What Do Capital Inflows Do?
Dissecting the Transmission Mechanism for Thailand, 1980–96

W. Jos Jansen*

Monetary and Economic Policy Department, De Nederlandsche Bank, Amsterdam, Netherlands

This paper examines the effects of private financial (non-FDI) capital inflows in Thailand in the pre-crisis period (1980:I–96:IV). Private capital inflows are found to be associated with higher asset prices, lower lending rates, surges in bank lending and domestic spending driven by higher investment, higher output, modest inflation, and modest real exchange rate appreciation. Inflows are also associated with a greater vulnerability to a liquidity crisis, but not with greater external solvency risk. Current account deficits are temporary, thus sustainable, as exports catch up with higher imports within two years. Consequently, the Thai crisis appears to be more of a liquidity crisis than an external solvency crisis.

JEL Classification Numbers: F30, F40, E44, O53
Keywords: Asian crisis, capital flows, lending boom, investment boom, transmission mechanism

W. Jos Jansen
Monetary and Economic Policy Department
De Nederlandsche Bank
P.O. Box 98
1000 AB Amsterdam
The Netherlands

Email: w.j.jansen@dnb.nl; wjosjansen@hotmail.com
Fax: 31-20-5242506
Phone: 31-20-5245727

July 2002 (final version, forthcoming in the *Journal of Macroeconomics*)

* Much of the research reported in this paper was done when I was a consultant with the Economic Policy Group of the PREM Network in the World Bank. The views expressed in this paper are my personal views, and not necessarily those of De Nederlandsche Bank or the World Bank. I would like to thank Amar Bhattacharya, Stijn Claessens, Swati Ghosh, Job Swank, Peter Vlaar and two anonymous referees for helpful comments on earlier drafts.

1. Introduction

The recent Asian financial crisis has again focused attention on the risks of large-scale private financial (non-FDI) capital flows to developing countries. Such flows may benefit recipient countries, because they allow a faster build-up of the capital stock. But they also pose the challenge of channeling the external funds to productive projects and avoiding macroeconomic overheating in an economy that, as a rule, does not have a sophisticated financial system yet. Moreover, they may make a country vulnerable to the serious disruptive effects of sudden and large capital outflows. Due to their structural reforms in the 1980s and strong fundamentals Indonesia, Malaysia, South Korea and Thailand were able to attract large amounts of foreign capital until 1997. Their economies prospered, achieving economic growth rates that far outstripped the global average. But after the devaluation of the Thai baht in July 1997, these economies suffered a private capital flow reversal of 100 billion dollar within a year, plunging them into an extremely severe recession.

The events of 1997–98 raise the question what financial capital inflows do in economies that are at an intermediate level of financial development. The burgeoning literature on the Asian crisis emphasizes the behavior of banks in the transmission process. Domestic banks play a dominant role in the financial intermediation process, as capital markets are underdeveloped in these economies. Large banks, and firms sometimes as well, operate under implicit government guarantees and poor supervision. Moreover, banks have poor credit quality assessment and monitoring capabilities, and are often undercapitalized. Moral hazard thus creates powerful incentives for external borrowing

(which is sometimes also stimulated by fixed exchange rate policies) and for lending to domestic parties that engage in excessively risky projects. The easing of liquidity constraints facing firms and consumers stimulates aggregate demand, which may be biased towards the nontradable sectors. The real estate sector, in particular, is prone to overinvestment. The lending boom fuels a stock market and property market boom, leading to increases in collateral values, which then may further sustain the credit boom. In the end, the country may find itself with a current account deficit, an overvalued exchange rate, and a financial system and corporate sector whose balance sheets are excessively vulnerable to declines in asset prices, including the exchange rate and property prices. When adverse shocks occur, concerns about the fragility of the financial system start to mount, and may rapidly translate into the collapse of the exchange rate peg and a full-blown financial crisis.[1]

Taking the story above as a starting point, this paper attempts to cast light on the background of the Asian crisis by analyzing step-by-step what happens when a private financial (that is, non-FDI) capital inflow enters a country. Unlike other papers, which compare experiences across countries within a relatively short time-span on the basis of annual or averaged data, this paper presents an in-depth description of the transmission mechanism for Thailand in the pre-crisis years (1980–96) based on quarterly data. Such an analysis provides a historical frame of reference for judging the Asian crisis. In order to dissect the transmission process of private capital inflows we have assembled quarterly data on a broad array of real and financial sector variables. We address questions like: What is the reaction of the central bank to the capital inflow? Is there a subsequent surge in lending, building activity, investment or consumption? Do private capital flows carry the

seeds of a crisis by encouraging unsustainable current account deficits? Our empirical methodology is borrowed from the literature on the monetary transmission mechanism, in particular the paper by Christiano, Eichenbaum and Evans (1996).[2] The focus on Thailand is motivated by the fact that it was the breakdown of the baht-dollar peg that ignited the Asian financial crisis in July 1997. The mechanisms stressed above may be easier to uncover in the Thai case, since the experience of the other countries in the region is probably tainted by contagion effects (Baig and Goldfajn 1999). In addition, Thailand has received sizable amounts of foreign private capital since the late 1970s, making an empirical analysis based on time series data feasible.

The remainder of the paper is organized as follows. Section 2 presents some key facts on the size and nature of private capital flows to Thailand during 1980–96. Moreover, it briefly discusses central bank policies and the roles commercial banks, finance companies and capital markets played in the financing of investment and consumption in Thailand. Section 3 goes into some econometric issues, while Section 4 presents an empirical description of the transmission mechanism – the way private capital inflows ultimately translate into changes in output and the price level. Section 5 discusses whether the Thai baht crisis was more of a liquidity crisis than an external solvency crisis. Section 6 contains a summary and discusses some policy implications.

2. Key facts about the Thai economy, 1980–96

This section presents some essential features of the Thai economy during the years 1980–96, which are key to an understanding of the transmission mechanism of financial private

capital inflows in this period. We present data on the size and composition of private capital flows to Thailand, briefly discuss some central bank policies, and describe the make-up of the financial sector, focusing on the different roles which commercial banks, finance companies and capital markets played in the financing of certain types of investment and consumption in Thailand.

Private capital inflows

Until the crisis broke in 1997, Thailand was very successful in attracting private capital flows, as is evident from Figure 1. During the recent inflow period 1988–96, private capital inflows averaged 10% of GDP per year. However, substantial inflows were also recorded in the first half of the eighties. Thailand needed the capital inflows to finance its persistent and large current account deficits, which since 1988 are largely driven by an investment boom rather than a consumption boom (World Bank 1997). Investment as a percentage of GDP increased from an average of 26% in the mid-1980s to an average of 41% in 1990–96. National saving sharply increased as well, but not enough to prevent a steep increase in the current account deficit. Since 1987 more capital has flown into Thailand than was needed to finance the current account deficit, translating into a growing stock of international reserves. Between 1986 and 1996 Thailand's international reserves increased from 7% of GDP to 21% of GDP.

[INSERT FIGURE 1 AND TABLE 1 ABOUT HERE.]

Table 1 contains data on the composition of the private capital flows. Although measured as a share of GDP foreign direct investment has risen after 1987, its share in the total private flow has been on a declining trend since the mid-1980s. Loans have always been the most important component of the capital inflow, and since 1987 a shortening of maturity has occurred. Between 50 and 60% of the financial (non-FDI) inflows are short-term debt flows during 1987–96. The importance of portfolio capital has sharply increased in the 1990s, accounting for about a quarter of total private inflows during 1993–96.

Central bank

The Bank of Thailand (BOT) can be characterized as a conservative central bank, whose main objective was low inflation.[3] Average inflation (based on the CPI) was only 4% between 1982 and 1996, which is very low for a developing country. Monetary policy was anchored by an exchange rate policy aimed at a fixed parity with the dollar (Kochhar *et al.* 1996). Monetary policy was implemented by influencing short-term interest rates, especially the cost of bank liquidity (Easterly and Honohan 1990). In general, the Bank of Thailand did not rely on direct instruments (such as credit ceilings) for monetary control, but used three indirect instruments instead: (1) frequent open market operations in the repurchase market; (2) infrequent adjustments of the bank rate, used to signal changes in the policy stance; and (3) moral suasion, which was feasible because of the high degree of concentration of the banking system. Reserve requirements were only used for prudential purposes, and were fixed at 7% of all deposits.[4]

Commercial banks

The Thai financial system was dominated by financial institutions rather than capital markets. Commercial banks and finance companies accounted for about 90% of total credit extended to the private sector at the end of 1996. Commercial banks are the most important financial intermediaries, although their market share in the provision of external finance to the corporate sector has declined from about 85% in the early 1980s to about 80% in 1993–95 (Callen and Reynolds 1997). For most of the period 1980-96 the banking system counted 15 domestic banks and 14 foreign banks, as new entry was severely restricted. Domestic banks dominated the banking system, accounting for over 95% of total banking sector assets, with the five largest domestic banks possessing two-thirds of total bank assets. Banks mainly attracted domestic funds by issuing deposits, mostly time and savings deposits. In the 1990s foreign borrowing became an important alternative source of funds as a result of capital account liberalizations and the relaxation of foreign exchange controls.[5]

[INSERT TABLE 2 ABOUT HERE.]

