Financial liberalization and economy crisis: macromodelling the Thai economy

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**NOTE**

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CHAPTER 5
MACROECONOMIC MODEL FOR THAILAND

5.1 Introduction

This chapter develops a dynamic macroeconomic model for Thailand based on the portfolio balance approach. The model emphasizes the long run adjustment process, emphasizing the effects of exogenous shocks arising from Thai financial liberalization policies since the 1980s and their impact upon the development of the Thai economy. In particular, the currency and financial crisis occurring since mid 1997 will be focused upon. Four different scenarios arising from financial liberalization will be constructed and analyzed, in which an exogenous shock occurs in an economy operating with different exchange rate regimes and under different degrees of capital mobility (See Figure 5.1). Figure 5.1 summarizes four scenarios. Scenario I shows an economy operating under imperfect capital mobility and a flexible exchange rate. Scenario II is a situation of imperfect capital mobility associated with a fixed exchange rate. Scenario III is associated with perfect capital mobility and a fixed exchange rate and, scenario IV implies perfect capital mobility with a flexible exchange rate.

Scenario III may be regarded as representative of the Thai economy prior to the current financial crisis. Preceding the crisis (during the late 1980s until mid 1997) Thai exchange rate policy effectively involved pegging the currency to the US dollar, and came to be viewed as an implicit guarantee of its exchange value. An environment of booming optimism about the outlook for the Thai economy more broadly, together with the implicit guarantee of the exchange value of its currency, which was fixed at 25 baht per dollar for a long period, caused domestic and international investors to downplay the perceived risk between holding domestic and foreign assets. The absence of perceived risk implies that the domestic and foreign assets may be regarded as perfect substitutes in terms of their risk characteristics, so that they differ only in their interest rates and the currencies in which they are
denominated. As mentioned in the previous chapter, perfect capital mobility required two assumptions; a freedom of capital movement and perfect substitutability between assets denominated in home currency and foreign exchange. In recent years Thai domestic financial markets have become highly integrated with global financial markets, which partly resulted from financial liberalization policy during the early 1990s. In this regard the two conditions of "perfect" capital mobility are satisfied in the Thai case, and hence uncovered interest parity holds. This scenario therefore is representative of the period when the nominal exchange rate was fixed, combined with perfect capital mobility. This inconsistent policy mix between a fixed exchange rate and perfect capital mobility was one of the major factors in creating the Thai currency and financial crisis.

Scenario I may be regarded as representative of the Thai economy during the period of the financial crisis since mid 1997. In the wake of the Thai financial crisis, confidence over the sustainability of the exchange rate was undermined by a growing awareness of the weakness in the Thai financial sector and corporate indebtedness.
both external and domestic. Funds began to flow out of the country, and the exchange rate sharply depreciated until the Thai government was forced to allow its currency to float in July 1997. Under this circumstance the risk of holding domestic assets compared with foreign assets was perceived to rise substantially, and hence the riskless uncovered interest parity condition does not hold in this case. Therefore there is no longer perfect capital mobility.

As a result the model developed can be used to compare the macroeconomic consequences of exogenous shocks to the Thai economy operating prior to the financial crisis since mid 1997 and operating during and after the crisis, as represented in scenario III and I respectively.

Furthermore, the model developed focuses upon the important aspects of the Thai current financial crisis. Firstly, the model separates private investment into two categories; productive and non-productive investments. Too much emphasis on non-productive investment is one of the crucial factors in creating the Thai financial crisis. Secondly, it emphasizes the role of short-term and long-term flows in influencing economic growth. Short-term flows, especially those regarded as "hot money", could create excessive non-productive investments. Thirdly, it incorporates a risk premium on holding domestic assets, which seems to have played an important role in the rapid depreciation of the Thai currency in 1997. Fourthly, it incorporates an exogenous shock arising from a collapse in aggregate supply brought about through financial and corporate sector insolvencies in Thailand during the crisis period. Finally, it emphasizes the role of public spending which is separated into two categories; public investment and public consumption. In the wake of the Thai financial crisis the Thai government has implemented fundamental changes in its economic and institutional structures as a condition for receiving IMF funds, this includes a massive cut in public spending and especially on infrastructure projects. This in turn has potentially adverse effects on the development of the Thai economy. All four aspects will be discussed in detailed in the next section.
This chapter proceeds as follows. In Section 5.2 a number of deficiencies with the general models analyzed at length in Chapter 4 are discussed. Section 5.3 specifies a macroeconomic model for Thailand (scenario I). Section 5.4 explains alternative versions of the model (scenario II, III and IV). Finally, Section 5.5 presents the major conclusions derivable from this chapter.

5.2 Deficiencies of, and Extensions to, the General Models

The models discussed in the previous chapter, the MF, DB and PBM models are the basic models utilized to analyze the impact of financial liberalization on the macroeconomy, and its contribution to economic vulnerability arising from exogenous and policy induced shocks. The model to be developed combines the contributions of these three general models and also of Harvie (CH) (1993) and Harvie and Kearney (HK) (1994), which are long-run macroeconomic models and which themselves have their theoretical foundations based upon the three general models. However the major amendments to these three general models, and also that of CH and HK, in order to make them more applicable to Thailand is now outlined:

(1). The Supply Side of the Economy

The MF, DB and PBM models are not general equilibrium models. They emphasize the demand side of the economy and focus upon the role of financial markets in transmitting the effects of changes in policies, as well as exogenous shocks in general, to the real sector (goods market). They neglect the supply side and the determination of the supply and demand for labour and hence aggregate supply. This is remedied in the CH and HK models which are regarded as long run macroeconomic models. They incorporate capital stock accumulation and the supply side equations, namely, the wage price nexus and aggregate supply. In the context of this study, an exogenous shock arising from a collapse in aggregate supply brought through financial and corporate sector insolvencies during the Thai financial and economic crisis period is incorporated into the aggregate supply equation of the model.
(2). Productive and Non-productive Investment.

