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Thailand: Selected Issues

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INTERNATIONAL MONETARY FUND

THAILAND

Selected Issues

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Approved by Asia and Pacific Department

August 16, 2005

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I. Overview

1. **The essays in this Selected Issues paper address three questions related to key policy challenges in Thailand**. The focus is on the effect of higher global interest rates on Thailand, the relationship between financial crises and long-term potential growth, and the factors that could help determine if credit booms will lead to financial deepening or dangerous credit bubbles.

2. **The purpose of the second chapter is to measure the effect of shocks to world interest rates on real activity in Thailand**, **and to identify the appropriate monetary policy response**. Emerging economies have enjoyed an exceptionally favorable economic and financial environment throughout 2004 and early 2005, supported by solid global growth, low interest rates, and suppressed credit spreads. The United States' easy-money policy of recent years has spilled worldwide, creating an environment of low interest rates in international markets. If world interest rates were to take a sudden course upward, this would increase the cost of borrowing for emerging economies, and lead to less hospitable financing conditions for emerging markets. The analysis employs the Global Economy Model (GEM) developed by the Research Department of the IMF by calibrating the model to Thailand and the United States, and investigating how key macroeconomic variables in Thailand respond to interest rate shocks originating in the United States. The chapter finds that monetary policies in Thailand that allow more exchange rate flexibility cushion the adverse effect on output, consumption, and investment.

3. **The third chapter studies how financial crises affect countries' long-term growth potential, and considers the specific case of Thailand and its growth outlook**. The effects of currency crises on output are highly diverse. While the average country suffers output and growth losses, a significant fraction of crises leads to growth accelerations. This chapter documents this diversity and identifies some of the macroeconomic determinants that are correlated with stronger post-crisis growth recoveries. In the case of Thailand, it argues that while growth rates have come down from the exuberant rates in the 1990s that led to the crisis, they since then seem essentially in line with Thailand's longer growth experience.

4. **The fourth chapter identifies episodes of faster-than-normal credit growth and examines if such credit growth events are associated with benign financial deepening or dangerous credit bubbles**. While financial deepening has been shown to be both a cause and an effect of economic development, the rapid growth of credit aggregates has often been associated with episodes of bank distress, leading to the widespread belief that credit booms are a recipe for financial disaster. However, historically, only a minority of boom episodes has ended in a crash. This chapter examines the characteristics of a panel of credit booms and identifies factors that can help the early detection of dangerous bubbles from episodes of healthy financial deepening. The results suggest that it is not possible to fully discriminate between "good" and "bad" (or "ugly") credit booms, but several macroeconomic variables help to predict whether a boom is heading for some form of financial distress.

II. The Role of Interest Rates in Business Cycle Fluctuations in Emerging Countries: The Case of Thailand [1]

A. Introduction

Emerging economies have enjoyed an exceptionally favorable economic and financial environment throughout 2004 and early 2005, supported by solid global growth, low interest rates, and suppressed credit spreads. The United States' easy-money policy of recent years has spilled worldwide, creating an environment of low interest rates in international markets. If world interest rates were to take a sudden course upward, this would increase the cost of borrowing for emerging economies, and lead to less hospitable financing conditions for emerging markets. The purpose of this chapter is to measure the effect of shocks to world interest rates on real activity in Thailand. The analysis employs the Global Economy Model (GEM) developed by the Research Department of the IMF.

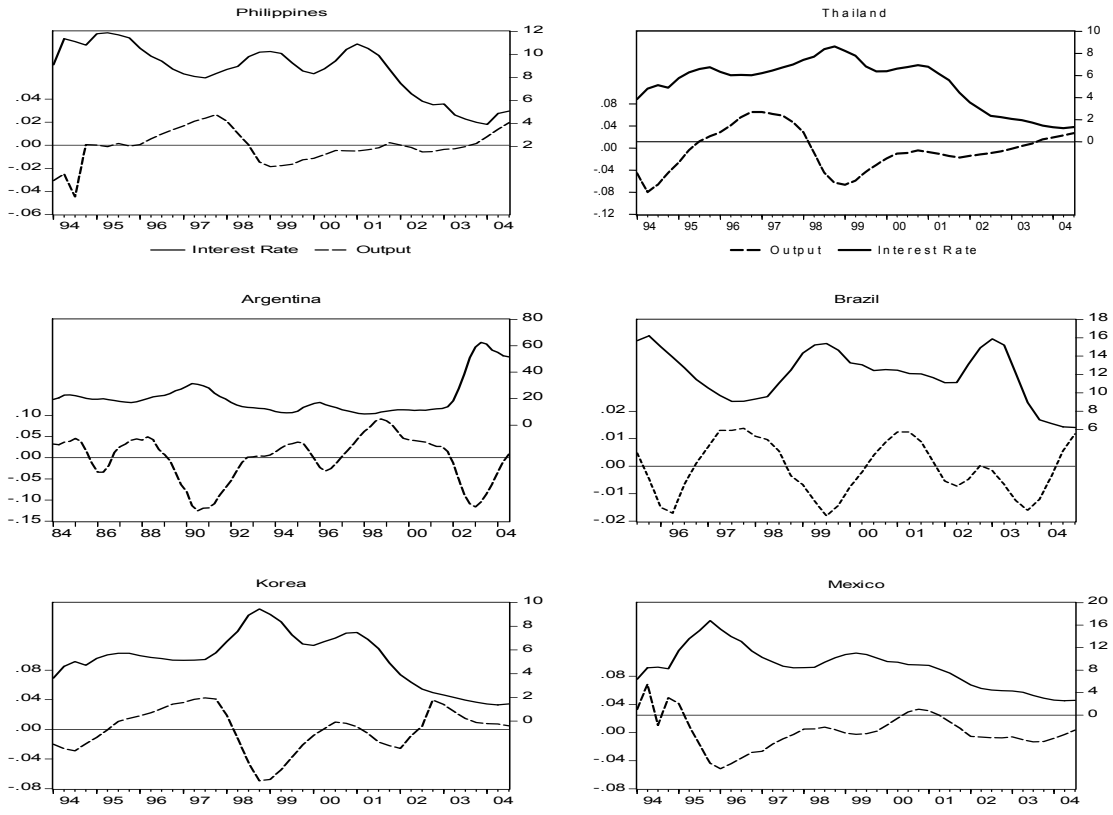
1. **The paper is organized as follows.** Section B describes the importance of interest rates in determining business cycles in emerging market economies. Section C introduces the model and explains the calibration. Section D describes the effects of two sets of interest rate and credit spread shocks: a 1 percent interest rate blip in the United States on output, consumption, investment, labor effort, and capital stock in Thailand, and an experiment that resembles the global bond market rout of 1994. Section E investigates how monetary policy can best minimize the impact of a more prolonged interest rate hike in the United States combined with a higher risk premium in Thailand.

B. Interest Rates and Business Cycles

2. **Interest rates are a key determinant of business cycles in emerging markets**. In recent years, a great number of emerging economies have coped with frequent and large changes in the interest rates that they face in international financial markets; these changes have usually been associated with significant business cycles swings. This observation is illustrated in the figure below, which graphs output and country interest rates for six emerging market economies. Periods of low interest rates are typically coupled with economic expansion, and times of high interest rates are often associated with suppressed levels of aggregate activity.

[1] Prepared by Ivan Tchakarov.

Real Interest Rates and Real Output in Selected Emerging Market Countries

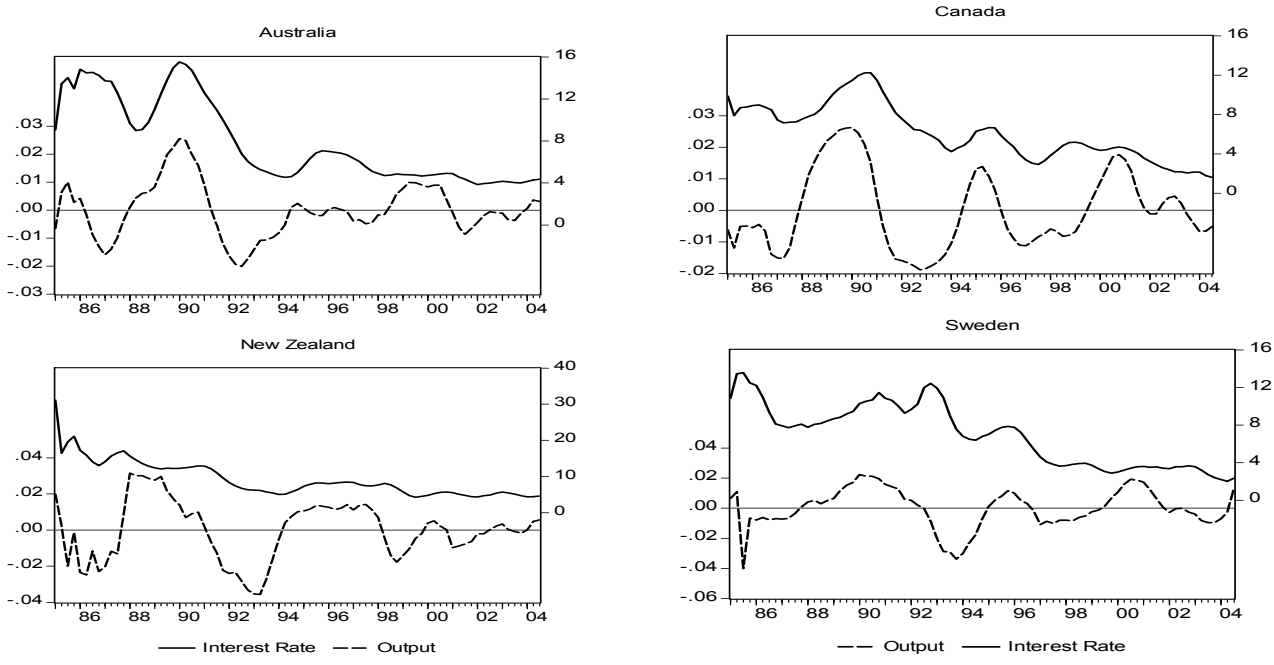


Sources: *IFS*; Emerging Market Bond Index (EMBI) Global Spread; and Fund staff calculations.

Note: Output is seasonally adjusted real GDP, and is detrended using the HP filter. Interest rate is constructed as the sum of the 90-day U.S. T-bill and the J. P. Morgan EMBI Global Spread for the respective country, adjusted for the United States's expected inflation.

3. **The link between interest rates and output in emerging countries is markedly different from that in developed economies.** While the previous figure demonstrates that real interest rates in emerging markets are clearly countercyclical, in the developed countries the interest rates are at best acyclical. The following figure depicts this relationship for four small open economy developed countries.

Real Interest Rates and Real Output in Selected Developed Economies



This is further demonstrated by the estimates for the correlation coefficients for these countries, shown in the table.

Correlation of Real Interest Rates with GDP

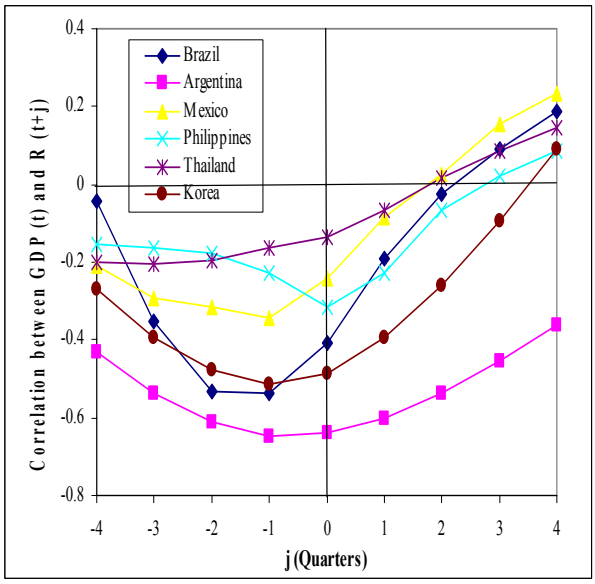
Emerging Economies					
Argentina	Brazil	Mexico	Korea	Philippines	Thailand
-0.64	-0.41	-0.24	-0.49	-0.31	-0.14

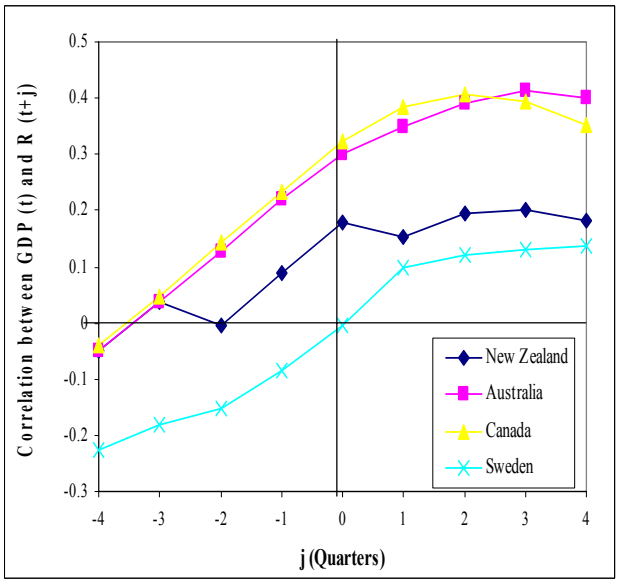
Developed Economies			
Australia	Canada	Sweden	New Zealand
0.30	0.32	0.00	0.18

Source: Fund staff calculations.

