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**Asset Prices, Leverage and Financial Crisis:  
The Case of Thailand**

by

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Thesis submitted in fulfilment of the requirements for the degree of  
Doctor of Philosophy in Economics

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To my parents

# Contents

Acknowledgements	vii
Declaration	vii
Abstract	viii
<b>1. Introduction</b>	<b>1</b>
1.1 Motivation	1
1.2. Outline of the thesis	3
1.2.1 A Study of corporate leverage and financial fragility	4
1.2.2 The Case of Thailand	8
1.3 A brief review of theories of currency and financial crisis	14
1.3.1. First and second generation models of currency crisis	14
1.3.2 Third generation models of financial crisis in Asia	15
<b>2. Asset Price Bubbles and Collapse</b>	<b>20</b>
2.1 Introduction	20
2.2 Leverage and margin calls	23
2.3 The basic KM model	27
2.4 Bursting bubbles and escalating debts	34
2.4.1 A squeeze - loan recalls: general equilibrium	35
2.5 Financial stabilisation	39
2.5.1 A freeze – loan roll-ups	39
2.5.2 Financial restructuring – loan write-downs	40
2.6 Conclusion	43
Appendix I: Temporary finance	44
Appendix II: Infinite-period rollovers	46
<b>3. Leverage and Financial Fragility: A Quantitative Exploration</b>	<b>47</b>
3.1 Introduction	47
3.2 Exact and linearised solutions of the KM model	49
3.2.1 Exact solution	50
3.2.2 Numerical comparisons	54



3.2.3 Non-homogenous user cost of land	55
3.3. The introduction of a margin requirement	57
3.3.1 Steady state	61
3.3.2 Aggregate productivity shock	65
3.4. Leverage and financial fragility: Some numerical exercises	70
3.4.1 Asset price shocks	70
3.4.2 Interest rate shocks	74
3.5 Temporary relaxation of a margin requirement	79
3.5.1 Discussions	82
3.6 Conclusion	85
<b>4. Understanding the Thai Financial Crisis</b>	<b>87</b>
4.1 Introduction	87
4.2 The boom (1987 - 1996)	91
4.2.1 Financial liberalisation and capital inflows	92
4.2.2. Asset price boom and bust	106
4.3 The run-up (1996 – mid 1997)	114
4.3.1 Real estate and finance company crises	114
4.3.2. Currency devaluation	120
4.4 The financial collapse (mid 1997 – 1998)	122
4.4.1 Foreign investor panics on commercial banks	123
4.4.2 The meltdown	129
4.5 Concluding remarks: Some perspectives on the Thai crisis	131
<b>5. Managing corporate debt crisis: Lessons from Thailand</b>	<b>135</b>
5.1 Introduction	135
5.2 Will voluntary renegotiation avert the credit crunch?	139
5.3 Formal legal mechanisms in Thailand	142
5.3.1 Legal origins and history of property rights in Thailand	142
5.3.2 Creditor vs debtor and efficiency of judicial system	145
5.3.3 Legal and Judicial Reform in Thailand	148
5.4. Dealing with systemic bankruptcy	159
5.4.1 A brief history of the ‘London Approach’	160
5.4.2 The Bangkok Approach	163

5.4.3 CDRAC as ‘filtering device’	166
5.4.4. Some practical issues	168
5.5. Concluding remarks	169
Appendix I	171
Appendix II	175
Appendix III	178
<b>6. Conclusion</b>	<b>179</b>
<b>Bibliography</b>	<b>184</b>

# List of Figures

1.1 Corporate leverage and the ‘balance sheet’ effect	3
2.1 Leverage and margin calls	25
2.2 Dynamics of the KM model with no surprise	31
2.3 The timing of events	33
2.4 Adverse shock and land price ‘overshooting’	36
2.5 Averting collapse: Roll-ups, write-downs and recovery	41
2.6 Temporary finance	45
3.1 Exact, linear-quadratic and linearised solutions of the KM model	52
3.2 Linear approximation of land price when $R=1.01$	54
3.3 Linear approximation of land prices when $R=1.5$	55
3.4 Impacts of user cost elasticity on speed of adjustment	57
3.5 Dynamics adjustment where $m > 0$	59
3.6 Short-run contraction and long-run expansion when $m$ increases	63
3.7 The process of rebuilding net worth after $m$ increases	63
3.8 Dynamics of land-holdings	69
3.9 Dynamics of land prices	69
3.10 The process of rebuilding net worth after negative shock	74
3.11 Impacts of an interest rate shock	77
3.12 How relaxing $m$ can help avert collapse	81
4.1 Net private capital inflows	93
4.2 Foreign borrowing of commercial banks and finance companies	102
4.3 Sources of corporate funding in Thailand (1996)	103
4.4 Return on assets and debt to equity ratio of listed companies	105
4.5 Land price index	107
4.6 Stock price bubbles	107
4.7 Changes in land prices and property lending	109
4.8 Structure of commercial bank collateral	111
4.9 Self-reinforcing dynamics resulting in increased vulnerability	114

# List of Figures

4.10 'Flight to quality' by domestic depositors	118
4.11 Exchange rate (Baht/\$US) and interbank rates	122
4.12 Lendings and borrowings of Thai commercial banks	126
4.13 Non-performing loans in financial system	127
4.14 Non-performing loans by sectors (end 1998)	128
4.15 Boom, Bust and Recovery	130
4.16 Corporate leverage and the 'balance sheet' effect	131
5.1 Trade-offs between bankruptcy regimes	147
5.2 Liquidation cases in Thailand	153
5.3 Property foreclosed by Thai commercial banks	155
5.4 Summary of the Thai Bankruptcy Law	158

## List of Tables

3.1 Comparisons between exact and linear-quadratic solutions	56
3.2 Margin requirements, land price coefficients, and autoregressive coefficients	61
3.3 Measuring the impact of asset price shocks: Some examples	71
3.4 High leverage vs low leverage economies	82
4.1 Main Economic Performance since 1950	87
4.2 Selected macroeconomic indicators	91
4.3 Composition of net private capital inflows to Thailand	97
4.4 Thailand's private external debt	98
4.5 Financial indicators of manufacturing firms in Thailand (1996)	104
4.6 Profit growth of listed companies in the stock market	108
4.7 Loan portfolio composition of commercial banks and finance companies	110
4.8 Lending practice in Thailand	112
4.9 Measures to revive the real estate sector	116
4.10 Net profit and loss of commercial banks and BIBF operations	124
4.11 Net private capital outflows	125
4.12 Consolidation of the Thai financial sector	129
5.1 Corporate distress in East Asia (as of 11/99)	136
5.2 Efficiency of judicial system and creditor rights	146
5.3 Overview of out-of-court workouts in East Asia (12/2000)	163
5.4 Summary of debt restructuring approaches	168



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## Declaration

An earlier version of Chapter 2 and some part of Chapter 3 -- entitled "Asset Bubbles, Leverage and 'Lifeboats': Elements of the East Asian Crisis" and co-authored with Dr. Hali Edison and Professor Marcus Miller -- was published in the *Economic Journal*, January 2000.

# Abstract

The first part of this thesis examines the role of highly-leveraged institutions in creating vulnerability in the financial system. By applying the framework of Kiyotaki and Moore (1997), Chapter 2 shows that when an asset price bubble bursts which cuts the value of land being used as collateral, the sudden fall in collateral value can create the possibility that firms' net worth is entirely wiped out and the whole financial system collapses. This is due to the powerful feedback effects where forced selling further depresses prices, setting in motion a downward spiral of asset prices and loan recalls. We then show how wholesale financial collapse can be avoided by coordinated loan roll-overs in the form of a general financial freeze; and how the breathing space gained in this way can be used to arrange for loan write-downs or capital injections. In Chapter 3, the degree of corporate leverage is analysed more explicitly by introducing margin requirements into the model and two types of adverse shocks are examined numerically, an asset bubble bursting and a sudden rise in real interest rates. We find that when the economy is highly leveraged, a small shock to real interest rates can have powerful impacts on asset prices and cause widespread bankruptcy of the credit-constrained sector. To shed light on the recent debate on the role of prudential regulatory policies in mitigating the impact of a bubble bursting, we show that relaxing margin requirements can be used as a form of 'regulatory forbearance' for avoiding and/or reducing the knock-on effects.

The second part of the thesis is a case study of Thailand. Chapter 4 provides a detailed account of Thailand economic developments from 1988 to 1998; it is argued that the nature of Thai financial crisis lied in the profound boom and bust in real estate sector which played a central role in creating tensions in the financial system and ultimately causing severe contraction of the economic activity. Chapter 5 explores some key issues relating to systemic bankruptcy of the corporate sector in aftermath of the Thai crisis. We show that when the efficiency of legal system is taken into account (particularly the built-in delay involved in the judicial process), a creditor-oriented bankruptcy law may effectively turn into debtor-friendly regime. In the case of large-scale debt crisis, while such build-in delay may help preventing fire-sales of assets, it can also create efficiency losses as efficient firms are prevented from being restructured. This suggests the need for a quick resolution. It is argued that the out-of-court restructuring framework used in Thailand -- by giving restructuring priority to large and viable firms that have the most impacts on the economy -- can help increase efficiency in resolving systemic debt problems.

# Chapter 1

## Introduction

### 1.1 Motivation

Since Irving Fisher's (1933) 'debt-deflation' explanation of the Great Depression, financial factors, such as borrower net worth, have been considered an important element of output fluctuations. This theme was treated in a seminal paper by Bernanke (1983) and formally modelled by Bernanke and Gertler (1989, hereafter BG) and Kiyotaki and Moore (1997, hereafter KM). While BG and KM both emphasise the central role of the endogenous evolution of borrower's net worth in macroeconomic dynamics, the channels affecting net worth of the borrowers are different. In BG, adverse temporary shocks are amplified and propagated through the *cash flows* of the borrower: in KM, the main source of net worth fluctuations comes from changes in *asset prices*.

Recognition that the presence of credit-market imperfections could play a similar role in the recent emerging market crises has led to a growing literature on the subject.<sup>1</sup> In particular, one strand of the 'third generation' crisis models of the Asian crisis has been developed to capture the role of 'balance sheet effects' derived from currency mismatches. For example, Aghion, Bacchetta and Banerjee (2001) and Krugman (1999) construct an open economy version closely in spirit of BG, i.e. credit limit depends on cash flow of the borrowers who have debt in domestic and foreign currency. They show that a sudden currency depreciation increases firms' debt repayment in foreign currency; hence their

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<sup>1</sup> See, for example, Arellano and Mendoza (2002) for current developments.



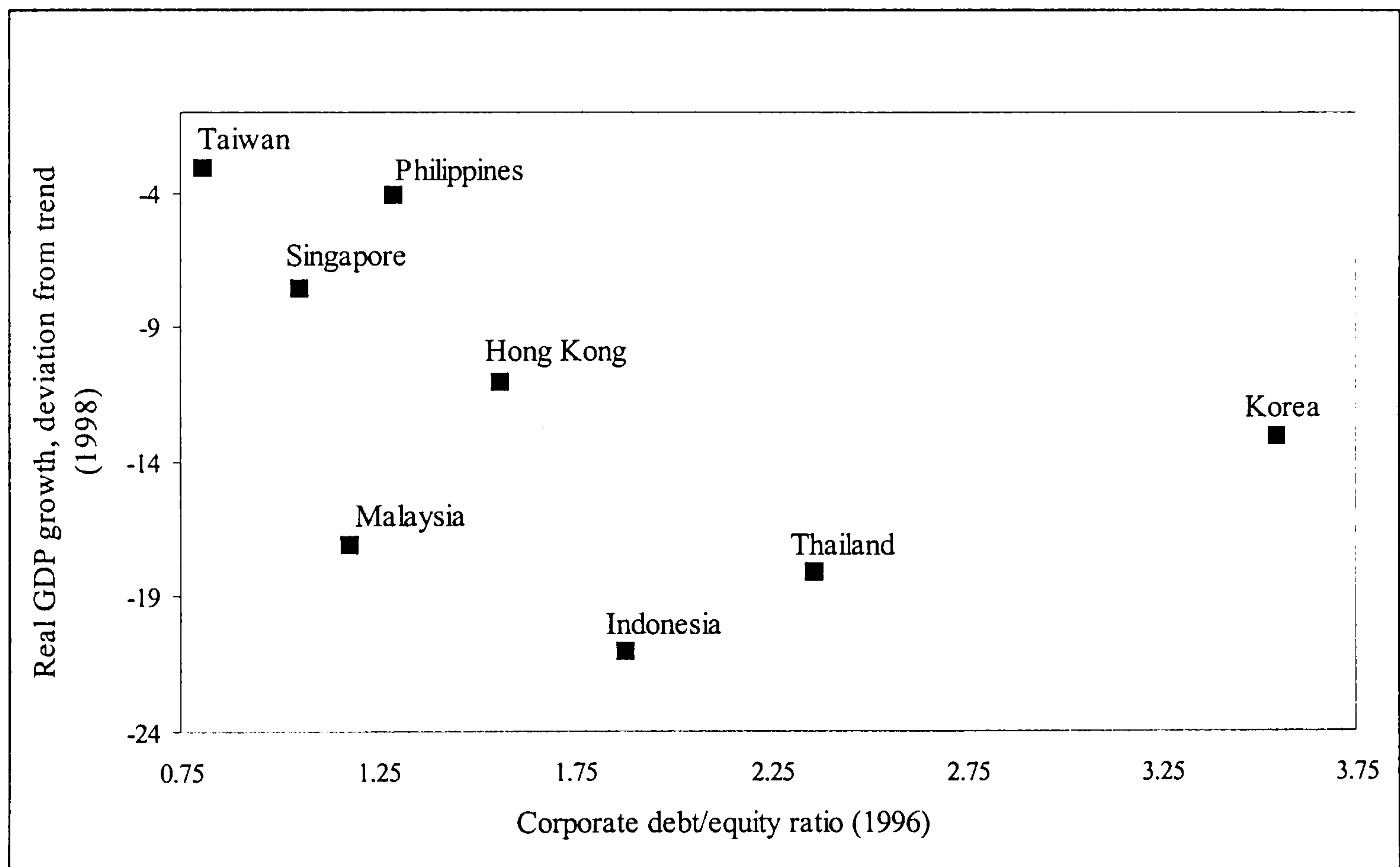
profits decline, which in turn tightens the borrowing constraint. A fall in investment and output then reduces demand for domestic currency and leads to further depreciation.

In this thesis, however, the analysis is restricted to a closed economy and the theme explored is not the problem posed by the currency composition of domestic firms' debt. Instead our purpose is to examine the vulnerability of highly-leveraged firms to changes in asset prices and to see how this might lead to a collapse of the financial system. Interestingly, Krugman (2001, p.2) notes that "third-generation currency crisis models are actually not very specific to currency crises: the mechanisms for speculative attack and self-fulfilling pessimism that these model identify... suggests ... that a fourth-generation crisis model may not be a currency crisis model at all; it may be a more general financial crisis model in which other asset prices play the starring role."

In Thailand, there is a strong evidence of land price bubble prior to the crisis; from 1985 to 1996, prices grew at the rate of over 35 percent per year. To put this into perspective, land prices in Tokyo rose 2.6 times within 5 years from 1985 to 1990 (before they burst in 1991) while value of land in Bangkok recorded a phenomenal increase of around 20 times over the same period. While the consequences of asset price collapse have varied widely across countries, it is evident that crashes in real estate markets tend to have more impact on real economic activity than those in equity markets (Hunter et al., 2003). Real estate (especially in form of land) is widely used as collateral for loans in many emerging market countries: so a rise in land prices facilitates more borrowing; but when prices fall, the process of unwinding leveraged positions can give rise to financial collapse.