The upper panel of Table 2 presents some data on the credit portfolio of the banking sector. Bank loans as a percentage of GDP more than tripled between 1980 and 1996, reflecting in part a continuing process of financial deepening.[6] In general, the Bank of Thailand relied on moral suasion to influence the lending policies of the commercial banks. Banks had to submit credit allocation plans to the BOT every six months, but in practice they determined their lending portfolios under few formal constraints (Easterly

and Honohan 1990). About 20% of the bank loans at the end of 1996 went to the real estate, construction and financial services sectors, which are relatively vulnerable to cyclical fluctuations of the economy. Loans to the real estate sector have sharply increased over time, from a share of 3% in the early 1980s to more than 11% in the early 1990s, when the property market boomed. The share in the loan portfolio for personal consumption purposes has risen steadily, from 8% in the early 1980s to 12% in the 1990s.

Finance companies

Finance companies were the other important class of financial intermediaries. There were some 90 finance companies in Thailand, which accounted for approximately 20% of total credit extended to the private sector.[7] Total credit outstanding rose from 8% of GDP in 1980 to 32% in 1996 (Table 2, lower panel). Their activities comprised short-term finance, leasing finance, underwriting and security trade, and consumer finance. Finance companies traditionally directed more of their lending toward riskier, but higher yielding activities, because their cost of funds was higher and they faced even fewer restrictions than banks on their lending practices.[8] Finance companies were big players in the markets for consumer credit and real estate credit, with market shares of 37% and 47% respectively in 1996. Margin loans on securities accounted for 8.5% of their loan portfolio at the end of 1996. The lower panel in Table 2 shows that in the 1990s approximately two-thirds of the loan portfolio went to the construction and real estate sectors, the financial services sector, and consumer credit, which was twice as much as for banks. In comparison with commercial banks, finance companies were thus much more exposed to economic and financial shocks.

Capital markets

The stock market played a modest part in the financing of private sector investment. Stock market capitalization was in the first half of the 1980s very small, but grew spectacularly from 7% of GDP at the end of 1986 to 105% of GDP at the end of 1993. This increase was the result of an enormous hike in the share price index as well as a steep increase in the number of companies listed on the Stock Exchange of Thailand. In 1986 only 98 companies were listed, while in 1993 this had risen to 347. Since then the share price index has nosedived due to anxiety about financial weaknesses, but the number of listed companies has continued to grow. At the end of 1996, total stock market capitalization stood at 55% of GDP and 454 companies were listed. New issues of shares financed around 5% of private sector investment between 1987 and 1995; before 1987 this was only 1% (Callen and Reynolds 1997).

Finally, the Thai corporate bond market has always been small, although it has expanded in recent years following liberalizations. Only since 1990 have public sector enterprises issued bonds in significant amounts, whereas private sector companies were not allowed to issue bonds until 1992 (Duriyaprapan and Supapongse 1996). Bonds issued by private corporations have grown rapidly since 1993. Calculations by Callen and Reynolds (1997) show that bond issues financed about 6% of private investment in the period 1992–95.

3. Econometric issues

To describe the transmission mechanism of private financial capital inflows, we employ a Vector Autoregression (VAR) model, which can be written as

$$Z_t = A_1 Z_{t-1} + \ldots + A_p Z_{t-p} + u_t \qquad (1)$$

where Z_t is a vector of variables observed at time *t*, and *p* is the maximum lag of the system. Conceptually, *Z* contains the private capital inflow (the beginning of the transmission process), all the variables that transmit the capital flow shock through the economy (the transmission variables), and output and price level (the end of the process). The VAR disturbance vector u_t is assumed to be serially uncorrelated and to have covariance matrix *V*. The VAR model (1) is a reduced form that can be thought of as being derived from the following structural model,

$$Z_t = B_0 Z_t + B_1 Z_{t-1} + \ldots + B_p Z_{t-p} + e_t \qquad (2)$$

where e_t is the vector of the underlying structural shocks. e_t has as covariance matrix the identity matrix. The reduced form disturbances u_t are thus related to the underlying structural disturbances e_t by

$$u_t = [I - B_0]^{-1} e_t = A_0 e_t, \qquad (3)$$

implying $V = A_0 A_0^{'}$. The reaction of Z_t to shocks in e_t (impulse response function) can be calculated via

$$Z_t = [I - A(L)]^{-1} A_0 e_t \qquad (4)$$

The transmission process can be described by the impulse-response functions (IRF) of all *Z*-variables to a shock in the structural disturbance of the private capital inflow. We estimate eq. (1) by ordinary least squares to obtain estimates of the matrices *V* and *A(i), i* = 1, …, *p*. A_0 is calculated from *V* using the conventional Cholesky decomposition. Hence, A_0 is a lower triangular matrix and u_t is determined in a recursive fashion by e_t.

Our empirical analysis is based on quarterly data for the period 1980.I–96.IV. The maximum lag *p* is set at 4 to allow for realistic lag structures. Consequently, 16 years of data are available for estimation after using up one year of data as starting values of lagged variables. There are numerous variables that play a part in the transmission mechanism. Ideally, one would like to include them all in a single unconstrained VAR system, estimate the model and then calculate the IRFs of all *Z*-variables in one go. Given the limited length of the available time series, this is clearly impossible. On the other hand, including too few variables in the VAR model runs the risk of significant omitted variables bias. Given this trade-off, we follow the intermediate strategy employed by Christiano, Eichenbaum and Evans (1996). Let us denote the transmission variables by *X*. For each *X*, we calculate the IRF to a private capital inflow shock on the basis of a separate VAR model for which the

vector *Z* contains five variables. Apart from *X*, *Z* always includes the following four key macroeconomic variables: the log of the GDP deflator (*P*), the log of real GDP (*Y*), the interbank rate (*RB*), and private capital flows (*CF*). Conceptually, our VAR is made up of the two variables that represent the end of transmission process (*P* and *Y*), the variable that starts it (*CF*) including the monetary policy reaction (*RB*), and one of the intervening variables (*X*). The IRFs of the transmission variables *X* that are reported in Sections 4 and 5 are thus derived from different VAR models. They measure partial equilibrium effects in the sense that potential interactions among the transmission variables themselves, which an all-encompassing VAR system would accomodate, are neglected. As noted by Christiano, Eichenbaum and Evans (1996), a consequence of our approach is that the capital inflow impulse is not exactly the same across the different VAR models, because the fifth *Z*-variable is different. However, the fact that the IRFs of the four common variables (*P*, *Y*, *CF* and *RB*) are broadly similar across the models, suggests that this is not a serious problem in our case.

The global explanation of the Asian crisis, outlined in the introduction, serves as a guideline for the selection of the transmission variables *X*. Consequently, the *X* variables are related to central bank behavior (sterilized intervention), financial sector behavior (credit creation), building activity, private investment and consumption, and the external position. Due to data limitations, we are forced to resort to indirect indicators in a number of cases.[9] Each VAR model also contains the following exogenous conditioning variables: the current and one-period lagged values of the 3-month euro-dollar deposit rate, the Japanese short-term interest rate, the yen/dollar exchange rate, a commodity price index

denominated in dollar, a dummy to take account of the devaluation in 1984.IV, and seasonal dummies.[10] Details on the data can be found in the appendix.