In addition, real interest rates in emerging economies lead the cycle, whereas in developed economies interest rates lag the cycle. This point is illustrated in the next figure, which shows the cross correlations between GDP and real interest rates in emerging and developed countries. In all emerging countries, there is a distinctive U-shaped pattern of the cross correlation, whereas in developed countries the cross correlations are completely different and do not exhibit this pattern .

Correlation Between Real Interest Rates and Real Output in Emerging and Developed Countries





C. The Global Economy Model with the Financial Accelerator

4. **GEM[2] is a new type of policy model with strong microeconomic foundations, in which consumers maximize utility and firms their profits.** MULTIMOD was the policy model of choice in the IMF in the last two decades. While MULTIMOD is able to generate realistic dynamic responses to cyclical disturbances, its lack of solid theoretical foundations makes it susceptible to the "Lucas critique." In particular, policy analysis using reduced-form equations that fit the data but are only loosely tied to theory, can not properly account for resulting shifts in behavior. GEM, on the other side, combines production, consumption, nominal rigidities, trade, and international financial markets in a coherent theoretical framework.

5. **GEM has many important strengths.** First, GEM can study policies in a general equilibrium setting, thus taking into account the full range of interactions between consumers and producers as well as across sectors and countries. Second, the costs and benefits of a policy can be measured by the impact on consumer welfare, rather than by using less accurate and more ad hoc proxies of welfare. Third, GEM has a very flexible structure, so that one can include or exclude features easily in accordance with the issue at hand.

6. **However, moving to a model with tight theoretical structure imposes some limitations.** First, models are not easy to build and run. Second, the need to create a large interlinked structure constrains theoretical specifications and hence model properties.[3] Third,

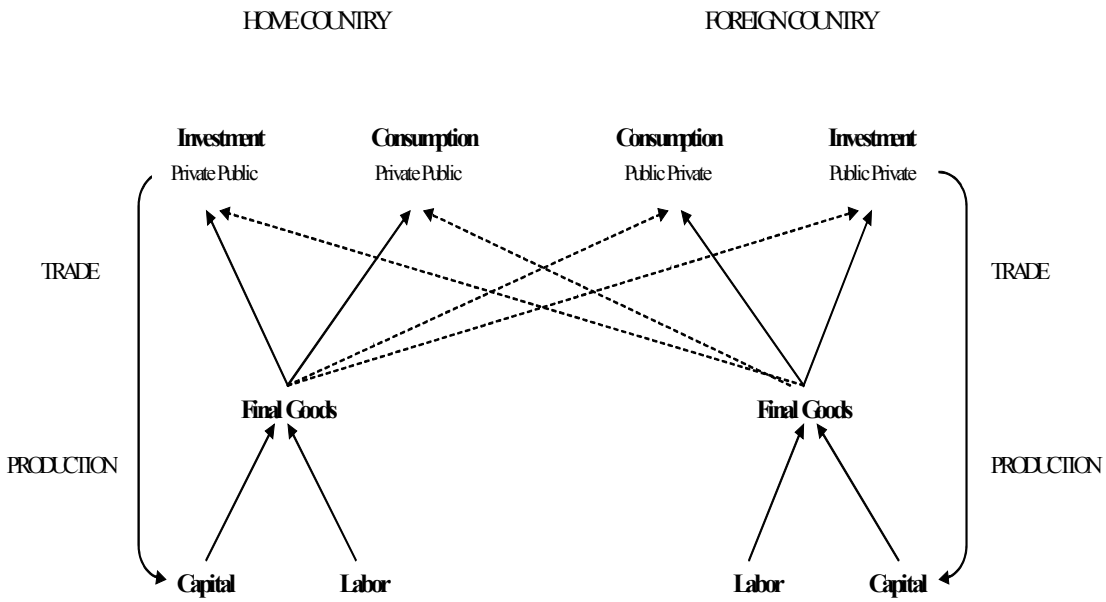
[2] A brief note on the GEM is provided in the appendix.

[3] For example, since the model is based on a single representative consumer, it can not be used to address issues of income distribution.

calibration is time-consuming, as the model concepts do not dovetail with existing data.[4] Fourth, capital account is not richly modeled and, therefore, issues related to capital flows can not be adequately addressed.

7. **The following figure displays the simplest version of a two-country GEM structure.**[5] Labor and capital are combined to produce a single type of tradable good that can be used for consumption or investment. Given the preferences of consumers, firms, and the government, these goods are then distributed across countries.

Simple GEM Structure



8. **A key feature of the model is that it breaks down the domestic interest rate into the sum of world interest rate and country risk premium, and that it endogenizes the premium.** Shocks to world interest rates do not usually translate one to one to movements in country interest rates due to the presence of country risk premia. They themselves may be positively related to world interest rates, and may, therefore, amplify the interest rate cycle of industrial countries.[6] The attempt to analyze the relationship between interest rate and real activity is also complicated by the fact that country risk premia respond systematically and countercyclically to business conditions in emerging economies.[7] The model endogenizes the

[4] For example, it is not easy to split output into traded and nontraded goods or to determine the role of commodities and semifinished goods in production.

[5] For a full technical description of GEM, see Laxton and Pesenti (2003).

[6] Evidence in support of this notion can be found in Fernandez-Arias (1996), Kaminsky and Schmukler (2002), and Uribe and Yue (2003).

[7] See, for example, Cline (1995), Cline and Barnes (1997), Cantor and Packer (1996), and Eichengreen and Mody (1998).

risk premium by assuming that it moves inversely with the net worth, so that it becomes increasingly difficult to borrow when the country faces unfavorable shocks.[8]

9. **This is captured in the model through the financial accelerator mechanism**. The financial accelerator mechanism refers to the combination of two salient features of economic environment in emerging markets that complicate the conduct of monetary policy. First, emerging economies typically can only borrow in foreign currency denominations, a phenomenon usually referred to as the "Original Sin."[9] Second, they are subject to a risk premium above and beyond the international lending rate. The risk premium depends on the economic conditions in the country. In particular, the premium is a positive function of the ratio of the value of assets to the value of net worth.

10. **The financial accelerator mechanism amplifies the effects of shocks to world interest rate on the domestic economy.** Since domestic interest rate is the sum of foreign interest rate and risk premium, interest rate hikes in the foreign country induce interest rate increases in the domestic economy. Due to nominal rigidities, this also leads to a rise in the real domestic interest rate which, in turn, engenders contraction in consumption, investment, and output. However, the fall in asset prices generated by the drop in output raises the ratio of value of assets to the value of net worth. As the risk premium is positively related to this ratio, the resulting increase in the risk premium further suppresses real activity beyond the original impact of the foreign interest rate hike.

11. **The long-run properties of the model are calibrated to Thailand, the United States, and the Rest of the World (RoW).** The table below provides a summary of the key steady state ratios calibrated using 2004 annual data. Sizes are based on a simple average of the shares of these countries in world population and GDP. Thailand makes up 1 percent, the United States 19 percent, and RoW 80 percent of the world. Consumption- and investment-to-GDP ratios for Thailand and the United States are calculated from national accounts data. Since the precise computation of these ratios for the RoW would require aggregating all individual countries' consumption and investment data, it is simply assumed that consumption and investment in the RoW account for two-thirds and one-third of output, respectively. The imports-to-GDP ratio is significant in Thailand, amounting to 57 percent of GDP. The share of goods imported from the United States is 5 percent of GDP, and the rest of the goods are imported from the RoW. The United States is a much less open economy with imports-to-GDP ratio of 12 percent of GDP. The imports from Thailand are negligible, with the bulk of imports coming from the RoW. The RoW is almost a closed economy with imports-to-GDP ratio of 4 percent of GDP. Imports from the United States and Thailand account for 3.6 and 0.4 percent of GDP, respectively. The risk premium is calibrated using the EMBI index for Thailand. The risk premium has been steadily decreasing since the Asian crisis, and its average value in 2004 was 70 basis points.

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[8] This uses the concept of the financial accelerator developed by Bernanke, Gertler, and Gilchrist (1999).

[9] For details, see Eichengreen and Hausman (1999).

Model Calibration

	Thailand	United States	RoW
Size	0.01	0.19	0.8
Consumption-to-GDP ratio	0.67	0.86	0.66
Investment-to-GDP ratio	0.26	0.18	0.33
Imports-to-GDP ratio	0.58	0.12	0.04
Import of consumption goods-to-GDP ratio	0.17	0.09	0.02
Import of investment goods-to-GDP ratio	0.41	0.03	0.02
Imports from Thailand-to-GDP ratio	n.a.	0.002	0.004
Imports from the U.S.-to-GDP ratio	0.05	n.a.	0.036
Imports from RoW-to-GDP ratio	0.54	0.118	n.a.
Risk premium (in percent)	0.007	n.a.	n.a.

Sources: *IFS;* BOT; and Fund staff calculations.

12. **The deep parameters in the micro-founded model are calibrated using estimates from microeconomic studies.** The deep parameters define the long-term responses of firms and consumers, such as the elasticity of substitution of different types of goods, and the responsiveness of hours worked to changes on real wages and of consumption to movements in real interest rates. Currently, the only available GEM calibration to an emerging market economy is the Czech Republic and this calibration is used in the exercise.[10]

13. **The monetary framework in Thailand is based on inflation targeting.** Since the Asian crisis, Thailand has adopted an inflation targeting regime, and has intervened in the foreign exchange market to prevent excessive baht volatility. The model assumes that monetary policy in Thailand is conducted by a Taylor rule. This rule is augmented with a target for the real exchange rate for the simulation with a managed float. This is a modeling assumption and does not imply that BOT actually targets the real exchange rate.The weight on the exchange rate is smaller than the weights on expected inflation and the output gap. Monetary policy for the United States and Row follows a Taylor rule with no weight on the real exchange rate.

D. Interest Rate and Credit Spread Shocks

14. **A 1 percent interest rate shock in the United States moderately suppresses economic activity in Thailand.** It is assumed that half of the increase in the foreign interest rate is transmitted to the domestic interest rate. The impulse response functions on the next page depict the dynamic behavior of the economy, and show that the largest decrease in the main economic variables occurs 4–5 quarters after the shock. GDP, consumption, investment, and labor effort drop by 0.19, 0.04, 0.57, 0.23 percent relative to steady state, respectively. Due to the presence of adjustment costs, capital accumulation reaches a trough of minus 0.08 percent relative to steady state 10 quarters after the shock. Since the risk premium is calibrated only at 70 basis points in steady state, it is only negligibly affected by the foreign interest rate shock. Entrepreneurs' net worth is reduced by 0.7 percent. percent.[11]

[10] For details, see Douglas and Pesenti (2003).

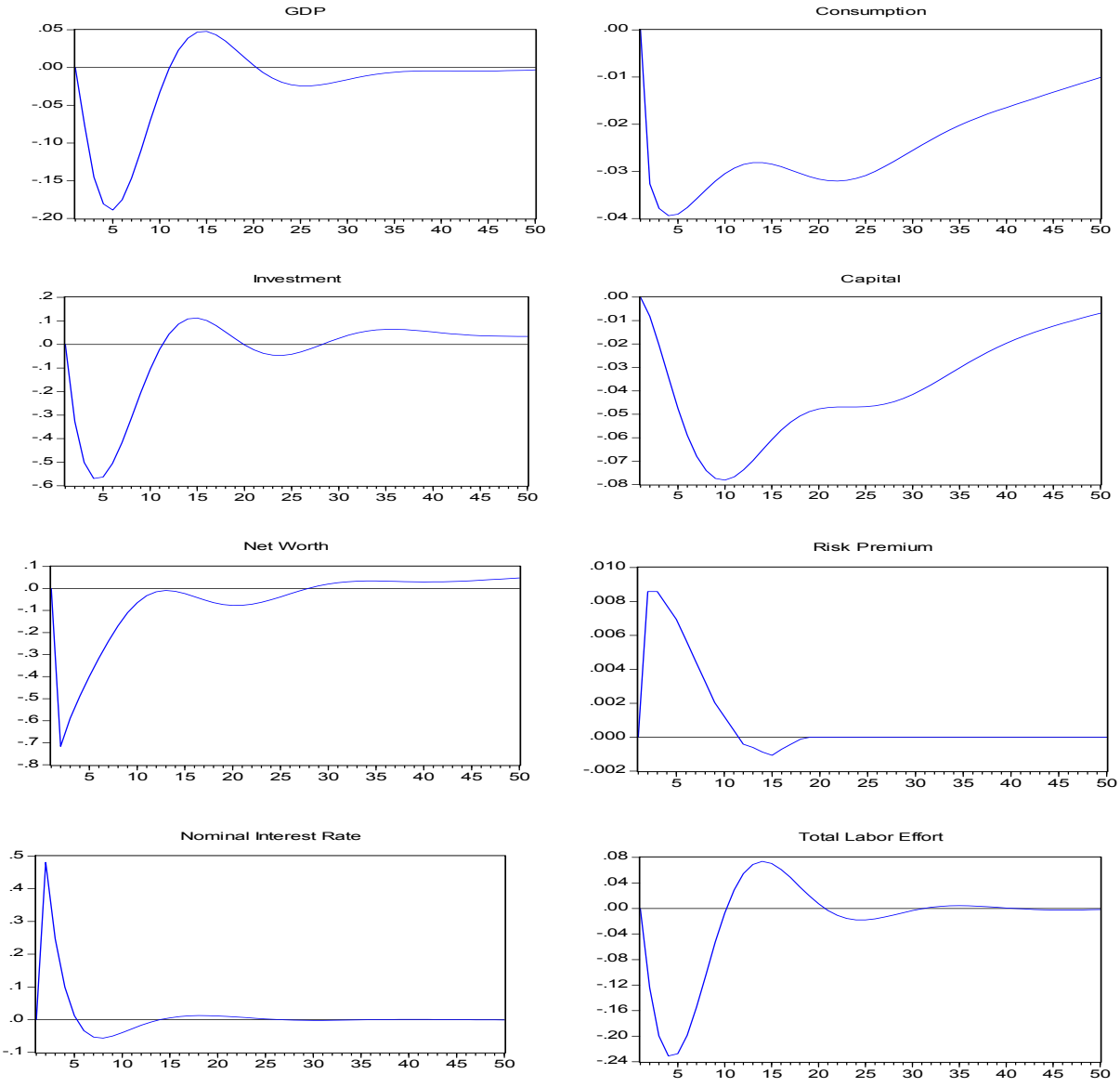
[11] The assumption that half of the increase in the foreign interest rate is transmitted to the domestic interest rate may overstate the impact of US monetary policy on Thai monetary policy under the inflation targeting framework with floating exchange rate system.

