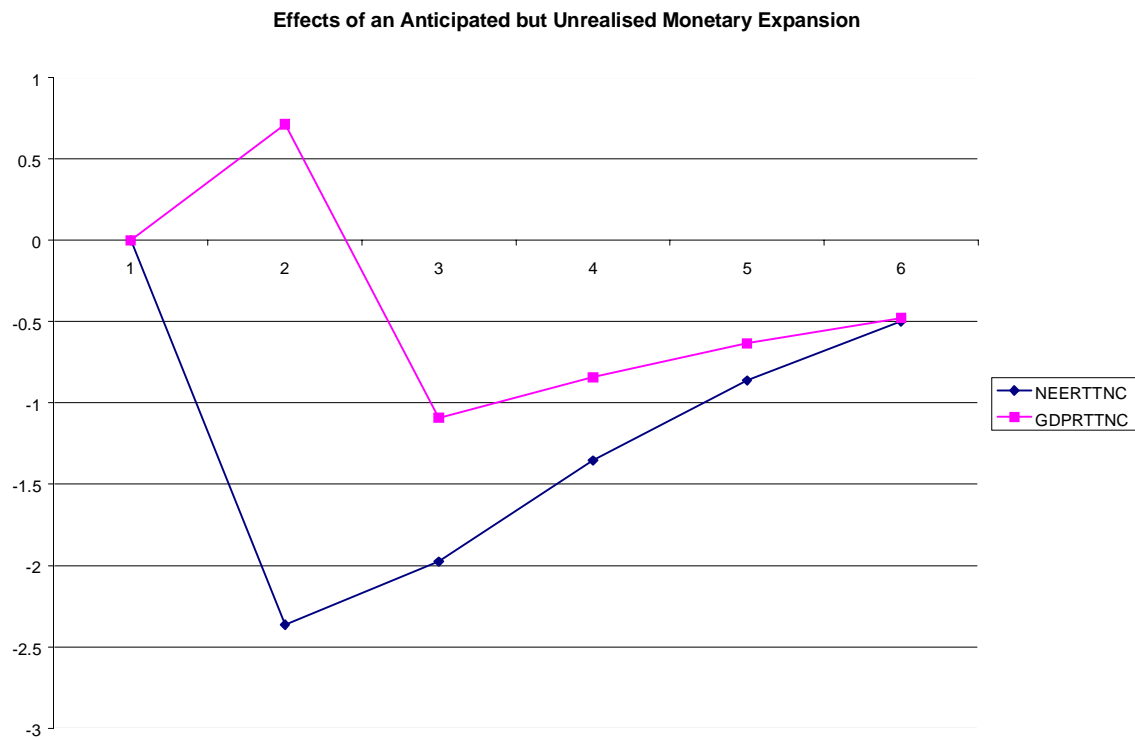


Figure 17(b). Effects of an Anticipated, But Unrealized Monetary Policy Relaxation.

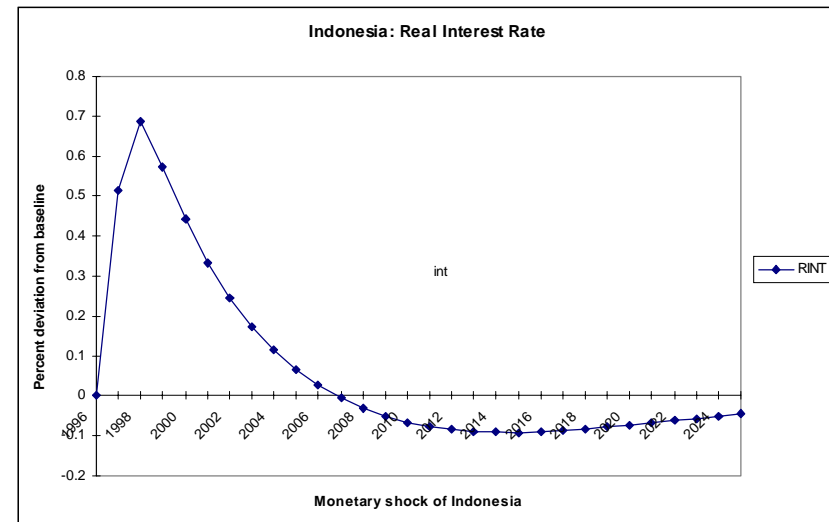
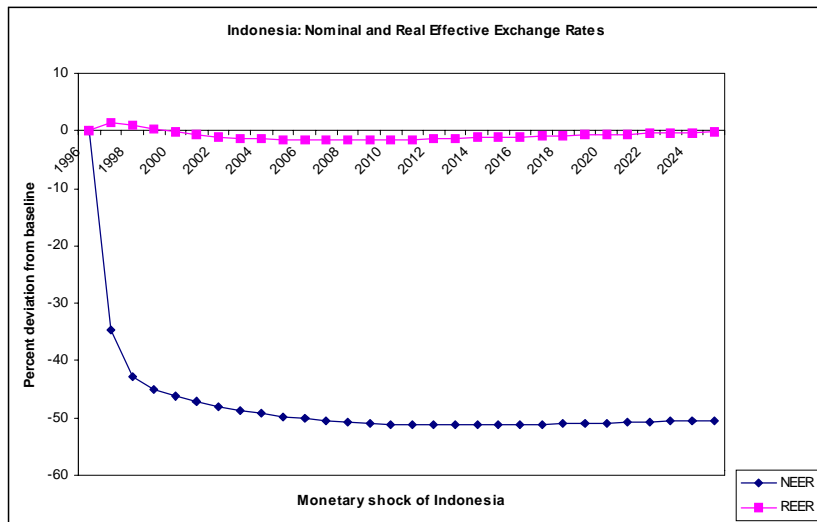
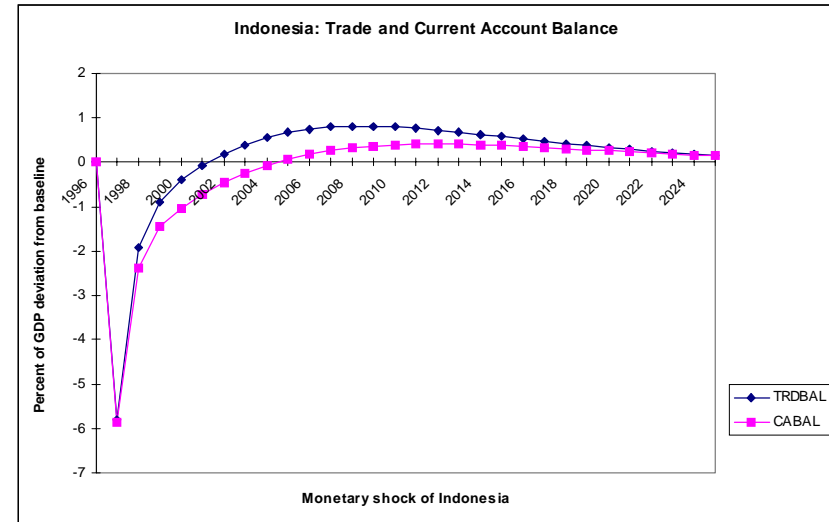
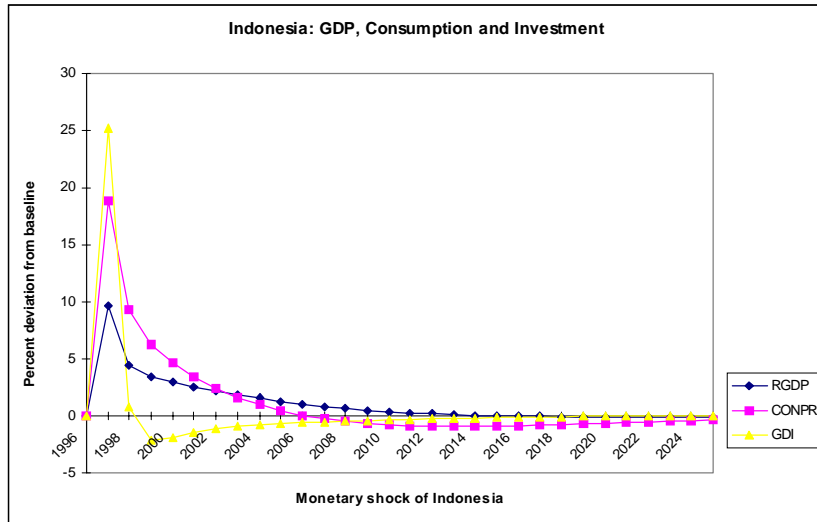


The choice between a monetary policy that validates some of the inflationary impacts arising from devaluation is a difficult one. A policy that accommodates may reduce the costs of foregone output, albeit at the cost of increasing inflation rates that may be difficult to lower subsequently. An unyielding monetary policy stance will, as observed earlier, result in high real interest rates and some loss of output. However, the worst outcome is clearly one where the government's commitment to an unyielding monetary policy stance is not regarded as credible. This experiment clearly highlights the importance of policy credibility.