Figure 1.1 below suggests that financial leverage played an important role in explaining the depth of the crisis in Asia. By plotting real GDP growth deviation from trend in 1998 against average debt to equity ratio of listed companies in 1996, we see that output contraction was more severe for countries which had high initial levels of financial leverage.

*Figure 1.1: Corporate leverage and the 'balance sheet' effect*



Source: Thaicharoen and Kiatikomol (2002).

In the remainder of this introductory chapter, we outline the structure of the thesis and then provide a brief literature review with respect to the Asian financial crisis.

## 1.2 Outline of the thesis

This dissertation is divided into two main parts. The first part (Chapters 2 and 3) is a theoretical study on the role of highly-leveraged institutions in creating fragility to the

financial system. The second part (Chapters 4 and 5) is a detailed case study of Thailand, examining developments in financial sector and property markets from the boom period during 1987-96 to the crisis in 1997-8, and discussing macroeconomic implications of bankruptcy law reform in aftermath of the crisis.

### **1.2.1 A study of corporate leverage and financial fragility**

In **Chapter 2**, we study how corporate leverage can create systemic risk of financial collapse and find that not only high leverage reduces the capacity of credit-constrained firms to bear the initial negative shocks, but the efforts to repay loans can generate the powerful ‘knock-on effects’ which can rapidly turn illiquidity into insolvency. Specifically, the situation we examine is what would happen if asset price bubble bursts which cuts the value of land being used as collateral; by applying the framework of Kiyotaki and Moore (1997), *we show that the sudden fall in collateral value can create the possibility that firms’ net worth is entirely wiped out and the whole financial system collapses.*

Note that there are both negative and positive effects at work following asset price shocks. First is *direct negative effect*, as mentioned above, due to capital losses from initial bursting bubble and the subsequent knock-on effects from fire-sales. Second is an *indirect positive effect*, not explicitly discussed in KM, – the efficiency gain on remaining land. The first may lead to complete collapse; but, if not, the second permits complete recovery. The positive effect comes from the fact that a fall in land prices enables the credit-constrained sector to exploit the profit-opportunity which arises from the difference between the total returns from using land by this sector and the user cost of land determined by the unconstrained sector; hence allowing credit-constrained firms to gradually rebuild their net worth back to its long-run equilibrium.



Because their efforts drive down land prices and cause bankruptcy, lenders trying to recall loans impose externalities on others willing to restructure debts. A financial freeze is one way of solving this collective action problem, because during the freeze, no loans are recalled and any arrears of interest are rolled over, so there need be no fire-sale disposals of land. Another form of stabilisation is the provision of temporary finance by existing lenders. So long as borrowers are still solvent after the initial shock, temporary financing can reduce (or avoid) the multiplier or knock-on effects that come from the dumping of assets in a scramble for liquidity; and so it can prevent illiquidity becoming insolvency. Firms cannot continue rolling over interest in this fashion forever; so financial restructurings to reduce debt are required. Temporary relaxation of margin requirements can nevertheless help stabilisation – as we discuss in the next chapter.

**Chapter 3** takes further steps towards developing a framework that is suitable for quantitative analysis. In the homogenous KM model presented in Chapter 2, the largest size of asset price shocks (consistent with a return to the long-run equilibrium) is minuscule, compared to what goes on in the real world. With setting interest rates as high as 50 percent, the ‘exact solution’ of the non-linear KM model yields the maximum shock of only 1.8 percent. The reason is that knock-on effects turn out to be very powerful; by selling about a quarter of land, the knock-on effects are 6 times relative to the initial fall in land prices. A non-homogeneous model with reduced sensitivity of land prices to land sales proves more robust to shocks.

A key innovation in this chapter is the inclusion of a ‘margin requirement’ (where lenders only lend up to some fraction of present discounted value of collateral). This allows us to

examine the effects of corporate leverage on financial stability more explicitly. By varying margin requirements, *we show that the higher is the degree of financial leverage, the higher is the impacts of monetary policy shocks on asset prices.*

Two numerical exercises are considered; temporary shocks to asset prices and to real interest rates. In the former, our simulations show that reducing leverage increases the stability of the financial system. As to the second type of shock, i.e. the impact of an unexpected temporary rise in real interest rates, we find that knock-on effects in this case turn out to be much stronger than those of asset price shocks (given that shocks to asset prices and interest rates lead to the same initial drop in net worth). The sudden increase in interest expenses of existing short-term debt obligations leads the credit-constrained firms to sell land to satisfy the margin requirements which causes asset prices to drop unexpectedly as in the case of asset price shocks. But there is an additional reinforcing effects, namely that higher rate of interest when used to discount the future value of land tighten the credit constraint further.

In Aghion et al. (2000), the proportion of foreign-currency debt (and the sensitivity of credit supply to changes in interest rates) plays a key role in determining whether raising interest rate might help stabilising exchange rates in the midst of the crisis. While our modified model falls short on this ‘open economy’ dimension, the analysis suggests that the degree of corporate leverage would also be of similar importance and needs to be taken into accounts. If most firms are highly leveraged, the use of high interest rates to stabilise exchange rates can lead to widespread bankruptcy. This brings to mind a critical comment made by Joseph Stiglitz (2002, p.110) on policy during the Asian crisis, namely that: “At the heart of the analysis of macroeconomy *should* have been an analysis of what an

increase in interest rates would do to the chances of default and to the amount that creditors can recover in the event of default.” [italics in original] From this perspective, the framework used here could provide an alternative approach to study monetary policy with bankruptcy. [Indeed, in their later work presented at Clarendon Lecture, Kiyotaki and Moore (2001) have developed a micro-founded framework to study monetary policy under credit-constrained environment and made a remark that: “Monetary economics may be displaced by Liquidity Economics – which is what I guess Keynes and Tobin would want.” (p. 33).]

In recent years, there has been a lively debate on what policy instruments can be used in controlling asset price bubbles and in mitigating the impact of a bubble’s bursting (see, in particular, a conference proceedings edited by Hunter et al., 2003). In fact, the debate is conducted on two levels; first, whether monetary policy should target asset prices and second, what prudential regulatory actions can be taken. In the former case, Bernanke and Gertler (1999) argue that monetary policy should not react to changes in asset prices (except that they signal changes in expected inflation). However, Cecchetti, Genberg and Wadhvani (2003) argue that when there are adverse shocks in asset markets, a policy of ‘leaning against the wind’ of asset price changes may help, even though it is very difficult to apply.

In light of the practical difficulties in identifying and appropriately reacting to asset bubble with monetary policy, Hunter et al. (2003, p. xxii-xxiii) note that “prudential policy offers possibly the best line of defense”. To this end, a number of microeconomic policies have been proposed. For example, Goodhart (2003) suggests, among other things, that margin requirements can be used as ‘automatic stabiliser’ so that when prices increase, margin



requirements should be increased (i.e. tightening borrowing constraint) and when prices fall, they should be reduced. This suggestion appears to fit well in the context of our modified model where *we show that temporarily relaxing the margin rules when the bubble bursts can help mitigate the credit crunch*. How much relaxation is required depends on the initial level of leverage in the credit-constrained sector. Two closely related papers, i.e. Aiyagari and Gertler (1999) and Mendoza and Smith (2002) study how credit constraints can produce overshooting in asset prices; but their analyses do not examine policy actions to reduce the impacts.

### **1.2.1 The Case of Thailand**

The 1997/8 Asian financial crisis has often analysed as a single episode from a set of common factors. The typical ‘stylised’ story runs as follows. First came financial sector deregulation and capital accounts liberalisation in early 1990s; this encouraged large inflows of short-term foreign capital, resulting in a profound boom in asset prices and a rapid accumulation of foreign-currency-denominated debt in private sector. The crisis came with a ‘sudden stop’ of capital flows, leading to the collapse of the fixed exchange rate regime, and a sharp contraction of the economy.

Although most, if not all, of the third generation models of crisis are built to investigate these phenomena. They have focussed on difference aspects. First is the focus on moral hazard in financial markets, where implicit government bailout-guarantees to banks lead to over-borrowing and over-investment (Krugman, 1998 and McKinnon and Pill, 1996); and it is government limited capacity to honour such guarantees (i.e contingent large fiscal liabilities) that makes the crisis ‘inevitable’ (Burnside, Eichenbaum and Rebelo, 2001; Corsetti, Pesenti and Roubin, 1998; and Dooley, 2000).

Second is the view that the Asian economies essentially fall into the victim of investor pessimism that makes the financial panics become 'self-fulfilling'. The source of vulnerability comes from the balance sheets of financial institutions i.e. maturity and currency mismatches (Change and Velasco, 1998; and Radelet and Sachs, 1998). The third aspect is that the crisis should be interpreted as a result of a negative shock that gets amplified by a 'financial accelerator mechanism'.<sup>2</sup> The main concern here is the net worth of domestic firms i.e. high leverage and unhedged foreign currency debt exposure (Aghion, Bacchetta and Banerjee, 2000; Edison, Luangaram and Miller, 2000; Krugman, 1999).

Insights from all three theories are very useful to understand the potential sources of the problems in Asia, each country in Asia; but each country in Asia has its own institutional characteristics which help to explain differences in the nature and severity of the crisis. For example, Indonesia suffered the sharpest depreciation in the region. As noted by Miller and Luangaram (1998), this was mainly due to the capital flight not by foreign creditors but from the ethnic Chinese minority who controlled the majority of Indonesia's largest companies. Fearing for the loss of their lives as well as their assets, they rushed for the exit when the currency began to fall. The regulatory policy of partial bank closures then generated bank panic on the whole financial system.

In **Chapter 4**, we take a careful look at the case of Thailand from the boom period during 1987-96 to the crisis in 1997/8. We find that both moral hazard and financial panic accounts appeared to play a role in the Thai crisis but through different types of financial

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<sup>2</sup> The term used by Bernanke et al. (1996), defined as the amplification of an initial shock brought about by changes in credit-market conditions.



institutions. Problems in finance companies are caused by moral hazard. The case for financial panics from foreign investors applies most to commercial banks.

The reason for this was due mainly to un-balanced and inadequate supervision and regulation between these two types of financial institutions. Finance companies were subject to less stringent regulation and supervision compared with commercial banks. When the authorities allowed finance companies to apply for a highly profitable banking license on the basis of asset size (i.e. the bigger they are, the higher chance they will become bank), their main incentive was to expand their assets as quickly as possible; and this was done by offering high interest rates to attract domestic funds so as to finance cyclical sectors especially real estate firms. In effect, they increased their share of domestic sources of funds. But the establishment of BIBF allowed the banks to attract cheaper funds from overseas, and pushed banks to toward short-term foreign borrowings<sup>3</sup>, this in turn made them more vulnerable to a sudden reversal of capital flows and to exchange rate risk.

As a result, while nominal GDP grew four-fold from 1985 to 1995 and total assets in commercial banks expanded five and a half times in nominal terms, assets in finance companies expanded by almost 12 times. At the same time, land prices in Thailand grew at the rate of over 35 percent per year. During the first five-year period, from 1985 to 1990, the value of land in Thailand recorded a phenomenal increase of around 20 times (as compared to 2.6 times increase in land prices in Japan during the same period before the Japanese bubble burst in 1991.)

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<sup>3</sup> Note that the share of foreign liabilities to total borrowing in commercial banks had risen substantially from 6 percent at the beginning of 1993 to 22 percent at the end of 1996. On the other hand, foreign borrowing by finance companies was less than 10 percent of their total sources of funds.

The detailed account of the Thai crisis provided in Rajan (2001) focuses on the collapse of Thai baht. Specifically he argues that the currency crisis in Thailand should be seen at two distinct phases; it was “originally pushed into devaluation by secularly deteriorating fundamentals, but it was then pulled into outright economic collapse by an international bank panic”, (p. 69). We argue, however, that the nature of Thai financial crisis lies in the profound boom and bust in the real estate sector which played a central role in creating tensions on the financial system and causing the severe contraction of the economic activity.

The implication of our account of the Thai case is that there was unique equilibrium of the crisis in real estate sector and finance companies but not for the commercial banks where collapse needs not have happened.<sup>4</sup> Consequently, policy to deal with problems in finance companies and in commercial banks should have been different, i.e. insolvent finance companies needed to be closed down while banks needed liquidity. In contrast, the ways that the Thai authorities chosen to deal with these problems appeared to be the opposite, namely that of by recycling liquidity out from the banks towards the finance companies during the run up to the crisis. It turned out that the insolvent finance companies were eventually closed down while the solvent commercial banks became undercapitalised. The effects of such policy not only pushed commercial banks towards the collapse equilibrium but it also led to unnecessarily high costs of financial restructurings when the crisis came. Another policy lesson we draw in this chapter is that the Thai central bank underestimated the risk of asset price deflation due to the collapse of real estate sector.

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<sup>4</sup> Based on our evidence, we do not find that loan portfolios in commercial banks were obviously unsound.

The problems in Thailand did not end with the collapse of finance and real estate companies. There is one important institution that also plays a crucial role in the dynamics of the crisis, namely the widespread use of collateral for loans. When finance companies continued on lending to real estate firms so as to increase the size of their assets, these real estate firms use borrowed funds to speculate on land and property which are generally used as collateral for loans in other lines of businesses. This in turn increased the capacity to borrow in other sectors. Since Thai firms always have tendency towards debt financing, it was not surprising that corporate leverage increased across the board. This is where the 'third explanation' (i.e. the 'balance sheet' effects) of the crisis is most relevant here. The use of tight monetary policy during the second half of 1997 to stabilise the currency turned out to be costly, as it opened another channel for a domestic liquidity crunch which led to widespread bankruptcies of corporate sector.

Macroeconomic dimensions of bankruptcy law reform in aftermath of the crisis are the main theme in **Chapter 5**. Following the Asian crisis, Claessens et al. (1999) find that, on average, 63 percent of the Asian firms were illiquid (i.e. earning less than debt service) and 31 percent technically insolvent (i.e. outstanding debt greater than assets). Indonesia suffered the most, where 77 and 65 percent of firms in the country were illiquid and insolvent, respectively. This was followed by Thailand with two-thirds of all firms illiquid and around a quarter were technically bankrupt.

One key policy issue that arises is how to deal with such widespread insolvency of domestic firms, arising from the sharp fall in currency values and the collapse in asset prices. While reforming bankruptcy procedures by strengthening creditor's rights and introducing the US Chapter 11-typed reorganisation law is necessary so as to ensure that



debts have been worked out in an orderly and efficient fashion, Miller and Stiglitz (1999) and Stiglitz (2001) argue that the nature of the bankruptcy law itself is not designed to deal with such systemic debt problems. This is because normal bankruptcy procedures which deal with individual cases might fail to internalise the price effects of the asset fire-sales. Secondly, the number of cases will be beyond the capacity of the judicial system. They argue for a case of a “super Chapter 11” -- a new provision where firms can automatically write off debt increases, due to devaluation, in excess of a given limit.

Two key lessons can be drawn in this chapter: (i) the extent to which an insolvency system to be effective depends crucially not by the letter of law but whether they can be implemented; (ii) when the efficiency of legal system is taken into account (particularly the built-in delay involved in the judicial process), a creditor-oriented bankruptcy law may effectively turn into debtor-friendly regime. In the case of systemic debt crisis, while such built-in delay may help prevent fire-sales of assets, it can also create efficiency losses as efficient firms are prevented from being restructured. This justifies the need for Chapter 11-style reorganisation law. But the latter played a minor role in the resolution of the debt crisis in Thailand. An alternative mechanism that turned out to be effective in Thailand is the establishment of out-of-court restructuring framework (CDRAC). We find that there are two important features in this Thai-style framework that can greatly help increase efficiency; namely (i) first priority in restructuring is given to large and efficient companies that have the most impact to the economy; (ii) the focus is on resolving debt owned by financial institutions, so that normal lending can be resumed and economic recovery facilitated.