15. **The cumulative costs to the interest rate hike are also limited.** The table computes the cumulative output, consumption, investment and capital losses in Thailand and the United States of a 1 percent interest rate blip in the United States.

Cumulative Losses in Thailand and the United States from a 1 Percent Interest Rate Hike in the United States

	Thailand	United States
Output	-0.23	-0.46
Consumption	-0.28	-0.52
Investment	-0.51	-1.21
Capital stock	-0.62	-1.34

Impulse Response Functions to 1 Percent Interest Rate Shock in the United States



Source: Fund staff calculations. Note: Impulse response functions in Thailand to a 1 percent interest rate blip in the United States. The impulse response functions are computed as percent deviations from the steady state.

16. **The monetary tightening in the United States in 1994 was followed by heightened bond market volatility and widening of emerging countries' credit spreads.** The Federal Reserve Board (Fed) began tightening monetary policy in February 1994. During the following 12 months, the Fed rate was doubled to 6 percent in the course of seven successive rate increases. Bond market volatility and the 10-year U.S. treasury yields shot up by 250 basis points, peaking at 8 percent in November 1994. In the process, investors curtailed their borrowing at short-term rates and their exposure to longer-dated, higher-yielding securities. This resulted in a marked widening of emerging bond market yield spreads from 405 basis points at end-1993 to 800 basis points in mid-December 1994.

17. **Current benign global market conditions for emerging economies are reminiscent of the period preceding the sell-off of 1994.** Low interest rates in the major financial centers, improved fundamentals, and abundant liquidity buoyed global asset prices. The complementary benefit of better credit quality pushed credit spreads on emerging market bonds to low levels. These factors created a very favorable external environment for emerging market borrowers in 2003 and 2004—with the EMBIG composite declining from 728 basis points at end-2002 to 423 basis points at end-2004—despite the onset of monetary policy tightening in the United States, significant commodity price volatility, and further widening of global imbalances.

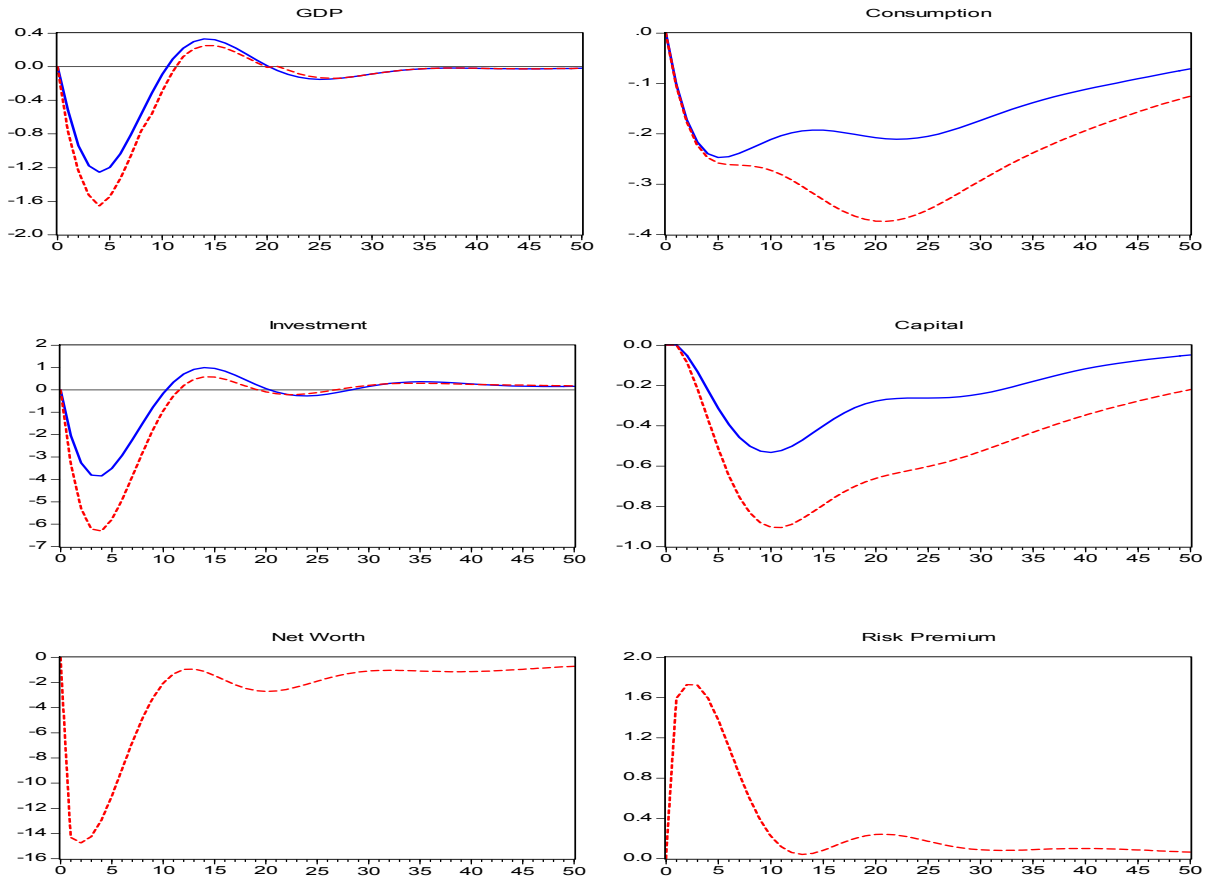
18. **Nevertheless, the risks that did not materialize in 2004 remain a concern.** Government bond yields and credit spreads remain quite low, leaving little room for unanticipated spikes in world interest rates. An unanticipated spike in yields and volatility in the U.S. treasury market could trigger a widening of credit spreads on emerging market bonds. Emerging market borrowers would face higher borrowing costs, and underlying vulnerabilities that have been masked by the very favorable external financing environment.

19. **A recent IMF study found that mature market interest rates and global liquidity have become the most important determinants of emerging market spreads following September 2001.** The IMF's *2004 Global Financial Stability Report* estimates a simple econometric model with a view to identifying the drivers of the latest emerging bond market rally. Theoretical predictions suggested that the model should include relevant measures of country-specific fundamentals, global liquidity as represented by mature market interest rates, the expansion of demand through the widening investor base, and risk preferences. The main conclusions are that these variables are significant and that the signs are as expected, with improved fundamentals, greater investor demand, and lower volatility all lowering spreads. However, while improving fundamentals are found to have been a significant factor driving the contraction of emerging bond market spreads, the estimation results indicate that liquidity stemming from the U.S. interest rate easing cycle has become a more important influence than fundamentals in the emerging bond market rally.

20. **Two percent interest rate shock in the United States over four quarters and a risk premium of 7 percent could have serious economic consequences for Thailand.** It is believed that the Fed will continue to raise the short-term rate to a "neutral" level that should minimize inflationary pressures but not dampen economic growth. Various estimates suggest that the "neutral" level is somewhere between 3 and 5 percent. It is assumed that the interest

rate in the United States will be raised by 2 percent in four 50-point increments over a year. The average emerging market spread since 1990 to 2004 is about 7 percent, and the risk premium is calibrated at this level. The graphs show the response of key economic variables in Thailand to a 2 percent shock in the United States with and without the financial accelerator mechanism.

Impulse Response Functions to 2 percent Interest Rate Shock in the United States



Source: Fund staff calculations.

Note: Impulse response functions in Thailand to a 2 percent interest rate shock in the United States lasting for four quarters. The impulse response functions are computed as percent deviations from the steady state.

21. **The cumulative costs to the interest rate hike are also significant.** The table computes the cumulative output, consumption, investment and capital losses in Thailand following a 2 percent interest rate shock in the United States lasting for one year. In the model without the financial accelerator output, consumption, investment and capital decrease by 1.80, 2.31, 1.75 and 2.60 percent, respectively. The presence of the financial accelerator adds considerably to the losses, with output and consumption falling by 2.90 and 3.09 percent. The losses are much larger in investment and capital, which drop by 8.10 and

8.08 percent. This is explained by the fact that the financial accelerator operates mainly through the investment channel. As investment projects are financed by net worth and foreign debt, and the risk premium depends negatively on the capital-to-net worth ratio, an increase in the foreign interest rate reduces asset prices in Thailand and, therefore, pushes up this ratio. The associated rise in the risk premium makes foreign financing less accessible and chokes investment and capital accumulation. This has repercussions for output.

Cumulative Losses in Thailand from a 2 Percent Interest Rate Hike in the United States

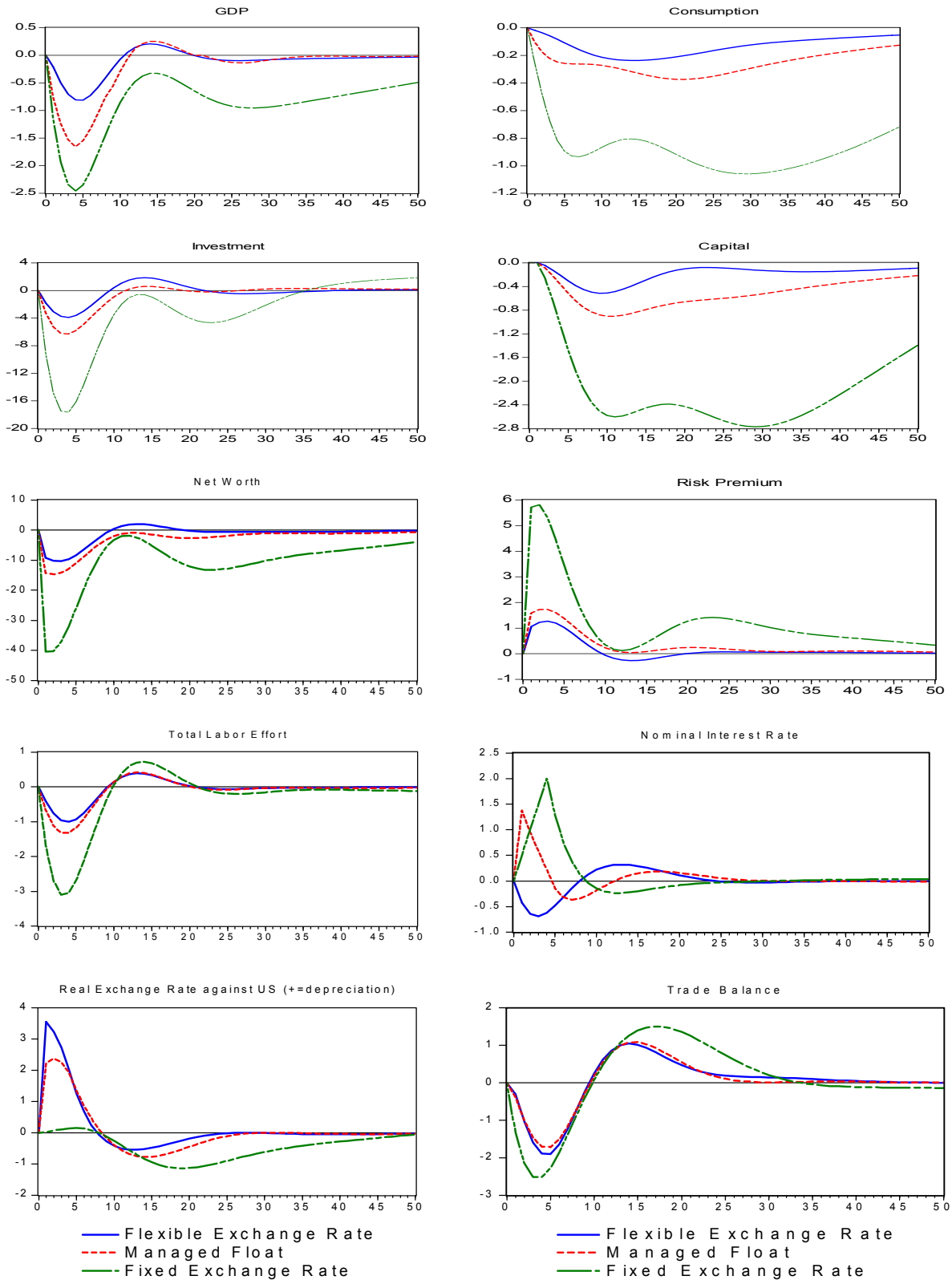
	No financial accelerator	Financial accelerator
Output	-1.80	-2.90
Consumption	-2.31	-3.09
Investment	-1.75	-8.10
Capital stock	-2.60	-8.08

E. What Role for Monetary Policy?

22. **The final experiment investigates what exchange rate regime can best limit the impact of spillovers from higher U.S. interest rates**. The last table underscores the severity of the economic losses that could face Thailand. The obvious question is to what extent monetary policy can affect these losses. It is assumed that monetary authorities in Thailand can pursue three different exchange rate regimes via a Taylor-type interest rate rule. A flexible exchange rate policy will target only inflation and the output gap. A fixed exchange rate policy will target the baht/dollar exchange rate. A regime of managed float implies that monetary authorities target simultaneously inflation, output gap, and the exchange rate, but the weight on the exchange rate is smaller than on inflation and the output gap

23. **Thailand will minimize the effects of higher U.S. interest rates if it follows a flexible exchange rate policy**. The impulse response functions and the computed cumulative output losses indicate that the economic losses will be minimized under a flexible exchange rate regime. The intuition is straightforward. The losses are biggest with the fixed regime as domestic interest rates will have to rise one-for-one with foreign interest rates. The fall in asset prices and, therefore, the rise in the risk premium are the largest under this scenario. The associated reduction in investment and capital accumulation contributes to the biggest output drop. In the case of a flexible exchange rate regime, the rise in the risk premium and the fall of output are the smallest. The managed float is an intermediate case.