The DB and PBM model is a dynamic model. In the PBM model the link between the short and long run is found from foreign asset stock accumulation via developments in the current account. However the model does not say anything about the role of capital stock accumulation during the adjustment process. The major contribution of the CH and HK models are that they allow for endogenous capital stock accumulation in influencing output supply. The long run output supply is not fixed, at some "natural level", but can vary with capital stock accumulation/decumulation which is affected by developments in Tobin's q ratio. Although the CH and HK models pay attention to capital stock accumulation in stimulating economic growth, the crisis in the East Asian countries, and Thailand in particular, suggests that it should have paid more attention to the quality of investment as to whether it is productive or non-productive. Productive investment as used in this context, refers to spending devoted to increasing both aggregate demand and aggregate supply in particular. Productive investment spending serves to augment the stock of productive capacity of the economy and hence increases aggregate supply of output. Non productive investment in this context merely adds to aggregate demand but not to the productive capacity stock and therefore not to aggregate supply. In the case of people purchasing existing shares or new shares and this adds to the resources of companies which they then use for investment in productive assets (machinery etc), then in this context it would be described as productive investment. Even though the initial investment has been in a financial asset. Non productive investment is where such resources are not invested, directly or indirectly, into such productive assets but simply involve investment in property or other assets which do not add to aggregate supply. This could be described as being more speculative in nature, and hence non productive investment plays a significant role in stimulating more aggregate demand and ultimately results in asset price bubbles.
(3). Equity Claims on the Domestic Physical Capital Stock

In the PBM model there are assumed to be three financial assets available in the economy, domestic money, bonds and foreign bonds. However the CH and HK models, and also this study, pay particular attention to equities as an important financial asset in linking financial markets and the real sector via a change in Tobin's q ratio. In Thailand the collapse of the Thai equity market during the period of the financial crisis since mid 1997, resulting from a rapid deterioration of confidence by both foreign and domestic investors, caused a substantial decline in the market value of equities. This in turn had a negative effect on Tobin's q, and thereby created an incentive to reduce productive investment.

(4). The Relative Riskiness of Different Financial Assets^1

A key feature of the PBM is that investors no longer regard domestic and foreign financial assets as perfect substitutes. This means that the expected returns on the two assets no longer have to be equal. In other words the riskless uncovered interest parity condition does not hold due to investors perceiving differences in risk between domestic and foreign assets. Interest rate differentials between countries will reflect not only exchange rate expectations, but also the fact that assets may be qualitatively different between countries. Investors need to be rewarded for accepting the exchange risk inherent in uncovered transactions and as well as the risk associated with the financial asset itself. That is share values on equity markets should fall. For example, as in the case of the East Asian crisis, investors may regard domestic assets as being relatively risky as compared to foreign assets, and they therefore will require a higher expected return on domestic assets than foreign assets. Equilibrium will be restored when the price of domestic financial assets has fallen. This additional expected return on relatively risky assets as compared to less risky assets is know as

^1 McKibbin (1998) has introduced changes in risk perceptions into his G-Cubed model (Dynamic intertemporal general equilibrium model) by incorporating the risk premium on holding financial assets into the uncovered real interest parity. This study has done along these lines (coincidence). However the difference is that this study emphasizes separately between the risk premium on holding domestic bonds and the risk premium on holding equities (see details how to incorporate these into the model developed in Chapter 5).
the risk premium. Equilibrium will be restored where the price of domestic assets has fallen. Hence the model developed will pay attention to the relative riskiness of alternative financial assets.

(5). Fixed and Flexible Exchange Rates

The PBM model is based upon the characteristics of a flexible exchange rate. The policy emphasized here focuses upon different exchange rate regimes, fixed or flexible, under different degrees of international capital mobility, either perfect capital mobility or imperfect capital mobility. The model to be developed will be able to explain and compare the case of a fixed exchange rate regime, implemented in Thailand during the 1980s until 1997, and the case of a floating exchange rate since mid 1997. The basis for this can be found in the CH model. However only scenario I, flexible exchange rate version of the model will be utilized for simulation analysis in Chapter 7.