## **1.3 A brief review of theories of currency and financial crisis**

Following the 1997/8 financial crisis in East Asia, several interpretations regarding its nature and mechanisms have been proposed. In this section, we do not attempt to provide extensive literature on the subject (see, for example, Corsetti, 1998, Dooley and Walsh, 2000).

### **1.3.1 First and second generation models of currency crisis**

Theories on currency crises before the Asian crisis are known as first and second generation models. In the former (Krugman, 1979 and Flood and Garber, 1984), an exchange rate crisis reflects the conflict between the needs of public sector finance and the preservation of a fixed exchange rate, leading to continuous reserve. This is considered effective in explaining the crises in Latin American countries during the 1980s. According to these models, a government suffering from a large fiscal deficit will try to monetize the deficit by extending domestic credit, thus making it difficult to maintain a fixed foreign exchange rate system. This is because in order to maintain a fixed foreign exchange rate system, money supply (the sum of domestic credit and foreign reserves) needs to be maintained at a certain level. The extension of domestic credit leads to a fall in foreign reserves by the same amount. When foreign reserves fall below a certain level, investors come to anticipate a depreciation of the currency and start to sell it, and the economy can no longer maintain the fixed foreign exchange rate system.

The second explanation in terms of self-fulfilling speculative attack, developed to account for the largely unanticipated collapse of the European Exchange Rate Mechanism in 1992, by Maurice Obstfeld (1994, 1996) in particular. In this case, a currency crisis involves an

unanticipated shift from one equilibrium (a peg) to another (a float). As applied to the ERM crisis, the government was faced with the choice between sticking to an exchange rate peg (with no output stabilisation) and a surprise devaluation which would create extra jobs: in conditions of high unemployment, it would not take much to lead people to expect the latter and it would be optimal for the government to behave accordingly, i.e., self-fulfilling.

It should be noted that this multiple equilibrium story provides no economic explanation of the coordination mechanism of what causes the attacks. As Obstfeld and Rogoff (1997, p.652) point out “With multiple equilibria, some seemingly unimportant event could trigger an abrupt change in expectations, shifting the equilibrium... Such an event would look much like [a] sudden speculative attack on [the] exchange rate”. In order to understand the mechanism for coordinating such a shift, Morris and Shin (1998) apply the concept of equilibrium selection to the multiple equilibrium model of currency crisis and argue that with small amount of asymmetric information about economic fundamentals, the multiplicity of equilibria can be eliminated, i.e. unique equilibrium of crisis. However, Boonprakaikawe and Ghosal (2002) challenge this view by arguing that if all investors observe public signals (such as stock market indices or exchange rate options) and if such signal has sufficiently precise information about the true state of fundamentals, then it becomes common knowledge. In this case, multiple equilibria would restore.



### 1.3.2 Third generation models of financial crisis in Asia

Following the Asian crisis, it is widely agreed that the first and second generation models appear to be inconsistent with the situations in Asia. First, the fiscal situation of each country was sound and the currency collapse was largely unanticipated. Second, it seems inadequate to describe events as optimal regime choices by the governments concerned. Particularly, the East Asian countries had no especially large temptation to devalue; unemployment rate was low and the GDP growth was strong in all of the countries. In addition, the option of devaluation would have a large potential (and subsequently actual) cost in term of weakening corporations and banks which had substantial short-term, foreign exchange nominated debt, Furman and Stiglitz (1998). Furthermore, the devaluations both in the first and second generations are expansionary, i.e. they should lead to improvement in economic activity, Marion (1999). This is clearly not the case in Asia. Finally, financial crisis in Asia did not specific to crisis in foreign exchange market but also in other financial markets.

This has led researchers to either build new theoretical models or to expand the existing theories to interpret the causes of the outbreak in Asia. These theories emphasise three different sources of problems. For moral hazard view, it is *government* limited ability to honour implicit guarantees (i.e. prospective large fiscal deficits). For financial panic view, the source of vulnerability comes from the balance sheet of *financial institutions* (i.e. maturity and currency mismatches). And for financial accelerator view, the main concern is in the balance sheets of *domestic firms* (i.e. high leverage and foreign currency debt exposure).

### (i) The moral hazard view

The basic explanation of this view is that implicit government guarantees on poorly-regulated banking system are the main source of the crisis (Krugman, 1998). Specifically, it is argued that while East Asian countries had a sound fiscal policy prior to the crisis, the bailout commitment to the failing financial institutions would eventually translate into a large increase in government's contingent liabilities and the expectations that these deficits would be financed by seigniorage revenues or an inflation tax, can give rise to a currency crisis (Dooley, 2000; Burnside et al. 2001; Corsetti et al., 1998). Note that these contingent liabilities effectively represent a *fiscal problem* that would not be apparent until the crisis unfolds; this interpretation therefore has a parallel to the first generation currency crisis model that emphasises fiscal deficits and their monetisation as an underlying cause of crisis (Marion, 1999).

### (ii) The financial panic view

Radelet and Sachs (1998) argue that it is hard to understand the magnitude of the economic collapse without reference to the severe turmoil in the financial sector: i.e., the deterioration of conventional fundamentals seems too small to explain the magnitude of the subsequent crisis.

By way of theoretical background, they cite the work of Diamond and Dybvig (1983) where the source of financial fragility is maturity mismatch and bank runs can be triggered by exogenous stochastic demands for liquidity by some depositors and not by fears of imprudent lending. Banks lend prudently and are essentially solvent, but their investments are illiquid: it is the conflict between the liquidity needs of some depositors and the illiquidity of the bank's assets that can precipitate a bank run. While a run on the deposits



of a single, solvent bank may be satisfied by disposing of its assets to other banks, this is not true if there is a generalised bank panic affecting the banking system as a whole. In that case, deposit withdrawals can lead to a 'self-fulfilling' financial collapse, with the efforts of all banks to dispose of illiquid assets in a hurry leading to falling asset values and widespread insolvency.

The financial panic view is further refined by Chang and Velasco (1998a) who develop an 'open economy' version of Diamond and Dybvig. Chang and Velasco argue that currency crisis in Asia occurred because the objectives of stabilising banks and keeping the exchange rate peg become mutually incompatible. To help the bank, the central bank must pursue an expansionary monetary policy, either to keep interest rates from rising (and further wreck in the banks) or to provide lender-of-last-resort funds. But in either case private agents will use the additional domestic currency to buy reserves, eventually causing the collapse of the fixed exchange rate. A balance of payments crisis is best understood as a situation in which a central bank runs out of international liquidity. Chang and Velasco (2002, p.425) define international illiquidity as a situation when "its potential short-term obligations in foreign currency exceed the amount of foreign currency to which it can have access on short notice"

Marion (1999, footnote 18) makes an observation that: "It is interesting that open-economy bank run models developed to analyze the Asian crises are based on the Diamond-Dybvig approach since empirical evidence from earlier crises favors the 'asymmetric information' view of bank runs over the Diamond-Dybvig 'random withdrawal' story". In response to this point, it should be noted that, although it is widely believed that there is no moral hazard in the Diamond-Dybvig model, it has been suggested that it may account for the

nature of the contracts. In particular, Sayantan Ghosal argues that, with a wider set of contracts, if the payouts to depositors from asset liquidations could be made contingent on the number of other simultaneous liquidations, then bank runs might be avoided. This is because such contracts impose a penalty on joining the herd, rather than giving an incentive as is the case with the First-Come-First-Serve rule. Why are such contracts not used? The answer, he argues, is that the discretion they would give to bank managers is subject to moral hazard; the contracts make them responsible for liquidating assets and they cannot be trusted. So the existence of demand deposit is a device to check moral hazard on part of the bank. This means that imposing deposit insurance would do more harm than good because it might open the door for a bank manager to gamble for resurrection.

### (iii) The balance sheet view

At the core of this view is the consideration that the Asian financial crisis does not end with a collapse of the fixed exchange rate regime, because the devaluation itself appear to produce a dynamic feedback effect on the banking sector and the real economy. As argued by Aghion et al (2001), the crisis should be interpreted as a result of a shock that gets amplified by a 'financial accelerator mechanism'. They show that a sudden currency depreciation increases firms' debt repayment in foreign currency; hence their profits decline, which in turn tightens the borrowing constraint. A fall in investment and output then reduces demand for domestic currency and leads to further depreciation. Note that there are two main types of balance sheet effects. The balance sheet effects presented in Aghion et al works through reduction in future aggregate supply, while in Krugman (1999), they reduce current aggregate demand.

## Chapter 2

### Asset price bubbles and collapse

#### 2.1 Introduction

In early 1997 Thailand had completed another year of rapid growth. There were some warning signs large current account imbalances and stock market past their peak but nothing to indicate impending disaster. By the year-end the country was in the throes of severe financial crisis, with share prices falling by a half in local currency value, and currencies halving against the dollar despite emergency funding from the IMF.

Before the crisis, Thai baht were effectively pegged to the dollar and competitiveness was lost as the dollar strengthened. But surging capital inflows allowed an excessive credit build-up during the economic boom, financed in large part by financial institutions borrowing short term in foreign currency; this created over-valued assets, especially in the real estate or property sector. When the financial crisis was triggered by speculative attacks on the over-valued currencies, it rapidly led to a vicious downward spiral in other financial markets.

There has been extensive research on the role of the financial system in the macroeconomy and its importance in propagating business cycles; see, for example Bernanke (1983) on the Great Depression, Bernanke and Gertler (1995), King (1994), Kiyotaki and Moore (1997), and Allen and Gale (2000). These studies show how the banking sector can amplify the magnitude of the business cycle because bank credit behaves procyclically. A



booming economy raises expectations about the future, increases the willingness of firms to invest and induces them to borrow more, causing an expansion in bank credit: in a downturn, loans are recalled tightening credit and exacerbating the recession. In addition, the paper by Allen and Gale emphasises the agency problem that arises when investors are able to use borrowed funds so as to gain from good outcomes but avoid losses because of limited liability.

In a globally integrated environment, with strong growth and large capital inflows (as in East Asia), these credit market effects can be more pronounced than in closed economies, as capital inflows give banks and near-banks a larger supply of funds to intermediate, allowing them to increase credit rapidly and substantially change the allocation of resources.<sup>1</sup> The lax regulation of financial institutions in East Asia meant that poor investment of borrowed funds was not uncommon, though it took different forms in different countries: in Thailand there was excessive property development, in Korea overinvestment in Chaebol, and in Indonesia the problem of connected lending. For recent evidence of an association between large capital inflows, lending booms and banking/currency crises, see World Bank Report (1997), Goldstein and Turner (1996), Kaminsky and Reinhart (1996) and Gavin and Hausmann (1996).

This chapter draws on this literature and takes much the same perspective as Krugman (1998) who observes that, to understand the crisis in Asia, one must focus on the role of financial intermediaries and the price of land and other assets. Krugman focuses on the incentives for undercapitalised and deregulated financial intermediaries to overvalue risky assets and create an asset bubble; here we take up the story after the bubble breaks. We

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<sup>1</sup> As Krugman (1998, pp. 78-79) points out, in a closed economy, it would be the rate of interest rather than the volume of investment that responds excess demand.

show how the scramble for liquidity in credit-constrained markets can rapidly turn financial boom into bust. Our aim in this paper is to employ a consistent approach to study both the dynamics of financial contraction and techniques of crisis management. The framework used is one where collateral plays a central role and adverse exogenous shocks can trigger a vicious spiral of falling asset values and loan recalls.<sup>2</sup>

In this framework, market imperfections are created by the lack of contractibility by agents, so only physical assets (i.e. land) can be used as collateral by highly-leveraged, credit-constrained borrowers and creditors limit gross borrowing to the present discounted value of land in order to protect themselves from the threat of repudiation. This implies that the ability of borrowers to acquire collateral determine their investment decisions and the interaction between asset prices and credit constraint can play an important role in generating the amplification of an adverse shock. Note that Kiyotaki and Moore mainly discuss positive productivity shock, so the possibility of collapse is ruled out. Here, our purpose is to look at financial contractions, i.e. what would happen if asset price bubble bursts which cuts the value of land being used as collateral. In addition, we emphasise the fragility of equilibrium created by corporate leverage and shows how rapidly boom can turn to bust as a sudden fall in collateral value can create the possibility that firms's net worth is entirely wiped out and the entire financial system collapses.

This chapter is organised as follows. To motivate the formal analysis that follows, Section 2.2 shows how loan recalls generate a 'positive feedback' effect where falling asset prices triggers further sales, but ignores the dynamic effects these sales may have on asset prices. Section 2.3 outlines the analytical framework used here, namely the model of credit cycles

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<sup>2</sup> For an alternative approach to financial vulnerability in emerging economies --with endogeneous cycles but no collateral requirements -- see Aghion et al. (1999).



developed by Kiyotaki and Moore (1997) [henceforth KM] to study the first-round effects on net worth and the further ‘knock-on’ effects that asset sales have on prices. In section 2.4, we examine the effects on land prices of two shocks which have hit the East Asian economy, the bursting of an asset price bubble (with origins, it may be, in the moral hazard problem of under-regulated financial institutions as Krugman and others suggest); and an unanticipated devaluation (with unhedged foreign currency borrowing). Section 2.5 discusses how wholesale financial collapse can be averted by co-ordinated loan roll-overs in a form of general financial freeze: and how the breathing space gained in this way can be used to arrange for loan write-downs or capital injections. Section 2.5 concludes.

## **2.2 Leverage and margin calls**

Leverage has played a key role in creating vulnerability and propagating financial crisis. For example, the US stock market in 1929, where share prices rose over 200 percent between 1925 and 1928 and ultimately collapsed by 90 percent in value, was widely attributed to high leverage. As noted by Jacobs (1999): “While margin credit abetted the market’s rise in 1929, the stock sales forced by margin calls exacerbated the ensuing crash. The Securities Exchange Act of 1934 recognized this, empowering the Board of Governors of the Federal Reserve System to regulate margin credit in the hope of preventing subsequent collapses. Just as margin liquidations contributed to the 1929 crash, the forced selling of stock by insurers served to undermine the market in 1987.” (p. 174).