Impulse Response Functions under Three Different Exchange Rate Regimes



Source: Fund staff calculations. Note: Impulse response functions in Thailand to a 2 percent interest rate shock in the United States computed in four 50-point increments. Impulse response functions are calculated for three exchange rate policies: flexible, managed float, and fixed. And are computed as percent deviations from the steady state.

Cumulative Losses in Thailand Under Three Different Exchange Rate Regimes

	Float	Managed float	Fix
Output	-1.60	-2.90	-12.26
Consumption	-1.93	-3.09	-13.40
Investment	-2.63	-8.10	-27.60
Capital stock	-2.81	-8.08	-28.86

A BRIEF NOTE ON THE GEM

A. Overview

1. **The IMF Research Department's GEM is a large multi-country macroeconomic model, derived from a choice-theoretic basis, designed to analyze a range of policy issues**. Building on recent research in international finance and monetary economics and following recent models in "New Open-Economy Macroeconomics" literature, GEM provides a general equilibrium stochastic framework for policy analysis. In particular, the model can be used to analyze policy questions such as the impact of structural reforms and the international transmission of shocks in the context of macroeconomic interdependence among countries. Among others, GEM has the following main features:

- Imperfect competition (monopoly power) in product markets, for both tradables and nontradables;

- Nominal wage and price rigidities, with wages and nominal prices of tradables and nontradables subject to adjustment costs, both for levels and rates of change;

- Realistic hump-shaped responses of macroeconomic variables to shocks due to habit persistence in consumption and adjustment costs in capital accumulation and imports.

2. **A three-country version of GEM is used in this paper**. The three blocks are: Thailand, the United States, and the ROW. In each block, there are households, firms, and a government. Households maximize utility derived from the consumption of goods and leisure. Firms use capital and labor to maximize their net incomes from the production of nontradable and tradable intermediate goods and produce final goods. Governments consume goods financed through nondistortionary taxes and adjust short-term nominal interest rates to provide nominal anchors.

B. The Model Structure

3. **Households own domestic retail firms, supply differentiated labor inputs to firms, and consume the final good**. Households' monopoly power in labor supply implies that the wages they receive contain a markup over the marginal rate of substitution between consumption and leisure. In addition, aggregate nominal rigidities materialize through the wage bargaining process due to adjustment costs in wage contracts. The market for capital is competitive, with accumulation subject to adjustment costs that also contribute to the gradual pace of adjustment of macroeconomic variables. Both labor and physical capital are immobile internationally. Households trade internationally short-term nominal bonds, denominated in U.S. dollars; there are intermediation costs for households entering the bond market.

4. **There are three types of firms in the model—final goods producers, intermediate goods producers, and entrepreneurs**. The *final consumption and investment goods* are

produced in a perfectly competitive market. Firms use nontradable and tradable intermediate goods (domestic and/or imported) as inputs in final goods production. The final good is either used for investment by the entrepreneurs or consumed by domestic households or the government. The *intermediate goods* are produced in a monopolistically competitive market—as a result prices contain a markup over marginal cost. International trade is driven by the interaction of preferences, technology, and relative prices, as the structure of final good production reflects the preferences of households' demand for, and firms' production technology of, intermediate goods. Firms also provide financial intermediation services, enabling households to trade in bonds. The *entrepreneurs* manage the production process by deciding how much capital will be used in the production of intermediate goods. They can finance the acquisition of capital either by their net worth or by borrowing from abroad. Due to the presence of market imperfections in the capital markets, entrepreneurs' demand for capital depends on their respective financial position—this is the key aspect of the financial accelerator. The model assumes the existence of an agency problem that makes uncollateralized external finance more expensive than internal funds. In addition, the agency problem defines exactly the form of the external finance premium, which depends on the ratio of capital to net worth. In general, the finance premium varies inversely with the entrepreneurs' net worth—the greater the share of capital that the entrepreneurs can either self-finance or finance with collateralized debt, the smaller the agency costs and, hence, the smaller the external premium that they have to pay.

5. **Governments use interest rates as nominal anchors and spend exclusively on final nontradable goods**. Government spending is financed through a nondistorting consumption tax. The governments in all three regions control their national short-term nominal interest rates with the goal of providing a nominal anchor and price stability for their economies.

6. **The parameter values of GEM used in this paper are calibrated by taking into account the following factors**: empirical estimates available in the literature; the desired steady-state characteristics of the economies; and the model's dynamic adjustment properties.[12] While the focus has been primarily on the steady-state characterization of the economies, attention was also given also to achieving plausible dynamic adjustment responses for some key variables.

[12] To enhance the data coherence of the model's parameter values, the IMF's Research Department is working on Bayesian methods to estimate GEM parameters, extending the approach applied in Smets and Wouters (2003), and Del Negro and Schorfheide (2004). A smaller model with the financial accelerator has been estimated by Elekdag, Justiniano, and Tchakarov (2005).

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III. Financial Crises and Growth[1]

A. Introduction

The effects of currency crises on output are highly diverse. While the average country suffers output and growth losses, a significant fraction of crises leads to growth accelerations. This paper documents this diversity and identifies some of the macroeconomic determinants that are correlated with stronger post-crisis growth recoveries.

1. The Asian financial crisis of the late 1990s resulted in significant output contractions in the five crisis countries: Indonesia, Malaysia, Philippines, South Korea, and Thailand, and it took all of these countries several years to recover to their pre-crisis levels. However, the depth of the crisis and the speed of recovery differed widely across these countries. For example, while real per-capita GDP in Indonesia dropped by over 14 percent in 1998 and barely reached its pre-crisis level in 2004, the Philippines lost less than 3 percent in 1998 and surpassed its pre-crisis GDP by 2000. Thailand's experience is somewhere in the middle, with a loss of just over 11 percent and a recovery to pre-crisis GDP before the end of 2002. In fact, looking beyond the specific case of the Asian crisis, a broader look at cross-country experiences indicates that the effects of financial crisis are often much less severe, sometimes even leading into growth accelerations. What are possible sources of the different outcomes across countries? This is one of the questions that this chapter attempts to address.

2. Perhaps more important than the short- and medium-term aftermath of the crisis, however, is the second question this chapter is concerned with, namely, do financial crises affect countries' long-term growth potential? That is, do countries embark on growth profiles in the long term that are flatter or steeper than their pre-crisis growth paths? Both are conceivable outcomes. A financial crisis may be the unavoidable outcome of unsustainably, high pre-crisis growth rates, as may occur in episodes of speculative bubbles; a return to the lower, fundamentals-driven growth rates would then be the expected outcome. But crises may also trigger structural reforms to remedy the structural weaknesses that contributed to the crisis, thereby allowing the country to move to higher long-term growth.

3. Although a key focus of this paper is on the Asian crisis, and specifically its implications for Thailand's growth, the questions posed above are difficult to answer within the narrow context of the Asian crisis, given the small sample and the short-time period that has elapsed since then. This chapter therefore takes a cross-country perspective to provide some answers to these questions. Lessons for Thailand are then examined in a case study. The outline is as follows. In Section B, some of the conceptual issues surrounding crisis effects are discussed and descriptive statistics of crises effects presented. Using a dynamic panel dataset, a first set of empirical analyses then examines the long-term implications of financial crisis. Focusing on crisis events only, a second set of regressions analyzes the correlates of growth recovery with key macroeconomic variables, including fiscal and

[1] Prepared by Martin Schindler.

monetary policy indicators. Section C considers the specific case of Thailand and its growth outlook, and Section D concludes.

B. Financial Crises and Growth

Conceptual issues and descriptive statistics

4. Financial crises, currency and/or banking, are typically associated with large losses in economic activity and severe and prolonged recessions. This view has been reinforced by the recent Asian financial crisis in 1997/98 in which all of the affected countries suffered large output losses. A first glance at the data indicates, however, that this dire view of financial crises is not fully reflected by the international experience. Table 1 provides data on the medium-term growth effects of 183 currency crises during the 1980s and 1990s. As an indicator of the severity of crisis effects, the difference in average real, per-capita GDP growth rates in the five years leading up the to crisis and those in the five years following the crisis, including the crisis year, is calculated. Both the median and mean are shown for a number of subsamples, including by decade, level of development and region.

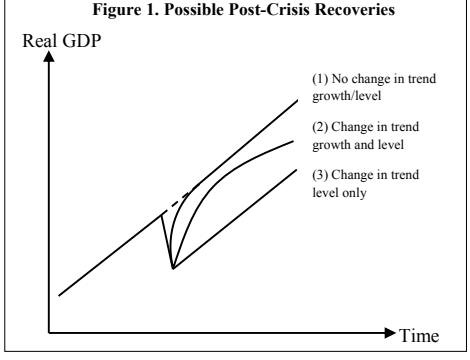
Table 1. Medium-Term Effects of Currency Crises: Difference in Average Per-Capita GDP Growth 5 Years Post- and Pre-Crisis
(median/mean, number of crises in parentheses)

	1980s	1990s	All
All	-.278/-.315 (107)	-.027/.333 (76)	-.110/-.046 (183)
Developing	.141/-.116 (89)	.072/.482 (69)	.106/.145 (158)
Developed	-1.481/-1.300 (18)	-1.629/-1.131 (7)	-1.526/-1.252 (25)
East Asia	-1.328/-2.153 (4)	-3.160/-3.440 (9)	-2.096/-3.044 (13)
Latin America	.903/-.151 (34)	-.605/-.305 (13)	.162/-.194 (47)

5. Two aspects stands out. First, in general, the effects of crises on growth are relatively small. The average loss in growth after crisis is only about 0.05 percentage points, with a median loss of 0.11 percentage points. This is particularly surprising in light of a commonly held view that speculative bubbles are the source of crises, with "artificially" elevated pre-crisis growth rates. Second, there is a large heterogeneity in outcomes. The growth losses that were observed in East Asia are larger (in absolute terms) by several orders of magnitude compared to the full sample mean, both during the 1990s, reflecting the Asian crisis, but also during the earlier decade. The table also indicates that currency crises have become less harmful over time overall, mostly reflecting the trend in developing countries, while emerging markets in East Asia and Latin America went the opposite way. In summary, large differences in outcomes can be observed, both over time, across regions, and across income levels.

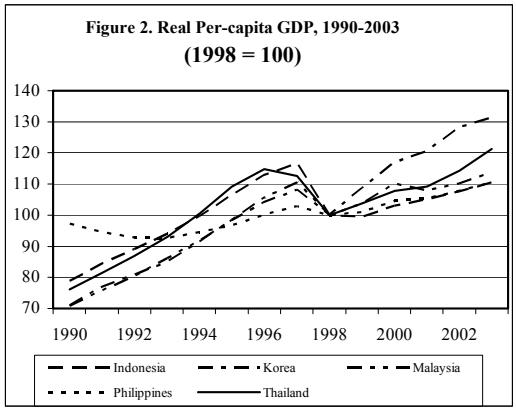
6. To gain a conceptual understanding of the potential growth outcomes, it is helpful to consider the diagram in Figure 1 which depicts three stylized growth outcomes. Clearly, many other outcomes are possible, but as will be seen below, these are some of the empirically relevant ones. Case 1 in this figure takes a benign view of financial crises: while output dips at the time of the crisis, it recovers after a transition period to the pre-crisis trend level, thus involving no permanent

Figure 1. Possible Post-Crisis Recoveries



loss, although growth rates will be above trend/pre-crisis growth during the transition period. Case 3 depicts an outcome at the lower end of the spectrum: output drops to, and stays at, a lower trend level without ever recovering, thus involving large permanent losses. Case 2 is somewhere in between: GDP recovers somewhat after the crisis, but not fully, leading to higher than pre-crisis growth rates in the short and medium term and to lower than pre-crisis trend growth in the long run, thus incurring permanent losses, albeit smaller than in case 3.

7. Figure 2 presents the empirical counterpart to Figure 1 for the five countries most affected by the Asian financial crisis in the late 1990s. A casual glance at the graph suggests that all three cases depicted in Figure 1 are represented in the data. Corresponding to the more benign case 1 in Figure 1, Korea appears to have quickly recovered back to its pre-crisis growth path within only a few years after the crisis, helped by the fact that the drop at the crisis was relatively small. On the other end of the spectrum, corresponding to case 3, is Indonesia. Malaysia, the Philippines, and Thailand are somewhere in between, catching up to some extent, but not all the way to the pre-crisis trend, thus corresponding to case 2 in Figure 1.