(6). Public Investment Spending and Public Consumption Spending

In contrast to the MF, DB and PBM models that assume government policy is exogenously determined, the contribution of public investment expenditure, in particular, is very essential for macroeconomic development. In Thailand, total expenditures of the public sector accounted for around 17 percent of GDP during 1970-1985. However since the late 1980s the Thai government has liberalized domestic financial markets in order to encourage large capital inflows to assist finance its rapid economic growth. During this period, in order to limit the potentially adverse effects of accelerating capital inflows, Thailand's main policy approach has been to tighten fiscal policy, resulting in seven years (1988-1994) of fiscal surpluses averaging about 2.6 percent of GDP. As a result total public spending as a percentage of GDP declined substantially from 20% in 1985 to 15% in 1990. In addition, during 1970-1990, a significant shift occurred in the structure of Thai government spending away from capital spending towards current spending. The public capital/current spending ratio has declined substantially from 3:7 in 1970 to 2:8 in 1990 (See Table 5.1), and this partly explained Thailand's infrastructure bottlenecks in the early 1990s.
The situation has reversed since the early 1990s, the capital/current spending ratio having increased substantially. Many infrastructure projects were implemented. However during the financial crisis, public expenditures, especially public infrastructure (capital) spending, has declined sharply due to a very restrictive fiscal policy prescribed by the IMF, requiring a budget surplus of 1 percent of GDP. This was a very difficult task to accomplish in a time of recession with revenue collections declining substantially, and hence the only way to meet this target has been through a massive cut in government expenditures. As a result in December 1997 the expenditure budget of fiscal year 1998 was cut to a mere 800 billion baht, 13.5 percent less than the 1997 fiscal budget. A breakdown shows a cut of 34.4 percent in capital expenditure and only 3.1 percent in government consumption expenditure.

Table 5.1 Thailand: Composition of Government Expenditure: 1970-1996

<table>
<thead>
<tr>
<th>Year</th>
<th>government expenditure (%)</th>
<th>Total government expenditure/GDP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total expenditure</td>
<td>Current</td>
</tr>
<tr>
<td>1970</td>
<td>100.0</td>
<td>68.4</td>
</tr>
<tr>
<td>1975</td>
<td>100.0</td>
<td>77.6</td>
</tr>
<tr>
<td>1980</td>
<td>100.0</td>
<td>78.0</td>
</tr>
<tr>
<td>1985</td>
<td>100.0</td>
<td>83.5</td>
</tr>
<tr>
<td>1990</td>
<td>100.0</td>
<td>81.8</td>
</tr>
<tr>
<td>1991</td>
<td>100.0</td>
<td>78.3</td>
</tr>
<tr>
<td>1992</td>
<td>100.0</td>
<td>73.9</td>
</tr>
<tr>
<td>1993</td>
<td>100.0</td>
<td>68.6</td>
</tr>
<tr>
<td>1994</td>
<td>100.0</td>
<td>66.1</td>
</tr>
<tr>
<td>1995</td>
<td>100.0</td>
<td>67.7</td>
</tr>
<tr>
<td>1996</td>
<td>100.0</td>
<td>67.6</td>
</tr>
</tbody>
</table>


The economic impact of the fiscal adjustment program under pressure from the IMF, is much affected by which expenditures are trimmed. A policy of fiscal restraint which focuses upon reducing public capital spending could have potentially adverse effects upon the economy's infrastructure and impede economic performance. The reason is that government-provided infrastructure may complement private capital and improve its productivity. For example, better roads and bridges reduce

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travel time and make private cars and trucks more productive. Similarly, the public ports, docks, and dams make shipping more productive. Therefore the substantial cut in the ratio of capital to current expenditure programs during the Thai economic crisis in 1997/98 caused great concern, in that it may have a negative effect upon the long run productive potential of the Thai economy. Hence this study will separate public spending into two categories, namely, current public spending (government consumption) and capital public spending (government infrastructure investment) with the aim of comparing the effects of variations between public investment spending and public consumption spending upon the Thai macroeconomic adjustment process.


One of the major features of the PBM model is the incorporation of foreign asset stock accumulation arising from current account developments. The current account of the balance of payments is equivalent to the change in domestic holdings of foreign assets. The accumulation of foreign assets affects domestic wealth and will ultimately impact upon domestic demand for output and financial assets. This study also emphasizes the significant role of current account developments. However, the PBM model does not distinguish between short-term and long-term capital flows which are directly related with the deficit/surplus in the current account. Actually the current account deficits reflect positive capital inflows. However the composition of the capital inflows necessary to finance a given current account deficit is an important determinant of sustainability. Long-term capital inflows, in particular foreign direct investment, are more stable than short-term flows. In this regard a current account deficit that is financed by large long-term flows and foreign direct investment, is more sustainable than a deficit financed by short-term flows that may be reversed if market conditions and sentiments change as occurred in the recent crisis in Thailand and some East Asia countries. In particular, the role of short-term flows in contributing to an increase in non-productive investment and the long-term flows in stimulating
productive investments and enhancing the productive capacity of output supply as well as competitiveness will be emphasized.

5.3 A Macroeconomic Model for Thailand (Scenario I)

The model to be developed enables an analysis of the macroeconomic adjustment processes arising from monetary and fiscal policies, and exogenous shocks emanating from the liberalization of the financial sector, for a small open economy such as Thailand's. The model developed is based upon a number of important assumptions, and these are now outlined.

The model assumes a deterministic framework, as with CH and HK, in which economic agents are assumed to possess rational expectations. This is equivalent to the case of perfect foresight. Non-financial markets do not clear continuously, because they are subject to sticky quantity adjustment, specifically relating to the adjustment of the physical capital stock and foreign asset stocks (current account) which can be regarded as pre-determined non-jump variables. Such stickiness can be justified on the basis of the existence of adjustment costs (See Harvie (1993), (1994)). On the other hand financial markets are assumed to be in continual equilibrium, implying that financial variables such as the real exchange rate and Tobin's q are non-predetermined jump variables which can make discontinuous jumps so as to maintain continual equilibrium in financial markets. Hence the effect of any exogenous shock in the model is transmitted initially through financial markets and then to product and labour markets.