While monetary policy appears to have been relatively tight in Korea and Thailand, monetary policy in Indonesia was loosened very substantially in late 1997. By January 1998, M2 was 50 percent above its level in June of 1997. Figure 18 assesses the consequences of a one off, unanticipated, increase of this magnitude on key economic variables. The experiment is performed with the model in standard form, without taking into account any impacts of the resulting exchange rate depreciation on the financial performance of firms.

The first panel of Figure 18 shows that an unanticipated expansion of the money supply would be expected to lead to a sharp increase in real consumption and investment demand. The stimulus to investment is particularly large, at 25 percent. Real GDP also increases, by about 10 percent. A consequence of the much greater increase in spending than in income is a deterioration of 6 percent of GDP in the trade and current account balances. Real interest rates rise in the first year by 0.5 percentage points, and by 0.7 percentage points in the second year, despite the increase in liquidity and the decline in nominal interest rates.

**Figure 18: Effects of a 50 Percent Increase in the Money Supply in Indonesia**



The favorable short term impacts depicted in Figure 18 omit some of the important adverse consequences of such an expansionary policy. Where the balance sheets of firms contain substantial amounts of unhedged foreign exchange liabilities, as appears to have been the case in Indonesia<sup>4</sup>, devaluation increases the debt burden of local firms and can cause an effective breakdown of a country's financial markets. Where such a devaluation comes on top of an initial devaluations associated with downward revisions about the profitability of investment, and rising risk premia, even initially strong firms can be driven into insolvency. As Mishkin (1998) points out, such a combination of shocks seems to have been a major source of contraction both in the East Asian crisis and in the Mexican crisis of 1994.

### **Contraction Resulting from the Financial Crisis**

In these experiments, we combine an anticipated long term decline in productivity of the type considered earlier, with an immediate decline in productivity resulting from the financial collapse. The shocks are calibrated to be broadly consistent with the declines in output relative to the model baseline represented by current assessments of the output levels in 1998. Without accounting for these initial declines in output from financial sector distress, we have not been able to replicate the short term output declines relative to the high rates of growth contained in the model baseline, and in pre-crisis projections.

For Thailand, a decline in total factor productivity of 6.5 percent results in a decline in real GDP of roughly 10 percent relative to the model's baseline growth rate. This decline increases, relative to the model's baseline, to over 15 percent in the second year, a decline that would translate into close to zero overall growth in the second post-crisis year.

This immediate nature of the decline in productivity, together with the larger value of the long-run negative productivity shock (-6.5 percent rather than -5 percent) results in

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<sup>4</sup> Chang and Velasco (1998, Table 16) estimate that only 2.15 percent of Indonesian debt to BIS banks was denominated in local currency.

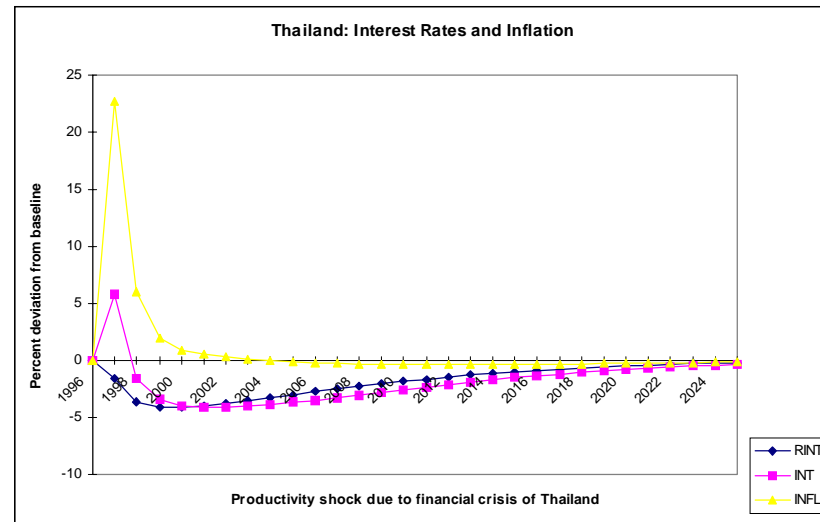
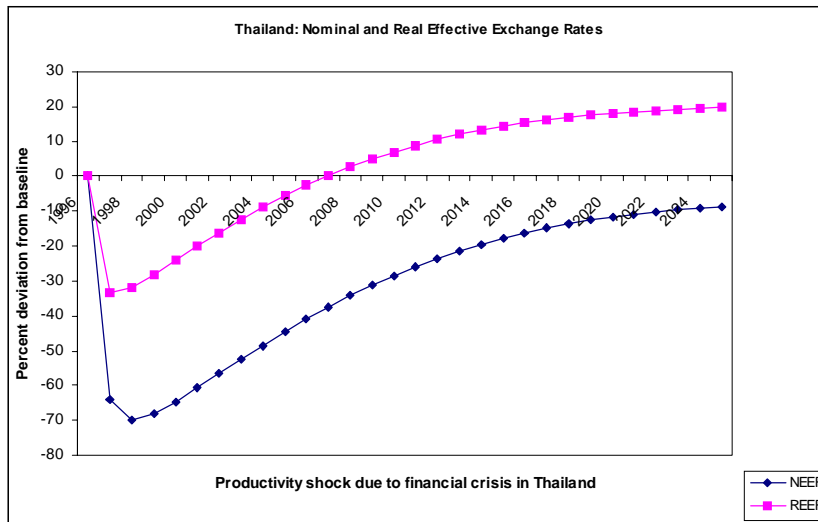
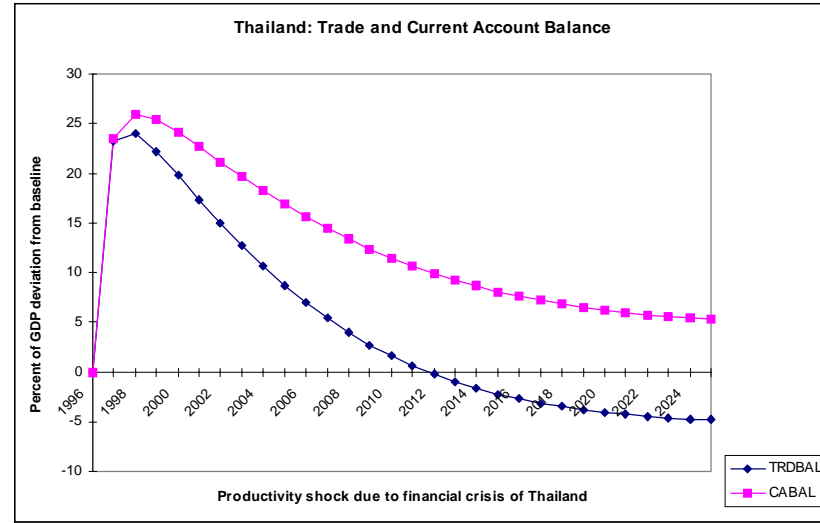
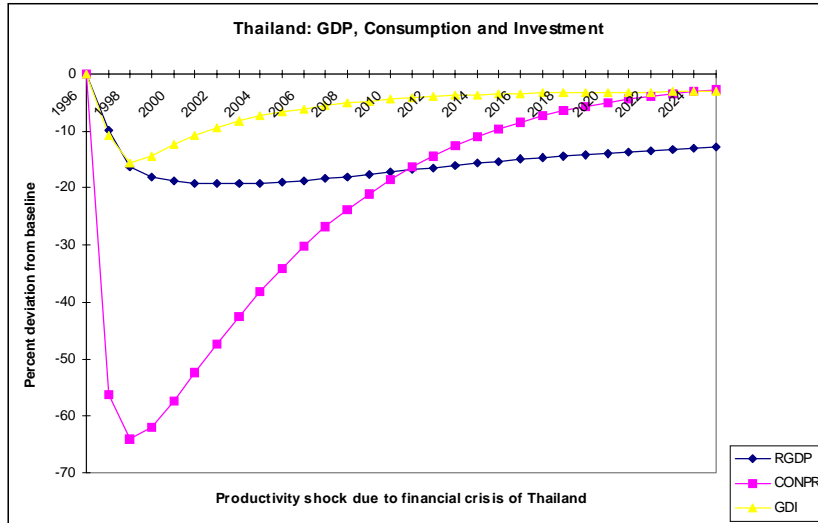
larger short term declines in consumption, investment and output than in the anticipated productivity shock considered earlier. In the long run, GDP again declines by substantially more than the productivity shock as Thailand becomes less competitive in international markets for investment goods. The decline in GDP is substantially larger than the decline in GNP, consumption and investment. The depreciation of the nominal effective exchange rate, at over 50 percent, goes a long way towards explaining the observed decline in the value of the Baht which peaked at over 50 percent during the course of the crisis. Inflation jumps by 20 percentage points, and interest rates rise by only a little over five percent. The long term real interest rate actually falls slightly in the first year, in contrast with the spike in real interest rates observed in the anticipated productivity and risk premium experiments.

The adverse shock to the Korean economy required to match projections of the output decline is substantially smaller (3 percent) than that required for Thailand (6.5 percent). This results in generally smaller impacts, although the pattern of all of the effects is generally the same as in the case of Thailand.