8. The conceptual and empirical considerations in Figures 1 and 2 suggest important lessons for the estimation of the effects of financial crisis on output and growth. First, comparing pre- and post-crisis growth rates may not yield much information on the changes in long-term trends, given that even without changes in the trend, as in the Korean case, growth rates may be higher than pre-crisis for several years due to catch-up. Second, the fairly large differences in growth outcomes across countries, even conditional on the "same" crisis as shown in Figure 2, opens up the possibility that country-specific factors, such as institutions and policies, have a possibly important influence on how the country is affected by a financial crisis.

9. The empirical analyses in the following two subsections attempt to highlight some possible explanations for differences across outcomes. The main objective of this paper is to provide an analytical framework which allows for a meaningful discussion of Thailand's recent experience and its outlook. As such, much of the work in this paper draws from the existing literature, although some of the results obtained here extend and modify some of the existing work. Some of the main contributions on which this chapter builds are Barro (2002) and Barro and Lee (2003) who focus on the medium-term growth implications of currency and banking crises. Their main finding is that crises have little medium-term impact, but as will be seen below, considering a longer-term horizon challenges this view. Park and Lee (2002) take an event-based view and focus on the recovery profile after a crisis; their methodology is used in the section on short- and medium-term recovery below. Gupta,

Mishra, and Sahay (2003) take a similar approach, although they focus on medium-term output losses only, rather than tracing out the recovery path.

Long-run growth

10. Data on financial crises, both currency and banking, are a key element of this chapter. The source of currency crisis data is Gupta, Mishra, and Sahay (2003) who use a majority rule based on five currency crisis definitions from the four papers by Milesi-Ferretti and Razin (1998; 2 definitions), Frankel and Rose (1996), Berg and Pattillo (1999), and Goldstein, Kaminsky, and Reinhart (2000). Data on banking crises are from Demirgüç-Kunt and Detragiache (2005). All remaining data series are from the World Bank's *World Development Indicators* except for data on education attainment which is from the Barro-Lee dataset.

11. Table 2 presents the regression results for dynamic panel regressions using the General Method of Moments (GMM) methodology developed by Arellano and Bond (1991). The regression setup is very similar to that used by Barro and Lee (2003) using lagged GDP, schooling, trade openness, investment, government size, and democracy as control variables. The regressions here also include dummies for currency and banking crises. Although Barro and Lee use 2SLS and a different measure of trade openness, their results are very similar to those obtained here. In particular, columns (1) to (3) replicate their regressions, including in various combinations, contemporaneous, and lagged values of dummies for currency and banking crises. The negative coefficient on lagged per-capita GDP is evidence of conditional convergence; also as expected, trade openness, investment rates, and democracy are all significantly and positively correlated with growth.

12. As in Barro and Lee, currency and banking crises are found to be negatively correlated with growth around the time of impact, but positively when lagged by one five-year period. In light of the previous section's discussion, this is not surprising: on average, countries suffer output losses at the time of the crisis, but growth is likely to be elevated during the recovery period. Barro and Lee conclude that there is no evidence of a long-run impact of financial crisis on growth. This conclusion may be misleading in several ways, however. First, growth recoveries in the medium term provide little information on the longer-term effects of a crisis—the simple picture in Figure 1 and the related discussion suggest that elevated growth rates in the short to medium term are consistent with any long-term outcome. The results from columns (1) to (3) therefore still leave open the question of whether a country permanently suffers from a crisis. Second, the time horizon of one lag, that is, about five years, is arguably too short to measure long-term effects of a crisis.

13. A fuller picture emerges from considering longer horizons, as done in columns (4) and (5) which also include twice-lagged crisis dummies and so measure, on average, the growth effects 10 years after a crisis. The coefficients for both currency and banking crises are statistically significant (column 5) and negative. Financial crises appear to induce a growth pattern similar to case 2 in Figure 1—namely, a negative growth shock at the time of the crisis, elevated growth rates during the following recovery period, and a convergence to growth rates in the long term that are below those the country experienced around the time of the crisis.

Table 2. Dependent Variable: Per-Capita GDP Growth, 1980-2000 1/

	(1)	(2)	(3)	(4)	(5)
Lagged per-capita GDP	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.000) ***	(0.000) ***	(0.000) ***	(0.000) ***	(0.000) ***
Average years of schooling	0.007	-0.026	-0.004	0.418	0.327
	(0.378)	(0.370)	(0.398)	(0.494)	(0.480)
Trade openness	0.054	0.034	0.043	0.045	0.046
	(0.015) ***	(0.017) **	(0.016) ***	(0.015) ***	(0.015) ***
Investment/GDP	0.133	0.170	0.140	0.205	0.174
	(0.057) **	(0.059) ***	(0.062) **	(0.058) ***	(0.061) ***
Government size	0.000	0.000	0.000	0.000	0.000
	(0.000) **	(0.000)	(0.000) *	(0.000)	(0.000)
Democracy index	0.045	0.080	0.059	0.091	0.095
	(0.028)	(0.029) ***	(0.029) **	(0.042) **	(0.040) **
Currency crisis	-0.661	-	-0.733	-	-0.625
	(0.358) *		(0.351) **		(0.445)
Banking crisis	-1.020	-	-1.414	-	-1.102
	(0.336) ***		(0.395) ***		(0.427) ***
Currency crisis (one lag)	-	1.260	1.286	-	1.189
		(0.372) ***	(0.347) ***		(0.366) ***
Banking crisis (one lag)	-	0.615	1.064	-	1.144
		(0.348) *	(0.419) **		(0.460) **
Currency crisis (two lags)	-	-	-	-0.997	-0.875
				(0.374) ***	(0.383) **
Banking crisis (two lags)	-	-	-	-0.775	-0.886
				(0.515)	(0.458) *
Observations	373	308	308	236	236
Number of countries	83	83	83	83	83
Test for second-order autocorrelation 2/	0.478	0.994	0.917	0.162	0.167

Note: Numbers in parentheses are robust standard errors. Significance levels are *10%; **5%; ***1%. All regressions are estimated by GMM and include time dummies and a constant.

1/ Non-overlapping five-year averages.

2/ Numbers are p-values for the Arellano and Bond (1991) test of no second-order autocorrelation in residuals.

14. Barro and Lee's (2003) conclusion that the "analysis found no evidence that financial crises had effects on growth that persisted beyond a five-year period" (p. 83) is thus to be interpreted with caution; indeed, the reverse is likely to be true. Nonetheless, a variant of Barro and Lee's conclusion may still hold true: the results do not preclude the possibility that average pre-crisis growth rates were "artificially" high (that is, above trend growth)—using raw growth data without detrending, as is done here, therefore still allows for the fact that the observed negative effect on future long-term growth simply reflects a return to a country's "true" potential growth rate. As such, a crisis may well represent a correction of excessively high pre-crisis growth rates, rather than a permanent loss in a country's growth potential, and in this sense, crises may indeed have little impact on a country's long-term growth. As is discussed in Section C, this appears to be the case in Thailand.

15. Considering the effects of crisis on investment rates can provide added insight into the effects of crises on growth. As the regressions in Table 2 indicate, the investment-to-GDP ratio is one of the key explanatory variables in the growth regressions. Table 3 presents the

results from dynamic panel regressions very similar to those in Table 2, except that now investment-to-GDP is the dependent variable. Crises trigger a sharp reduction in investment rates at impact, but have no statistically significant effect in the medium or long term. That is, investment rates under medium and long horizons are not significantly different than in the absence of crises. In the context of East Asia, Sarel (1995) has argued that both physical capital accumulation and productivity growth account for East Asia's strong growth performance prior to the crisis. The results in Table 3 do not preclude the possibility of a long-term effect on growth, but they suggest that changes in average growth rates are likely to come from changes in productivity growth rather than from reduced capital accumulation.

Table 3. Dependent Variable: Investment/GDP, 1980-2000 1/

	(1)	(2)	(3)	(4)	(5)
Lagged per-capita GDP	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.000) ***	(0.000) ***	(0.000) ***	(0.000) **	(0.000) **
Average years of schooling	-0.382	-1.197	-0.803	-1.500	-0.965
	(0.623)	(0.766)	(0.804)	(0.901) *	(0.882)
Trade openness	0.140	0.107	0.116	0.106	0.122
	(0.019) ***	(0.019) ***	(0.018) ***	(0.017) ***	(0.017) ***
Government size	0.000	0.000	0.000	0.000	0.000
	(0.000) **	(0.000) *	(0.000) *	(0.000)	(0.000)
Democracy index	0.042	0.084	0.070	0.047	0.017
	(0.050)	(0.061)	(0.058)	(0.071)	(0.070)
Currency crisis	-1.595	-	-1.962	-	-2.421
	(0.665) **		(0.733) ***		(0.748) ***
Banking crisis	-0.684	-	-0.637	-	-1.334
	(0.532)		(0.537)		(0.698) *
Currency crisis (one lag)	-	0.039	0.328	-	-0.141
		(0.614)	(0.646)		(0.752)
Banking crisis (one lag)	-	-0.088	-0.066	-	0.004
		(0.494)	(0.559)		(0.632)
Currency crisis (two lags)	-	-	-	0.614	1.019
				(0.809)	(0.870)
Banking crisis (two lags)	-	-	-	0.784	0.539
				(0.658)	(0.662)
Observations	358	302	302	236	236
Number of countries	84	83	83	83	83
Test for second-order autocorrelation 2/	0.532	0.513	0.540	0.953	0.953

Note: Numbers in parentheses are robust standard errors. Significance levels are *10%; **5%; ***1%. All regressions are estimated by GMM and include time dummies and a constant.

1/ Nonoverlapping five-year averages.

2/ Numbers are p-values for the Arellano and Bond (1991) test of no second-order autocorrelation in residuals.

Short- and medium-term recovery

16. By considering five-year averages, the analyses in the previous section abstract from shorter-term fluctuations and thus take a longer-term view. However, independent of whether or not financial crises have long-term growth (or level) implications, it is clear that they typically inflict severe economic short-term pain by inducing sharp losses in economic output during the year(s) of the crisis. Thus, even if economies eventually adjust and escape

such crises with little long-term damage, an important question to the policymaker remains as to how the adjustment can be made as quickly and painlessly as possible.

17. To shed light on this question, rather than including all observations, as was done in the previous section, this section focuses on crisis events only and considers in more detail the economic adjustment during the five years following a crisis. To maximize the sample size, the focus is on currency crises, for which more observations are available; twin crises, that is, contemporaneous banking crises, are controlled for via a banking crisis dummy.

18. The methodology closely follows Park and Lee (2002). For each of the five years following the onset of a crisis, average growth since the crisis year *T* is calculated and regressed on a number of variables, thus providing an understanding of countries' adjustment profile, and the evolution of its determinants, over time. The setup is parsimonious in order to focus on the main policy indicators, namely, fiscal and monetary. Financial (capital flows) and investment variables are also included in order to measure the extent to which domestic and international investors regain confidence in the economy. World economic growth, time dummies, trade-weighted real exchange rate developments, trade (the sum of exports and imports as a percentage of GDP), the country's per-capita GDP at the time of the crisis, and its average growth rate during the five years prior to the crisis are also included to control for world economic conditions as well as the country's economic development and business cycle.[2]

19. Table 4 presents the results for the growth regressions. Perhaps surprisingly, the coefficient on the pre-crisis growth variable is almost always positive. Although it is never statistically insignificant, it does suggest that countries with high growth rates do not suffer more strongly than countries that enter a crisis with more modest growth. The factors determining depth of the crisis (column 1) and its recovery (columns 2–6) change during the adjustment process. Countries that are able to avoid drops in investment moderate the negative growth impact at time *T*, with other factors, including fiscal and monetary policy, playing no role. As the country emerges from the crisis, the degree to which investment is maintained plays a smaller role, becoming insignificant from *T*+2 onwards. Fiscal and monetary expansions, in turn, start to play a more important role throughout the remainder of the recovery, although their quantitative importance peaks at around *T*+3. Capital flows play no statistically significant role until *T*+5. Twin crisis, that is, those that involve both a currency and a banking crisis, are particularly severe, although the added effect of banking crises appears to dissipate relatively quickly within two years after the crisis.

[2] Other variables were also experimented with, including a capital control variable and measures of fiscal volatility, none of which turned out significant in any of the regressions and therefore, in the interest of parsimony, were omitted from the final regressions.

Table 4. Dependent Variable: Average Per-Capita GDP Growth During k-1 Post-Crisis Years

k =	(1)	(2)	(3)	(4)	(5)	(6)
Per-capita GDP, T	-0.001	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000) **	(0.000)	(0.000)	(0.000)	(0.000)	(0.000) *
Pre-crisis GDP growth, T-5 to T-1	0.230	-0.065	0.032	0.034	0.071	0.032
	(0.218)	(0.144)	(0.140)	(0.136)	(0.105)	(0.088)
World growth, T to $T+k$-1	7.179	-0.969	-1.648	-2.804	-0.718	1.447
	(1.228) ***	(1.053)	(1.137)	(0.746) ***	(1.209)	(0.863) *
Investment/GDP, T to $T+k$-1	0.213	0.165	0.104	0.071	0.022	0.052
	(0.107) *	(0.088) *	(0.092)	(0.081)	(0.064)	(0.060)
Change in RER (trade-weighted), T to $T+k$-1	0.000	0.000	-0.000	-0.000	-0.000	0.000
	(0.000) *	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Trade, T to $T+k$-1	0.004	-0.013	-0.003	0.007	-0.002	-0.006
	(0.019)	(0.014)	(0.013)	(0.012)	(0.014)	(0.012)
Gov't cons growth, T to $T+k$-1	-0.003	0.079	0.096	0.158	0.144	0.131
	(0.057)	(0.033) **	(0.048) **	(0.060) **	(0.061) **	(0.064) **
Real money supply growth, T to $T+k$-1	0.038	0.143	0.145	0.178	0.170	0.110
	(0.028)	(0.046) ***	(0.037) ***	(0.041) ***	(0.051) ***	(0.042) **
Capital flows, T to $T+k$-1	0.034	0.147	0.033	0.081	0.214	0.405
	(0.171)	(0.111)	(0.093)	(0.108)	(0.137)	(0.122) ***
Banking crisis	-5.715	-3.750	-3.530	-1.848	-1.568	-1.161
	(2.204) **	(1.494) **	(1.437) **	(1.107)	(0.936) *	(0.764)
Observations	88	88	87	86	79	73
Adjusted R^2	0.33	0.43	0.33	0.42	0.43	0.49

Note: Numbers in parentheses are robust standard errors. Significance levels are *10%; **5%; ***1%. All regressions are estimated by OLS and include a constant and time dummies.