This phenomenon can be demonstrated in the seminal Thai financial and economic crisis example occurring during 1997/98. The Thai financial markets adjusted instantaneously to a collapse in confidence of domestic and foreign investors in the soundness of the Thai economy, especially the Thai financial system, resulting in massive outflows of capital. The large capital outflows from the domestic securities

\[ \text{Maekusen (1991) asserts that long-term capital flows such as foreign direct investment tends to be more important for developing countries in the early stages of development, because it serves to complement labour and hence raise productivity and output supply.} \]
markets led to a sharp decline in share prices, decreasing the market valuation of the capital stock relative to its replacement cost. Tobin's q ratio would therefore fall. The impact effect on financial markets gradually impinge upon developments in the goods market, as the adjustment process moves from the short-run to the medium and long run. The decline in the q ratio depresses private sector investment resulting in a decumulation of the private capital stock. This ultimately reduces output supply and also aggregate demand in the real sector. Not only do share prices in the securities market adjust instantaneously to exogenous shocks so also does the domestic interest rate and exchange rate, which are major variables in the financial sector and also play a significant role in transmitting shocks to the real sector in the Thai economy.

Massive capital outflows lead to a sharp depreciation of the nominal exchange rate, contributing to a substantial rise in the nominal interest rate so as to maintain the uncovered interest rate parity condition. Now incorporating a risk premium component the sharp increase of domestic interest rates leads to a fall in domestic demand in the form of investment and consumption. This fall in aggregate demand is then followed by a fall in production and a recession in the real sector of the Thai economy.

There are assumed to be four financial assets; domestic money, domestic bonds, foreign bonds; and equities. Domestic bonds, money and equities are assumed to be only held by domestic residents. Domestic bonds are assumed, for simplicity, to be inside bonds\(^4\), that is they are issued by agents in the private sector and held by agents in the same sector. Hence they are not included as part of the private sector's net wealth. Domestic and foreign non-money assets are assumed to be imperfect substitutes. Hence it follows that risk-averse agents will wish to hold a mixed portfolio of non-money assets, the proportions of particular assets held depending

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\(^4\) The reason this study assumes domestic bonds to be as inside bonds because if bonds are outside bonds, then domestic bonds can be issued by the government for financing their budget deficits. Such domestic bonds will be included as part of the private sector's net wealth and thereby increase the net wealth of the private sector. These increases in turn give rise to dynamic adjustments in the other endogenous variables such as the level of private consumption expenditure. This in turn gives rise to further repercussions and contribute dynamic instability to the model (See details in Turnovsky (1977), Chapter 4).
upon their relative risk premium and expected rate of return. With free mobility of funds into and out of a country, arbitrage continually ensures that the expected return on competing financial assets will be the same once allowance is made for differential risk due to changes in the interest rate and exchange rate.

The model developed initially assumes that the Thai economy operates under a flexible exchange rate and imperfect capital mobility, as represented by scenario I in Figure 5.1. Other scenarios will be discussed in section 5.4.

The equations of the model are now discussed in detail, being categorized under the headings of product market equilibrium, asset market equilibrium, wage price nexus and aggregate supply, and definitions. All equations in the model, except the domestic nominal interest rate and the world interest rate, are presented in log-linear form (See Table 5.2). The symbols are defined in the box following the equations (See Table 5.3).

Overall equilibrium in the model depends upon equilibrium in the product market, asset market and external balance. Equilibrium in the product market is discussed first.

The product market equilibrium consists of eight equations, which are represented by Equations (1)-(8). Equation (1) describes the aggregate demand for real output \( y' \) as comprising private consumption, private investment, government consumption, government investment, and the trade balance consisting of exports less imports. Equation (2) indicates that private consumption expenditure \( (c^p) \) depends positively on the level of real income\(^4\), and real private sector wealth. Equation (3), the total private investment equation, consists of two components: productive \( (i^p) \) and non-productive \( (i''p) \) investment. In this context household investment is used as a proxy for non-productive investment and private corporate investment is used as a proxy for productive investment.

\(^4\) Using aggregate supply rather than aggregate demand because aggregate supply indicates domestic production of goods and services, hence domestic income generated. This is a major variable influencing consumption expenditure.
Table 5.2 The Model: Flexible Exchange Rate with Imperfect Capital Mobility

**Product market**

\[
y^d = \alpha_1 c^p + \alpha_2 i^{pp} + \alpha_3 c^g + \alpha_4 i^g + \alpha_5 l \quad (1)
\]

\[
c^p = c_1 y^e + c_2 w^p \quad (2)
\]

\[
i^{pp} = \xi_1 i^{pp} + (1 - \xi_1) i^{np} \quad (3)
\]

\[
i^{np} = h_1 w^p + h_2 st_f \quad (4)
\]

\[
i^{pp} = k^p = q + h_3 lt_f \quad (5)
\]

\[
c^g = c^g, \quad (6)
\]

\[
i^g = k^g \quad (7)
\]

\[
t = t_1 (e - p) - t_2 y^d + t_3 y^* \quad (8)
\]

**Asset markets**

\[
m = p + \sigma_1 y^d - \sigma_2 r \quad (9)
\]

\[
R = \varepsilon_1 y^e - \varepsilon_2 k^p + \varepsilon_3 k^g \quad (10)
\]

\[
e = r - r^* - rp^b \quad (11)
\]

\[
q = \delta_3^{-1} [q - \delta_1 R + \delta_2 (r - \pi - rp^b + rp^g)] \quad (12)
\]

\[
w^p = \gamma_1 (f + e - p) + \gamma_2 (k^p + q) \quad (13)
\]

\[
f = \mu_1 f + \mu_2 r^* f - (1 - \mu_2) (e - p) \quad (14)
\]

\[
st_f = -\beta f \quad (15)
\]

\[
l_{t_f} = -(1 - \beta) f \quad (16)
\]