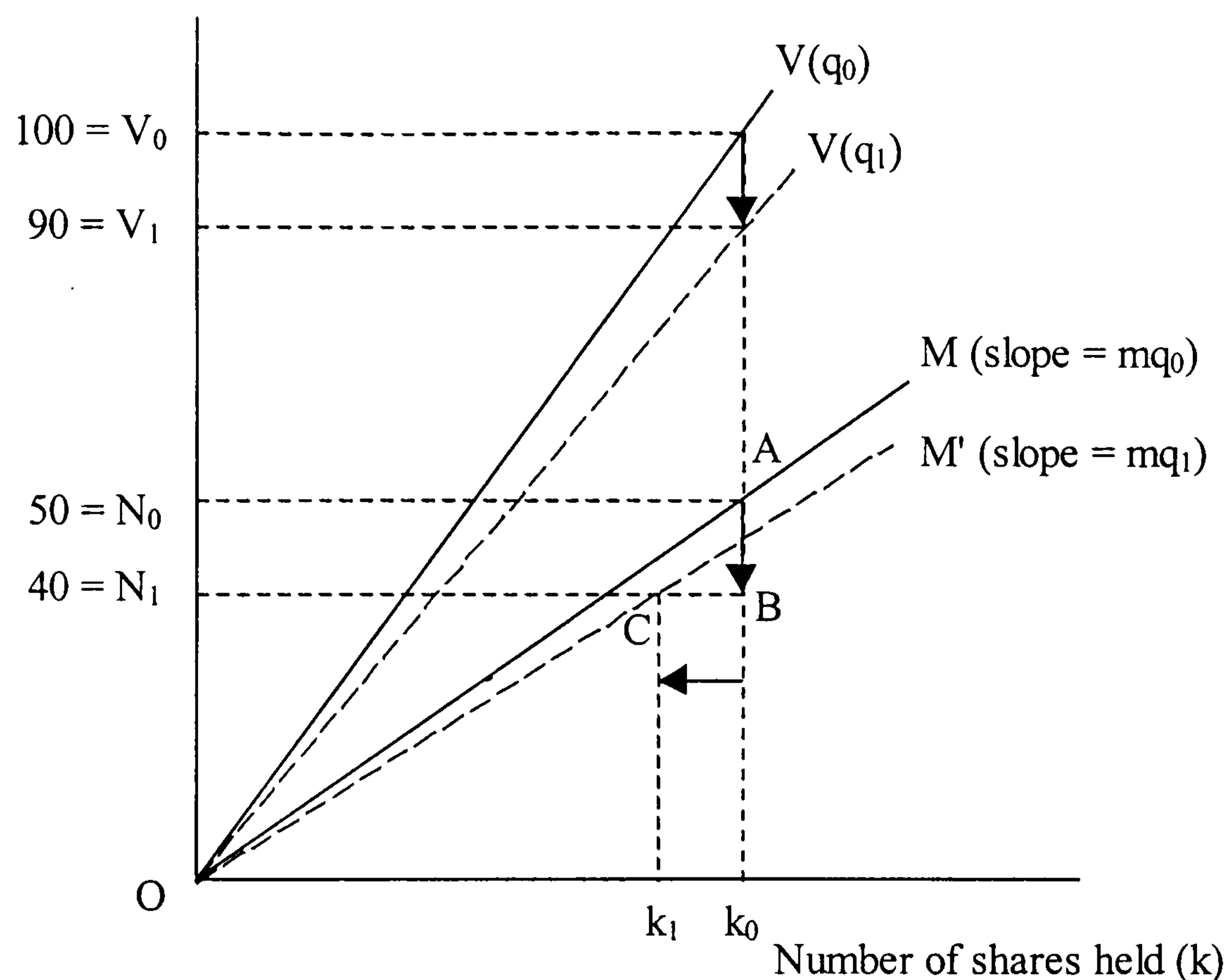
In this section, we discuss how margin calls generate a ‘positive feedback’ effect where falling asset prices triggers further sales. For present purposes, however, we ignore the dynamic effects these sales may have on asset prices (as the extension of leverage raises

asset prices and vice versa). These are explicitly considered in the next section in the formal model of Kiyotaki and Moore.

How margin calls trigger asset sales in the face of falling stock market prices is illustrated in Figure 2.1 below, where the horizontal axis is number of shares held by investors while the vertical axis represents values of their net worth and stock portfolio. For convenience, variables used here is consistent with the KM model in the next section, i.e.  $q$  is price of stock,  $k$  is number of shares held,  $m$  is margin requirements, and  $n$  is net worth. As lenders require credit-constrained investors to put a margin of  $m$  in order to lend up to  $1-m$  of the share values, total portfolio value of investors at date 0, measured by the distance  $OV_0$ , consists of two components: own net worth ( $ON_0$ ) and the amount borrowed ( $N_0V_0$ ). These are separated by line  $OM$  (where its slope equals to  $mq_0$ ) at point A. Assuming that  $m$  is 0.5, so a net worth of 50 can be levered with a 50 margin loan to buy a 100 stock portfolio. (Note that, during the 1929 stock market crash in the US, Jacobs (1999, p. 174) documented that “margins were unregulated at that time and exhibited considerable variation across brokerage firms. Minimum margins were customarily on the order of 10 to 25 percent; the average effective margin rate was about 50 percent in October 1929.”)

Figure 2.1: Leverage and margin calls

Values of net worth and portfolio



Now suppose that a temporary adverse shock hits the stock market at date 1, which reduces share prices by 10 percent, i.e. from  $V_0$  to  $V_1$ . This leads the net worth of investors to drop by 20 percent i.e. from 50 to 40. At point B, loans are under-collaterised, so 'margin calls' by creditors force them either to provide additional funds (by 5) or, if not, to reduce their debts (to 40). Assuming that investors are credit-constrained and have used all net worth for loans, these margin calls force them to reduce their debts by a sale of 10 of stock (i.e 11 percent of 90 portfolio), as shown by the movement from point B to C in the figure.

What if  $m$  is smaller or leverage is higher? Algebraically, one would find that two components are at work: first, an initial fall in share prices gives rise to a drop in net worth which is scaled up by the leverage factor of  $1/m$ ; second, since the fall in net worth means that these margin loans are being under-collaterised, in restoring margin rule, investors are



forced to reduce debt from asset sales. Hence, one can write the overall proportional change of share prices to share sales as follows.

$$\frac{(k_1 - k_0)/k_0}{(q_1 - q_0)/q_0} = \frac{(k_1 - k_0)/k_0}{(n_1 - n_0)/n_0} * \frac{(n_1 - n_0)/n_0}{(q_1 - q_0)/q_0} = (1 - m) \frac{q_0}{q_1} * \frac{1}{m}$$

As shown in the figure above, with 0.5 margin requirements, a 10 percent fall in prices causes the net worth to drop by 20 percent as 11 percent of shares held in margin are sold. But if a required margin is very low, for example  $m = 0.1$ , this 10 percent fall in share prices will be enough to wipe out all net worth of the credit-constrained investors who are forced to leave the market.

While the above discussion demonstrates the role of leverage in creating vulnerability to the financial system – as prices fall force margin investors buying on margin to sell -- it misses one important aspect, i.e. the dynamic interaction between forced sales and asset prices. In the formal model that follows, this feedback can potentially be powerful in that this forced selling may well further depress prices, leading to a downward spiral of asset prices and loan recalls; so the process of unwinding leveraged positions to meet margin calls can lead to financial collapse.<sup>3</sup> When highly-leveraged property companies in Thailand were hit by adverse shocks in the crisis of 1997, for example, the effects of the initial shocks (e.g. bursting of land price bubble and/or a sudden devaluation) were magnified both because their net worth was reduced by a greater proportion and because their efforts to repay loans by selling assets turned illiquidity into insolvency.

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<sup>3</sup> When prices are rising, of course, and the ability to borrow is directly linked to price of assets that serve as collateral, a rise in asset prices will facilitate even more borrowing and this will drive the price up.

## 2.3 The basic KM model

In this section, we use the model of Kiyotaki and Moore (1997), hereafter KM, to study the first-round effects on net worth and the further ‘knock-on’ effects that asset sales have on prices. Before using it to show how the ending of an asset bubble and a sudden devaluation of the currency can easily lead to financial collapse, we provide a simple linear quadratic formulation of their model.

Assumption is that there are two sectors, the credit-constrained sector whose land holdings are largely financed by short-term borrowing, i.e. bought on margin; and another sector which is not credit constrained whose ability to absorb asset sales determine their price of land. We refer to the first sector as ‘property companies’: (KM refer to them as ‘farmers’). Second sector is a consolidation of the lending institutions and all other land-owners; for convenience, we refer to these lenders/owners as ‘finance houses’ (corresponding to KM ‘gatherers’).

How is the quantity of land held by the property companies, denoted  $k_t$ , determined? We begin with a – slightly simplified – budget constraint<sup>4</sup>:

$$q_t(k_t - k_{t-1}) + Rb_{t-1} = \alpha k_{t-1} + b_t \quad (1)$$

*Land accumulation + Debt repaid = Income + Borrowing*

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<sup>4</sup> Note that the left-hand side of this equation includes consumption purchases, while the right-hand side includes the non-tradable output from land. Since these turn out to be equal in equilibrium, they drop out from the equation. Further details on this issue are discussed in Chapter 4.

where  $b_t$  is the amount of one-period borrowing, repaid as  $Rb_t$  ( $R$  being one plus the one-period interest rate),  $q_t$  is price of land, and  $\alpha$  measures the productivity of land in this sector.

The reason for credit constraints is that the owner/manager of each company in this sector uses an ‘idiosyncratic<sup>5</sup> technology’ and retains the right to withdraw labour. This means that owner/managers may credibly threaten creditors with repudiation, and puts a strict upper limit on the amount of external finance that can be raised, as “debt contracts secured on land are the only financial instruments investors can rely on” KM (1997, p.218). The rate of expansion of these highly-leveraged, credit-constrained property companies is thus determined not by their inherent earning power but by their ability to acquire collateral.

Assuming that there is no margin requirement and borrowing gross of interest is chosen to match the expected value of collateral implies

$$b_t = E_t(q_{t+1})k_t/R. \quad (2)$$

Since there is generally no aggregate uncertainty in this model and agents are assumed to have perfect foresight,  $E_t(q_{t+1}) = q_{t+1}$  – except for the initial unanticipated aggregate shock.

After substitution in (1), one obtains

$$(q_t - q_{t+1}/R)k_t = \alpha k_{t-1} \quad (3)$$

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<sup>5</sup> Idiosyncratic in the sense that once production has started at date  $t$ , only s/he has the skill necessary to produce output at  $t+1$ , i.e., if s/he were to withdraw labour between  $t$  and  $t+1$ , there will be no output at  $t+1$ , only the land  $k_t$ . Note that the manner in which Long-Term Capital Management was rescued in 1998 supports the notion of an idiosyncratic technology - at least for hedge funds: the reason why the existing management was not replaced was that only Nobel Prize winners could understand the contracts!



where the LHS measures the net-of-borrowing cost of acquiring land  $k_t$  and the RHS measures the net worth<sup>6</sup> of the firms at beginning of the period. As KM (1997, p.220) remark, the firms use all their “net worth to finance the difference between price of land,  $q_t$  and the amount they can borrow against a unit of land,  $q_{t+1}/R$ . This difference  $q_t - q_{t+1}/R$  can be thought of as the down payment required to purchase a unit of land”.

It is worth emphasising here that, in this specification, the down payment is effectively a ‘prepayment of interest’. This is because lenders apply a discount when evaluating the future collateral value for loans, so there is a wedge between the current value of land and the amount that can be borrowed. (Note that the rate of land price inflation is always smaller than the rate of interest in this model.) Interestingly, the existence of the wedge implies that own funds are required, even though firms are fully leveraged. This means that the ability to borrow by the credit-constrained firms is limited by own net worth. Since these funds can be used as a buffer against an adverse shock. So one can also think of this up-front payment as a ‘quasi-margin’. (Note that actual margin requirements imposed by lenders mean that firms require to hold a margin of  $m$  and they lend only the fraction of  $1-m$  of the collateral value; the size of  $m$  generally depends on the cost of liquidation, for example, expected legal and other transaction costs.) But the size of the quasi margin in this case depends on rate of interest. For example, in equilibrium where land price is 100, if interest rate is set to 50 percent, the leverage ratio (defined as the value of debt claim over the value of firm’s net worth) will be  $q^*k^*/\alpha k^* = R/(R-1)$ , i.e. three times or the quasi margin required is one-third of loans.

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<sup>6</sup>By definition, the net worth of property companies at the beginning of date  $t$  is the value of tradable output and land held from the previous period, net of debt repayment, i.e.  $(\alpha + q)k_{t-1} - Rb_{t-1} = \alpha k_{t-1}$ .

The arbitrage condition for the other users of land, the ‘finance houses’, implies

$$f(k_t) + q_{t+1} - q_t = (R - 1)q_t \quad (4)$$

where  $f(k_t)$  is the marginal productivity of land in the unconstrained sector. Or, as KM put it,

$$(q_t - q_{t+1}/R) = f(k_t)/R = u(k_t) \quad (5)$$

where  $u(k_t)$  is the discounted marginal productivity of land in the unconstrained sector (which, because of arbitrage, we refer to as the ‘user cost’ of land in what follows).

Equating the down payment required to purchase a unit of land to the user cost, i.e. substituting (5) into (3), gives

$$u(k_t)k_t = \frac{\beta}{R} k_t^2 = \alpha k_{t-1}. \quad (6)$$

where, for simplicity of exposition, we assume that the user cost is proportional to  $k_t$  (Specifically  $\beta k_t$  measures the rate of decline in the marginal productivity of land used by the finance houses, and the discount factor  $1/R$  reflects the one-period lag in production.<sup>7</sup>)

Combining (5) and (6) yields a non-linear difference equation:

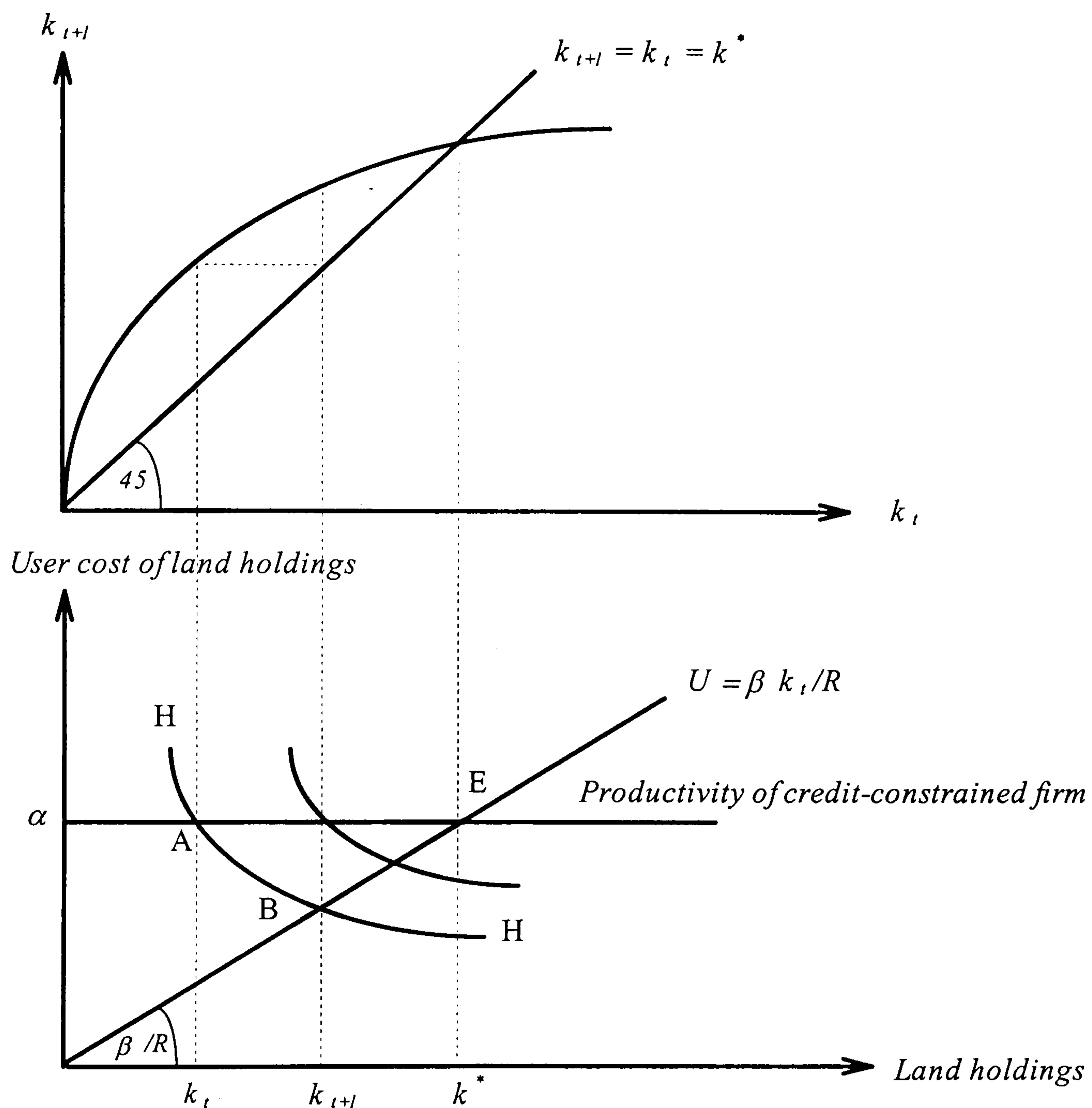
$$k_t = \sqrt{\frac{R\alpha}{\beta}} k_{t-1}^{1/2}. \quad (7)$$

There are evidently two equilibria, one at zero and the other at  $k^* = R\alpha/\beta$ ; the latter is stable while the former is not.