The disturbances are orthogonalized on the basis of the conventional Cholesky decomposition. In that case, the ordering of the variables in the VAR determines the pattern of recursivity, and thus may be of crucial importance for the orthogonalization of the disturbances. The main identifying assumption in this paper is that the interbank rate and capital flows do not contemporaneously affect real variables and prices, since the latter are sticky in the short run. If X is a financial variable, say a credit aggregate, we use the ordering P, Y, CF, RB, X_{fin}. If X is a real variable, say an investment indicator, then we use the ordering P, Y, X_{real}, CF, RB. We make an exception if X is an import variable, because capital inflows may be directly linked to import flows. In that case X_{imp} comes after CF, but before RB.[11]

The time series we use, except the baht/dollar exchange rate, are non-stationary (integrated of order one).[12] This brings up the question whether we should difference the data. Employing differenced data has the drawback of neglecting potentially important long-run relationships among the time series involved. Faust and Leeper (1997) argue that – in part because the number of cointegrating relationships is unknown and thus has to be estimated – imposing long-run restrictions will not necessarily improve the reliability of structural inferences. Like a number of recent empirical papers on the monetary transmission mechanism, we have therefore chosen to refrain from imposing cointegration and to estimate unrestricted VAR models in levels.[13] Our approach still allows for the existence of cointegrating relationships, however.

4. The transmission mechanism

This section outlines the transmission process of a private financial capital inflow. We start by discussing the capital inflow shock and its ultimate effects on real GDP and the price level, which represent the end of the transmission process. We then describe the transmission mechanism roughly in chronological order. As financial variables react faster than real variables, we first focus on developments in the financial system, in particular the response by the central bank and the impact on credit creation by financial institutions. We then examine the effects on the stock market, the real estate market and private expenditures. The empirical evidence is presented in the form of graphs of the impulse response functions (IRF) of the transmission variables *X* after a one-standard error shock to private financial capital inflows.[14] The IRFs are expressed as percentage points in deviation of the baseline path. The broken lines indicate one-standard error bands.[15]

Private capital inflows and their effects on output and price level (Figure 2)

Capital inflows are measured as the growth rate of the stock of private foreign financial liabilities. The stock of private foreign financial liabilities is measured in dollars, and has been computed by cumulating private capital inflows excluding foreign direct investment inflows. Figure 2a presents the private financial capital flow impulse, which can be described as a one-time spike followed by a smaller but sustained inflow. The economy thus reacts to the capital inflow in a way that attracts more capital. This can be explained by the stimulative effects of capital inflows on domestic asset prices and economic activity (see below). What kind of shock is a private capital inflow? In many ways it looks like a

money supply shock, working its way through the economy in a manner familiar from the literature on the monetary transmission mechanism. However, since a capital inflow also constitutes a loosening of the resource constraint facing the economy, it can be viewed as a supply shock as well. The capital inflow enables a faster accumulation of capital and thus, after some time, an expansion of the supply of goods and services. Figures 2b and 2c depict the responses of real GDP and the price level. Both variables are hardly affected by the capital inflow in the short run, but they steadily increase as time goes by. After three years output has risen by 0.6%, reflecting the output-enhancing effect of investment, while the price level has risen by 0.3%. Nominal GDP thus rises by approximately 1%.

The response of the central bank: sterilized intervention (Figure 3)

If unchecked, the capital inflow would result in an appreciation of the baht, which would be inconsistent with the fixed exchange rate commitment of the Bank of Thailand. The central bank is therefore forced to intervene in the foreign exchange market and buy foreign currency. The interventions show up as an increase in international reserves (Figure 3a). On impact international reserve holdings increase by 1.5%, and ultimately by over 3% compared to the baseline. By intervening the BOT succeeds in keeping the baht/dollar exchange rate close to the peg, allowing a gradual appreciation of just 0.2% (Figure 3b). Unsterilized interventions would translate into an equivalent increase in the base money supply, and thus a substantial loosening of monetary policy. For this reason, the central bank tries to mitigate the expansionary effect of the foreign exchange market interventions by sterilization operations (Figure 3c).[16] Initially, it sterilizes to the tune of 2% of bank reserves, but after two years the total of the sterilization operations amounts

to 8% of bank reserves. The sterilization attempts temporarily put upward pressure on the interbank rate, but after two quarters the interbank rate falls by about 30 basis points, and returns to the baseline in the next two quarters (Figure 3d).[17]

The response of the financial institutions: lending boom (Figure 4)

Despite the BOT's sterilization efforts the banking system remains very liquid for about a year. The banks' nonborrowed reserves (Figure 4a) and especially liquid asset holdings (Figure 4b), which can be easily transformed into reserve assets, display a sustained increase until the fourth quarter after the capital inflow. In reaction, the banks lower their lending rate by five basis points on impact and by another ten basis points over the next few quarters (Figure 4c).[18] The greater availability and lower cost of credit is a powerful stimulant to credit creation. Lending to the private sector by commercial banks grows about twice as fast as nominal GDP (Figure 4d), while lending by finance companies grows even faster (Figure 4e). Banks also disproportionally extend credit to finance companies (Figure 4f), especially in the first few quarters after the capital inflow. Commercial banks thus act as intermediaries for the much smaller finance companies to give them access to foreign funds. The discussion in Section 2 showed that the lending portfolio of finance companies is skewed towards real estate finance, consumer finance and the financing of stock market investments. Since finance companies account for a relatively large part of the credit creation, this implies that new lending is disproportionately directed towards the stock market and the property market.

Effects on the equity and property markets: higher asset prices (Figure 5)

On the stock market, real stock prices (Figure 5a) increase 1% on impact and ultimately more than 3%. As quarterly data on real estate prices are unavailable, we rely on the logic of Tobin's (1969) Q-theory to present some indirect evidence that property prices too increase.[19] As the construction of new buildings only makes sense when this is cheaper than purchasing already existing buildings, it is likely that an observed rise in building activity was preceded by a rise in real estate prices. There is indeed evidence that building activity quickly picks up after a capital inflow. Domestic sales of cement increase sharply after a capital inflow (Figure 5b), while building permit approvals also soar (Figure 5c). Moreover, the relative price of construction materials shows a prolonged increase for two years (Figure 5d), pointing to a sustained relative shift in demand for building materials. The increase in stock prices and property values means an increase in the value of assets that borrowers can put up for collateral. This gain in creditworthiness further stimulates lending by banks and finance companies.

Effects on private expenditure: strong investment growth (Figure 6)

The combination of greater availability of credit, lower lending costs and increases in equity and real estate values provides a powerful boost to private expenditure (private consumption and private investment). Figure 6a shows that private expenditure grows much faster than output: after five quarters private spending has risen by 1.5% compared with 0.4% for output. How is the spending increase divided between investment and consumption? Since data problems prevent a direct answer, we turn to import data to produce some indirect evidence on this issue. Apart from the building boom suggested by Figure 5, import data too suggest that investment rather than consumption mainly drives

private spending. The initial capital inflow is partly used to finance additional imports, which are fairly evenly divided between imports of consumption and capital goods (Figures 6b–6d). However, the subsequent rise in private spending coincides with a huge increase in imports of capital goods, as within a year these imports rise by 4%. By contrast, imports of consumption goods, including those of durable consumption goods, decline. Additional support for a dominant role for investment instead of consumption is provided by the different behavior of the sales of motorcycles and those of vehicles (passenger cars and commercial vehicles).[20] Vehicles can be considered to be mainly investment goods, while motorcycles are mainly durable consumption goods. Sales of vehicles broadly follow the same pattern as private expenditure (Figure 6e), but sales of motorcycles only pick up after one year, when output has risen significantly, and they also do not grow as strongly as vehicles sales (Figure 6f). The strong response of investment translates into a higher capital stock and thus production potential. This increase in aggregate supply explains why capital inflows have only limited inflationary consequences (Figures 2b and 2c).

5. Was the Thai financial crisis a solvency crisis or a liquidity crisis?

A country that receives private capital inflows exposes itself to the risk that investors may suddenly want to withdraw their money. It is conceivable that (large) private capital flows carry the seeds of a crisis with them, because the transmission process also comprises developments that can be viewed as weaknesses, such as current account deficits and real exchange rate appreciation. Sachs, Tornell and Velasco (1996), Radelet and Sachs (1998),

Mishkin (1999) and Corsetti, Pesenti and Roubini (1998a,b) argue that a lending boom (Figure 4) in itself provides indirect evidence of greater fragility of the financial system, because in a climate of rapid expansion of lending average loan quality is likely to deteriorate. A similar point can be made about the construction and investment boom (Figures 5 and 6), which is also likely to get accompanied by declining investment efficiency. In case of adverse developments the banking system may be confronted with a more serious bad loans problem. As the fiscal burden of a potential bailout rises, investors may have more reasons to harbor doubts about the credibility of the implicit government guarantee of the liabilities of the banking system and those of the private sector, heightening the risk of a run on the foreign exchange reserves (Corsetti, Pesenti and Roubini 1998a,b). In this section we discuss the effects private capital inflows have on the external position and the vulnerability to a run on the foreign exchange reserves.