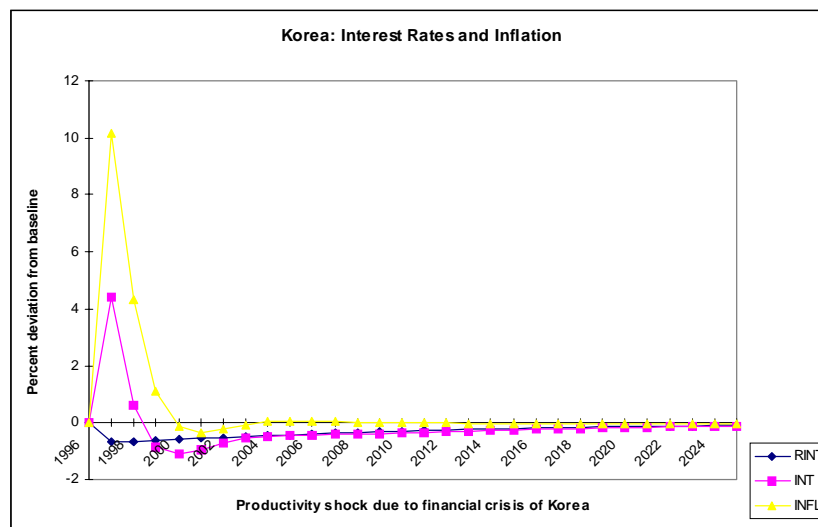
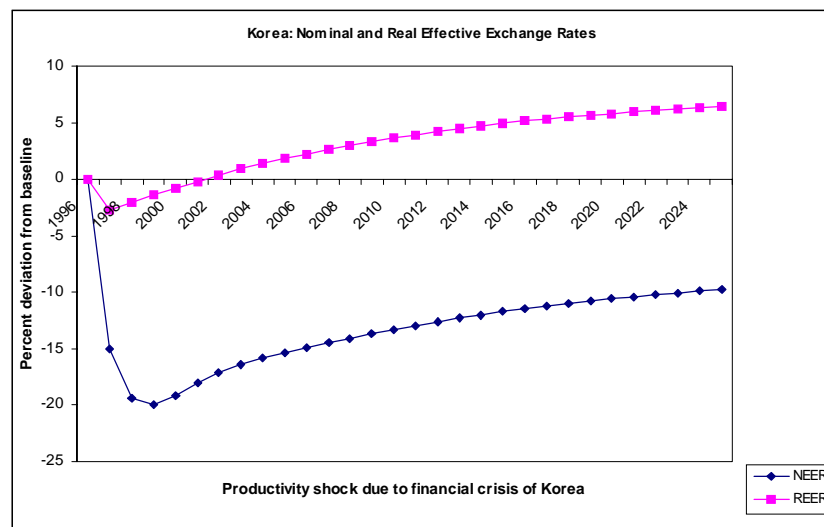
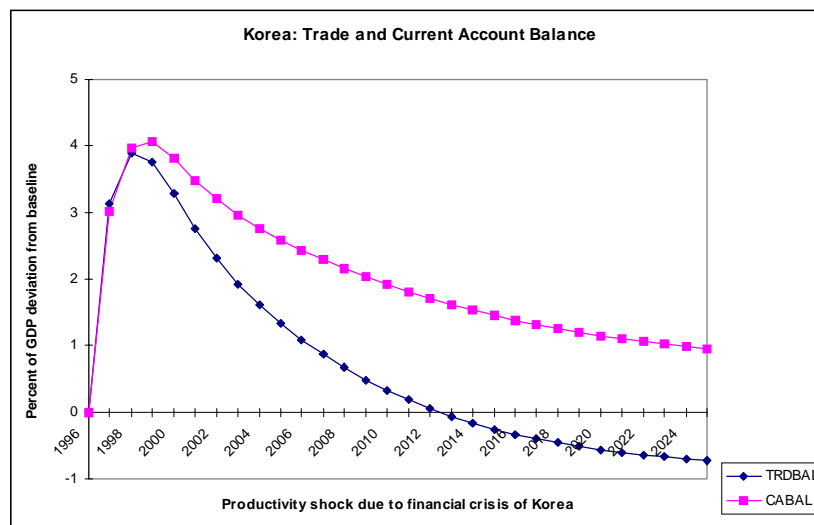
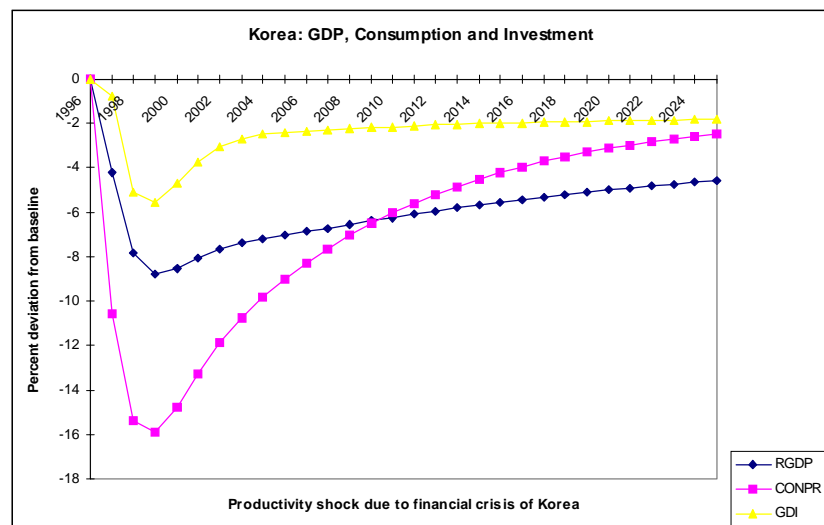
The adverse shock to the Indonesian economy required to match likely projections of the output impacts of the crisis is larger, at -8.0 percent, than that required in Thailand or Korea. This contributes importantly to the larger fall in consumption, investment and output in the Indonesian economy. The long run fall in output is very substantial, at around 20 percent, relative to baseline. The trade and current account balances improve--initially by close to 20 percent of GDP. The trade balance change remains positive for almost 15 years, and the current account change remains positive throughout the projection horizon, reflecting the reduced need to service foreign debts. The nominal real depreciation is over 30 percent with a decline in the terms of trade/real exchange rate measure of almost 15 percent.



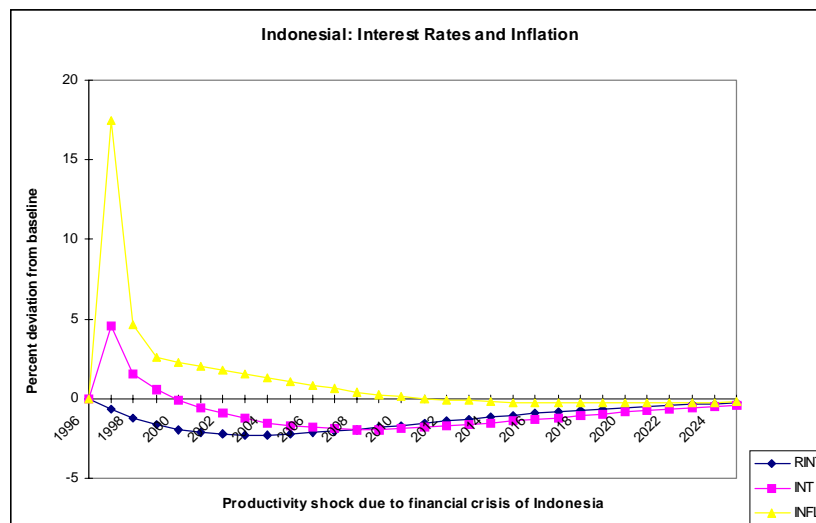
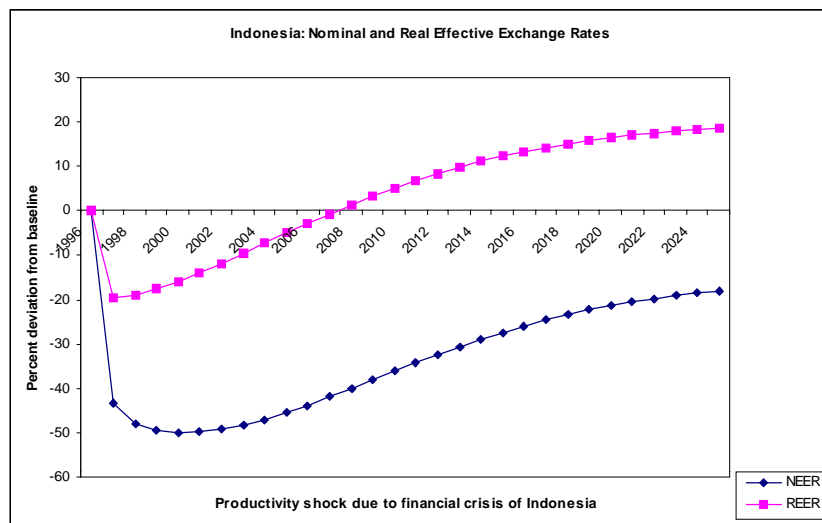
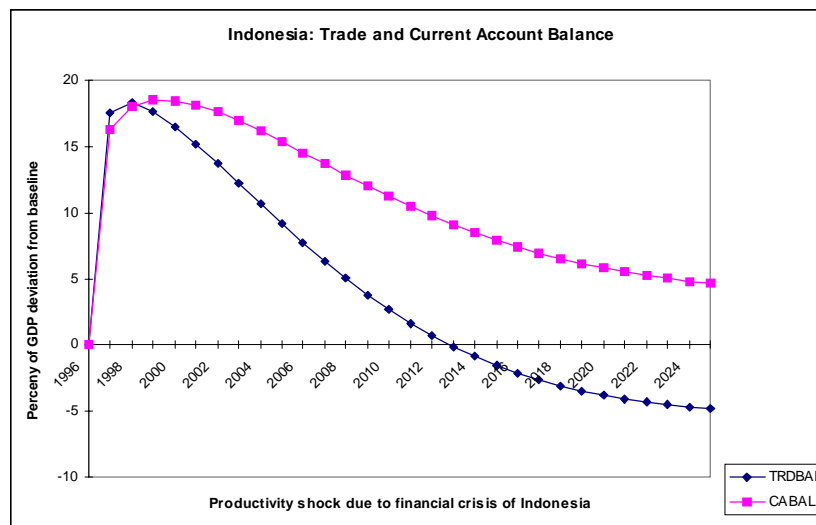
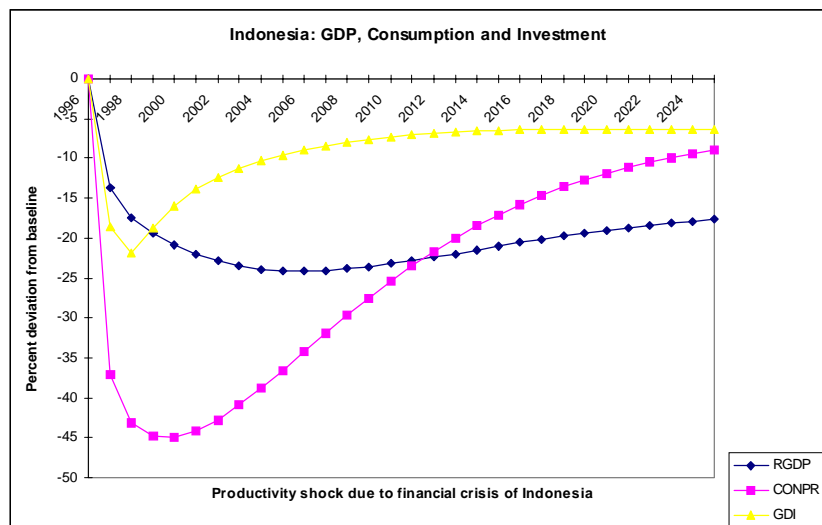
**Figure 19: Impacts of Output Declines Resulting Form Financial Crisis: Thailand**