**Price/wage nexus**

\[
p = \chi w + (1 - \chi) e \quad (17)
\]

\[
w = \phi_1 (y^d - y^e) + \phi_2 \pi \quad (18)
\]

\[
y^e = \lambda_1 k^p + \lambda_2 k^g - \lambda_3 (w - p) + \lambda_4 y^/ \quad (19)
\]

\[
\pi = \pi_1 (p - \pi) \quad (20)
\]

**Definitions etc**

\[
c = e - w \quad (21)
\]

\[
l = m - w \quad (22)
\]

Eight equations were estimated in Chapter 6, equation (2), (4), (5), (8), (9), (13), (14), and (19).
### Table 5.3
List of Symbols Using in the Model

**Endogenous Variables**

- $y^d$: Aggregate demand for real output
- $c^p$: Private consumption
- $i^p$: Total private investment
- $i^p$: Productive investment
- $i^p$: Non productive investment
- $t$: Trade balance
- $y'$: Aggregate supply of output
- $w^p$: Real private sector wealth
- $k^p$: Private capital stock
- $q$: Tobin’s q
- $p$: Domestic price level
- $e$: Nominal exchange rate (only where exchange rate is flexible)
- $c$: Real exchange rate
- $l$: Real money balances
- $R$: Real profits stream derivable from the capital services
- $r$: Domestic nominal interest rate
- $\pi$: Inflationary expectation
- $f$: Foreign asset stocks
- $si_f$: Net short-term inflows (short-term capital outflows minus short-term capital inflows)
- $li_f$: Net long-term inflows (long-term capital outflows minus long-term capital inflows)
- $w$: Domestic nominal wage

**Exogenous variables**

- $c^g$: Government consumption
- $i^g$: Government investment
- $k^g$: Public capital stock
- $y^*$: World real income
- $y'$: Aggregate supply of output
- $m$: Nominal money supply (only where exchange rate is fixed)
- $res$: Foreign exchange reserves by the central bank (only where exchange rate is flexible), in the case of fixed exchange rate changes in foreign reserves ($res$) is endogenous variable.
- $r^*$: World nominal interest rate
- $dc$: Domestic credit expansion
- $rp^b$: risk premiums on holding domestic bonds relative to foreign bonds
- $rp^q$: risk premium on holding domestically owned equities
In the Flow-of-Funds Accounts of Thailand total private investment consists of two components: household investments and private corporate investments. Household investments are estimated as the sum of the National Accounts categories "private residential construction" and "investment in new lands". This study has followed the same practice and calculated household investment from the National Accounts. Private corporation investment is obtained by deducting household investment from total private investment. The share of household investment in Thailand accounted for around 30 percent of total private investment during the period 1980-1994. The share of household investment as a proportion of GDP increased substantially since the early 1980s from 4.1 percent of GDP in 1980 to 6.55 percent in 1985, and with very high peaks of 9.27 percent in 1990 and 9.76 percent in 1991 respectively. Investment by private corporations was fairly stable at around 13.8 percent of GDP during the early 1980s and has risen sharply since 1988, averaging 24 percent during the period of 1990-1994 as a result of increased foreign investment flows (See Table 5.4).

The sharp rise in capital inflows during the late 1980s induced a higher level of both household investment and private corporate investment. However the sharp increase in household investment as a percentage of GDP since the late 1980s was associated with a downward trend of the household savings ratio, and hence the traditional savings surplus of the household sector has declined rapidly in recent years. This is one of the factors contributing to a widening gap of the current account deficits in Thailand. During the late 1980s to the first half of the 1990s Thailand has achieved rapid economic growth which has contributed to substantial increases in private sector wealth, both in the corporate and household sectors. The wealth effect in the household sector may create a sharp rise in consumption and non-productive investment spending. Households may invest for speculative purposes, such as in purchasing real estate, land and the outstanding stock of equities. Hence higher household investment may not lead to higher real capital stock and higher
productivity, which is the major factor in generating growth of the economy, but rather stimulate excessive aggregate demand and lead to an asset price bubble. On the other hand private corporate investment is regarded as being more productive, in the sense that it creates new capital stock, such as factories, machinery, and other equipment used in production. This is one of the important features of the present model.

Equation (4) identifies the determination of non-productive investment, which depends positively on real private sector wealth and net short-term capital inflows. In the case of Thailand the large interest rate differential between the low foreign interest rate and the high domestic rate, together with the long-running stability of the baht relative to the US dollar, led borrowers not to consider sufficiently the risk of a baht devaluation. This in turn encouraged banks to increase their short-term borrowing substantially, and unhedged, for purposes of long-term domestic lending, as discussed at length in Chapter 3. As a result foreign capital was increasingly made up of short-term commercial bank loans, reducing the relative role of much less footloose FDI. FDI which had made up over a half of net foreign capital flows in 1986, was down to just over a quarter of the net flows by 1996.