Effects on the external position: sustainable current account deficits (Figure 7)

Exports are hardly affected by capital inflows for about a year and they increase by 1% to 1.5% over the next two years (Figure 7a). This delayed response suggests that a significant part of the private capital inflow is channeled into export-oriented sectors, but that it takes time to implement the necessary investment projects. Imports initially go up because the capital inflow is partly spent on imports, while after a short pause imports surge in connection with the investment boom (Figure 7b). Capital inflows make the economy more outward-oriented as both imports and exports increase more than output. The behavior of the current account balance following a private capital inflow is determined by the interplay of imports and exports of goods and services (Figure 7c).[21]

Accordingly, a capital inflow initially translates into a larger current account deficit. After a temporary improvement, the current account goes into a sharp decline because of higher imports, which is then reversed after two quarters when rising exports restore the current account to close to its initial value over the next year. Capital inflows are thus associated with sustainable current account deficits.[22]

The modest increase in the real effective exchange rate is also testimony to the sustainability of the current account position (Figure 7d). The small appreciation of the baht and rising domestic prices translate into an increase in the real effective exchange rate by 0.7% in the medium term. In view of the healthy growth of exports, this appreciation does not seem to represent a significant worsening of competitiveness. It could partly reflect an increase of the equilibrium real exchange rate, reflecting productivity gains in the tradables sectors as a result of the extra investment. This interpretation is consistent with the gradual rise of the relative price of nontradables, which is a measure of the internal real exchange rate, by 0.3% over 3 years (Figure 7e). However, it is also possible that this relative price change indicates that a substantial part of the spending increase falls on nontradable goods and services (especially construction).

Effects on the vulnerability to a run on the foreign reserves (Table 8)

Following Radelet and Sachs (1998) and Corsetti, Pesenti and Roubini (1998a,b) we present three ratios that may gauge the vulnerability to a run on the foreign exchange reserves. An increase in these ratios indicates a higher degree of vulnerability. The ratio of total private foreign debt to international reserves initially decreases due to the interventions aimed at preventing the appreciation of the domestic currency. This ratio

ultimately returns to the baseline (Figure 8a). Hence the foreign exchange coverage of total private debt temporarily improves and does not deteriorate over the medium term. By contrast, a similar indicator using foreign liabilities of domestic banks and finance companies as the debt variable does worsen over time (Figure 8b). Since the foreign liabilities of the Thai financial institutions were largely of a short-term nature, private capital inflows are associated with increases in vulnerability to a liquidity crisis.[23] Finally, the ratio of broad money (M2) to international reserves is a broader measure of vulnerability, which refers to the credibility of the implicit government guarantee of the domestic financial system. This indicator, which measures the vulnerability of a run on the reserves by domestic residents, also improves rather than deteriorates following a capital inflow (Figure 8c).

On balance, our empirical analysis offers supportive evidence for the view that the Thai crisis was not an inevitable external solvency crisis. A remarkable finding is that private capital inflows do not lead to unsustainable current account deficits, as exports catch up with imports with a lag of about two years. Moreover, private capital inflows do not cause a loss of competitiveness. Finally, the only vulnerability indicator that deteriorates is the one that proxies for the risk of a liquidity crisis. The historical experience suggests that the large current account deficits in 1995 and 1996, which partly reflected large capital inflows, should not have raised questions of external solvency. Based on the historical pattern, the current account was set to improve in 1997 and 1998, so there was no urgent need for investors to withdraw their money from the country. Consequently, the Thai baht crisis seems to be more of a liquidity crisis, in which financial panic played an important role, than a genuine solvency crisis. Of course, the cumulative

effects of nine years of large capital inflows had made the Thai financial institutions vulnerable to changes in market sentiment or deteriorating expectations about their cash flows and net worth. So when some investors did begin to retreat from Thailand, the process quickly ensued in a scramble for the exit, rendering the 13-year old link between the baht and the dollar unsustainable. After the fall of the baht, capital flight hit the rest of the region as well – due to perceived similarities between Thailand and the other Asian countries – and the Asian financial crisis was born.

6. Summary and policy implications

This paper aims at increasing our understanding of the background of the Asian crisis of 1997–98. Using quarterly data for the pre-crisis period (1981–96), we give an empirical decscription of the transmission mechanism of private financial capital inflows, including their effects on the external position.

Our findings can be summarized as follows. Despite efforts by the monetary authorities to mitigate their expansionary effects, private capital inflows are found to be followed by higher asset prices, lower lending rates, and a surge in lending by financial institutions to the private sector. The response of domestic spending is driven by sharp increases in building and investment activity rather than a consumption boom. The higher investment boosts productive capacity, and allows an expansion of output with limited inflationary consequences. The current account balance temporarily deteriorates, since imports initially go up sharply – in particular those of capital goods – and exports only start to catch up after one year. There is also a modest appreciation of the real exchange

rate, which hardly signifies a worsening of competitiveness as it does not preclude strong export growth. Capital inflows also lead to greater integration in the world economy as imports as well as exports tend to increase more than output.

Our findings provide corroborative evidence for the view that the Thai baht crisis bears more resemblance to an acute liquidity crisis, in which financial panic played an important role, than a genuine external solvency crisis. The historical record for 1981–96 suggests that foreign capital flows were spent in a responsible manner as the associated current account deficits were sustainable and losses of competitiveness were avoided. Moreover, capital inflows are correlated with a greater vulnerability to a liquidity crisis, but not with a worsening of external solvency risk.

What are the policy implications concerning the prevention of a financial crisis? Since external solvency appears to be less of an issue (at least for Thailand), crisis prevention and containment revolves around reducing the build-up of perceptions of vulnerability. The World Bank (1998, chapter 3) offers an overview on this topic, discussing more flexible exchange rate regimes, better regulation and supervision of domestic financial institutions, improvements in credit risk evaluation and monitoring capabilities of domestic financial intermediaries, capital market reform, better corporate governance, and provision of better and more timely information by central banks and governments.[24] Such measures enhance the efficiency of the process by which investment is allocated in the economy – and thereby limit the potential for ultimately destabilizing asset market, lending, and investment booms – and also reduce the scope for panic.

Finally, another policy measure that has been advocated is restrictions on (short-term) capital inflows. The argument is that short-term capital inflows carry fewer

economic benefits than long-term (especially FDI) inflows, but are much more prone to damaging reversals. However, the Thai experience suggests that such a policy could involve considerable costs. We find substantial positive output effects of private financial capital inflows, despite the fact that short-term inflows made up a large portion of total financial inflows throughout the sample period (see Table 1). Apart from that, there are serious doubts about the efficacy of capital controls in general.

Appendix

A.1 Sources and construction of the data

The main sources of the data are *International Financial Statistics* (*IFS*), published by the IMF, and the Statistical Appendix in the *Monthly Bulletin* and the *Quarterly Bulletin* of the Bank of Thailand (denoted by *BOT* below). The numbers of the *BOT* Tables given below refer to the ones in the 1997 issues of the *Bulletins*. In earlier issues the relevant table may have a different number due to changes in coverage of the Statistical Appendix. Its title is usually unchanged. Data have been collected for the period 1980:I–96:IV.

The stock of private foreign financial liabilities is measured in dollars, and calculated by cumulating net private capital inflows, which are computed as net capital inflows minus net official inflows minus net foreign direct investment (FDI). Quarterly data on net capital inflows and net FDI inflows are taken from *IFS*, lines 78bd, 78be and 78bj. Quarterly net official inflows in baht are taken from *BOT* Table 44 (*Balance of Payments*), and converted to dollars using the average baht/dollar exchange rate (*IFS*, line rf). The end-1979 starting value of total external liabilities is taken from *Global Development Finance* (World Bank). The end-1979 starting value of government external debt is taken from *BOT* Table 27 (*Government External Debt*). The stock of international reserves is from *IFS*, line 1d.