**Figure 20: Impacts of Output Declines Resulting From Financial Crisis: Korea**



**Figure 21: Impacts of Output Declines Resulting From Financial Crisis: Indonesia**



### ***The Yen-Dollar Exchange Rate and Japanese Fiscal Expansion***

A great deal of attention has been focussed on the economic travails of Japan, and appropriate policy responses to these problems. A particular focus of concern has been the yen-dollar exchange rate. The sharp depreciation of the yen since 1995 is seen as having created competitiveness problems for Korea, which competes with Japan in products such as automobiles and computers. While the other crisis countries compete less directly with Japan, the yen exchange rate is also important because it influences the cost of their exports to end users in Japan. In the light of the collapse of the yen, and the recession in the Japanese economy, a key question revolves around the appropriate policy response. Fiscal stimulus is widely seen as necessary, and the Government of Japan unveiled a fiscal stimulus package of just over 3 percent of GDP in April.

In this section, we examine three experiments. The first is a pair of asset market shocks that are sufficient to cause the observed outcomes of a sharp decline in the yen and the Japanese stock market, and the buoyancy observed in the US stock market and exchange rate. This experiment is implemented by incorporating a five percent fall in expectations of productivity growth in Japan over five years. In the US, a mirror-image increase in the productivity growth rate is added.

The second and third experiments involve fiscal policy responses. The second is a temporary fiscal stimulus scaled to be consistent with the announced fiscal stimulus package. Specifically, this package considered involves 1 percent of GDP spending on durable manufactures, 1 percent of GDP spending on Non-Durable manufactures, 0.5 percent of GDP spending directly on employment, and a 2 percent tax cut. The temporary stimulus is scheduled to last for two years and then to stop. The third experiment involves the same stimulus but, in this case, specified to continue indefinitely.

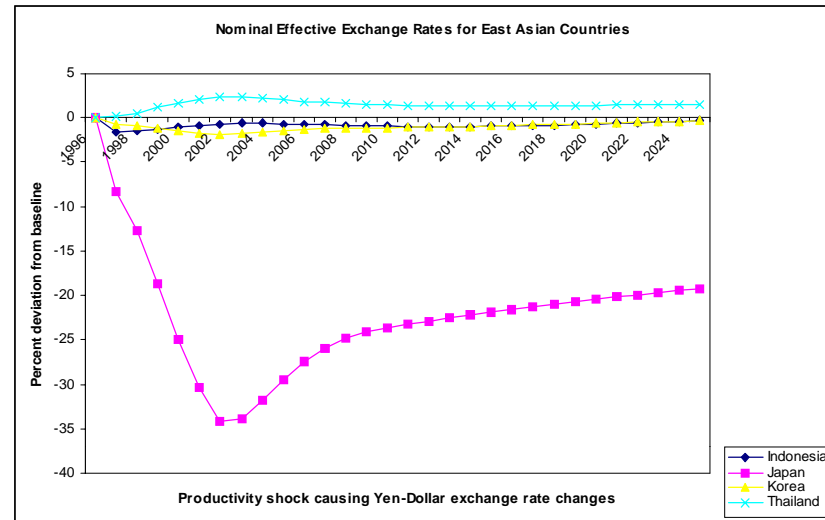
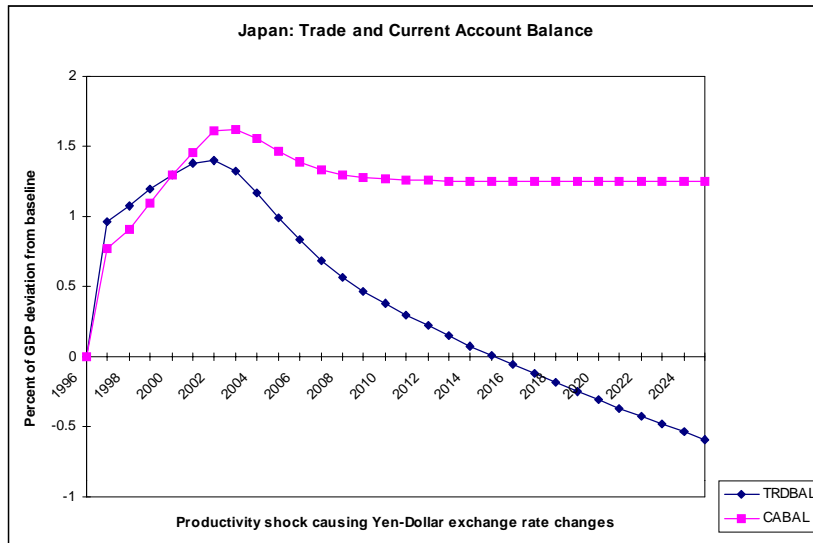
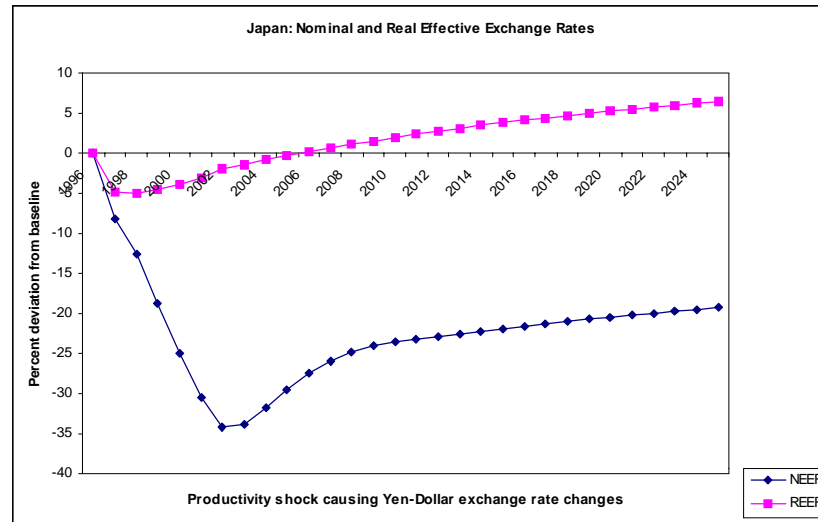
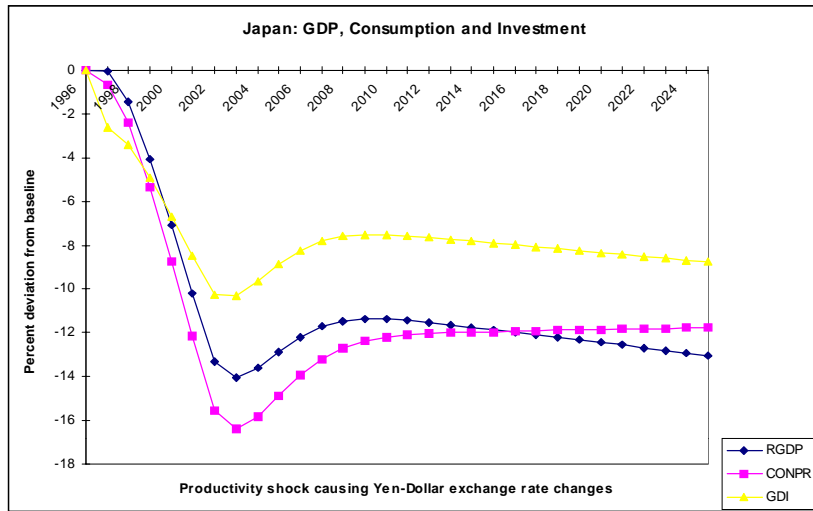
## **The Yen-Dollar Exchange Rate**