20. While macroeconomic demand management via fiscal and monetary policy is unlikely to be effective for boosting long-term growth, the lesson that emerges from these regressions is that they may play an important role during the recovery from a financial crisis. Of course, countries that are sufficiently robust to avoid confidence losses in the first place and can maintain high investment will be in a better position. Similarly, in the medium to long term, restoring both domestic and external confidence is crucial for growth. In this context, a word of caution is appropriate: while both fiscal and monetary expansionary policies are positively correlated with growth recoveries, an important possible link is not reflected in these regressions: to the extent that excessive fiscal and monetary policies may lower confidence, these may negatively influence capital inflows, for example. Hence, the positive coefficient may be upward biased. Nevertheless, modest expansionary policies are likely to help the recovery process.

21. The same regressions are repeated with investment-to-GDP as the dependent variable, the results are presented in Table 5. Fiscal and monetary policy appear much less relevant for investment. The key correlates of investment are trade and capital flows. That is, the external performance appears to matter strongly for investment flows. While the connection between investment and growth recovery does not appear very strong (see Table 4), it is likely to be important for long-run growth prospects as suggested by the earlier long-run growth regressions. Adjustments in the real exchange rate (specifically, devaluations, represented by decreases in the real exchange rate indicator) also help.

Table 5. Dependent Variable: Investment/GDP During k-1 Post-Crisis Years

k =	(1)	(2)	(3)	(4)	(5)	(6)
Per-cpita GDP, T	0.000	0.000	0.000	0.000	0.000	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Pre-crisis GDP growth, T-5 to T-1	0.848	0.640	0.606	0.686	0.522	0.422
	(0.177) ***	(0.202) ***	(0.189) ***	(0.163) ***	(0.168) ***	(0.190) **
World growth, T to $T+k$-1	2.601	5.590	-4.297	-6.505	1.225	3.541
	(1.300) **	(1.657) ***	(0.925) ***	(0.984) ***	(1.771)	(1.784) *
Change in RER (trade-weighted), T to $T+k$-1	0.000	-0.001	-0.001	-0.001	-0.001	-0.000
	(0.000)	(0.000) *	(0.000) ***	(0.000) *	(0.000) *	(0.000)
Trade, T to $T+k$-1	0.089	0.057	0.063	0.064	0.075	0.093
	(0.024) ***	(0.021) ***	(0.019) ***	(0.015) ***	(0.017) ***	(0.020) ***
Gov't cons growth, T to $T+k$-1	-0.015	-0.064	0.071	0.095	0.216	0.359
	(0.035)	(0.068)	(0.082)	(0.084)	(0.123) *	(0.146) **
Real money supply growth, T to $T+k$-1	-0.006	0.131	0.172	0.137	0.195	0.231
	(0.039)	(0.092)	(0.096) *	(0.075) *	(0.070) ***	(0.075) ***
Capital flows, T to $T+k$-1	0.653	0.835	0.793	0.818	0.928	0.529
	(0.158) ***	(0.222) ***	(0.164) ***	(0.171) ***	(0.183) ***	(0.303) *
Banking crisis, T	2.399	1.009	0.975	1.166	0.744	0.605
	(1.976)	(1.780)	(1.348)	(1.330)	(1.156)	(1.440)
Observations	88	88	87	86	79	73
Adjusted R^2	0.55	0.55	0.59	0.64	0.69	0.63

Note: Numbers in parentheses are robust standard errors. Significance levels are *10%; **5%; ***1%. All regressions are estimated by OLS and include a constant and time dummies.

Discussion

22. Overall, from a long-term perspective, the above analysis suggests that financial crises are costly, and more so in the case of a twin crises, that is, the contemporaneous occurrence of currency and banking crisis. Whether or not crises affect a country's long-term growth potential cannot be unambiguously determined from the regressions—the long-term growth reductions that were found may be a lowered growth potential, but they may also represent the unavoidable correction of pre-crisis growth rates that were unsustainable. In the latter scenario, therefore, growth reductions are to be interpreted as returns to the country's growth trend, rather than a reduction in the trend.

23. Although the long-term implications leave room for interpretation, it is clear that crises are costly, resulting in large average output losses when they occur and requiring several years of recovery. The second set of regressions provides some guidance to the policymaker as to how the recovery process can be helped. Expansionary fiscal and monetary policies are likely to help, as are mechanisms that allow for an adjustment of real exchange rates and a free flow of goods and capital. It is crucial, of course, to limit the negative effects of a crisis in the first place—here, countries that maintain high investment rates do better. Maintaining high investment rates is likely to be a function of the degree of confidence that market participants have in the economy, and as such, prudent and stable macro policies are generally likely to be helpful in mitigating the negative effects of crises.

C. The Case of Thailand

Recent growth experience

24. On the background of the cross-country analyses, this section examines in more detail Thailand's recent macroeconomic experience, with particular focus on the implications of the financial crisis of 1997/98 for Thailand's growth outlook. Figure 2 depicts per-capita GDP outcomes between 1990 and 2003 for the five East Asian countries hit by the crisis. The divergence of possible outcomes in the full sample of crisis, as documented in Table 1, is also reflected in the smaller context of the Asian crisis. While Korea could be interpreted as following the path of case 1 in Figure 1, quickly resuming its pre-crisis growth path, Indonesia can be seen to occupy the opposite end of the spectrum, experiencing the largest drop and suffering both a level and a growth decline, with Malaysia and the Philippines taking a similar path. While Thailand is recovering well particularly in recent years, it is not doing quite as well as Korea. Indeed, no country other than Korea appears to be resuming its pre-crisis path. This outcome is, of course, consistent with the negative crisis dummy coefficients shown in Table 2. As mentioned above, however, these comparisons pertain only to the growth path that was observed during the years prior to the crisis—as will be seen in the next section, there is little evidence that Thailand in particular has suffered a growth loss in comparison to its long-term growth average.

25. Given the empirical exercises in the previous section, it is worthwhile examining for each of the crisis countries some of the macro variables that were included in the regressions. Figure 3 presents the time-series for investment, the real exchange rate, trade, government consumption, M2/GDP, and capital flows for the five crisis countries during 1990–2003.[3]

26. All countries suffered drops in investment, and their ranking on this dimension broadly corresponds to the countries' relative growth recoveries: Korea has maintained a relatively high investment ratio, and also Thailand's recent growth spurt is consistent with its recovery in investment. By contrast, the other countries, after a brief bounce-back, suffered continuing declines in investment. The evidence is less clear on the trade dimension, with almost all countries (except for Indonesia) maintaining stable trade paths. Similarly, the empirical evidence for a positive effect of expansionary fiscal policy on growth recovery is not clearly borne out in the Asian crisis context; if anything, the reverse appears to be the case, lending support to the previously discussed potential role of fiscal policy for shaping investor perceptions and building confidence. Finally, M2/GDP appears to have contributed to Korea's recovery, where M2/GDP has been fairly expansionary since the crisis, in contrast to the other countries.

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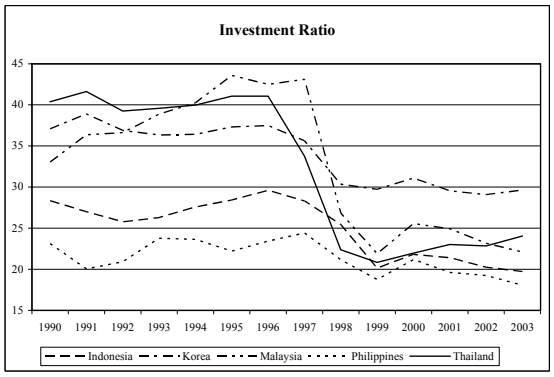
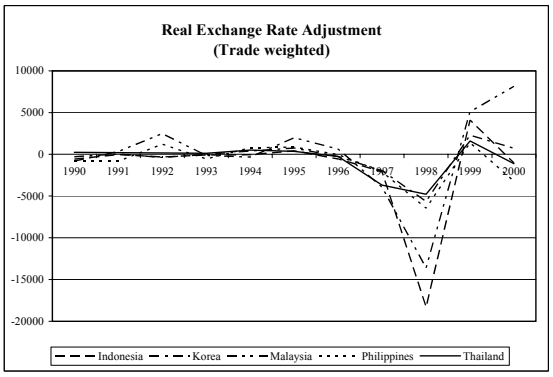
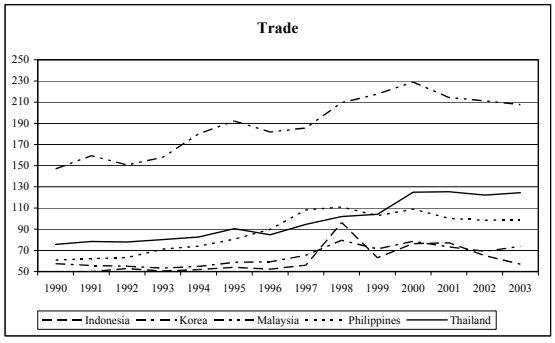
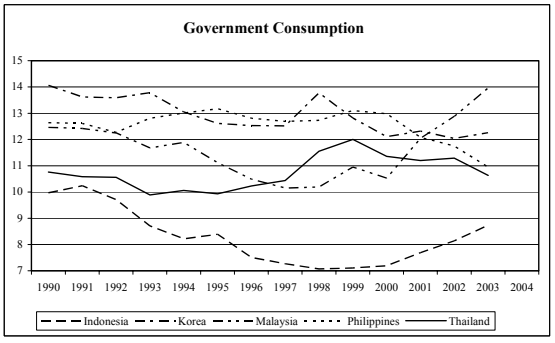
[3] No capital flows data were available for Korea. A money supply measure that may be more representative of actual liquidity conditions is M2a, which includes promissory notes in addition to M2. However, the BoT only provides this measure from 1994 onwards and cross-country availability of this measure is limited. Given that the analyses in this chapter utilize a sample with long time-series data for a large number of countries, the more standard M2-measure is used throughout. However, it is noted that for the 1994–2000 period, at a correlation coefficient of .97, the two time-series are highly correlated in Thailand, indicating that the results presented here are unlikely to be substantially affected by the choice of the money supply measure.

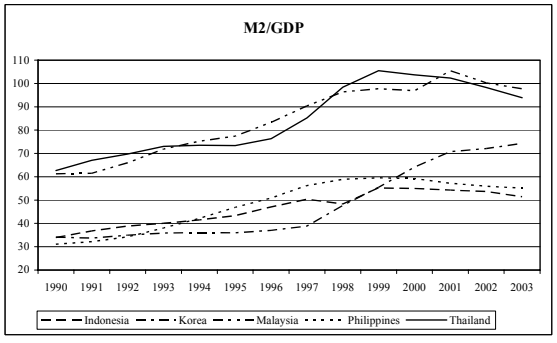
Figure 3. Selected Macroeconomic Variables, 1990-2003

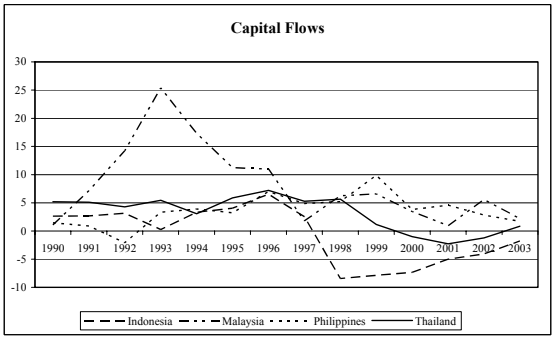












Growth outlook

27. This section attempts to look forward and to answer the question as to what Thailand's long-term potential is. This section employs several different methods, including nonstructural trend estimation techniques and growth accounting, all of which produce broadly similar results. To extract Thailand's long-term trend, two alternative methods were used: log-linear trend estimation, where the log of per-capita GDP is regressed on time, and Hodrick-Prescott filtering[4] (with λ=100 for annual values). Both methods included a shift dummy for 1997 to allow for trend shifts resulting from the crisis, and the trend estimation additionally included a slope dummy from 1997 onwards to allow for structural changes in growth rates. The actual series as well as the two trend series are shown in Figures 4 (levels) and 5 (growth rates).