When the data for this research were collected, quarterly national accounts data were not available. Quarterly data are constructed by interpolating annual data taken from *IFS*, lines 90–99. For real GDP, the electricity consumption, calculated as total sales

minus sales to residences, is used as interpolating variable. The source of the electricity sales data (measured in kWh) is the *Quarterly Bulletin of Statistics* (Table 4.1 *Electricity – Installed Capacity, Energy Generated and Sold*), published by the National Statistical Office. Exports and imports of goods and services are interpolated by their respective counterparts from the Balance of Payments statistics (*BOT* Table 44), deflated by the GDP deflator. Public expenditure (public investment plus public consumption) is interpolated by the current and capital outlays by the government, deflated by the GDP deflator. The government budget data are taken from *BOT* Table 27 (*National Government Actual Expenditures by Major Economic and Functional Classification*). The GDP deflator is interpolated by the Consumer Price Index (*IFS*, line 64). Private aggregate demand, the sum of private consumption and private investment, is then calculated via the National Accounts identity, as GDP minus public expenditure minus exports plus imports.

Lending to the private sector by banks is taken from *BOT* Table 7 (*Assets and Liabilities of Commercial Banks*). That by finance companies is taken from *BOT* Table 22 (*Assets and Liabilities of Finance Companies*). Lending by banks to finance companies is also taken from *BOT* Table 22. *BOT* Table 15 (*Reserves of Commercial Banks*) contains data on bank reserves. Nonborrowed reserves are calculated as total reserves minus liquidity credits by the central bank, taken from *BOT* Table 3 (*Monetary Base*). Liquid assets of banks are taken from *BOT* Table 9 (*Main Assets and Liabilities of Commercial Banks*). Liquid assets comprise vault cash, deposits with the BOT, other financial institutions and banks abroad, government and public sector enterprise securities, and gold. Base money and M2 are taken from *IFS*, lines 11 and 35l, respectively. The

sterilization variable is calculated as holdings of government bonds and T-bills by the BOT minus government deposits held at the BOT minus BOT bonds held by banks (see footnote 16). The first three items are from *BOT* Table 6 (*Assets and Liabilities of the Bank of Thailand*), the last one from *BOT* Table 7.

Imports of capital goods, consumer goods and consumer durables are from *BOT* Table 33 (*Imports by Economic Classification*). They have been deflated by the GDP deflator. Sales of motorcycles and vehicles (measured in units) are taken from *BOT* Table 61 (*Domestic Sales of Manufactured Goods*) for 1990–96, and from tables in the regular reports on recent economic developments in the *Quarterly Bulletin* for earlier years. Vehicles comprise both passenger cars and commercial vehicles, like trucks and buses. Separate series for the two types are not available for the whole sample period.

Domestic sales of cement (including imports, measured in tons) are taken from *BOT* Table 61 for 1990–96, and from tables in the regular reports on recent economic developments in the *Quarterly Bulletin* for earlier years. These reports are also the source of the construction permits (measured in square meters). The relative price of construction materials is calculated as the ratio of the wholesale price subindex for construction materials and the corresponding subindex for manufactured products. Source of the data is *BOT* Table 66 (*Wholesale Price Index for Thailand by Groups*). The relative price of nontradables is calculated as the ratio of a CPI subindex for nontradables and the WPI for manufactured products. The nontradables subindex refers to housing, personal and medical care, and recreation and education. Data (including spending weights) are from *BOT* Table 69 (*Consumer Price Index for Whole Kingdom by Groups*).

The interbank interest rate is taken from *IFS*, line 60b. The lending rate is the minimum overdraft rate taken from *BOT* Table 23 (*Structure of Interest Rates*) and from tables in the regular reports on recent economic developments in the *Quarterly Bulletin*. Data for 1980–81 refer to the prime rate. The source of the US and Japanese interest rates is *IFS*, lines 11160ldd and 60ea, respectively. The yen/dollar exchange rate (expressed as yen per dollar) is taken from *IFS*, line rf. The commodity price index is calculated as the average of the oil price and the world export price indices, both taken from *IFS* (line 466 in the table on commodity prices and line 001 in the table on export prices). The stock market index in local currency is taken from the Emerging Market database of the International Finance Corporation (IFC). Source of the real effective exchange rate based on consumer prices is the Information Notice System of the IMF.

A.2 Impulse response functions

The IRFs of the four key variables (Figures 2a, 2b, 2c and 3d) are derived from the same VAR system, where $Z = (P, Y, CF, RB)$. All other figures show the IRFs of the various transmission variables X. These IRFs are derived from the VAR model for which Z includes X as the fifth variable. Regarding the ordering, $Z = (P, Y, X_{real}, CF, RB)$ for Figures 5b, 5c, 5d, 6a, 6e, 6f, 7a, and 7e; $Z = (P, Y, CF, RB, X_{fin})$ for Figures 3a, 3b, 3c, 4a, 4b, 4c, 4d, 4e, 4f, 5a, 7d, 8a, 8b and 8c; $Z = (P, Y, CF, X_{imp}, RB)$ for Figures 6b, 6c, 6d, 7b and 7c.

Table 1. Size and composition of net private capital flows to Thailand, 1980–96

	80-85	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
(% of GDP)												
Net private capital inflow	3.7	-1.0	2.0	6.8	9.1	11.7	12.3	9.1	9.0	8.5	13.0	9.5
(% of total inflow)												
Foreign direct investment	18.8	-59.6	34.1	26.5	27.0	24.4	18.4	21.2	19.0	11.5	9.7	16.8
Portfolio - equity	0.5	-7.0	11.1	11.7	21.7	4.5	0.4	0.0	32.9	-4.5	10.1	9.3
Portfolio - bonds	4.3	27.1	-8.2	1.0	1.7	-0.9	-0.7	5.5	19.3	33.5	9.5	2.3
Long-term bank lending	58.6	87.5	-1.8	9.9	23.3	16.9	27.9	16.5	0.5	-0.2	13.6	48.9
Short-term bank lending	17.8	52.0	64.8	51.0	26.3	55.1	54.1	56.7	28.3	59.8	57.2	22.7

Source: World Bank, *Global Development Finance 1998*.

Table 2. Lending portfolios of Thai banks and finance companies, 1980–96

	1980	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
	Commercial banks											
Loans *(% of GDP)*	32.0	46.9	50.5	53.4	58.5	66.7	70.2	75.1	82.5	93.0	99.6	101.5
(% of total loans)												
Total to high-risk sectors	22.2	24.2	27.6	26.6	29.4	31.6	32.1	34.0	33.8	34.4	34.1	33.4
Construction	5.3	5.6	4.6	4.2	3.8	4.0	4.0	4.0	3.8	4.1	4.4	4.9
Real estate	3.0	3.8	4.5	6.1	8.9	11.9	11.5	11.5	11.3	10.5	9.4	8.8
Financial sector	6.5	6.1	9.1	6.2	5.9	5.1	5.5	6.1	6.0	7.1	8.0	7.1
Personal consumption	7.4	8.8	9.4	10.1	10.8	10.6	11.2	12.3	12.6	12.7	12.3	12.6
	Finance companies											
Loans *(% of GDP)*	8.2	9.0	8.7	9.8	12.5	14.3	16.3	19.7	23.6	27.9	31.0	31.7
(% of total loans)												
Total to high-risk sectors					59.1	61.3	64.2	66.0	67.3	68.8	67.6	64.6
Construction					2.7	2.8	2.6	3.0	3.0	3.0	3.1	3.8
Real estate					17.7	22.9	24.0	22.0	22.3	23.8	25.0	24.4
Financial sector					9.1	6.7	5.7	8.0	9.1	10.4	10.7	10.6
Personal consumption					29.7	28.9	31.9	33.0	32.9	31.6	28.9	25.9

Source: Bank of Thailand, *Quarterly Bulletin* and *Monthly Bulletin*, various issues.