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<sup>7</sup> Note that -- on the assumption that total amount of land is fixed in supply -- the user cost (i.e. the discounted marginal product) is, for convenience, expressed in (5) as an increasing function of land held by property sector -- instead of a decreasing function of land used by finance houses themselves.

Figure 2.2: Dynamics of the KM model with no surprise



The path of convergence to  $k^*$  from an initial value of  $k_t < k^*$  is also shown in the lower panel where the vertical axis measures its productivity in the small business and the user cost of land (its discounted productivity in the other sector). As (6) requires  $\alpha k_{t-1}$  (i.e. net worth) be set equal to  $u(k_t)k_t$  (today's holdings times the user cost), the points labelled A and B must lie on the same rectangular hyperbola, labelled HH in the figure. This illustrates how to find  $k_t$  given  $k_{t-1}$ . (On the same principle, land holding in period  $t+1$  can be found by shifting the hyperbola to the right as shown.) Note that the net worth of



property companies ( $\alpha k_{t-1}$ ) increases as  $k$  approaches  $k^*$ . This is because, with credit rationing, the productivity of land in this sector is higher than the user cost.

In these circumstances, the value of land is given by the present discounted value of user costs i.e.

$$q_t = \sum_{s=0}^{\infty} \frac{u(k_{t+s})}{R^s} \quad (8)$$

where these are measured along the path towards equilibrium. In the analysis below, we approximate this by the linear function

$$q_t - q^* = \theta(k_t - k^*) \quad (9)$$

where  $q^* = R\alpha/(R-1)$  and  $\theta$ , which measures the sensitivity of land prices to land sales, =  $\beta/(R-\phi/2)$ , and the autoregressive coefficient of land accumulation,  $\phi = (R\alpha/\beta)^{1/2}$ ; so  $\theta = \beta/(R-1/2)$  where  $\phi = 1$ .

Before adding extra features to their model, KM use it to study the effects of a temporary productivity shock which unexpectedly raises the parameter  $\alpha$  by  $\Delta\alpha$  for one period only; and they show that because the small business sector is credit-constrained, this has effects on the value and allocation of land which persist beyond one period. They emphasise that this unexpected rise in productivity not only eases the borrowing constraint on small businesses directly by raising  $\alpha$  in (6), it also helps indirectly by raising the price of their land, which (because debt is not indexed) raises their net worth.

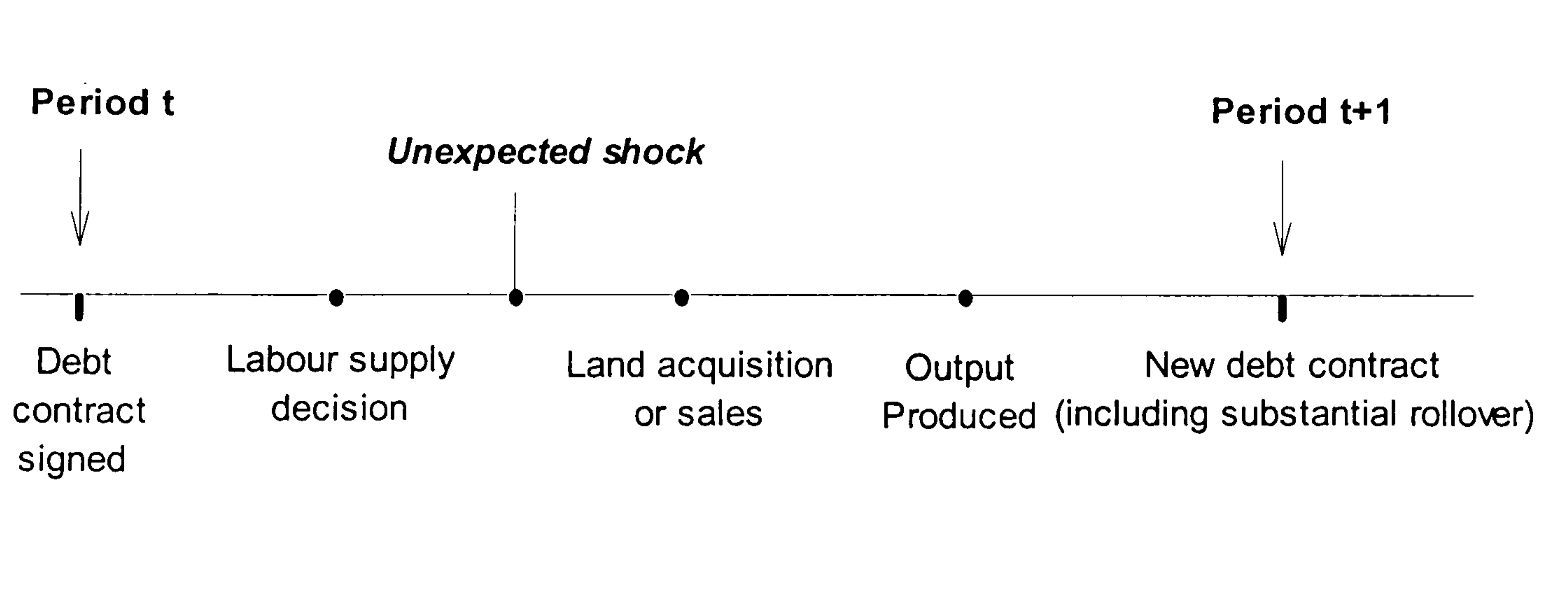
In the face of a one-time positive productivity shock, which occurs when the system is in equilibrium, (6) needs to be recast as:

$$u(k_t)k_t = (\alpha + \Delta\alpha + q_t - q^*)k^* \quad (10)$$

where  $\Delta\alpha$  is the ‘direct’ effect of the productivity gain and  $q_t - q^*$  is the ‘indirect’ effect due to the rise in land prices.<sup>8</sup>

Much more important for our purposes, which is to look at contractions, is what would happen if the productivity shock were negative. It might appear from Kiyotaki and Moore’s assumptions that equation (10) would not apply in that case, as any unanticipated fall in land prices would lead borrowers to negotiate debt write-downs. If all unanticipated capital losses have to be borne by the lender, this would buffer the system against negative shocks, but it would undermine the use of land as collateral. But this is not true if, as they indicate in KM’s Footnote 13 (p. 224), the unexpected shock takes place after the labour supply decision has been taken, see Figure 4 below. For, in this case, borrower can no longer costlessly repudiate the debt contract: to walk away would be to lose all of his/her net worth.

Figure 2.3: The timing of events



<sup>8</sup> Note that, in the KM model, without the inclusion of non-tradable output, with positive productivity shock, farmers would not have an incentive to hold more land in the market equilibrium and so the borrowing constraint would become non-binding. This is because it is not profitable for them to do so as the marginal return from investing one more unit of land is less than cost of buying land i.e.  $\alpha/(R-1) < R\alpha/(R-1) = q^*$ .

## 2.4 Bursting bubbles and escalating debts

Land prices in Thailand fell more than a quarter in 1997 and the baht lost half of its value against the dollar. How do credit constraints operate if a property price bubble bursts (or there is a sudden increase in debts due to unhedged foreign currency borrowing), so liabilities are no longer fully collateralised? Lenders try to protect themselves from repudiation of debts backed by inalienable capital by lending only on the security of marketable collateral. But where is their protection when collateral values fall with the bursting of a property bubble? In reality, lenders will be protected by the cushion of borrowers equity (and their willingness to inject new capital): and this can be seen in the almost complete collapse in the share value of property companies in Thailand for example. But if this is insufficient, then lenders will have to face the consequences.

On the strict timing assumption of the KM model (see Figure 2.3 above), there can be no write-down of uncollateralised lending: it will instead be recalled. The formal reason for this is that by deciding to supply labour before the shock comes, borrowers have forfeited their bargaining strength. Another reason is that for lenders 'adversity is strength': borrowers in Thailand were unable to negotiate a prompt write-down because their losses exceeded the capacity of the lenders to pay. Finance houses could only have paid if they themselves were bailed out, but that would have posed a severe problem of moral hazard - as the IMF was quick to point out. (The IMF blamed implicitly-insured financial institutions for the asset price bubble and would not have approved of government subsidies for this purpose.)

With finance houses unable to absorb the capital losses, their efforts to recall loans (a squeeze) runs a considerable risk of simply driving borrowers into bankruptcy as sales of



land push down land prices: and the alternative of lenders rolling-up loans may be undermined by free-riding, i.e., those who roll-up will be undermined by those who go for the cash. So later we look at how a complete freeze on lending can solve this collective action problem and stabilise property prices.

### **2.4.1 A squeeze - loan recalls: general equilibrium**

Kiyotaki and Moore focus on solution paths which converge to equilibrium. As this is a saddlepoint equilibrium, however, there are also paths that diverge, as shown in Figure 2.4. In the absence of future changes, these paths are essentially asset bubbles. Gambling financial resources on a speculative bubble is not so implausible when investors can use other people's money for the purpose. In that case, a speculative bubble may be another manifestation of moral hazard.

Allen and Gale (2000) derive a simple theory of bubbles based on agency relationships. Investors use borrowed money to invest in assets. Risky assets are relatively attractive because investors can default in low payout states so their price is bid up; and Krugman (1998) describes how such an asset price bubble will end if financial guarantees are withdrawn following an unfavourable outcome. As incentives in lending institutions are not modelled in this paper, we simply assume that they are willing to gamble financial resources on speculative bubbles<sup>9</sup> which take asset prices above equilibrium.

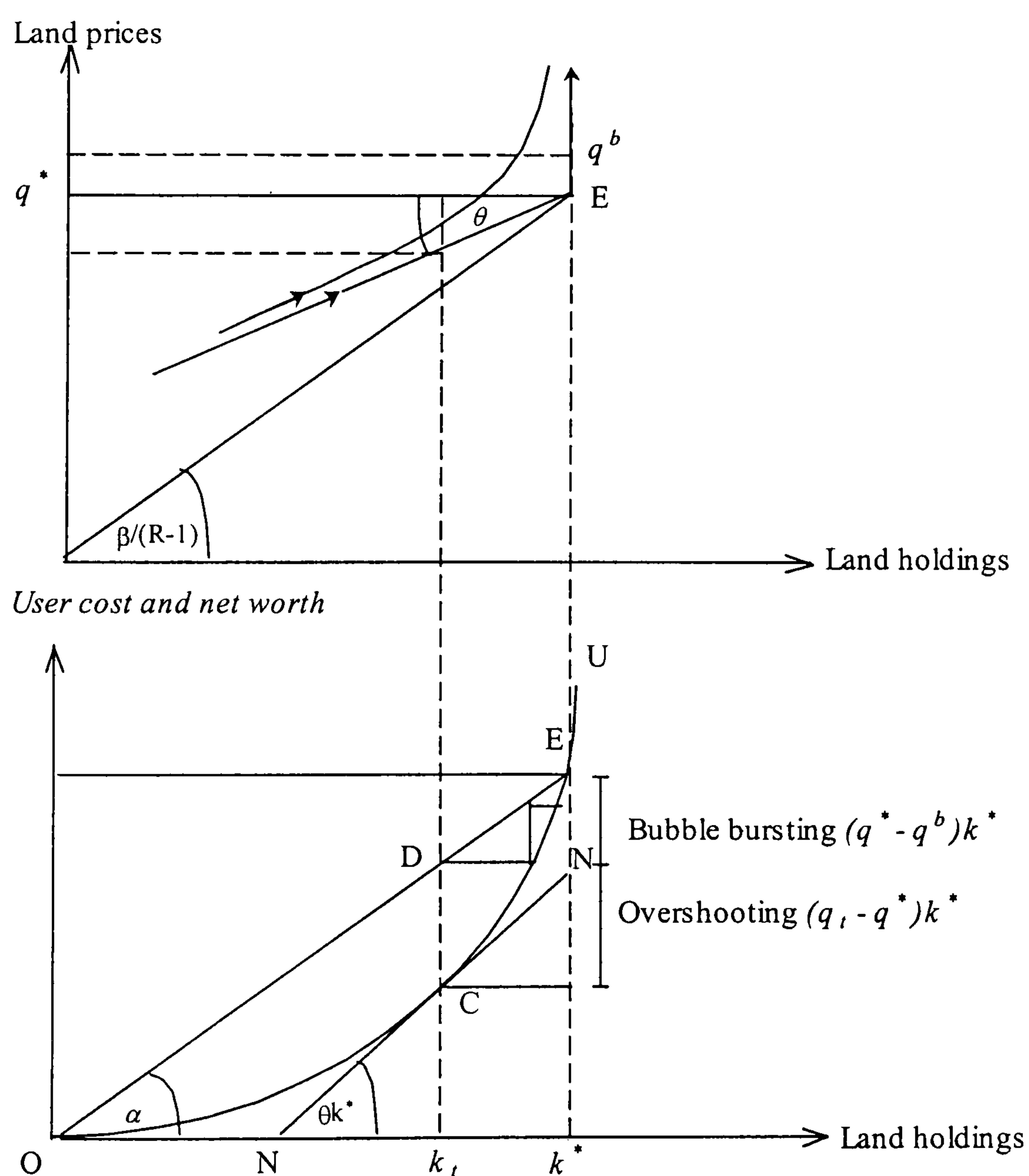
Consider specifically the unstable path leading directly upwards from equilibrium at E in Figure 2.4 and assume that lenders effectively ignore the probability of the bubble bursting. (On such a dynamic path, asset prices which begin above equilibrium will keep

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<sup>9</sup> These speculative bubbles will have different time-series properties from the 'Pangloss' value discussed by Krugman (1998). How the latter may be incorporated within the framework used here is discussed in Milnes (1998).

growing at a speed given by  $q_{t+1} = Rq_t - \beta k^*$  .) Say the bubble were to burst when land values reach  $q^b$  . If lenders were willing to absorb all the losses as asset prices drop to  $q^*$  , then there would be a prompt return to equilibrium at E. If not, loans will be recalled because of inadequate collateral, leading to ‘fire-sales’ of land and depressed land prices; the fall in land prices will ‘overshoot’ equilibrium.