Changes in the yen-dollar exchange rate have frequently been viewed as having significant impacts on trade and exchange rate outcomes for other East Asian countries (Hoekman and Martin 1998). A major difficulty involved in testing this hypothesis is the obvious endogeneity of the exchange rates. Clearly, the relationship between these two rates and any outcome will depend upon the source of the shocks.

It seems highly plausible that the sharp appreciation of the US dollar relative to the yen since 1995 is due to changes in expected returns to capital in these countries. Assuming this to be the case, the consequences of an upward revision in expectations about returns to capital in the United States, and a corresponding downward revision in Japan were investigated. In Japan, the shock was a five percent decline in expected productivity. In the USA, the shock was a five percent increase.

Key results from this experiment are presented in Figure 22. A key feature is sharp falls in real GDP, and consumption and investment spending in Japan, together with a substantial increase in the trade and current account balances. The yen depreciates sharply relative to the trade-weighted currencies of its trading partners, while the currencies of the East Asian crisis countries depreciate relative to most currencies other than the yen, but appreciate relative to the weighted average of their trading partners because of the importance of the yen.

**Figure 22: Productivity Shocks Causing Yen Dollar Exchange Rate Changes**



## **Temporary fiscal expansion**

Some key results for the temporary fiscal expansion experiment are presented in Figure 23. From the first panel, it is clear that the expansion causes a significant increase in total consumption demand—about 2.9 percent of GDP in the first year, declining to 1.6 percent in the second year. The stimulus to output is not free, the government spending must ultimately be paid for and in the model solution, this is done by allowing the government to build up debt during the period of stimulus. This additional debt is maintained over the medium term, with taxes raised gradually to cover the additional interest servicing costs of this permanently higher stock of debt.

The initial stimulus to GDP of 1.2 percent of GDP, is smaller than the change in the fiscal deficit, but still significant. The size of this stimulus depends heavily upon the specification of the labor market as well as the impact on interest rates and real exchange rates. In the past, the Japanese labor market has been viewed as being very flexible, leaving little ability for fiscal policy to greatly affect output. The result presented here are based on a less sanguine view of the Japanese labor market, in which nominal wages respond to changes in expected inflation, past inflation and the gap between actual employment and full employment (along the lines of an overlapping contracts model of wage determination). The plot of GDI highlights one of the constraints on the effectiveness of fiscal policy. The fiscal expansion causes a 5.2 percent reduction in gross domestic investment, crowding out a significant part of the direct stimulus provided by the fiscal expansion. In addition, the fiscal stimulus appreciates the real exchange rate, which crowds out net exports (discussed below). In the year after the fiscal stimulus package ends, output actually falls, with the need for the government to service the debt acquired during the fiscal stimulus package acting as a brake on the economy's growth prospects.

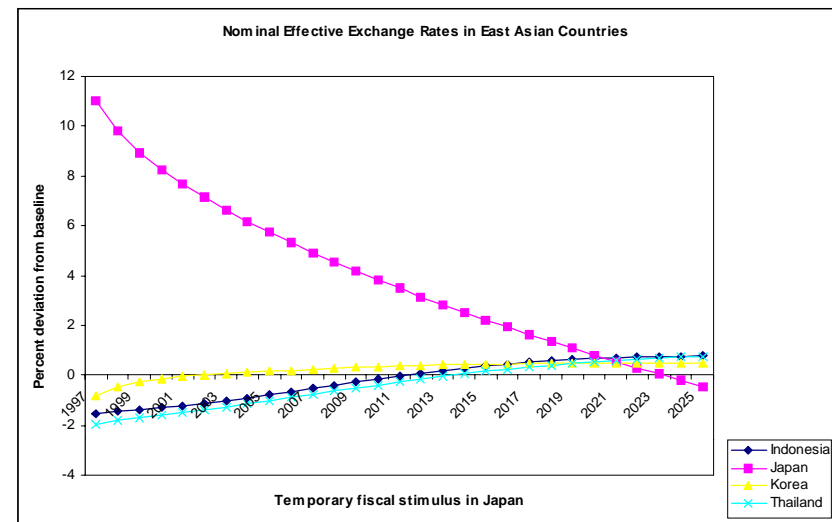
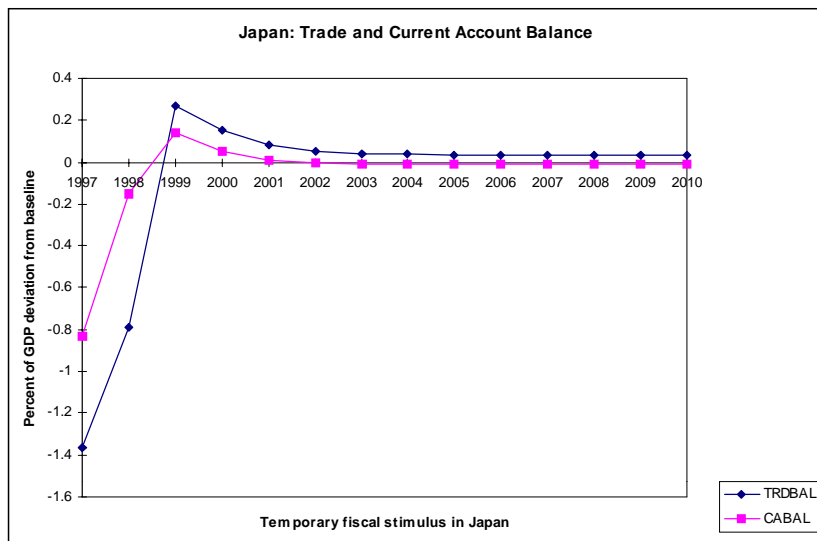
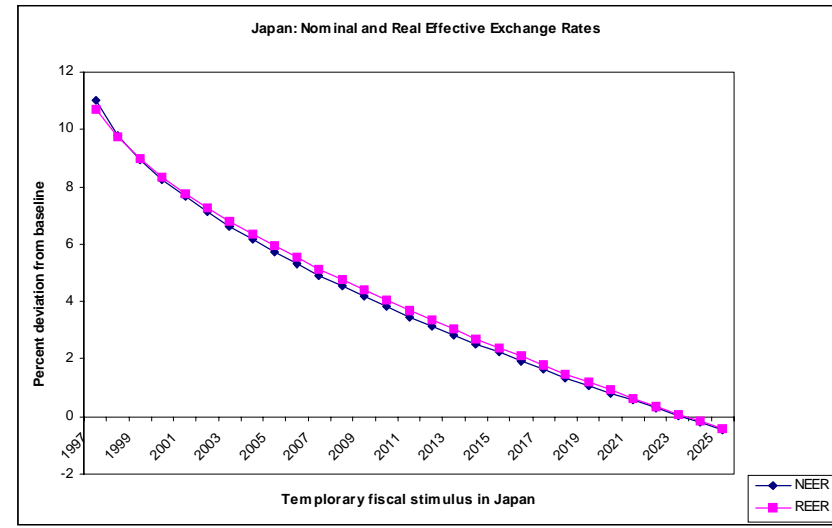
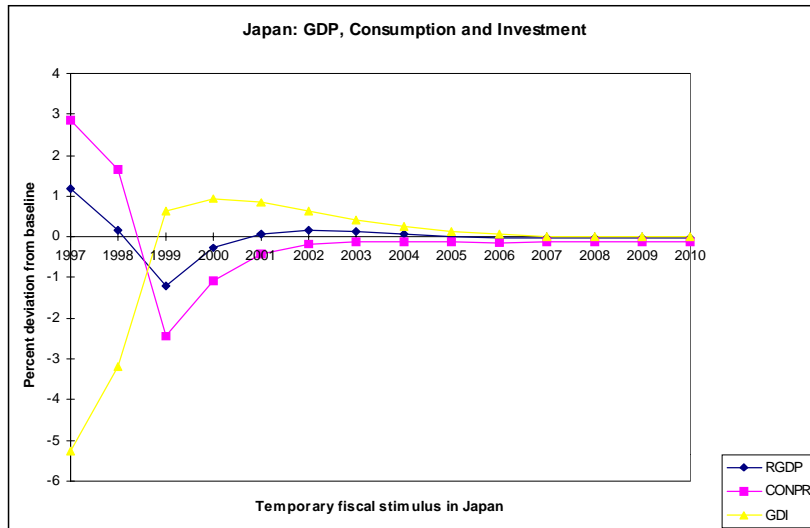
The fiscal expansion causes a sharp, if short lived, appreciation of the yen as shown in the figure. Both the nominal and the real exchange rate appreciate by roughly five percent in the first year. These appreciations are short-lived, with around half wearing off by the second year. In the third year, the exchange rate actually depreciates relative to the baseline. The fall in output in the third year of the experiment causes short term interest rates to fall. During this period of low interest rates, the exchange rate must be expected to appreciate if asset holders are to retain their dollar assets. The overshooting depreciation is the mechanism that allows this arbitrage condition to be satisfied.