Figure 1. Net private capital inflows and current account deficit, Thailand, 1980-96 *(% of GDP)*

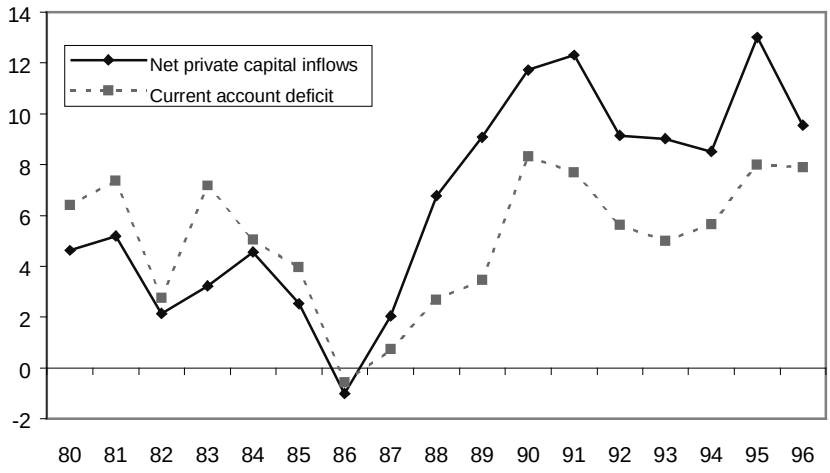
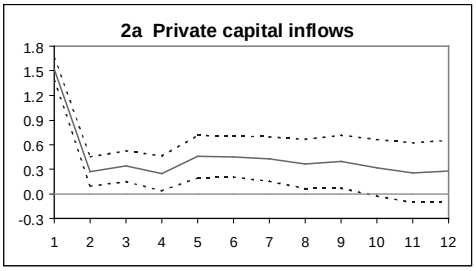
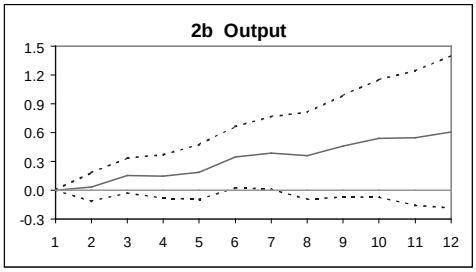


Figure 2. Private capital flows and their effects on output and price level





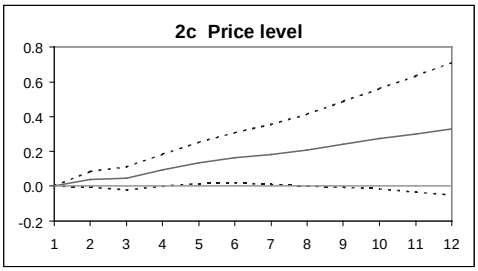
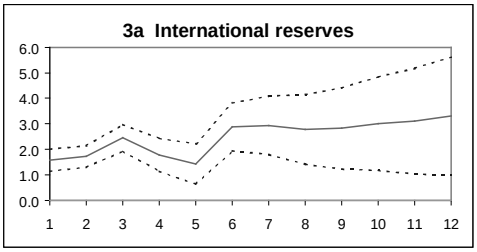
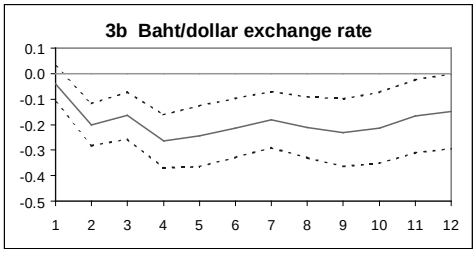
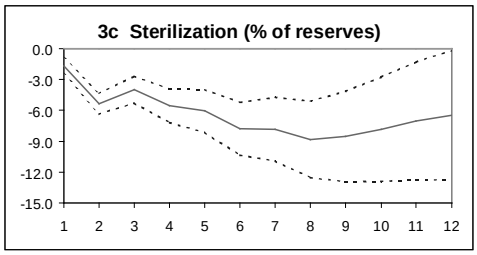


Figure 3. The response of the central bank: sterilized intervention







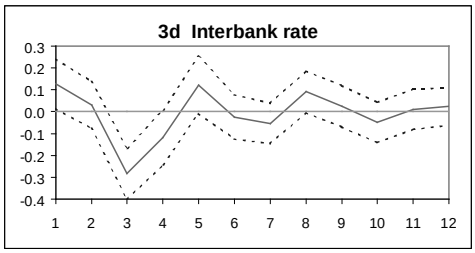
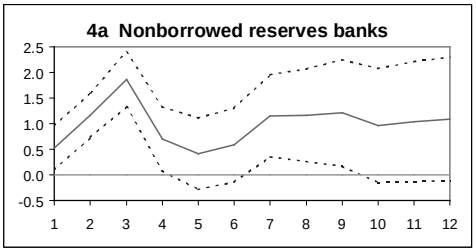
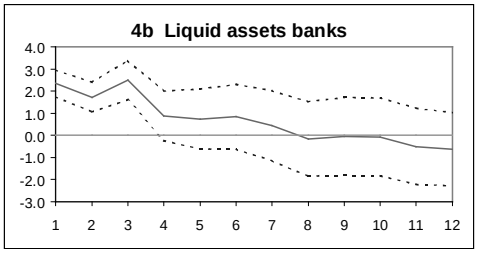
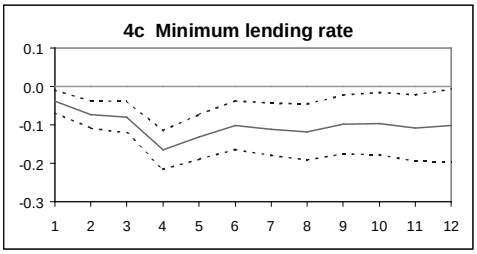
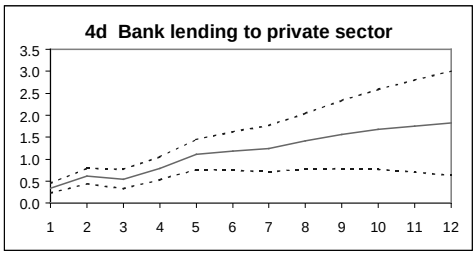


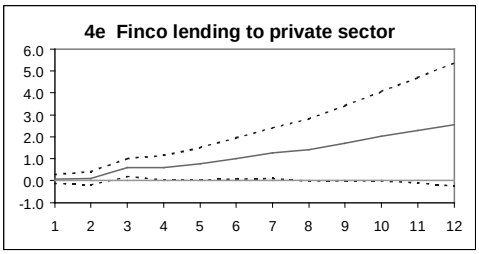
Figure 4. The response of the financial institutions: lending boom











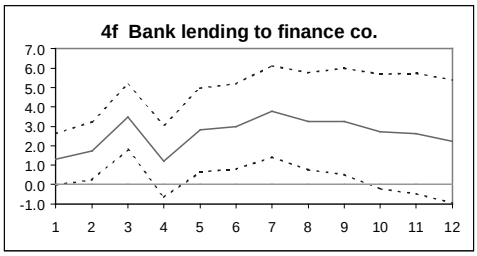
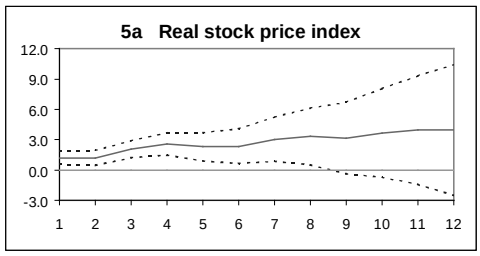
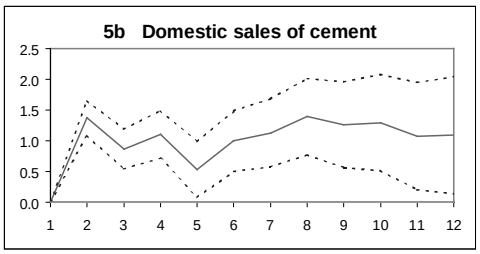
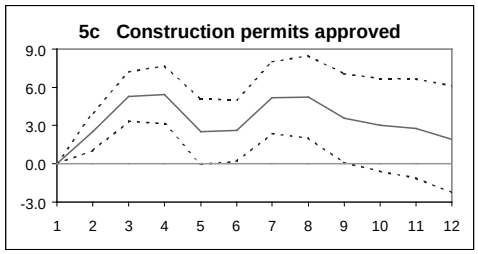