28. Both methods agree that Thailand grew at an average rate of about 5 percent during the time period. Although potential growth may have increased somewhat during the early 1990s, most of the growth was above potential and thus unsustainable, as evidenced by the financial crisis. Neither method lends support to the hypothesis that the crisis has induced a significant deviation in growth from Thailand's long-term historical average.[5] The collapse in 1997/98 is thus best interpreted as a correction of the above-potential growth rates that prevailed during the run-up to the crisis, rather than as a change in Thailand's long-term trend. Although such estimations are backward-looking and are therefore ill-suited for forecasting purposes, they are suggestive that, in the absence of unexpected changes, and to the extent that historical structural relationships extend into the future, Thailand may well continue to grow at a rate of about 5 percent.[6]

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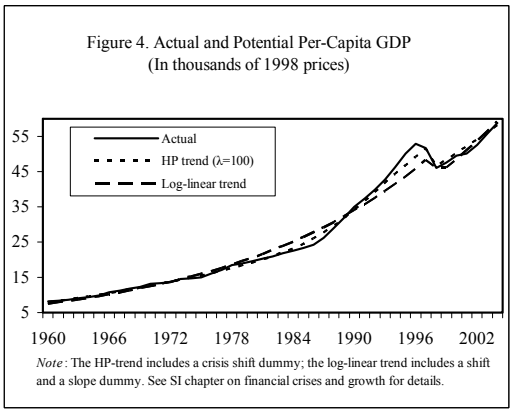
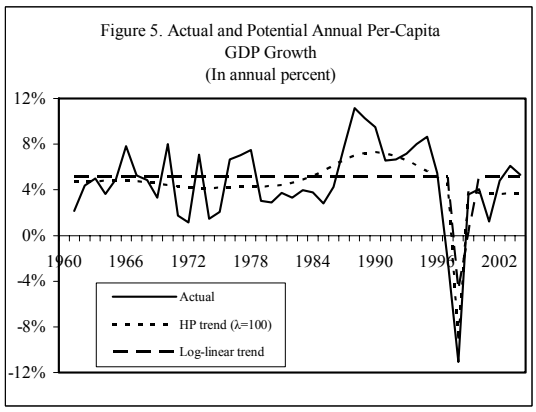
[4] The Hodrick-Prescott filtered time series was created by first regressing the log of per-capita GDP on time and a crisis shift dummy, adjusting the actual time series by removing the trend shift, filtering the adjusted data by applying the HP-filter, and finally adding the trend shift back into the filtered data.

[5] The apparent contradiction to the discussion in Section B is resolved by noting that Figure 2 compares post-crisis growth with growth in the 1990s, not with long-term growth as is done here.

[6] An important qualification applies, however, due to the limited numbers of observation since the crisis, making it difficult to reliably estimate post-crisis trend growth.





29. Given their atheoretical nature, these trend decomposition methods lack theoretical content; however, and it is therefore difficult to formally include economic assumptions in the forecast. An alternative approach with more economic context is growth accounting. This approach starts from the assumption that the aggregate production process follows a Cobb-Douglas production function of the form $GDP = TFP \cdot K^{\alpha} \cdot H^{1-\alpha}$, where K is the physical capital stock, H is the human capital stock, and α denotes the share of physical capital. Growth can then be decomposed as

$$\frac{\Delta GDP}{GDP} = \frac{\Delta TFP}{TFP} + \alpha \frac{\Delta K}{K} + (1-\alpha)\frac{\Delta H}{H}.$$

Given data on GDP, K, H and α, TFP can be calculated as a residual.[7]

30. This equation can be used in two ways. Under a long-term horizon, growth theory predicts a constant K/GDP ratio once a steady state has been reached.[8] Long-run per-capita steady-state growth can thus be expressed as

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[7] The capital stock is constructed as $K_t = (1-\delta)\cdot K_{t-1} + I_t$, where I_t is investment in year t and where a depreciation rate of $\delta = 0.05$ is assumed. The initial capital stock K_{1960} is taken from Bosworth and Collins (2003). For α, a variety of parameters were used. A constrained regression of GDP on K and H (with the coefficients summing to one) indicates $\alpha = 0.4$. Sarel (1997) uses an average value of 0.33, consistent with the standard value chosen in the macro literature. For robustness purposes, results for a value of 0.25 are reported as well. The human capital data are constructed as in Bosworth and Collins (2003), except that a 10 percent return on schooling is assumed (see Bils and Klenow, 2000).

[8] This is easy to see from the capital accumulation function from the previous footnote, which can be rewritten as $K_t/K_t.1 = 1 - \delta + I_{t-1}/K_{t-1}$. In a steady state, both the growth rate of K and the ratio I/GDP must be constant. This means one can express $I = sGDP$, where $s > 0$ is a constant. Consequently, $GDP_t/K_{t-1} = (K_t/K_{t-1} - (1-\delta))/s$ = constant, and so $K_t/K_{t-1} = GDP_t/GDP_{t-1}$.

$$\frac{\Delta GDP}{GDP} = \frac{\Delta TFP}{TFP} \Big/ (1-\alpha) + \frac{\Delta H}{H}.$$

Predicting long-term growth then requires making assumptions on growth in TFP, K and H, and on the value of α.

31. Assuming constant employment and labor force participation rates, growth in H is the sum of population and per-worker human capital growth. Population growth has converged to about 0.7 percent in recent years, while human capital per worker has grown at about 0.8 percent during the last five years. Human capital growth is thus estimated at 1.5 percent. As the growth accounting equation shows, historical TFP calculations, and consequently TFP predictions to the extent that they are based on historical experience, are largely a function of α, given time series for K and H. It turns out, however, that average TFP growth rates are very similar, around 3.1 percent, during 2000–04 for all three values of α that were used.[9] Nevertheless, even small differences in TFP growth are magnified. Table 6 summarizes the resulting long-term growth predictions. According to these calculations, Thailand may approach per-capita growth rates between 5 and 6.1 percent in the long term, close to Thailand's historical long-run average.[10]

32. These projections look very far into the future. Over a medium-term horizon, the assumption of a constant K/GDP-ratio is likely not met. Staff estimates that the investment-to-GDP ratio may reach 30–35 percent by 2010, resulting in average capital accumulation rates of around 5.5 percent during that time period. A continuation of recent TFP growth and human capital growth of 1.5 percent would result in medium–term growth between 5 and 5.7 percent, between Thailand's historical growth and the long-term growth rates estimated above.

33. All of these projections omit many potentially relevant features. In particular, all of the above methods extrapolate from the past and implicitly assume that past structural relationships extend into the future, which may not be appropriate. By the same token, however, projecting higher growth rates than those above would require significant structural breaks with Thailand's past experience over the last four decades. It is noted that the projections above are based on the continuation of recent high TFP growth rates, which may be considered optimistic given that historical TFP growth was between 1 and 2 percentage points lower.

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[9] TFP growth in earlier periods differs more drastically across values α; for the whole period 1960–2004, average TFP growth ranges from 1.1 percent (α = 0.4) to 2 percent (α = 0.25).

[10] However, it is worth emphasizing that these rates are based on the recent years' TFP growth performance. A return to Thailand's long-run TFP growth would lower the growth estimates to between 2.7 and 3.5 percent.

D. Conclusion

34. The goal of this chapter has been to examine countries' experience with and recovery from financial crises, with a special application to the case of Thailand. There are several findings. Growth experiences after financial crises vary significantly across countries, with some countries experiencing growth accelerations. However, the average country suffers, with growth rates below those prior to the crisis even 5 to 10 years after the event. However, the general cross-country analyses do not reveal whether crisis permanently lower countries' growth potential or whether they simply correct unsustainable paths. In the case of Thailand, the answer appears to be the latter—while growth rates have come down from the exuberant rates in the 1990s that led into the crisis, the rates since then seem perfectly in line with Thailand's longer growth experience. Looking ahead, various methods suggest that such growth patterns are also likely to continue in the future.

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IV. Credit Booms: The Good, The Bad, and The Ugly[1]

While financial deepening has been shown to be both a cause and an effect of economic development, the rapid growth of credit aggregates has often been associated with episodes of bank distress, leading to the widespread belief that credit booms are a recipe for financial disaster. However, historically, only a minority of boom episodes has ended in a crash. This paper examines the characteristics of a panel of credit booms and identifies factors that can help the early detection of dangerous bubbles from episodes of healthy financial deepening.

A. Introduction

1. **The past 20 years have witnessed a global trend towards increasing financial deepening.** Financial intermediation has grown and in that context bank credit has increased dramatically in relation to GDP. In most Asian countries the ratio of bank credit to the private sector to GDP (BCPS ratio) more than doubled between 1980 and 2002. In Thailand, it about tripled over the same period, increasing from 27.5 percent to 77.5 percent

BCPS Ratio in Selected Economies
(in percent)

	1980	2002
United States	31.4	42.0
United Kingdom	26.4	138.1
India	20.5	30.8
Indonesia	8.3	20.8
Korea	37.3	89.4
Malaysia	36.7	95.3
Philippines	29.3	31.6
Singapore	65.7	106.6
Thailand	27.5	77.5

Source: IFS, staff's calculations

2. **However, this process has not been always a smooth one.** While in some countries financial deepening has followed an even path, in others it has been a bumpy process with sharp accelerations in aggregate credit, or credit booms, sometimes followed by episodes of financial distress and banking crises. This has contributed to the widespread belief that credit booms are a recipe for financial disaster.[2] However, the evidence shows that several episodes of fast credit growth have soft-landed without causing any disruption.

3. **Recent theoretical contributions suggest that different types of credit booms exist, supported by different underlying economic forces.**[3] Some booms—the "good" ones—reflect healthy financial deepening as credit grows faster than output as an economy develops. Others are associated with the financing needs of the corporate sector during the upside phase of the cycle. These booms, while not intrinsically "bad", can lead to increased fragility if banks' risk attitude changes with the cycle, if the rapid credit growth puts the resources of bank supervisors under strain, or if a financial accelerator mechanism leads to excessive bank exposure.[4] Finally, credit booms can be the "ugly" reflection of financial

[1] Prepared by Giovanni Dell'Ariccia.

[2] See Gourinchas, Valdes, and Landerretche (2001) for a discussion.

[3] See Gourinchas et al. (2001) and Hilbers et al. (2005).

[4] See Rajan (1994), Kiyotaki and Moore (1997), and Dell'Ariccia and Marquez (2004).

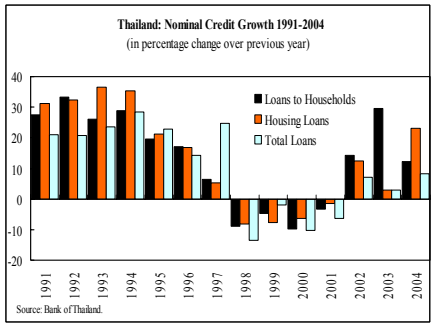
intermediation bubbles and destined to lead to financial crises and often associated with macroeconomic imbalances, such as large current account and public deficits and asset price bubbles.

4. **The question is, then, whether we can tell healthy from dangerous credit growth in advance and possibly intervene early, hence, avoiding major financial problems.** This paper sheds some light on this issue by identifying episodes of faster-than-normal credit growth and examining if, based on the information available to policy makers and market participants at the time of the episode, it is possible to distinguish between benign financial deepening and dangerous credit bubbles. The paper presents a new empirical framework to tackle this issue. The results suggest that it is not possible to fully discriminate between "good" and "bad" (or "ugly") credit booms, but several macroeconomic variables help to predict whether a boom is heading for some form of financial distress. In particular, booms that are longer lasting and greater in size and those associated with high inflation rates and large current account deficits are more likely to lead to crises. There is also some evidence that bad booms are associated with large increases in asset prices and with rapid investment growth. Finally, bad booms often occur in the context of real exchange rate appreciations and asset price bubbles, possibly associated with capital inflows. Further research is needed to refine these estimates in particular with regard to the role of sectoral imbalances and asset prices for which limited data have been available so far.

5. **The proactive use of prudential regulation and bank supervision may complement monetary policy to preserve financial stability during booms.** Monetary policy alone may not be sufficient to manage the trade-off between fast financial deepening and financial stability. First, especially in inflation-targeting regimes, monetary policy may find itself facing conflicting objectives if a boom develops during a period of low inflation. Second, monetary policy may be ineffective to the extent that a boom is fueled by capital inflows under an open capital account. Finally, monetary policy is a blunt and expensive instrument to tackle credit "bubblets" which may develop in specific sectors of the economy, while aggregate credit numbers are stagnant. In that context, regulatory curbs and prudential measures have been used with some success to limit sectoral credit growth.[5]

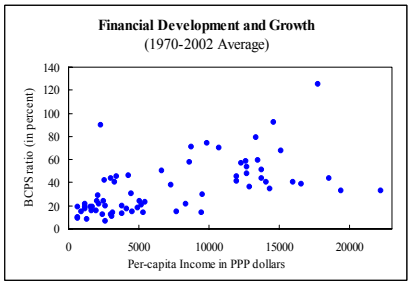
[5] See Hilbers et al. (2005) for a discussion of this issue.

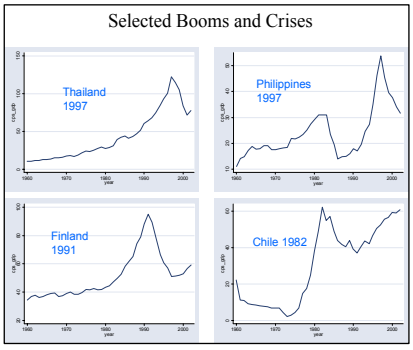
6. In recent years Thailand has experienced sluggish credit growth, but some segments of the credit market have been developing fast. Since 1998, aggregate bank credit to the private sector has been anemic, reflecting bank restructuring and corporate sector deleveraging, and the BCPS ratio has decreased consistently until 2004. Since 2002, however, banks have been actively extending credit to the household sector, resulting in fast rates of growth in the mortgage and credit-card markets. While, between 2001 and 2004, total loans grew by only about 19 percent on a nominal basis, housing loans grew by about 42 percent, lending support to a recovering real estate market, and overall loans to households grew by 66 percent. Over the same period, credit-card debt outstanding almost doubled. The Bank of Thailand has acted early to avoid the accumulation of potentially dangerous imbalances in the banking system. For example, prudential curbs were introduced to limit the growth of credit-card debt, establishing ceilings on outstanding balances and minimum income requirements for card holders. These measures have encountered some success with the rate of growth of credit-card debt slowing to an annualized 9 percent in the first four months of 2005. It should be noted that the analysis below does not apply to the current situation in Thailand. Thailand is not experiencing a credit boom, but only fast credit growth in some sectors of the economy.