The trade balance deteriorates by almost 1.5 percent of GDP in the first year reflecting both a rise in demand for imports through stronger domestic demand but also due to the temporary appreciation of the Yen. The deterioration in the trade balance provides a small stimulus to Japan's trading partners. The current account deteriorates by substantially less, because the fall in investment largely matches the decline in government saving.

During the two years of the stimulus package, both the interest rate and the inflation rate rise in Japan. Short-term real interest rates rise because the government needs to issue debt to finance the temporary fiscal stimulus. Long term interest rates change slightly because of the temporary nature of the financing requirements. The rise in domestic demand also puts upward pressure on domestic inflation and therefore nominal interest rates initially rise by more than real interest rates. The change in consumer prices is larger than the rise in producer prices because of the appreciation of the Yen.



**Figure 23: Temporary Fiscal Stimulus in Japan**



A key question is the impact of this stimulus package on exchange rates and trade and current account balances in the crisis countries. The stimulus package can be expected to have two impacts on exchange rates in the crisis countries. Its impact through the trade account would be expected to be positive, stimulating the demand for the exports of its trading partners and tending to appreciate the real exchange rate. The asset market effect works in exactly the opposite direction. A rise in Japanese real interest rates can be expected to put downward pressure on exchange rates in other countries. Since the impact of Japan's expansion on world interest rates is quite significant, the asset market effect outweighs the trade account impact. The exchange rates of all of the East Asian crisis countries actually depreciate as capital flows into Japan to finance the additional fiscal measures.

### **Permanent Fiscal Expansion**

It might seem logical to think that a permanent fiscal expansion would have a more powerful stimulatory effect than a temporary expansion. However, this need not be the case once allowance is made for the need to fund the increase in government expenditure and the consequences of this for asset markets.

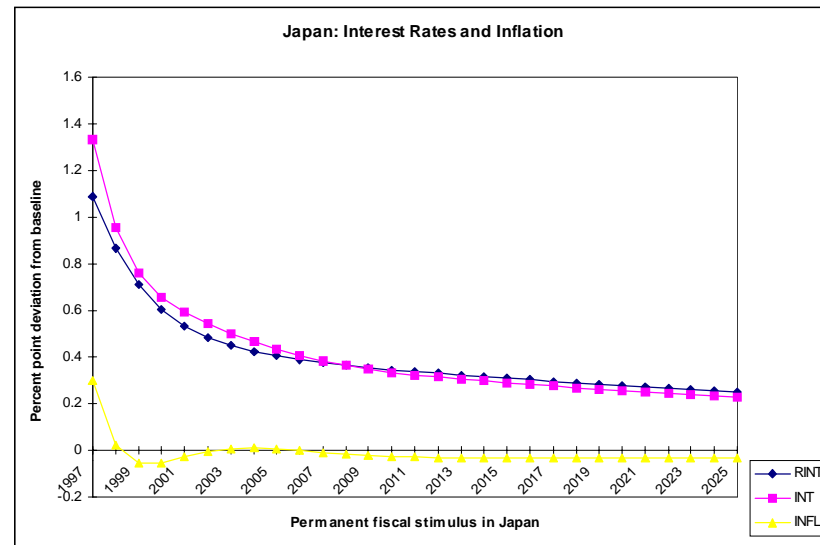
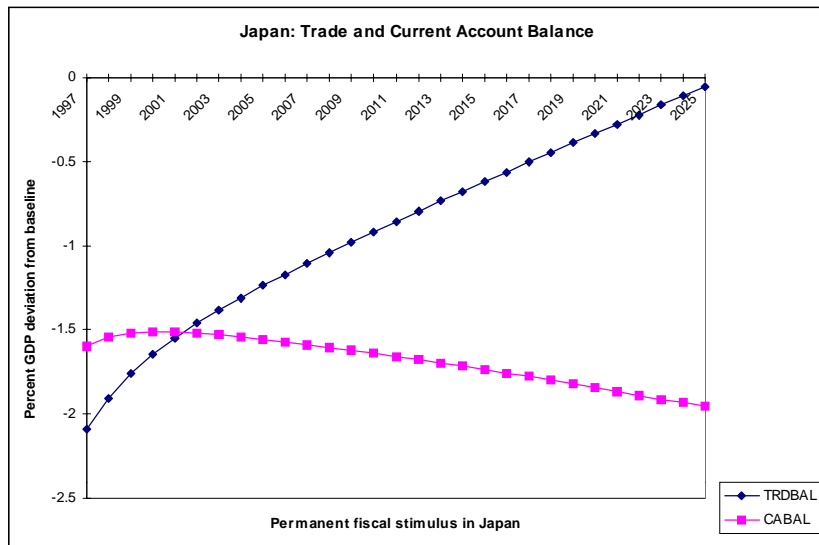
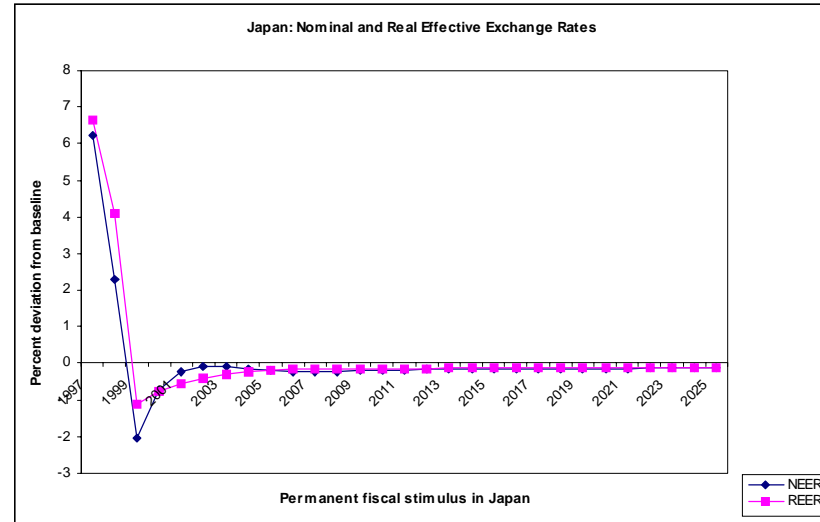
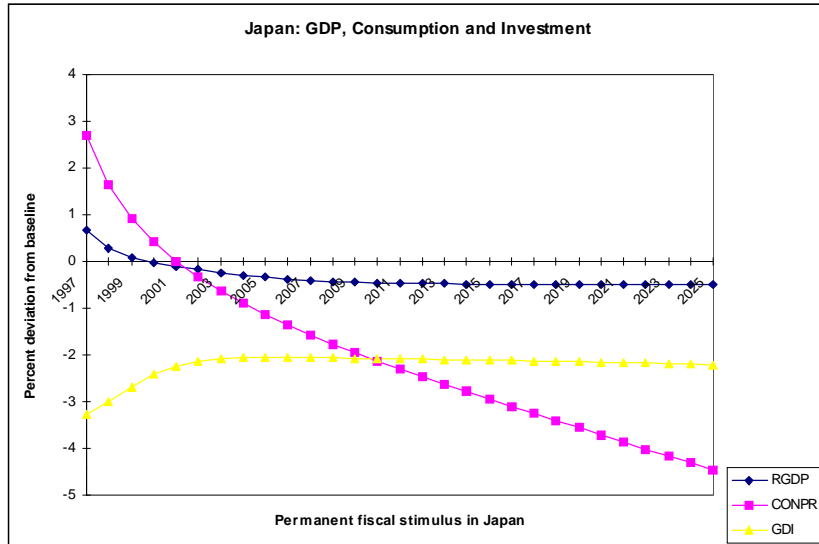
In the Asia-Pacific G-Cubed model simulation, it turns out that the adverse asset market impacts of sustained fiscal expansion outweigh its stimulatory impact right from the beginning. In Figure 24, it is clear that the stimulus to consumption demand is very small even in year one. This is because forward looking consumers recognize the future financing cost to them of the increase in government spending. In particular this simulation assumes that the permanent expansion of spending and cut in taxes leads to a permanently larger stock of government debt. This large stock of debt is serviced by gradually rising taxes but the stock of debt is not returned to the initial level of debt at any time in the simulation horizon.