Figure 2.4: Adverse shock and land price ‘overshooting’



The first-period equilibrium after the bubble bursts is determined as described above after the unanticipated productivity shock, see Equation (10) replacing  $\Delta\alpha$  by  $q^* - q^b$  . That is,

$$\frac{\beta(k_t)^2}{R} = [\alpha + (q_t - q^*) - (q^b - q^*)]k^* \quad (11)$$

The solution to equation (11) is shown in the lower panel of Figure 2.4. The LHS of this equation, the quadratic function OU, shows the user cost of land (with equilibrium at point E where the OU crosses the line  $\alpha k_t$ ); and the RHS, labelled NN, gives the net worth of all property companies after the bubble has burst. It is shown as a linear function of  $k$  with slope  $\theta k^*$ , as  $q_t - q^*$  has been replaced by the approximation  $\theta(k_t - k^*)$ . First-period equilibrium is where the two curves intersect.

The net worth of property companies falls for two reasons: first the impact of land prices dropping to long-run equilibrium at  $q^*$  (shown by the distance EN in the figure); and, in addition, the ‘overshooting’ due to forced sales by property companies. (It is because the latter depends on the volume of disposals, that the net worth function NN slopes downward to the left in the figure.) We illustrate the case where OU and NN intersect at a unique equilibrium point, C, where the net worth of all property companies is just sufficient to provide the down payment of land holdings,  $k_c$ . The distance EN, which measures  $(q^b - q^*)k^*$ , indicates the size of the largest adverse shock consistent with survival of credit-constrained borrowers. Note that this unique equilibrium is a special case, there may be multiple equilibria or none. A smaller shock, which leaves the net worth schedule above NN, yields two equilibria (above and below  $k_c$ ); while a larger shock, with a net worth schedule below NN, rules out any intersection – so all the credit-constrained firms go out of business.

It is importance to note that, while such a fall in land prices creates negative externalities across the credit-constrained sector, there appears to be conflicting factors following



adverse macro shocks. First, as discussed above, is direct negative effect due to capital losses from initial adverse shock and the subsequent knock-on effects. Second is indirect positive effect i.e. an increase in profit on land not sold. The first can lead to complete collapse; but, if avoided, the second permits complete recovery. As shown in the figure above, the net worth of these property companies will be rebuilt by following the dynamic path sketched in the figure from C to E.

The reason behind this positive effect is that a fall in land prices enables the credit-constrained sector to exploit their profit opportunity from using ‘cheap land’ relative to the equilibrium level at E while the other sector can not. To see how, consider the no-arbitrage condition given in equation (4) which determines the opportunity cost from using land in

period  $t$ , i.e.  $\frac{f(k_t)}{q_t} + \frac{q_{t+1} - q_t}{q_t} = r$ , where  $f(k_t)$  is the marginal productivity of land in the

unconstrained sector. Using their remaining land, the credit-constrained firms realise a total return of  $\alpha k_t$  (at point D in the figure). By comparing this with the other unconstrained sector (which is subject to the arbitrage condition), one can see that there is profit opportunity for credit-constrained firms which arises from the difference in productivity level between two sectors. (i.e. the distance between point C and D). So, along the dynamic path from point C to E where the total return from using land is always greater than the user cost of land, these property companies are able to use these extra profit to rebuild their net worth until the equilibrium reaches at point E where there is no more extra profit and so land holding by credit-constrained sector equals to  $R\alpha/\beta$ .

What would happen if a margin call triggers land sales but leaves land prices staying at equilibrium  $q^*$ ? Since land sales do not generate further fall in prices, the first-period

equilibrium of the property companies' net worth reduce to  $[\alpha - (q^b - q^*)]k^*$ . So land sales  $(k_t - k^*)$  required is the same as the size of the bubble  $(q^* - q^b)$ . In this case, line NN becomes horizontal. To find out if there is a prospect for recovery, one needs to compare with the user cost of land. Since land prices stay at  $q^*$ , this implies that the user cost of land is  $(R-1)q^*/R$  which equals to  $\alpha$ . So, in effect, the quadratic line OU has now become the same as line OE and so one can see that there is no profit opportunity to be made by property companies because their return is equal to the opportunity of using land. Therefore, the size of credit-constrained property companies will be reduced permanently<sup>10</sup>.

Note that, in an open economy setting, where unhedged short-term borrowing in foreign currency is a significant source of finance for land holdings, the financial sector is highly exposed to exchange rate movements. Let  $f$  be the fraction of total borrowing in foreign currency loans and  $\delta$ , the unexpected devaluation; as this raises local currency value of total borrowing by  $f\delta$  %, it will have the same effect on the property market as a  $f\delta$  % collapse in land prices.

## 2.5 Financial stabilisation

### 2.5.1 A freeze – loan roll-ups

By driving down property prices and causing bankruptcy, lenders trying to recall loans impose externalities on others willing to roll-over or write-off debt. A freeze is one way of solving this collective action problem. How is it put in place? Once again, we take Thailand as example. There the operations of the finance houses who provide credit to

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<sup>10</sup> Following random walk if the shock is repeated.

property companies were temporarily suspended, in some cases from a date preceding the devaluation of the baht. During the freeze, no loans are recalled and any arrears of interest are rolled up, so there need be no ‘fire-sale’ disposals of land and prices can fall to equilibrium without overshooting. Current lenders have to provide ‘temporary financing’ over and above what the rules of collateral would allow, so they are collectively forced to act as lenders of last resort.

Note that if forced land sales are to be avoided, i.e.  $k_t = k^*$ , lending must be determined not by the value of collateral but by the requirement that

$$b_t = Rb^b - \alpha k^* = (q^b - \alpha)k^* \quad (12)$$

i.e., new lending must exceed the principal of outstanding loans as interest payments are partly rolled up. [This follows from the budget constraint for the period after the bubble has burst which can be written  $q_t(k_t - k^*) + Rb^b = \alpha k^* + b_t$  where  $b^b = q^b k^*/R$ , i.e. the inherited level of borrowing reflects over-valued land prices.]

### **2.5.2 Financial restructuring – loan write-downs**

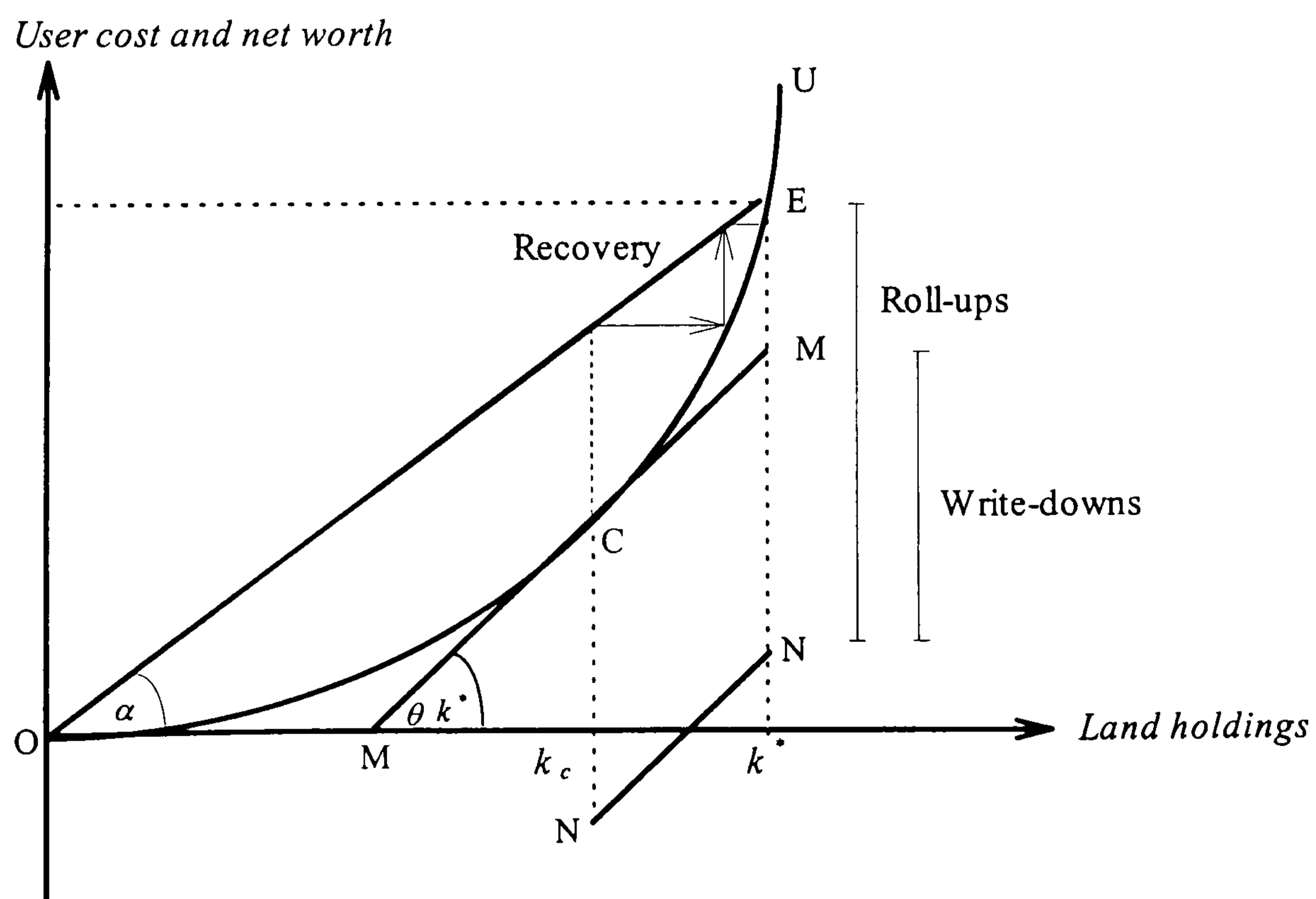
A financial freeze may prevent a collapse in land prices, but property companies cannot continue rolling up interest in this fashion forever. (Asymptotically, their debt would expand at the rate of interest, which violates the intertemporal budget constraint, see Appendix II) Debt write-downs and/or capital injections are required. But in Thailand, the write-downs needed exceeded the capital of the finance houses, so the authorities had to step in with public money. For obvious reasons of moral hazard, IMF conditionality ruled out using public funds to keep finance houses going under existing management. (The



main piece of evidence is the IMF-enforced closure of 56 out of the 91 finance houses, whose assets have been taken over by the government for later disposal.)

The resolution of property crisis in Thailand was freeze in 1997, followed by the closure of most finance houses: the next step will be a debt write-down for the property companies, together with capital injections mostly from foreign firms. This is illustrated in Figure 2.5. Let the initial adverse shock reduces net worth almost to zero before any knock-on effects are taken into consideration, see the net worth schedule NN. By providing roll-ups of EN, a freeze shifts the net worth schedule to OE and maintains a temporary equilibrium at E without any land sales; but net worth would inevitably fall to zero if fire-sales take place when the freeze ends. Debt write-downs of value MN will stabilise situation: the net worth of the property companies after reconstruction is shown by MM with temporary equilibrium at point C (i.e. landholdings of  $k_c$ ) and subsequent recovery to equilibrium at E as indicated in the figure.

Figure 2.5: Averting collapse: Roll-ups, write-downs and recovery



Our exposition has focused on debt write-downs,  $\Delta b < 0$ ; but in Thailand, for example, the market also expects cash injections from foreign companies tempted by low land prices and the cheap baht to take equity stakes in the property sector, as indicated by the term  $\Delta c$  above. In the KM model where all land is used to collateralise loans, equity participation is actually ruled out because there is no credible residual value for shareholders (see KM, 1997, p. 218, footnote 8). With margin requirements and debt write-downs, however, there could well be some residual value to re-assure equity investors (though equity financing is not something we formally analyse in this chapter).

Algebraically, the minimum amount of financial reconstruction required to avoid wholesale bankruptcy can be determined from the condition that

$$\frac{\beta(k_c)^2}{R} = [\alpha + q(k_c) - q^b - \Delta b + \Delta c]k^* \quad (13)$$

where  $k_c$  is the ‘unique’ first-period equilibrium shown in Fig. 2.5,  $-\Delta b$  is a debt write-down and  $\Delta c$  is a capital injection.

## 2.6 Conclusion

A number of economists have blamed the depth and persistence of the Great Depression in the USA on collapsing credit markets. Could similar mechanisms have played a role in ending the East Asian economic miracle - and in creating fragility in global financial markets?

It is widely agreed that the availability of abundant funds with little monitoring has led to over-inflated property prices. And it appears that asset sales by credit-constrained firm in response to adverse shocks could greatly amplify their effects. So, without intervention, the sudden ending of an asset bubble (or an exchange rate peg) might lead to financial collapse.

To shed light on the financial crisis affecting East Asia, we have applied Kiyotaki and Moore's model of credit cycles to land-holding property companies and analysed how stabilisation policy might prevent financial collapse. Among the drastic policy measures used to protect the financial system examined was a financial freeze, which delays loan recalls, and financial reconstruction to reduce debt and increase capital. While these may be effective crisis measures, the vulnerability of the financial systems in East Asia suggests the need for prevention, primarily by improved regulation of banks and near-banks so as to nip asset bubbles in the bud. To discourage exposure to unhedged foreign currency borrowing, Chile and Columbia tax short-term external borrowing more than long term, the justification being that they reduce a negative externality, namely systemic collapse. Further research on how highly-leveraged, financial institutions function might help explain the vulnerability of the global financial system to adverse shocks - and suggest ways to increase stability.



## Appendix I: Temporary finance

Consider the idea that creditors might roll over part of the loan, which firms promise to repay from the tradable goods available in the next period. This is an attractive prospect. For the creditors, it avoids a potentially costly liquidation and offers the prospect of repayment in full. For the debtors, the surrender of future tradable goods will slow the rate of recovery, but it will ensure survival.