Figure 5. Effects on the equity and real estate markets: higher asset prices







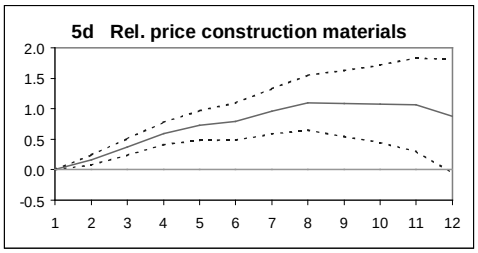
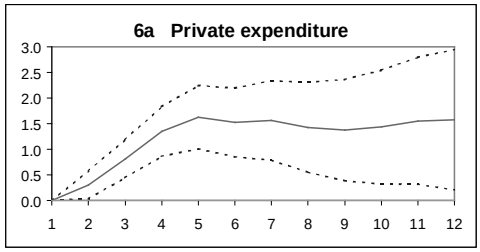
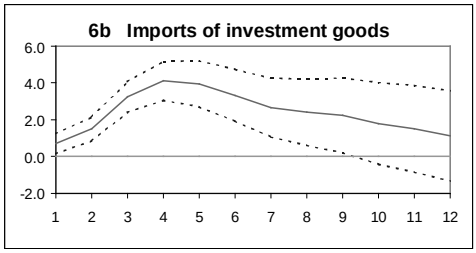
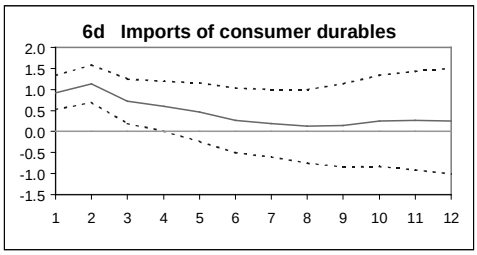
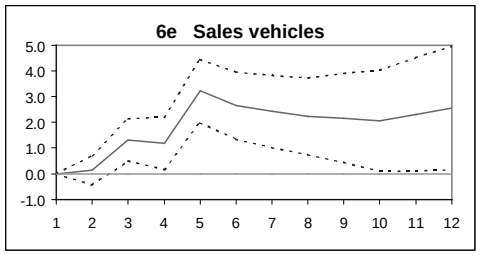


Figure 6. Effects on private expenditure: strong investment growth









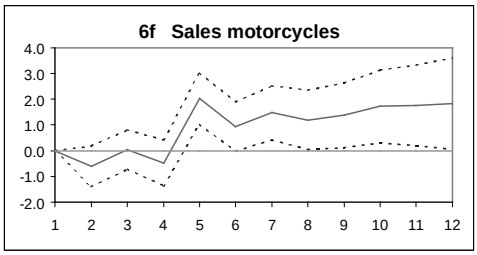
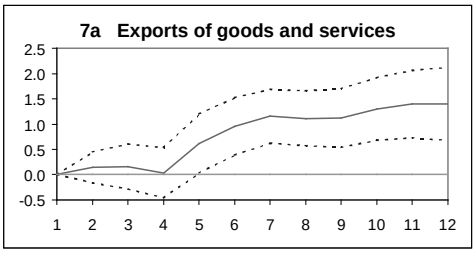
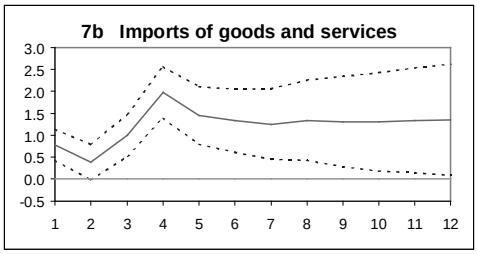
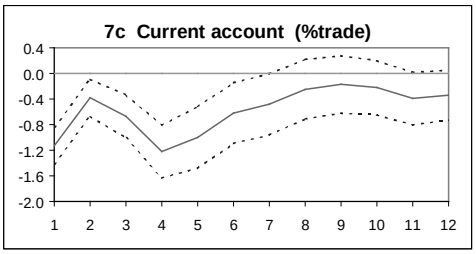
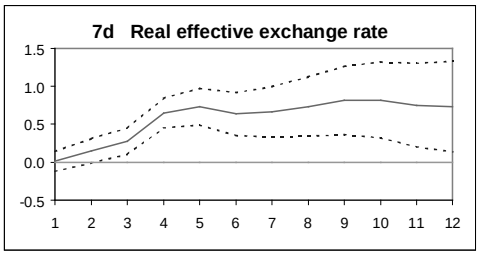


Figure 7. Effects on the external position: sustainable current account deficits









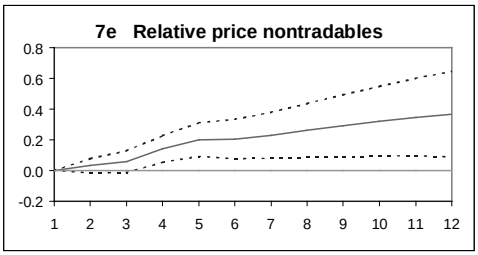
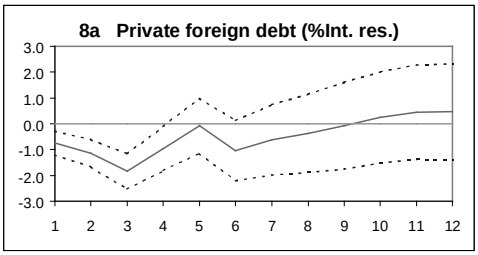
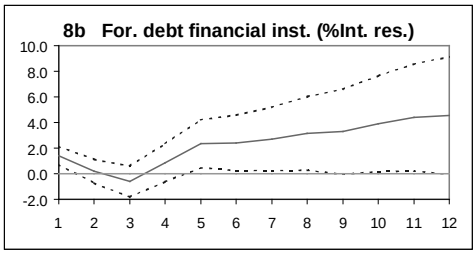
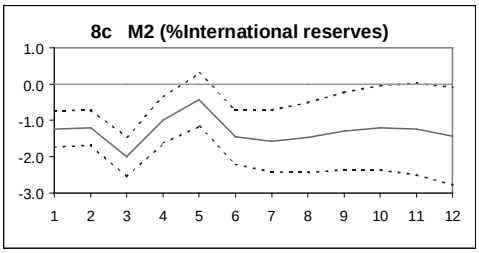


Figure 8. Effects on the vulnerability to a run on the foreign exchange reserves







References

Aghion, Philippe, Philippe Bacchetta and Abhijit Banerjee. "Capital markets and the instability of open economies." Center for Economic Policy Research Discussion Paper No. 2083, 1999.

Alba, Pedro, Amar Bhattacharya, Stijn Claessens, Swati Ghosh and Leonardo Hernandez. "Volatility and contagion in a financially integrated world: Lessons from East Asia's recent experience." World Bank Policy Research Working Paper No. 2008, December 1998.

Baig, Taimur and Ilan Goldfajn. "Financial market contagion in the Asian crisis." *IMF Staff Papers* 46 (1999): 167-195.

Berg, Andrew. "The Asia crisis: Causes, policy responses and outcomes." International Monetary Fund Working Paper WP/99/138, October 1999.

Bernanke, Ben S. and Alan S. Blinder. "The federal funds rate and the channels of monetary policy." *American Economic Review* 82 (1992): 901-921.

Callen, Tim and Patricia Reynolds. "Capital market development and the monetary transmission mechanism in Malaysia and Thailand." In *Macroeconomic Issues Facing ASEAN Countries*, edited by J. Hicklin, David Robinson and A. Singh. Washington, DC: International Monetary Fund, 1997: 184-230.

Christiano, Lawrence J., Martin Eichenbaum and Charles L. Evans. "Effects of monetary policy shocks: Evidence from the flow of funds." *Review of Economics and Statistics* 78 (1996): 16-34.

Corbo, Vittorio and Leonardo Hernandez. “Macroeconomic adjustment to capital inflows: Lessons from recent Latin American and East Asian experience.” *World Bank Research Observer* 11 (1996): 61-85.

Corsetti, Giancarlo, Paolo Pesenti and Nouriel Roubini. “Paper tigers? A model of the Asian crisis.” National Bureau of Economic Research Working Paper No. 6783, November 1998 (a).

Corsetti, Giancarlo, Paolo Pesenti and Nouriel Roubini. “What caused the Asian currency and financial crisis? Part I: A macroeconomic overview.” National Bureau of Economic Research Working Paper No. 6833, December 1998 (b).

Corsetti, Giancarlo, Paolo Pesenti and Nouriel Roubini. “What caused the Asian currency and financial crisis? Part II: The policy debate.” National Bureau of Economic Research Working Paper No. 6834, December 1998 (c).