Table 5.4 Thailand: Household and Private Corporate Investment: 1980-1996

<table>
<thead>
<tr>
<th>Year</th>
<th>Household investment/GDP</th>
<th>Private corporate investment/GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>4.16</td>
<td>14.8</td>
</tr>
<tr>
<td>1980-1984</td>
<td>5.72</td>
<td>13.8</td>
</tr>
<tr>
<td>1985</td>
<td>6.55</td>
<td>11.92</td>
</tr>
<tr>
<td>1985-1989</td>
<td>7.5</td>
<td>20.2</td>
</tr>
<tr>
<td>1990</td>
<td>9.27</td>
<td>24.9</td>
</tr>
<tr>
<td>1991</td>
<td>9.76</td>
<td>24.6</td>
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<tr>
<td>1992</td>
<td>7.55</td>
<td>23.7</td>
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<tr>
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<td>7.08</td>
<td>26.9</td>
</tr>
<tr>
<td>1996</td>
<td>6.55</td>
<td>26.1</td>
</tr>
</tbody>
</table>

Source: Office of the National Economic and Social Development Board (NESDB), Office of the Prime minister, Government of Thailand "National Income Accounts of Thailand".

The use of short-term foreign currency borrowing to finance domestic non-productive investment, especially in real estate and other non-tradeable activities,
rather than to finance productive capacity for manufactured exports, as in earlier periods, was particularly dangerous. Domestic banks became increasingly vulnerable for at least two reasons. First, by borrowing in foreign exchange and lending in Thai currency, the banks were exposed to the risk of foreign exchange losses from a depreciation of the Thai currency. Even if the domestic loans were denominated in dollars, domestic borrowers that were not earning foreign exchange, such as those in real estate, faced bankruptcy in the event of depreciation. Second, banks borrowed offshore in short-term maturities and lent onshore with longer payback periods, they were exposed to the risk of a sudden reversal of these foreign funds. In this regard short-term flows therefore only affect non-productive investment. This is an important feature of the model developed and an issue explored in greater depth in Chapter 7 when various simulations of the model are conducted.

Productive investment is given by equation (5a), which is equivalent to the change in the private sector's productive capital stock. This consists of two components. The first component captures the partial adjustment hypothesis, as in the CH model:

\[ k^p = \eta(k^* - k) + \dot{it} \]  

(5a)

This partial adjustment arises from the costs of adjusting the physical capital stock \(k\) to the desired capital stock \(k^*\). The desired capital stock depends upon its market value \((k + q)\), as given by equation (5b):

\[ k^* = k + q \]  

(5b)

where \(q\) is Tobin's \(q\), the ratio of the marginal market valuation of equity capital to the replacement cost of the capital. Substituting (5b) into (5a), then obtains equation (5). Net investment adjusts positively to Tobin's \(q\).

The second component of equation (5a) arises from the long-term capital inflows. From a policy perspective the long-term capital flows, especially foreign
direct investment flows, have contributed to an accumulation of private capital stock and ultimately contributed to growth of the economy.

Equations (6) and (7) explicitly explain government consumption and investment spending in the model. Government consumption and investment spending are exogenous policy determined variables. It is also assumed that the public capital stock is policy determined.

Equation (8) represents the trade balance which depends positively upon the real exchange rate, the nominal exchange rate deflated by the domestic price level \((e-p)\), negatively on domestic aggregate demand, and positively on world real income.

Asset market equilibrium is given by equations (9)-(16). The three non-money assets are assumed to be imperfect substitutes due to differences in their perceived risk. With free capital mobility, arbitrage between them continuously ensures the same expected rate of return adjusted for the risk premium. The expected rate of return adjusted for the risk premium must in turn be consistent with the proportion of money in agents' portfolios. For example, an increase in the anticipated rate of depreciation of the domestic currency or an increase in the risk premium on domestic assets will raise the expected cost of holding domestic money vis-à-vis foreign currency, and hence increase the expected rate of return on holding foreign assets. This must be consistent with an increase in the proportion of money balances held in foreign money in agents' currency portfolios. On the other hand, an expected domestic currency appreciation or a decline in the risk premium on the domestic assets will raise the proportion of domestic money in currency portfolios.

Equation (9) represents the demand for real money balances, which depends positively on the level of aggregate demand and domestic real wealth and negatively on the domestic nominal interest rate.

Equation (10) describes the real return on private capital as depending positively on the level of real income, and negatively on the private corporate capital stock due to diminishing returns, and positively on the public capital stock. The latter holds because public capital and private capital are assumed to be complementary,
hence productivity of private capital increases as the government provides more public infrastructure (See Aschauer (1989)).

The expected real return on domestic bonds adjusted for the risk premium required to hold domestic bonds relative to foreign bonds is equivalent to 

\[ (r - rp^b - \pi) \]

which must be continuously equivalent to the real return on foreign bonds adjusted for exchange rate expectations \( (r^* + e - \pi) \). Since domestic and foreign bonds are regarded as imperfect substitutes, from the perspective of domestic residents, any such capital flows between them need to consider both expected changes in the exchange rate and the risk premium between them. Expected currency yields must also be equalized. This implies that riskless uncovered interest parity does not hold and is replaced by equation (11).

\[
e = r - r^* - rp^b
\]

(11)

This expression shows that an increase of the risk premium on domestic bonds relative to foreign bonds requires domestic bonds to generate a higher return in order to compensate investors for the relative riskiness of domestic bonds. This pushes up the return on domestic bonds \( r \) so that the higher return is obtained. Meantime the expected exchange rate may appreciate \( (e \uparrow) \) due to an initial depreciation of the spot rate. This example was one of the crucial factors contributing to the rapid depreciation of the Thai currency in 1997. The equation above suggests that the only way the Thai government could prevent such a depreciation of the Thai currency and maintain its exchange rate peg to the US dollar, was to sharply increase the domestic interest rate