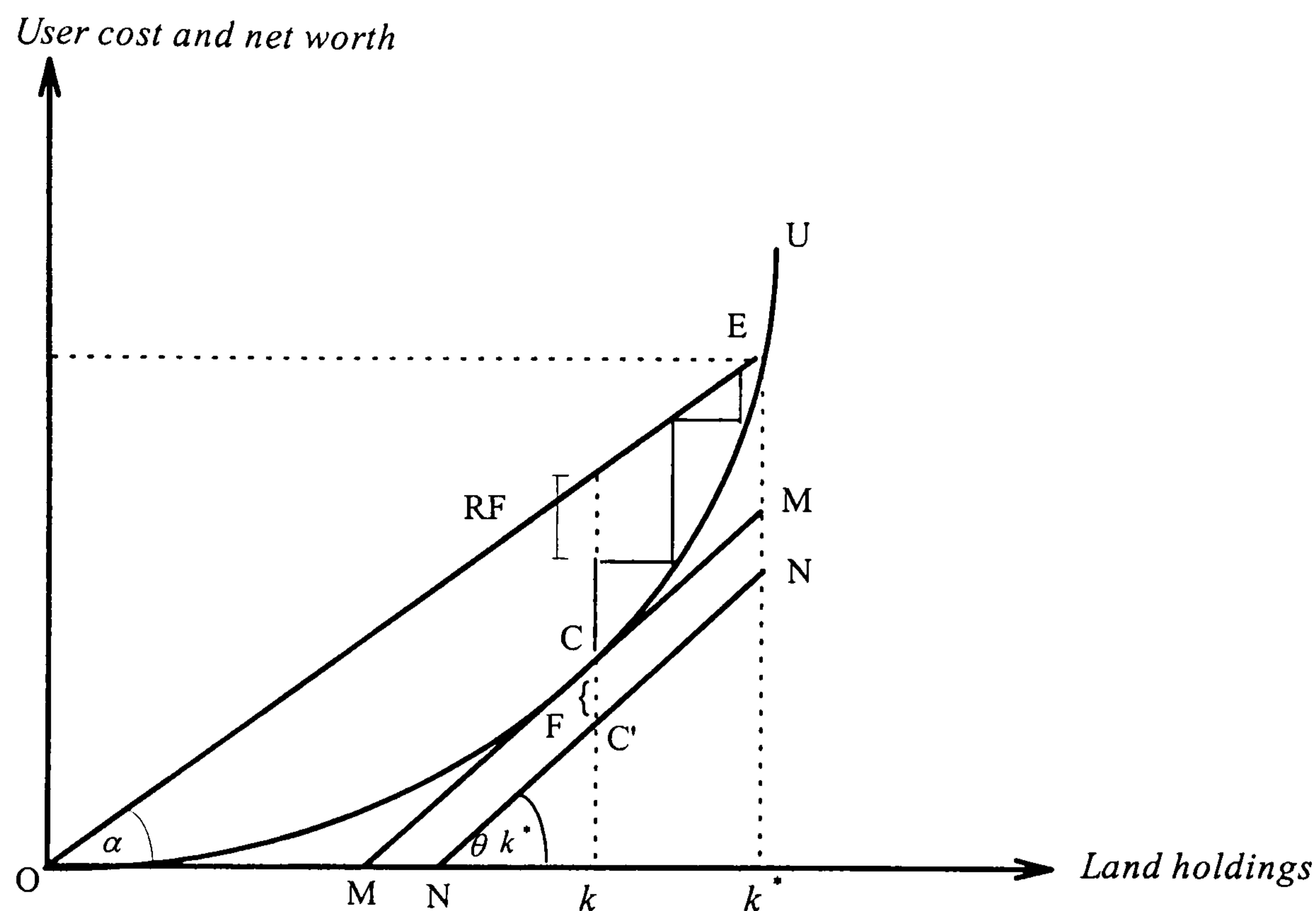
To see how extra lending offers a path to recovery, suppose first that there is no coordination/free-rider problems among lenders, they roll over debts by amount  $F$  when the shock occurs (in period  $t$ ) and the borrowers promise to give some of their tradable output by the amount of  $RF$  in the next period (period  $t+1$ ). If the amount provided is the minimum required to avert collapse, then this extra money would be just sufficient to shift the financing constraint up to provide a unique first-period equilibrium at C. Algebraically, the amount of temporary financing required can be determined from the condition that

$$u(k_c)k_c = [(1 - \Delta)\alpha + q_c - q^b]k^* + F \quad (\text{A1})$$

where  $k_c$  is the unique equilibrium shown in the figure below.

The amount of temporary finance provided may well exceed this minimum, shifting the financing constraint above the line MM in the figure and reducing the impact of the shock on land prices. With this given amount, there is convergence back to equilibrium at E. Note that, as the property companies have to give up some of their tradable output for repayment of  $RF$  in period  $t+1$ , they can only expand their business from the condition that  $u(k_{t+1})k_{t+1} = \alpha k_c - RF$ .

Figure 2.6: Temporary finance



So there is a clear economic case for emergency credit. As long as the borrowers are solvent, the prospect for voluntary rollovers looks promising. But what if the debtor cannot pre-commit? It is assumed in the KM model that seizure is the only credible option for the creditor. And the borrower can threaten to repudiate the existing loan by taking down payment and labour, and signing a new debt contract with another lender without adverse effects from earlier repudiation. In addition, it is also assumed in KM that traded goods cannot be seized when default occurs. This is because debtor simply runs away with whatever output they have. Under the provision of the US Chapter 7 provision, however, creditors may be allowed to grab traded goods if collateral value is less than debt obligations. So there could be some prospect of rollover allowed in the KM model if one assumes Chapter 7 provision.

## Appendix II: Infinite-period rollovers

From the budget constraint:

$$q_t(k_t - k_{t-1}) + Rb_{t-1} = \alpha k_{t-1} + b_t. \quad (\text{A2})$$

Re-arranging terms, we have

$$Rb_{t-1} = \alpha k_{t-1} + q_t(k_t - k_{t-1}) - b_t. \quad (\text{A3})$$

Forward this equation by one period and divide both sides by R, this yields

$$b_{t+1} = \frac{1}{R}[\alpha k_{t+1} - q_{t+2}(k_{t+2} - k_{t+1})] + \frac{b_{t+2}}{R} \quad (\text{A4})$$

Substituting (A3) into (A2) and by iteration, we get

$$Rb_t = \sum_{s=0}^{\infty} R^{-s}(\alpha k_{t+s}) - \sum_{s=0}^{\infty} R^{-s} q_{t+s+1}(k_{t+s+1} - k_{t+s}) - \lim_{s \rightarrow \infty} R^s b_{t+s+1}$$

Transversality condition implies  $\lim_{s \rightarrow \infty} R^s b_{t+s+1} = 0$ . So,

$$Rb_t = \sum_{s=0}^{\infty} R^{-s}(\alpha k_{t+s}) - \sum_{s=0}^{\infty} R^{-s} q_{t+s+1}(k_{t+s+1} - k_{t+s}). \quad (\text{A5})$$

Now consider the case when debts are rolled over without ever being repaid, the budget constraint becomes:

$$q_{t+s+1}(k_{t+s+1} - k_{t+s}) + Rb_{t+s} = \alpha k_{t+s} + b_{t+s+1} - R^s F. \quad (\text{A6})$$

Performing the same step as above and assuming transversality condition holds, we obtain

$$Rb_t = \sum_{s=0}^{\infty} R^{-s}(\alpha k_{t+s}) - \sum_{s=0}^{\infty} R^{-s} q_{t+s+1}(k_{t+s+1} - k_{t+s}) - \lim_{s \rightarrow \infty} R^s F. \quad (\text{A7})$$

$\lim_{s \rightarrow \infty} R^s F > 0$ , as the amount of rollover grows at the rate of interest, this violates the

intertemporal budget constraint.



## Chapter 3

# Leverage and Financial Fragility: A Quantitative Exploration

### 3.1 Introduction

In recent years, there has been a lively debate on whether monetary policy should be used in responding to asset price bubbles and this has sparked a hot debate about its desirability and effectiveness. But relatively little research has focused on the role of prudential regulatory policies as a means of controlling bubbles and mitigating the impact of a bubble's bursting. While the consequences of asset price collapse have varied widely across countries, it is evident that crashes in real estate markets tend to have had more impact on the real economic activity than those in equity markets. This is because real estate is widely used as collateral for loans in many countries, and as real estate prices increase, banks are willing to lend more and this in turn leads to further rise in prices. As discussed in the previous chapter, sudden fall in collateral value can create the possibility that firms' net worth is entirely wiped out and the whole financial system collapses.

The purpose of this chapter is to take further step toward developing a framework that is suitable for quantitative analysis in order to analyse the role of corporate leverage in contributing to financial instability more explicitly; and to consider the implications for regulatory policy to reduce the likelihood and effects of excessive or destabilising asset price movements.

This chapter is organised as follows. Section 3.2 explores the robustness of the homogeneous KM model used in the previous chapter. We begin with solving for the ‘exact solution’ of the non-linear KM model; and use it to distinguish the linearised approach used in KM from our basic linear-quadratic specification (i.e. where the land price equation is approximated with a linear function but the user costs of land remain quadratic in the landholdings of the credit-constrained firms). We show that allowing for some non-linearity is essential for analysing the possibility of financial collapse. As the basic model is very vulnerable to adverse shocks, due to the extra sensitivity of land prices to land sales, we modify the framework by reducing the elasticity of land prices.

In Section 3.3, we modify the model further by allowing for a margin requirement (where lenders only lend up to some fraction of present discounted value of collateral) so that the effects of corporate leverage on financial stability can be analysed more explicitly. One interesting aspect of the model is that while higher margin leads to contraction of credit-constrained firms in the short run, the long-run equilibrium holdings increase appear to be higher (i.e. they hold more land and land prices are higher). This is because firms are effectively forced to use more of their internal funds and rely less on external finance, so the agency costs are reduced. We then look at dynamic properties of the model and find that the impulse responses of a temporarily negative productivity shock on credit-constrained sector are much smaller with margin requirements but the effects of shocks become more persistent.

Section 3.4 contains simulation experiments of responses to two kinds of adverse shocks. First we study how vulnerable leveraged companies are to asset price shocks. Following

the analytical technique of computing maximum shocks used in the previous chapter, the simulations in this section make clear that reducing leverage increases the stability of the financial system. The second type of shock is the impact of an unexpected temporary rise in interest rates. A case in point is the financial crisis in Thailand when the authorities used high interest rate policy to check capital outflows. We find that there are two effects at work. First the increase in interest expenses of existing short-term debt obligations leads the credit-constrained firms to sell land to satisfy the margin rule; second this effort causes asset prices to drop unexpectedly. This process is similar to asset price shocks, but the knock-on effects in this case turns out to be stronger as the capacity to roll over debts declines with higher interest rates.

Section 3.5 analyses ‘regulatory forbearance’, specifically how a temporary relaxation of margin requirements can help avoid the credit crunch and reduce the impact of the knock-on effects. We then discuss potential policy instrument of using margin requirement as a build-in stabiliser. Section 3.6 concludes.

## **3.2 Exact and linearised solutions of the KM model**

In this section, we solve for the exact solution of the non-linear KM framework so as to illustrate some important features of the model (and to provide a benchmark for distinguishing our linear-quadratic version analysed previously from the KM linear-linear version). Another purpose is to see how well the linear-quadratic specification performs numerically comparing with the exact solution and to test the robustness of the basic KM model.



### 3.2.1 Exact solution

For convenience of exposition, let us briefly recall the three main elements of the homogenous KM model. First is the budget constraint of the credit-constrained property companies at the beginning of period  $t$ :

$$q_t(k_t - k_{t-1}) + Rb_{t-1} + x_t = (\alpha + \gamma)k_{t-1} + b_t,$$

where  $k_t$  is the amount of land held at the end of period  $t$ ;  $q_t$  is its price;  $b_t$  is the amount of borrowing;  $R$  is gross rate of interest on debt (one plus one period of interest,  $r$ ); and  $x_t$  is consumption. Output from land obtained by the credit-constrained sector consists of tradable output,  $\alpha k_{t-1}$ , that can be sold and non-tradable output,  $\gamma k_{t-1}$ , which can only be used for self-consumption.<sup>1</sup> It is assumed in KM that  $\gamma$  is large enough to ensure that credit-constrained firms will not consume more than their non-tradable output (and will use all available resources to land accumulation), i.e.  $x_t = \gamma k_{t-1}$ . Therefore the budget constraint reduces to

$$q_t(k_t - k_{t-1}) + Rb_{t-1} = \alpha k_{t-1} + b_t. \quad (1)$$

As will be discussed later when we introduce a margin requirement into the model, the role of the non-tradable output is not only crucial in determining the condition under which borrowing constraint is binding but also the maximum size of a margin requirement that can be allowed without violating the logic of the model. For the moment, assuming that borrowing gross of interest is chosen to match the expected value of collateral implies:

$$b_t = \frac{E_t(q_{t+1})k_t}{R} \quad (2)$$

Since there is generally no aggregate uncertainty in this model and agents are assumed to have perfect foresight,  $E_t(q_{t+1}) = q_{t+1}$  – except for the initial unanticipated aggregate shock.

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<sup>1</sup> Due to the linearity in preference of credit-constrained firms, non-tradable output is introduced to prevent borrowers from postponing consumption continuously.

The last equation is a pricing equation that comes from *other users* of land, the finance houses, assumed not to be credit constrained of the form,

$$q_t - \frac{q_{t+1}}{R} = u(k_t) = \frac{\beta}{R} k_t \quad (3)$$

where  $\beta k_t$  measures the marginal productivity of land used by the finance houses, written (for convenience) as homogeneous in land holdings in the constrained sector. The value of land is given by the present discounted value of user costs i.e.

$$q_t = \sum_{s=0}^{\infty} R^{-s} u(k_{t+s}). \quad (4)$$

In the face of an initial unanticipated temporary productivity shock which occurs when the system is in equilibrium, the first period equilibrium is

$$u(k_t)k_t = (\alpha - \Delta\alpha + q_t - q^*)k^*. \quad (5)$$

Or,

$$\frac{\beta}{R} k_t^2 = \left[ (1 - \Delta)\alpha + \sum_{s=0}^{\infty} R^{-s} u(k_{t+s}) \right] k^* - q^* k^*. \quad (6)$$

So far the modelling is similar to that presented in the previous chapter. In what follows, we will show that the non-linear solution in (6) can be re-written in a much simpler way. By replacing  $q^* = R\alpha/(R-1)$  and multiplying both sides of (6) by  $1/k^*$  (where  $k^* = R\alpha/\beta$ ) and  $(1/\alpha)$ , one obtains

$$\left( \frac{k_t}{k^*} \right)^2 = 1 - \Delta + \frac{1}{k^*} \sum_{s=0}^{\infty} R^{-s} k_{t+s} - \frac{R}{R-1}.$$

After substituting backward  $k_{t+s} = (k^*)^{1/2} (k_{t+s-1})^{1/2}$ , we can successively eliminate  $k_{t+1}$ ,  $k_{t+2}$ , and so on. Hence the *exact solution* of the homogenous KM model can now be written as follows:<sup>2</sup>

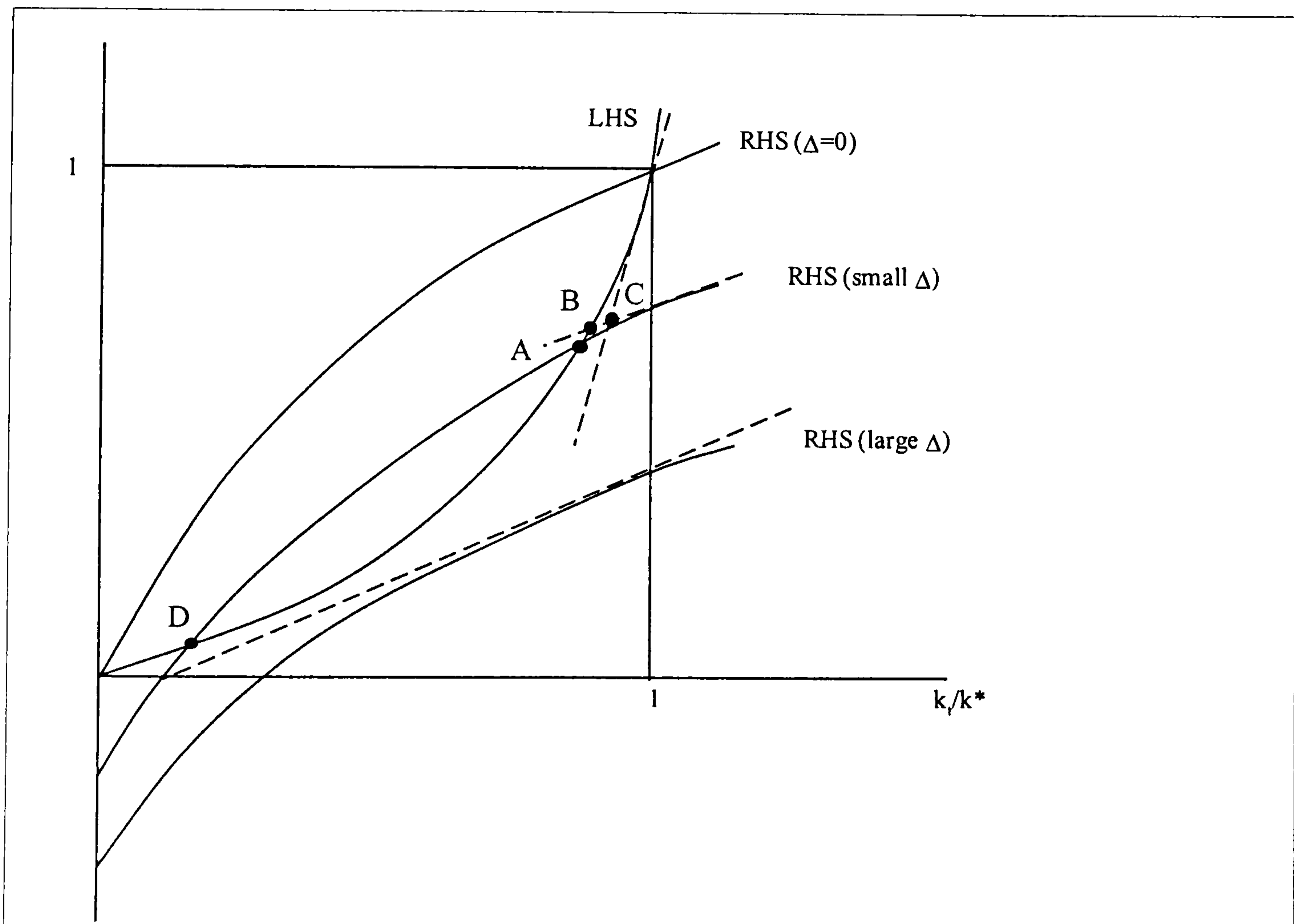
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<sup>2</sup> We are grateful to Craig Burnside (1998) for pointing this out in his discussion of Edison, Luangaram and Miller (1998).

$$\left(\frac{k_t}{k^*}\right)^2 = 1 - \Delta + \sum_{s=0}^{\infty} R^{-s} \left(\frac{k_t}{k^*}\right)^{1/2^s} - \frac{R}{R-1}. \quad (7)$$

While this equation is not in closed form, it can easily be analysed graphically and numerically. By plotting both sides of (7) separately in Figure 3.1, one can clearly see the distinction between the exact non-linear solutions of the basic KM model following negative shock, and the solutions from our linear-quadratic and KM's fully linearised versions.