The impact of the permanent fiscal expansion on asset markets is much larger than for the temporary fiscal expansion. The stock of government debt is expected to rise much more in the future and real interest rates are expected to rise in anticipation of increased government borrowing. The future tax liabilities are much larger for the permanent fiscal stimulus than for a temporary fiscal stimulus and therefore real interest rates rise by more for the permanent fiscal expansion (of course in a purely Ricardian world this effect would not occur because all the tax liabilities would be internalized without a need for interest rate changes). Higher real interest rates in Japan imply a stronger appreciation of the Yen . The rise in real interest rates dampens private investment expenditure in the short run and also dampens consumption expenditure through liquidity constraints. In addition, the stronger exchange rate leads to a larger crowding out of net exports as well in the case of the permanent versus temporary fiscal expansion.

In the Asia Pacific G-Cubed model, a permanent fiscal stimulus is less expansionary in the short run and more contractionary in the medium run because the asset markets effect in the short run are much larger than the direct demand stimulus from higher government spending or tax cuts. The overall stimulus to Japanese GDP is also considerably smaller than was the case in the temporary expansion.

The deterioration of Japan's trade balance-- the direct stimulus to the trade accounts of the East Asian crisis countries-- is around 2 percent of GDP which is substantially more than in the case of the temporary shock. This reflects the fact that the real exchange rate change is larger and more permanent in the case of the permanent fiscal expansion. Despite this apparently more positive stimulus to the rest of Asia, there is also a larger rise in global real interest rates through a permanent fall in Japanese saving which impacts negatively on net debtor economies in the region.

**Figure 24: Permanent Fiscal Stimulus in Japan**



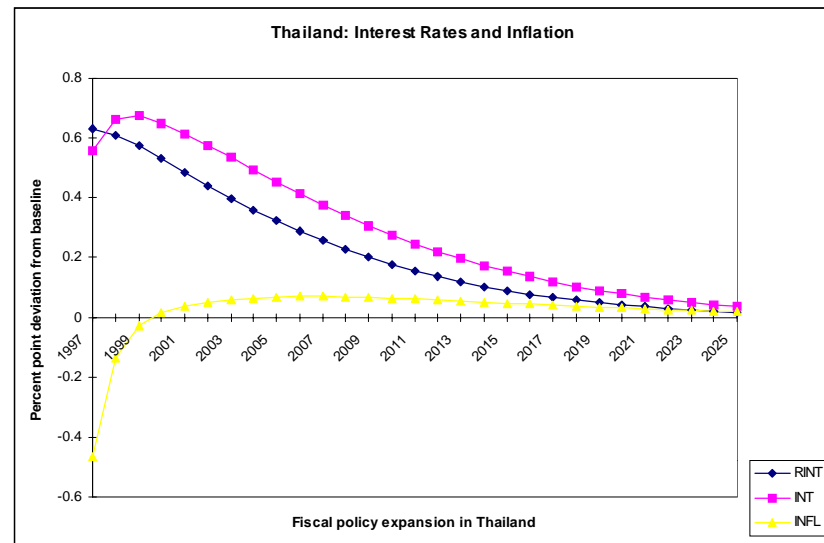
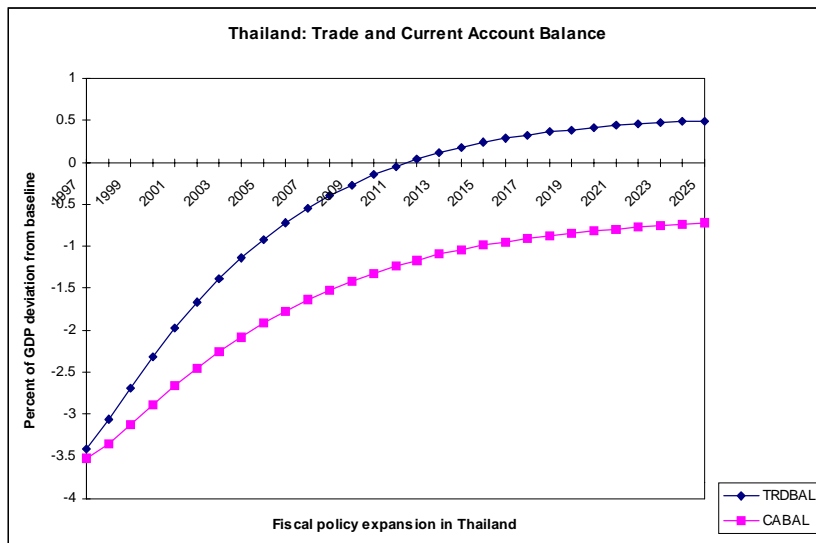
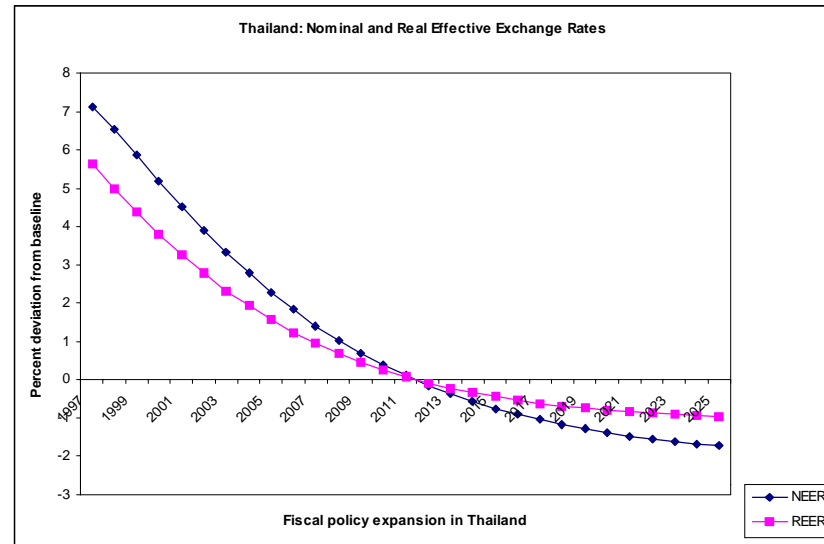
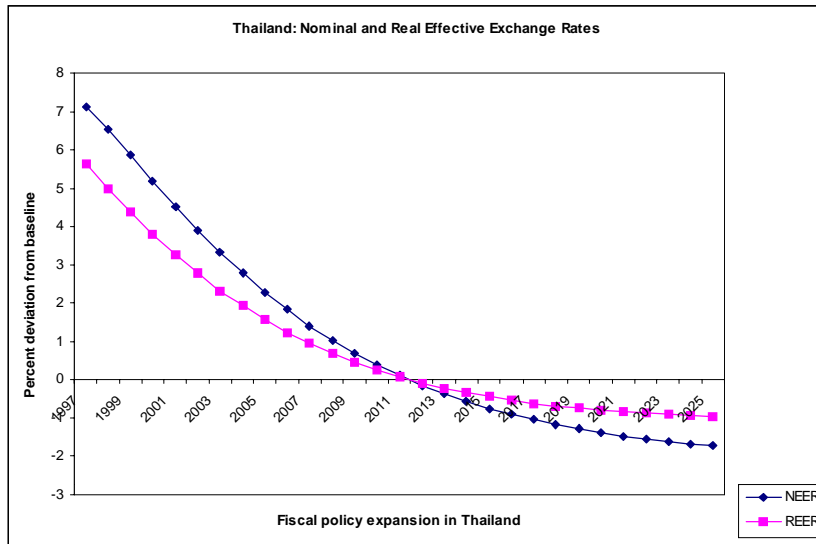
Overall these results demonstrate that a permanent fiscal expansion is actually less expansionary for Japan than a temporary fiscal expansion because of the impact on asset markets both within Japan and outside Japan. The important distinction between permanent and temporary fiscal changes and anticipated and unanticipated fiscal policy changes in Japan is dealt with in McKibbin (1997). The impact of the fiscal policy shift on countries outside Japan depends crucially on the extent of trade with Japan as well as the net foreign asset position of each economy. In each case, a temporary fiscal stimulus in Japan has a more positive effect on the GDP of economies within Asia than a permanent fiscal stimulus in Japan.

### ***Fiscal Policy Responses in the Crisis Countries***

An important issue in the policy debate about responses to the East Asian crisis is the choice of fiscal policy settings. The initial fiscal policy settings in the crisis countries were tight, providing much more flexibility than in countries where crises have been precipitated by excessive fiscal and monetary policy expansion. The initial policy responses involved further tightening, while subsequent adjustments have involved relaxation of these constraints. The analysis presented here assumes that fiscal policy changes can be made while holding other policy parameters, and particularly the money supply, constant. If changes in the fiscal policy stance are interpreted as signalling changes in other policy settings, then their impacts would be different, and would require an analysis involving anticipated changes in the other policy instruments.