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\( rp^b \) represents the net risk premium on holding domestic bonds relative to foreign bonds. If agents consider the domestic bonds more risky than the foreign bonds, then such a premium is positive. That is adding the uncovered domestic investments result in an increase in the overall risk of the investors' portfolios. In this case the real return on the domestic bonds \( (r - \pi) \) will have to exceed the real expected return on the foreign bonds \( (r^* + e - \pi) \) in order to compensate investors for the relative riskiness of domestic bonds. The difference between the expected real return on the domestic bonds and the real return on the foreign bonds is the risk premium. Similarly, if agents consider the foreign bonds more risky than the domestic bonds, then such a premium is negative, domestic investments decrease portfolio risk and hence the foreign rate of return \( (r^* + e - \pi) \) must exceed the real return on the domestic bonds \( (r - \pi) \) to compensate for their increased risk taking.
to the level that restores the risk-adjusted interest parity condition. However to maintain a high domestic interest rate for a long period could lead to a domestic recession, as has occurred in Thailand since late 1997.

With regard to equities the expected real return on holding equities adjusted for the risk premium for holding equities is given by:

\[
\frac{q}{q} + \frac{R}{q} - rp^q
\]  

(12a)

where \(q\) is the value (real) of these equities, \(R\) the real profit, the real return on private capital services, and \(rp^q\) is the risk premium for holding equities. The expected real return adjusted for the risk premium from holding equity capital depends upon the expected capital gain/loss from holding equity capital \(\frac{q}{q}\), where \(q = 0\) in the steady state, plus the real profits stream derivable from the capital services \(R\) relative to \(q\), and minus the risk premium form holding equities.

Arbitrage between domestic bonds, foreign bonds and equity capital, which is continual, implies:

\[
\frac{q}{q} + \frac{R}{q} - rp^q = r - rp^b - \pi = r^* + \pi - \pi
\]  

(12b)

Ignoring \(r^* + \pi\), since this must be equivalent to \(r - rp^b - \pi\), and taking a log linear approximation, we then obtain:

\[
q = \delta, R - \delta, (r - \pi + rp^b - rp^q) + \delta, q
\]  

(12c)

Rearrange and solving for \(q\) we then obtain equation (12)

\[
q = \delta, [q - \delta, R + \delta, (r - \pi + rp^q - rp^b)]
\]  

(12)

Equation (13) defines real domestic private sector wealth, which depends positively on the real domestic currency value of domestically held foreign bonds and on the value of the private sector capital stock \(k^p + q\).

Equation (14) defines the current account of the balance of payments, which is equivalent to the change in domestic holdings of foreign assets. This depends positively on the trade balance, the foreign net interest income \(r^*f\), and negatively
on the real exchange rate. In the long run steady state the current account balance must be zero, otherwise further wealth effects will rise which in turn requires further macroeconomic adjustment.

With regard to capital inflows, these are separated into two categories, short-term and long-term flows as represented by equations (15) and (16). Both short-term flows, equation (15), and long-term capital flows, equation (16), are assumed to adjust with the changes in foreign asset holdings. From a policy perspective an increased share of short-term flows in financing the current account deficits may have negative effects on economic development, because short-term flows can lead to an increase in non-productive investment in the real sector.

The next area to be considered is the wage price nexus and aggregate supply, which is given by equations (17-19). The domestic price level, equation (17), is a weighted average of domestic nominal wages and the world price of the imported good. Nominal wage adjustment is generated by an expectations augmented Phillips curve, as given by equation (18). Such adjustment arises from an excess demand in the product market and inflationary expectations. Aggregate supply is endogenously determined within the model. Aggregate supply, equation (19), is derived from the economy's aggregate production function, and depends positively on the private physical capital stock, public capital stock, the output of aggregate supply and negatively on the real wage rate.

Finally, equations (20-22) define the following. Equation (20), inflationary expectations (adaptive expectations), captures the partial adjustment hypothesis. The inflationary expectations are adjusted by a proportion of the difference between actual inflation rate ($p$) and expected inflation rate ($\pi$). Hence the inflationary expectations exhibit stickiness of adjustment, and is predetermined non-jump variable. Equations (21) and (22) define the real exchange rate and real money balances respectively.
5.4 Alternative Versions for the Model

The previous section represents the model in scenario I, where the economy operates under imperfect capital mobility and a flexible exchange rate. This section outlines alternative scenarios as follows:

**Scenario II**: the economy operates under a fixed exchange rate and imperfect capital mobility.

With a fixed exchange rate, two amendments are required. First equation (11) is replaced by equation (11a). With the nominal exchange rate fixed, growth of the money stock becomes endogenous and the nominal exchange rate is exogenous. Equation (11a) suggests that the money supply will change from two sources: an expansion in domestic credit ($dce$) engineered by the monetary authorities, and, secondly, the accumulation of foreign reserves through balance of payments surpluses/deficits. The second change is that with a fixed exchange rate it is unable to adjust, thus the balance of payments will not be in continual equilibrium. Equation (14a) gives the balance of payments equation, showing an accumulation/decumulation of foreign exchange reserves by the central bank arising from balance of payments surpluses/deficits. Such reserves can change from capital inflows or outflows arising from divergences between the returns on domestic and foreign bonds adjusted for the risk premium ($r - r^* - rp^b$), and from surpluses/deficits on current account ($f$). 