Duriyaprapan, Chittima and Mathee Supapongse. “Financial liberalization: Case study of Thailand.” *Bank of Thailand Quarterly Bulletin* (September 1996): 35-52.

Easterly, William and Patrick Honohan. “Financial sector policy in Thailand.” World Bank Policy Research Working Paper No. 440, 1990.

Faust, Jon and Eric M. Leeper. “When do long-run identifying restrictions give reliable results?” *Journal of Business and Economic Statistics* 15 (1997): 345-353.

Hamilton, James D. *Time Series Analysis.* Princeton, NJ: Princeton University Press, 1994.

IMF. *International Capital Markets: Developments, Prospects and Key Policy Issues.* Washington, DC: International Monetary Fund, 1998.

Johnston, R. Barry, Salim M. Darbar and Claudia Echeverria. "Sequencing capital account liberalization: Lessons from the experiences in Chile, Indonesia, Korea and Thailand." International Monetary Fund Working Paper WP/97/157, November 1997.

Kirakul, S. "Interest rate administration and liberalization and money market development in Thailand." In *Interest Rate Liberalization and Money Market Development – Selected Country Experiences,* edited by Hassanali Mehran, Bernard Laurens and Marc Quintyn. Washington, DC: International Monetary Fund, 1996: 75-110.

Mishkin, Frederic S. "Lessons from the Asian crisis." National Bureau of Economic Research Working Paper No. 7102, April 1999.

Radelet, Steven and Jeffrey D. Sachs. "The East Asian financial crisis: Diagnosis, remedies, prospects." *Brookings Papers on Economic Activity* (1998:1): 1-90.

Ramaswami, Ramana and Torsten Sloek. "The real effects of monetary policy in the European Union: What are the differences?" *IMF Staff Papers* 45 (1998): 374-96.

Robinson, David, Yangho Byeon, Ranjit Teja and Wanda Tseng. "Thailand: Adjusting to success: Current policy issues." International Monetary Fund Occasional Paper No.85, 1991.

Sachs, Jeffrey, Aaron Tornell and Andrés Velasco. "Financial crises in emerging markets: The lessons from 1995." *Brookings Papers on Economic Activity* (1996:1): 147-215.

Tivakul, Aroonsri. "Globalization of financial markets in Thailand and their implications for monetary stability." *Bank of Thailand Quarterly Bulletin* (1995): 37-55.

Tobin, James. “A general equilibrium approach to monetary theory.” *Journal of Money, Credit and Banking* 1 (1969): 15-29.

Warr, Peter G. and Bhanupong Nidhiprabha. *Thailand’s Economic Miracle: Stable Adjustment and Sustained Growth*, World Bank Comparative Economic Studies. Kuala Lumpur: Oxford University Press, 1996.

World Bank. *Private Capital Flows to Developing Countries: The Road to Financial Integration*. Washington, DC: World Bank, 1997.

World Bank. *Global Economic Prospects and the Developing Countries: Beyond Financial Crisis*. Washington, DC: World Bank, 1998.

Footnotes

[1] See, among others, Aghion, Bacchetta and Banerjee (1999), Alba *et al*. (1998), Berg (1999), Corsetti, Pesenti and Roubini (1998a,b,c), the IMF (1998), Mishkin (1999) and the World Bank (1998).

[2] As explained in Section 3 below, this methodology allows us to analyze many different data series at the same time. Using flow-of-funds data, Christiano, Eichenbaum and Evans (1996) employed it to trace the effects of a monetary policy shock through the financial system.

[3] See Warr and Nidhipradha (1996) for explanations of the macroeconomic conservatism of Thai policy makers.

[4] For a large part of the 1980-96 period the BOT could also influence market interest rates more directly via manipulations of various interest rate ceilings. After 1982 they were more frequently adjusted in order to better reflect market conditions and they were phased out in the early 1990s. Ceilings on deposit rates were mostly nonbinding, while ceilings on lending rates were non-binding for prime customers (large firms), but probably biting to some extent for smaller firms during 1985–88 (Easterly and Honohan 1990). See Easterly and Honohan (1990), Tivakul (1995) and Kirakul (1996) for more details on the implementation of monetary policy in Thailand.

[5] See Robinson *et al*. (1991) and Kirakul (1996) for institutional details on the Thai financial system, and Kirakul (1996), Duriyaprapan and Supapongse (1996) and Johnston, Darbar and Echeverria (1997) for overviews of the financial liberalization process.

[6] The mirror image of this development is the steep decline of the contribution of internal funds to the financing of private investment from 75% in the early eighties to 25% in 1993–95 (Callen and Reynolds 1997).

[7] In the aftermath of the crisis 56 finance companies were closed down by the government.

[8] Until 1995 finance companies were not required to submit credit plans to the Bank of Thailand.

[9] For example, we use sales of cement, a key building material, to measure building activity, and import data on consumer goods and capital goods to infer something about private consumption and investment behavior.

[10] The exogenous variables measure external factors affecting the Thai economy. Given the baht-dollar peg, the Thai short-term interest rate is tied to the dollar interest rate. As Japan is Thailand's most important partner country for both exports and foreign capital, we include the Japanese short-term interest rate and the yen/dollar exchange rate. Due to the baht-dollar peg, the frequently large movements in the yen/dollar exchange rate represent substantial changes in competitiveness. The primary commodity price index measures supply factors. The devaluation dummy is one before 1984.IV and zero otherwise. Although all data series are seasonally adjusted, either at source or by the X-11 method, we add seasonal dummies to correct for any remaining seasonality as a precautionary measure.

[11] Placing *P* in front of *Y* reflects the well-known fact that the price level is stickier than output in the short run. Putting *RB* after *CF* implies that the central bank can react contemporaneously to a capital inflow. We have checked that the results do not materially change if *P* and *Y* or *RB* and *CF* are interchanged in the ordering.

[12] The baht-dollar exchange rate is an I(0) variable, which reflects the fixed exchange rate commitment of the BOT. Results of the unit root tests are available on request.

[13] See, among others, Bernanke and Blinder (1992), Christiano, Eichenbaum and Evans (1996), and Ramaswami and Sloek (1998). See Hamilton (1994, Chapter 20.4) for a discussion on the issue of 'to difference or not to difference.'

[14] The appendix lists the VAR models which underlie the IRFs in Figures 2–8.

[15] Like Christiano, Eichenbaum and Evans (1996), we show one-standard error bands. We do this for presentational reasons, as displaying two-error bands would double the range of Y-axis and thus "flatten" the IRF. As is well-known, standard errors for dynamic inferences based on VARs are in general relatively large (see Hamilton 1994, chapter 11.7). This is likely to be even more true in our case, where the time-span of the data is relatively short, and the data refer to a developing country. The purpose of the plots is to concisely present the average response and a standard measure of the uncertainty surrounding it. The bands should not be interpreted as confidence intervals associated with conventional levels of statistical significance.

[16] The Bank of Thailand has used three sterilization methods: selling public sector bonds, selling BOT bonds, and transferring public sector deposits out of the commercial banking

system to the central bank. Unlike other countries, the BOT has not used changes in reserve requirements as a sterilization technique.

[17] The finding that, due to the central bank's reaction, capital inflows tend to be associated with somewhat higher interbank rates in the short run may be a bit surprising, but this has also been found for other countries that maintained fixed exchange rates and were confronted by large capital inflows; see Corbo and Hernandez (1996).

[18] It stands to reason that finance companies will also lower their lending rate, as the lending rates charged by banks and finance companies tend to move together. (The latter are only available from 1985.IV onwards.)

[19] Although we cannot present direct evidence, it is clear from the literature on the Asian financial crisis that capital inflows tend to push up property values.

[20] The split-up of vehicles into passenger cars and commercial vehicles (trucks and buses) is only available for part of the sample period. Measured in units, the share of passenger cars is less than 30% of total vehicles. Their share in total expenditure will be much less than that.

[21] As the correlation between the current account balance and the balance on goods and services is 0.98, the IRF of the balance on goods and services closely resembles Figure 7c.

[22] Note that although the current account does not revert to zero, the same holds for the financing private capital inflow.

[23] Radelet and Sachs (1998) found that the ratio of short-term debt to international reserves had predictive power for the onset of a financial crisis, while the ratio of debt to

international reserves did not. They took this as evidence that the crises they studied were liquidity crises rather than solvency crises.

[24] See also Corsetti, Pesenti and Roubini (1998c) and Mishkin (1999).