To investigate the effects of more relaxed fiscal policy settings, we consider a relaxation of fiscal policy in Thailand through the implementation of a permanent tax cut equal to two percent of GDP. The immediate impact of this policy change is, as shown in Figure 25, a sharp increase in consumption demand. This increase in demand is almost 8 percent in the first year, and then declines gradually as the increase in taxes required to fund the tax cut rises in line with the government's debt burden. Investment demand rises very slightly, as does real GDP.

**Figure 25: Permanent Fiscal Stimulus in Thailand**



The small increase in real GDP resulting from the fiscal stimulus is a concern given the sharp declines in output that have occurred in the crisis countries. As was noted above, standard macro models do not appear to account for anything like the decline in output that resulted from the crisis unless an additional shock to the financial system is incorporated. There is thus a possibility that the small increase in output resulting from the fiscal policy expansion understates the favorable impact of the fiscal policy stimulus. Whether this is so depends upon how the fiscal policy expansion interacts with the financial crisis and this, in turn, depends upon the impact of fiscal policy on the trade balance, on domestic interest and exchange rates.

As is evident from the figures, the fiscal policy stimulus causes the trade and current account balances to deteriorate sharply, offsetting to a minor extent the marked improvements associated with the original financial shocks that set off the crisis. From Figure 19, the initial improvement in the balance of trade resulting from the declines in output was in the order of 25 percent of GDP, as against a deterioration of 3.5 percent resulting from the fiscal expansion. This deterioration in the trade balance should not, of itself, be a serious problem for adjustment unless market participants treat the outcome on the trade balance as a signal of the extent of adjustment.

The fiscal stimulus also causes interest rates to increase by roughly 0.6 percentage points. This increase will clearly worsen the pressure on heavily indebted firms, and could worsen the pressures on the corporate and financial sectors.

The stimulus package, in the context of fixed money supply, causes an appreciation of almost six percent in the nominal effective exchange rate. This strengthening would be beneficial to companies with debts denominated in foreign currencies. Given the long delays frequently involved in corporate restructuring, and the output problems resulting from the apparent lack of liquidity in Thailand (Dollar and Hallward-Driemeier 1998), this appreciation might provide a stimulus to output that is additional to that captured in the macroeconomic framework used in the model. Certainly, over the range in which it can be used, fiscal stimulus seems preferable to monetary contraction as a means of strengthening the exchange rate.

## **Conclusions**

There remains considerable uncertainty about the causes of the shocks that have recently hit some of the most dynamic of the East Asian economies. In this paper, we have examined a number of the shocks that have been identified as possible causes of the crisis. The shocks examined included some of the “usual suspects” involved in earlier adjustment crises, such as terms of trade deteriorations and unsustainable currency pegs.

Of the three most hard-hit countries, only Korea appeared to have suffered a sizable terms of trade deterioration in a reasonably short period, and this was probably at least partly compensated for by technical change in the production of products such as semiconductors.

The much-criticized policy of pegging nominal exchange rates to the dollar also seems unlikely to have created the level of pressures needed to bring on a full-fledged adjustment crisis of the type observed. We decomposed changes in the effective exchange rates of each country into a component due to changes in the country’s rate against the dollar and a component due to changes in the US dollar’s value against the country’s trading partners. Only in Thailand did the US dollar appear to have appreciated significantly against trading partner currencies and, even there, the appreciation was relatively modest.

It seems unlikely that changes of the magnitude observed in exchange rates or the terms of trade could, alone, have caused an adjustment crisis of this magnitude. It remains possible, however, that they acted as triggers for a crisis by, for example, triggering changes in expectations about outcomes in financial markets<sup>5</sup>. Similarly, the exchange rate mechanism could have been insufficiently flexible to allow the sort of adjustment needed in response to a crisis emanating elsewhere in the economy.

The declines in the stockmarkets of Thailand and Korea from early 1996 are suggestive of another potential cause of the shock. In Thailand, it appears that expectations of future growth in corporate sector returns fell in early 1996, when the price-earnings ratio for this market began to fall. In Korea, actual returns on equity began

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<sup>5</sup> In another paper, McKibbin (1998) argues that an increase in US interest rates in March 1997 triggered a portfolio adjustment. This issue is not examined in the current paper.



to fall about this time, and stock prices to fall in line with this decline. Such a decline in asset valuations would be expected to result in major shifts in portfolios that could have major economic consequences.

Once such an asset market shock began to be felt, its consequences would likely be compounded by secondary shocks associated with the abrupt shift to floating rates, concerns about the credibility of government policies, weaknesses in financial sectors, and inadequacies in the mechanisms for corporate restructuring and liquidation. Some of these problems were reflected in increases in the risk premia on Thai and Indonesian securities. Others are evident only in the observed declines in output in the region.

The G-Cubed model provides some important insights into the likely responses of the economy to these shocks. Declines in the expected growth rate of returns on investment resulting from anticipated declines in the growth of productivity were found to set off a major set of adjustments including sharp currency depreciations, declines in consumption and investment, and rapid improvement in the trade and current account balances. While the impacts on Thailand of this experiment were large, the spillovers through economic channels onto the currencies of the other countries were small and even positive in the case of Korea. Clearly this suggests that contagion did not arise through direct trade or capital account linkages.

Increases in the risk premium on a country's securities were found to reinforce most of the impacts of the diminished expectations of future productivity growth. Increases in risk premia of the magnitude observed for Thailand and Indonesia resulted in additional nominal depreciations in the order of 25 percent in Thailand and 20 percent in Indonesia and, by reducing consumption and investment, provided a strong stimulus to the external accounts.

The response of monetary policy is clearly important. Some degree of monetary expansion was probably anticipated given the rise in prices created by the initial depreciations. Such a policy relaxation would stimulate output, albeit at the expense of a further exchange rate depreciation. Such an anticipated policy of monetary expansion would cause an exchange rate depreciation and have a modest stimulatory impact even before it was actually implemented. If, however, monetary relaxation was anticipated but

does not eventuate, output losses would be likely to exceed the gains in the initial period. This result highlights the need for policy credibility-- if a government promises to maintain a tight monetary policy but its commitments are not taken to be credible, the outcome is likely to be worse than with either an anticipated monetary expansion or a credible commitment to tight monetary policies.

The significant observed declines in output in the region make it clear that the problems in the financial and business sectors are having a sharply adverse impact on the productivity of the economy. This immediate decline in productivity reinforces the effect of the anticipated declines in the productivity of investments identified as a primary cause of the crisis. Combining this adverse productivity shock with key secondary shocks, such as the monetary policy response in Indonesia, allows us to capture some of the key features of the response to the crisis in these countries.

Several shocks involving developments in Japan are considered because of the importance of Japan for the region. The first is a decline in expected returns on capital in Japan and a similar increase in expected returns in the USA designed to broadly replicate the changes in their exchange rates. These shocks produce the expected declines in the Japanese exchange rate, and in the current account, but appear to produce relatively small changes in the exchange rates of the other East Asian countries. Two experiments involving Japanese fiscal stimulus of the type announced in the April 1998 package. The temporary fiscal stimulus is found to be more effective than a permanent fiscal. Both cause the nominal exchange rate to appreciate in Japan, but to depreciate in the East Asian crisis countries.

The final experiment considered is a fiscal policy stimulus in Thailand achieved by a permanent tax cut equal to 2 percent of GDP. This stimulates consumption, but crowds out investment, so that the net stimulus to output is relatively small. The trade account deteriorates. There is a relatively large exchange rate appreciation, and a modest increase in real interest rates.

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## Decomposing the Nominal Effective Exchange Rate

It is frequently argued that the peg to the US dollar, which was appreciating against most currencies in the pre-shock period, contributed to overvaluation of the currencies in the crisis countries. The decomposition suggested by Montiel (1997) allows changes in the nominal effective exchange rate to be decomposed into a component due to changes in a country's bilateral exchange rate relative to the reference currency (in this case the US dollar), and a component due to changes in the effective exchange rate of the US dollar.

The approach used for this analysis begins with a real effective exchange rate defined as:

$$A.1 \quad \log REER_i = \sum_j W_{ij} ( \log e_{ij} + \log P_j / \log P_i )$$

where  $REER_i$  is the real effective exchange rate for country  $i$ ;  $W_{ij}$  is the share of country  $j$  in the total trade (exports plus imports) of country  $i$ ;  $e_{ij}$  is the bilateral exchange rate (units of country  $i$ 's currency per unit of country  $j$ 's); and  $P_i$  and  $P_j$  are the price levels, in our case the CPI's, in countries  $i$  and  $j$ .

Equation A.1 may usefully be rewritten in the form of a nominal effective exchange rate (NEER) and one involving the relative price level:

$$A.2 \quad \log REER_i = \log NEER_i + \log (P^*/P_i)$$

The NEER may be decomposed by using the arbitrage condition which ensures that:

$$A.3 \quad e_{ij} = e_{i,US} \cdot e_{US,j}$$

In this way, the log of  $NEER_i$  may be written:

$$A.4 \quad \log NEER_i = \sum_j W_{ij} ( \log e_{i,US} \cdot e_{US,j} )$$

or

$$A.5 \quad \log NEER_i = \log EXCH + \log Dollar$$

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