Hence, equation (14a) appears in the fixed exchange rate version of the model, but not in the flexible exchange rate version.

\[
\begin{align*}
\dot{m} &= dce + \dot{res} \quad (11a) \\
\dot{res} &= (r - r^* - rp^b + f) \quad (14a)
\end{align*}
\]

**Scenario III**: the economy operates under a fixed exchange rate and perfect capital mobility. With a fixed exchange rate, equation (11) is replaced by equation (11a) as appeared in scenario II. However with perfect capital mobility, the three non-money assets are perfect substitutes, so that the risk premium does not exist. Arbitrage
between them implies the same expected (instantaneous) rate of return. Equation (12) is replaced by (12a)

$$\dot{q} = \delta_3^{-1}[q - \delta_1 R + \delta_1 (r - \pi)]$$

and Equation (14a) is replaced by (14b).

$$\dot{res} = r - r^* + f$$

As mentioned in the previous section this scenario may be regarded as representative of the Thai economy prior to the financial crisis since mid-1997. The inconsistent policy mix between a fixed exchange rate and perfect capital mobility led to an adverse effect on the Thai economy. Under a fixed exchange rate regime, sustained interest rate differentials, with perfect capital mobility, induced massive capital inflows that created an increase in the foreign exchange reserves (equation 14B) which resulted in an increase in the monetary growth (equation 11a). This in turn put upward pressure on inflation expectations (equation 20) and thereby generated a real appreciation of the exchange rate causing a deterioration of the current account of the balance of payments (equation 14). When the current account deficits reached an unsustainable level, the currency crisis occurred.

**Scenario IV:** the economy operates under a flexible exchange rate and perfect capital mobility.

Under a flexible exchange rate regime, the nominal exchange rate can adjust so that either capital inflows or outflows will have no effect upon foreign exchange reserves. As a result growth of the money stock is exogenous, and the nominal exchange rate becomes endogenous. Hence Equation 11a showing the growth of the money stock will not appear in the flexible exchange rate version of the model, and equation 11 will appear instead. Equation 14a showing a change of foreign exchange reserves by the central bank will also not appear in the flexible exchange rate version.

With perfect capital mobility, the risk premium does not exist. Assets are assumed to be perfect substitutes, and arbitrage between them implies the same
expected (instantaneous) rate of return. Hence equation (11), \( \dot{e} = r - r^* - rp^b \), is therefore replaced by equation (11c).

\[ \dot{e} = r - r^* \quad (11c) \]

and Equation (12) is replaced by (12a)

\[ q = \delta_3^{-1} \left[ q - \delta_1 R + \delta_2 (r - \pi) \right] \quad (12a) \]

5.5 Conclusion

This chapter has outlined a dynamic macroeconomic model emphasizing the long run, and will be utilized to analyze the economic adjustment process arising from a variety of shocks emanating from financial liberalization policies for the Thai economy. It focused upon the significance, for the adjustment process, of the exchange rate system, fixed or flexible, operative, under perfect capital mobility and imperfect capital mobility. The model was outlined in four different scenarios. Scenario I shows an economy operating under imperfect capital mobility and a flexible exchange rate; scenario II is a situation of imperfect capital mobility associated with a fixed exchange rate; scenario III is associated with perfect capital mobility and a fixed exchange rate; and scenario IV implies perfect capital mobility with a flexible exchange rate.

Under fixed exchange rate regimes, as shown in scenarios II and III, the money supply and hence monetary growth, is endogenously determined. It depends upon domestic credit expansion, assumed to be zero, and changes in foreign exchange reserves held by the central bank. Changes in foreign reserves are endogenously determined by balance of payments surpluses or deficits which arise from developments in the current account and capital flows, given the fixed nominal exchange rate. In contrast, under a flexible exchange rate (scenarios I and IV), the nominal exchange rate is capable of adjusting so that either capital outflows or
inflows will have no effect upon foreign exchange reserves. As a result growth of the
money stock is exogenous, and the exchange rate is endogenous.

Under perfect capital mobility (scenarios III and IV) two assumptions are
required. The first is freedom of capital movement-absence of impediments to capital
flows in the form of capital controls, taxes and so forth. The second is perfect
substitutability of assets denominated in home currency and foreign exchange. Hence
the riskless uncovered interest parity holds \( e = r - r^* \). In the case of imperfect
capital mobility (scenarios I and II), in this context capital is still assumed to be freely
mobile and this assumption is relevant for Thailand as its domestic financial markets
are highly integrated with global financial markets but assets are assumed to be
imperfect substitutes. Hence the riskless uncovered interest parity condition does not
hold and is replaced by \( e = r - r^* - r_p^h \). The existence of the risk premium is one of
the essential features of the model utilized.

In addition, the model developed emphasized the role of short-term flows in
contributing to an expansion of non-productive investment, and the long-term flows in
stimulating productive investments and enhancing the productive capacity of output
supply.

The role of public spending was also emphasized by separating public
spending into two categories, current public spending and capital public spending, in
order to compare the effects of variations between public investment spending and
public consumption upon the Thai macroeconomic adjustment process, and on long
run output supply which could be affected by such fiscal shocks.

Before conducting a simulation analysis, in Chapter 7, the model will be
empirically estimated by using appropriate Thai data. The source of the data and
method of estimation will be discussed in the following chapter.