B. Stylized Facts

7. **A positive relationship between financial development and growth has been long established.** Furthermore, a more recent literature based on industry-level data has shown that financial development is not just the result but also a determinant of economic growth.[6] Fast credit growth is, then, a positive development to the extent that it reflects fast financial deepening. For example, Ireland's strong macroeconomic performance of recent years has been accompanied and supported by an extremely fast growth of the BCPS ratio, without causing any major financial problems.





8. **However, excessively fast credit has also been associated with increased financial fragility and banking crises.** Most major banking crises in the past 25 years have been in the wake of periods of extremely fast credit growth. This regularity is not limited to emerging markets, but extends to advance economies as well: the Scandinavian banking crisis of the early 1990s followed a period of extreme credit growth. Other notable examples include Argentina in 1980, Chile in 1982, Mexico in 1994, and the Asian crisis of 1997. In the run-up

[6] See for example, Rajan and Zingales (1998).

to these crises the annual growth rate of the credit-to-GDP ratio often exceeded 5 percent, and in some countries was as high as 10 percent. All these crises involved heavy macroeconomic losses and were followed by prolonged periods of sluggish credit growth.

9. **That said, only a minority of credit booms has led to episodes of financial distress.** Out of 150 credit booms identified in this paper, only about a fifth (31) precedes systemic banking crises, with that proportion rising to about a third (47) if minor episodes of financial distress are included. Banking crises can also occur without lending booms. In our sample, for example booms precede less than half of the 70 systemic crises and the 110 episodes of financial distress.

C. Data and Methodology

10. **This paper identifies credit booms by examining whether the actual rate of growth of credit in an economy—as measured by BCPS ratio— appears abnormally high relative to its previous trend.** Then, based on a panel of developing and industrialized countries, it constructs a dummy variable that takes the value zero in the case of "good" booms and the value one in the case of "bad" booms defined as those that are followed by an episode of financial distress within two years from their end. Finally, it collapses the panel to a cross-section of credit boom episodes and regresses the dummy variable on a set of macroeconomic variables contemporaneous to the boom.

11. **The sample used in our regressions consists of 73 countries over the period 1980–2002.** It was selected along criteria similar to those in Gourinchas, and others (2001): for all the countries in the sample at least 15 years of data are available and the private credit to GDP ratio is at least 15 percent. In addition, several countries for which data appeared unreliable or that were affected by exogenous shocks such as persistent political turmoil and civil wars were excluded from the sample. Bank credit data are from line 22d of the *International Financial Statistics* (*IFS*) and GDP data are from line 99b. These series were corrected for structural breaks which otherwise would have likely been identified as booms. The series on inflation and the current account are from the WEO. Data on banking crises and episodes of financial distress are from Caprio and Klingebiel (2003).

12. **Since credit is a stock variable measured at year-end, the BCPS ratio is constructed with the geometric average of GDP in years *t* and *t+1*.** This measure has two main advantages. First, it can be built with readily available data with widespread country and time-series coverage. Second, it does not consider the financial sector in isolation, but relates it to the size of the economy, while at the same time correcting for the procyclicality of bank lending. That said, because of the positive relationship between financial development and growth, bank lending follows a positive trend, even when measured in relation to GDP. Therefore, credit booms need to be isolated as definite events separate from normal increments in the volume of credit.

13. **We apply the methodology developed in Gourinchas et al. (2001) and define a lending boom as an episode where the BCPS ratio deviates from a rolling, backward-**

looking, country-specific trend (estimated by a non-linear trend).[7] This means, that credit growth in each year *x* will be compared with a trend estimated over the period 1980-*x*. The idea is that such trend represents the historically "normal" pace of credit growth for each particular country. Furthermore, the estimated trend summarizes the information about past credit growth available to policy makers and market participants at the time of the boom. Alternatively, a trend could be estimated over the entire sample period, as in Mendoza and Terrones (2004). However, this approach would have two drawbacks. First, it would tend to overestimate bad credit booms because of the bias introduced by the subsequent crisis. Second, it would make use of information not available at the time of the boom, and hence, would make the estimates difficult to apply operationally.

14. **Based on this approach, an episode of fast credit growth becomes a boom if its deviation from the trend exceeds a certain threshold.** As in Mendoza and Terrones (2004), this paper employs country- and path-dependent thresholds, based on the standard deviation of the historical deviations of the BCPS ratio from its estimated trend. More specifically, an episode becomes a boom if the BCPS ratio exceeds or meets either of the two following conditions:

> i) The deviation from trend is greater than 1.5 times its historical country-specific standard deviation and the annual growth rate of the BCPS ratio exceeds 10 percent.
>
> ii) The annual growth rate of the BCPS ratio exceeds 20 percent.

This definition takes into account country-specific conditions and reflects both the relative level and the speed of the BCPS ratio. A country-specific threshold is needed since what may seem like a large deviation in countries with a historically smooth credit growth may be the norm in a country with an experience of uneven growth. The growth rate of the BCPS ratio is included to control for those cases where because of a relatively smooth acceleration in credit, extremely fast credit growth may occur while the actual BCPS ratio falls close to its trend.

15. **Once a credit boom is identified, its starting point is defined according to a similar criterion**, that is the earliest year in which: (i) the BCPS ratio exceeds its trend by more than three-fourths of its historical standard deviation and its annual growth rate exceeds 5 percent; or (ii) its annual growth rate exceeds 10 percent. A boom ends as soon as either of the two following conditions is met: (i) the growth of the BCPS ratio turns negative; (ii) the BCPS ratio falls within three-fourths of one standard deviation from its trend and its annual growth rate is lower than 20 percent.

16. **The panel is then collapsed to a cross-section of booms.** Two versions of a dummy variable, *BAD*, are constructed taking value one for booms followed within two years from their end by episodes of financial distress and by full-fledged banking crises, respectively. The country-specific mean value over each boom period of several macroeconomic and

[7] Gourinchas et al. (2001) employs a Hodrick-Prescott (HP) filter. This paper uses a cubic trend to avoid problems related to the end-point bias associated with the HP methodology.

structural variables, such as inflation, the current account balance, GDP growth, the capital account balance, the change in stock market capitalization, boom duration, and deviation of the BCPS ratio from its trend are associated with each observation. Finally, the following model is estimated with a probit regression:

$$BAD_i = \alpha + \Gamma X_i + \varepsilon_i;$$

where α is a constant and X is a vector of country-specific macroeconomic and structural variables averaged over the boom period.

D. Results

17. **The descriptive statistics of macroeconomic variables during credit boom episodes suggest that good and bad booms differ along several dimensions:**

i) *Bad booms appear to occur more often in countries with relatively higher per-capita income and BCPS ratios.* This suggests that episodes of fast credit growth are likely to reflect a catching up in financial deepening when they occur in poorer and less financially intermediated countries.

ii) *The size and duration of the boom matter*. Bad booms last on average almost a year longer and have deviations from trend about 25 percent larger than good ones.

iii) *Bad booms are associated with higher economic growth than good booms, but are accompanied by higher inflation and larger current account deficits.* This is consistent with the idea that bad booms are bubble-like phenomena often accompanied by domestic and external macroeconomic imbalances.

iv) *Bad booms are associated with large capital account surpluses and real exchange rate appreciations*, consistent with the notion that domestic banking systems may run into problems when they need to intermediate large capital inflows.

v) *Finally, there is evidence that asset price bubbles and investment booms may play an important role in determining whether a credit boom is bad or good*. During bad booms stock market capitalization increases on average by 113 percent compared to a much lower 47 percent in good booms. The investment-to-GDP ratio increases by 1.3 percentage points compared to 0.7 percentage points.

Selected Macroeconomic Indicators during Credit Booms 1/ (in percent, unless otherwise indicated)			
	All	Good	Bad
Number of Episodes	79	50	29
GDP per-capita (in US$)	$5,050	$4,840	$5,390
BCPS ratio	34.5	30.9	40.1
BCPS ratio deviation from trend (in percent of GDP)	4.3	3.9	4.8
Duration (years)	3.0	2.7	3.5
Annual GDP Growth	3.7	3.4	4.2
Annual Inflation	13.2	10.3	18.2
Current Account Balance (in percent of GDP)	-1.8	-0.8	-3.5
Capital Account Balance (in percent of GDP)	1.3	0.6	2.8
Change in REER 2/	8.0	6.7	10.6
Change in Stock Market Capitalization 2/	81.8	47.2	113.9
Change in Investment (in percent of GDP) 2/	0.9	0.7	1.3
Sources: WEO, IFS, Staff's calculations			
1/ Based on 79 boom episodes for which all data is available and inflation < 100 percent.			
2/ Based on a subset of episodes for which data is available.			

18. **These stylized facts are reflected in the results of our probit regression.** Data availability limited our choice of variables for this empirical model. The stylized facts described above suggest that variables such as real exchange rate appreciation, capital account balance, and changes in stock market capitalization should enter our regression. However, this would reduce drastically the number of observations and would make it close to impossible to obtain meaningful estimates. We, then, estimate a very parsimonious model where the dummy variable *BAD* is regressed over the current account balance (*CA*), inflation (*INFL*), boom duration (*DUR*), and the deviation of the BCPS ratio from its trend (*DEV*):

$$BAD_i = \alpha + \beta INFL_i + \gamma CA_i + \delta DEV_i + \zeta DUR_i + \varepsilon_i .$$

19. **All coefficients have the expected sign and are statistically significant.** Furthermore, their effect is economically relevant. Inflation and the absolute deviation from trend have the largest impact. A 1 percent increase in the inflation rate increases the probability that a boom will result in a crisis by 0.5 percentage points and an equivalent increase in the deviation from trend increases it by 0.6 percentage points. One percent increases in boom duration and the current account balance have smaller impacts of about 0.4 percentage points and 0.1 percentage points, respectively. Notably, the pseudo R-square of the regression is relatively low, indicating that still a lot of what makes a credit boom bad remains to be explained and that further research is needed to refine these estimates. For example, based on a smaller set of countries than in this paper, Borio and Lown (2002) find that sustained rapid credit growth combined with large increases in asset prices appear to increase the probability of financial instability.

20. **Finally, a word of caution on the interpretation of these results.** While models as that in this paper can be useful to predict whether a boom is bad or good, they have limitations when it comes to policy analysis. The extreme simplicity of the model leaves it open to omitted variable biases and potential simultaneity biases associated with the variables employed as regressors sheds doubts over the results of comparative static exercises based on

the model. That said, this model is a first step towards a better understanding of what determines whether a credit boom is bad or good.

Probit Regression (Sample of 79 booms with inflation < 100 percent)				
Dependent Variable *BAD*	Coefficient	Std. Error	z	Elasticity
Current Account Balance	-0.05*	0.03	-1.66	0.11
Duration	0.10*	0.06	1.65	0.36
Deviation from trend	0.12**	0.06	2.03	0.61
Inflation	0.03***	0.01	2.62	0.48
Constant	-1.88***	0.45	-4.15	...

BAD is based on all episodes of financial distress.
*, **, and *** represent statistical significance at the 10 percent, 5 percent, and 1 percent, respectively

E. Related Literature

21. **A large literature on banking crises finds a positive, but often small and not always significant, link between credit growth and financial crises.** Demirguc-Kunt and Detragiache (2002) and Kaminsky and Reinhart (1999) find evidence that fast credit growth increases the probability of banking crises. Gourinchas, and others (2001) examine a large number of episodes characterized as lending booms and find that the probability of having a banking crisis increases after such episodes and that the conditional incidence of having a banking crisis depends critically on the size of the boom. However, they find that the increase is not statistically significant, and that, as with this paper, and consistent with Tornell and Westermann (2001), most lending booms are not followed by crises. Mendoza and Terrones (2004) reach, instead, the conclusion that lending booms are typically bad. However, their definition of boom may entail a bias as their trend is estimated over the entire sample period. Hilbers, and others (2005) compare the behavior of several macroeconomic variables around booms and find evidence consistent with the results in this paper, in particular with regard to inflation and the current account balance.

22. **A few recent theoretical papers have provided explanations for why lending booms can lead to financial crises, especially in emerging economies.** Here we provide a brief and far from exhaustive review of these contributions. "*Financial accelerators*" (Kyiotaki and Moore, 1997): an increase in value of collateralizable goods releases credit constraints. This leads to an increase in the volume of lending, which in turn fuels further increases in asset values. When a negative shock inverts this cycle, the banking system may find itself overexposed. "*Institutional memory*" (Berger and Udell, 2004): in periods of fast credit expansion it is difficult for banks to recruit enough experienced loan officers (especially if there has not been a crisis for a while). This leads to a deterioration of loan

portfolios, which reduces bank profitability and increases the probability of a crisis. "*Adverse Selection and the Business Cycle"* (Dell'Ariccia and Marquez, 2005): during the expansionary phase of the cycle, adverse selection is less severe and banks find it optimal to reduce borrower screening and lending standards to trade quality for market share. This leads to deteriorated portfolios, lower profits, and an increased probability of a crisis.[8]

[8] Other related theoretical contributions include Caballero and Krishnamurthy (2001) and Tornell and Westermann (2002).

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