Figure 3.1: Exact, linear-quadratic and linearised solutions of the KM model



As illustrated in the figure, the non-linear KM model can have *multiple equilibria* for small negative shock (points A and D). The logic behind this multiplicity is that “if the farmers’ future landholdings are expected to be small, then currently the land price will be low, the farmers will have little net worth, and they will be unable to borrow as much to buy land --



which in turn justified the expectation that their future landholdings will be small.”, KM (footnote 16). While KM recognise this possibility, both sides of (7) are linearised in their analysis (which gives closed-form solutions) and hence yields unique equilibrium at point C.<sup>3</sup>

In our linear-quadratic specification of their basic model, the short-run equilibrium after shock will be at point B.<sup>4</sup> Here, the LHS of (7), which represents the user costs of land, remains quadratic but on the RHS, we approximate land price equation (4) by a linear function which comes from solving the dynamic equations of the system:<sup>5</sup>

$$q_t - q^* = \theta(k_t - k^*), \quad (8)$$

where  $\theta$ , measuring the sensitivity of land prices to land sales (around equilibrium),  $= \beta/(R - \phi/2)$ , and the autoregressive coefficient of land accumulation,  $\phi = (R\alpha/\beta)^{1/2}$ ; so  $\theta = \beta/(R - 1/2)$  where  $\phi = 1$ .

Such a specification allows us to study another key feature of the KM model -- which is our main focus but has not been emphasised in KM's analysis -- the potential risk of

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<sup>3</sup> Note that while the shocks considered in KM are small positive productivity shocks, the analytical solutions will be similar but in opposite sign.

<sup>4</sup> It should be noted that, in our linear quadratic specification, there exists another equilibrium at low level of landholdings (as discussed in the previous chapter), which are not shown in the figure.

<sup>5</sup> The linearised difference equation of the basic KM model can be written as follows:  $\hat{k}_{t+1} = \frac{\sqrt{R\alpha/\beta}}{2}\hat{k}_t$  and  $\hat{q}_{t+1} = -\beta\hat{k}_t + R\hat{q}_t$ , where  $\hat{k}_t = k_t - k^*$  and  $\hat{q}_t = q_t - q^*$ . Solving linearised difference equations above, we obtain stable and unstable roots i.e.  $\phi$  ( $<1$ ) and  $R$  ( $>1$ ), respectively. And eigenvectors are  $(1, \beta/(R - \phi))$  and  $(0, 1)$ . The dynamics of land holding and land price are:  $\hat{k}_t = c_1(\phi)^t$  and  $\hat{q}_t = c_1 \frac{\beta}{R - \phi}(\phi)^t + c_2(R)^t$ , where  $\phi = \frac{\sqrt{R\alpha/\beta}}{2}$ . Hence, by setting  $c_2=0$ , the stable manifold is given by  $\hat{q}_t = \frac{\beta}{R - \phi}\hat{k}_t$  and setting  $c_1=0$  gives the unstable manifold, i.e.  $\hat{q}_{t+1}/\hat{q}_t = R$ .

*financial collapse* when  $\Delta$  becomes larger. In fact, as illustrated numerically below, the shocks do not have to be very big for this to happen.

In the following section, we parameterise the model (by varying  $R$ ) to illustrate two main points. Firstly, the linear approximation of land prices turns out to fit the non-linearity well. As a result, the solutions from linear-quadratic specification are close to the ones from non-linear version with negative shocks to land prices. Secondly, the basic homogenous KM model appears too fragile to yield any realistic results.

### 3.2.2 Numerical comparison between the exact and linearised solutions

Figure 3.2 and 3.3 below report the simulation results of the basic KM model when  $R = 1.1$  and 1.5, respectively. We find that linear approximation of land prices fits the non-linear curve quite well even if the distance of the initial state ( $q^* = 100$  and  $k^* = 1$ ) is reasonably far from steady state equilibrium.

*Figure 3.2: Linear approximation of land price when  $R=1.01$*

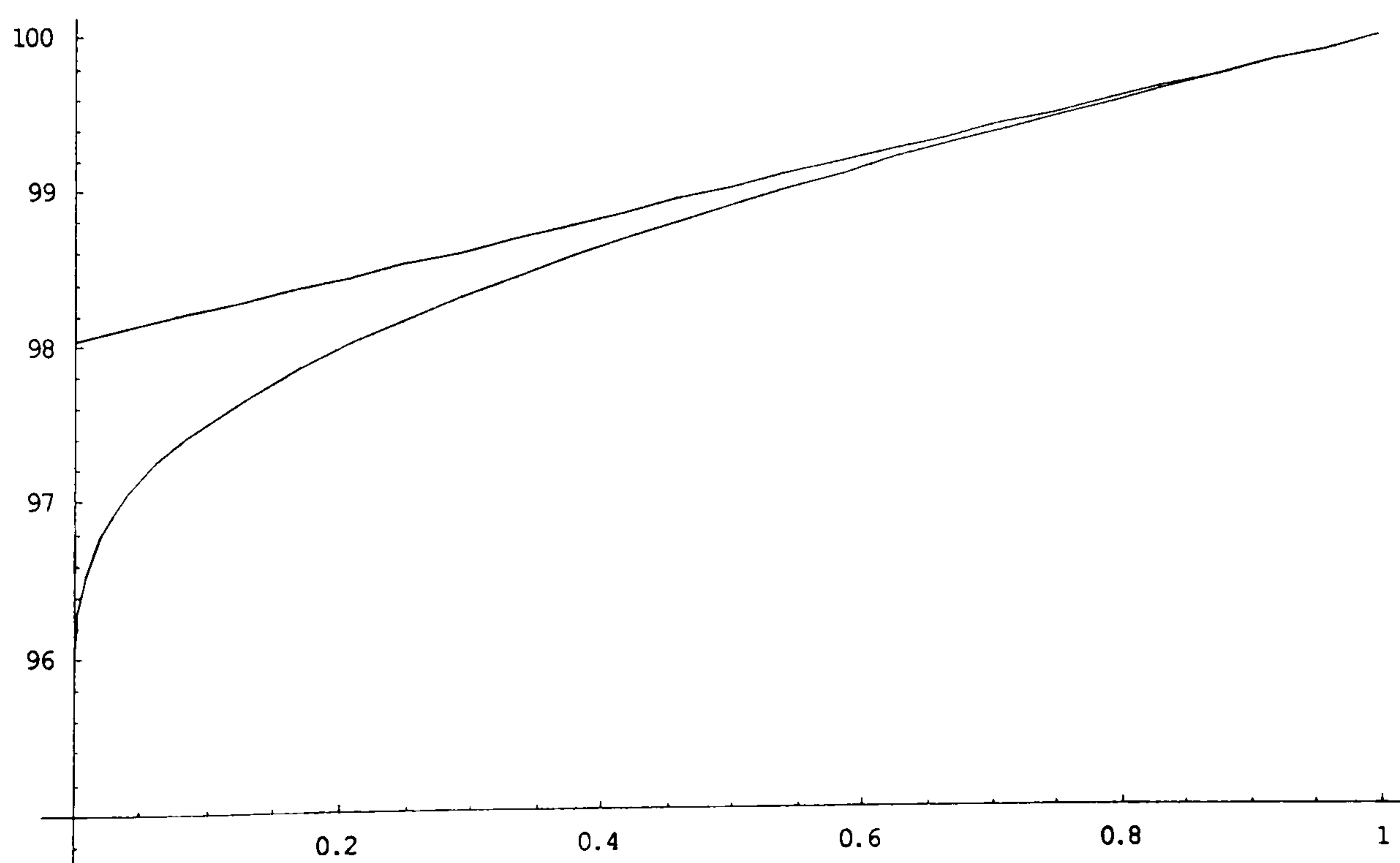


Figure 3.3: Linear approximation of land prices when  $R=1.5$

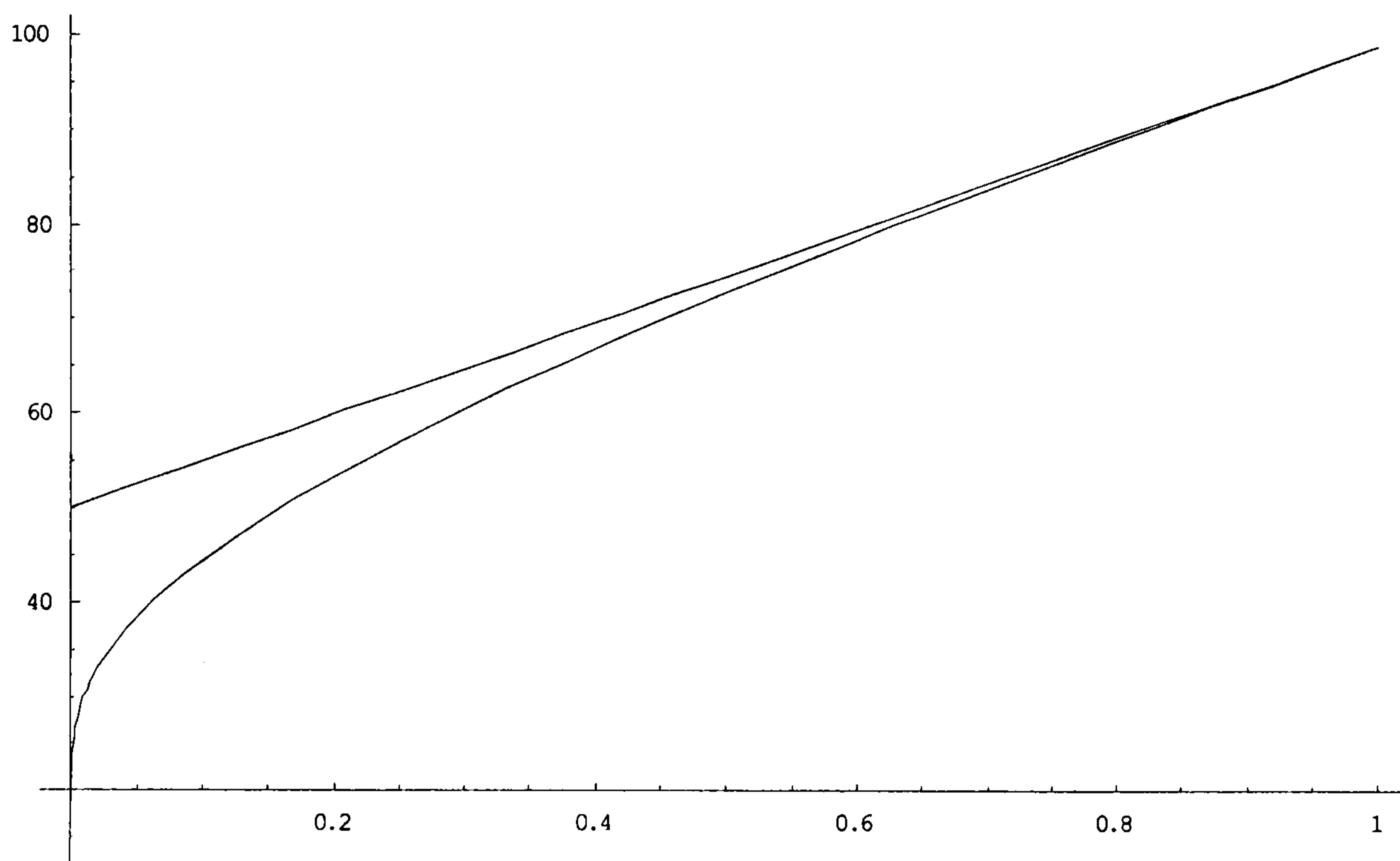


Table 3.1 below provides both the exact and the linear-quadratic solutions following asset price shocks, with three levels of interest rates. If fully-leveraged firms have to absorb losses, the model turns out to be very fragile. Even when we set interest rates as high as 50 percent, the maximum initial shock to asset prices that the system can stand is only around 2 percent (see Column 3 in the table). One of the main reasons for this is that the knock-on effects turn out to be very powerful. By selling about a quarter of their land holdings, they suffer a knock-on effect of 11-13 percent fall in land prices which is around 6 times relative to the initial fall. The exact sizes of the maximum shocks given by the non-linear model appear to be smaller than those given by our linear quadratic approximations; but given that the solutions from linear quadratic specification are reasonably close, the simulation exercises in Section 3.4 below will concentrate on this specification.



Table 3.1: Comparisons between exact and linear-quadratic solutions

	Exact solutions			Linear-quadratic solutions		
	1.1	1.3	1.5	1.1	1.3	1.5
Interest rates ( $R$ )	1.1	1.3	1.5	1.1	1.3	1.5
<b>Landholdings</b>						
-Before crash ( $k^*$ )	1	1	1	1	1	1
-After crash ( $k_t$ )	0.94	0.85	0.79	0.92	0.81	0.75
<b>Land prices (% fall)</b>						
-Initial shock ( $q^* - q^b$ )	-0.1	-0.7	-1.8	-0.1	-0.8	-2.1
-Knock-on effects ( $q_t - q^*$ )	-1.1	-5.9	-10.8	-1.4	-7.0	-12.5
-Total crash ( $q_t - q^b$ )	-1.2	-6.6	-12.6	-1.5	-7.8	-14.6

### 3.2.3 Non-homogenous user cost of land

For analytical convenience, the user cost specified earlier (and in the previous chapter) was assumed to be homogenous in  $k_t$ , so,  $\eta$ , the elasticity of land holdings by the constrained sector with respect to land prices is equal to 1. To reduce the fragility of the model, assume that the user cost of land -- and so land prices -- are less sensitive to land sales. By introducing some arbitrary constant term ( $\beta_0$ ), the modified non-homogenous user cost takes the form:

$$u'(k_t) = \frac{\beta'}{R} k_t + \beta_0. \quad (9)$$

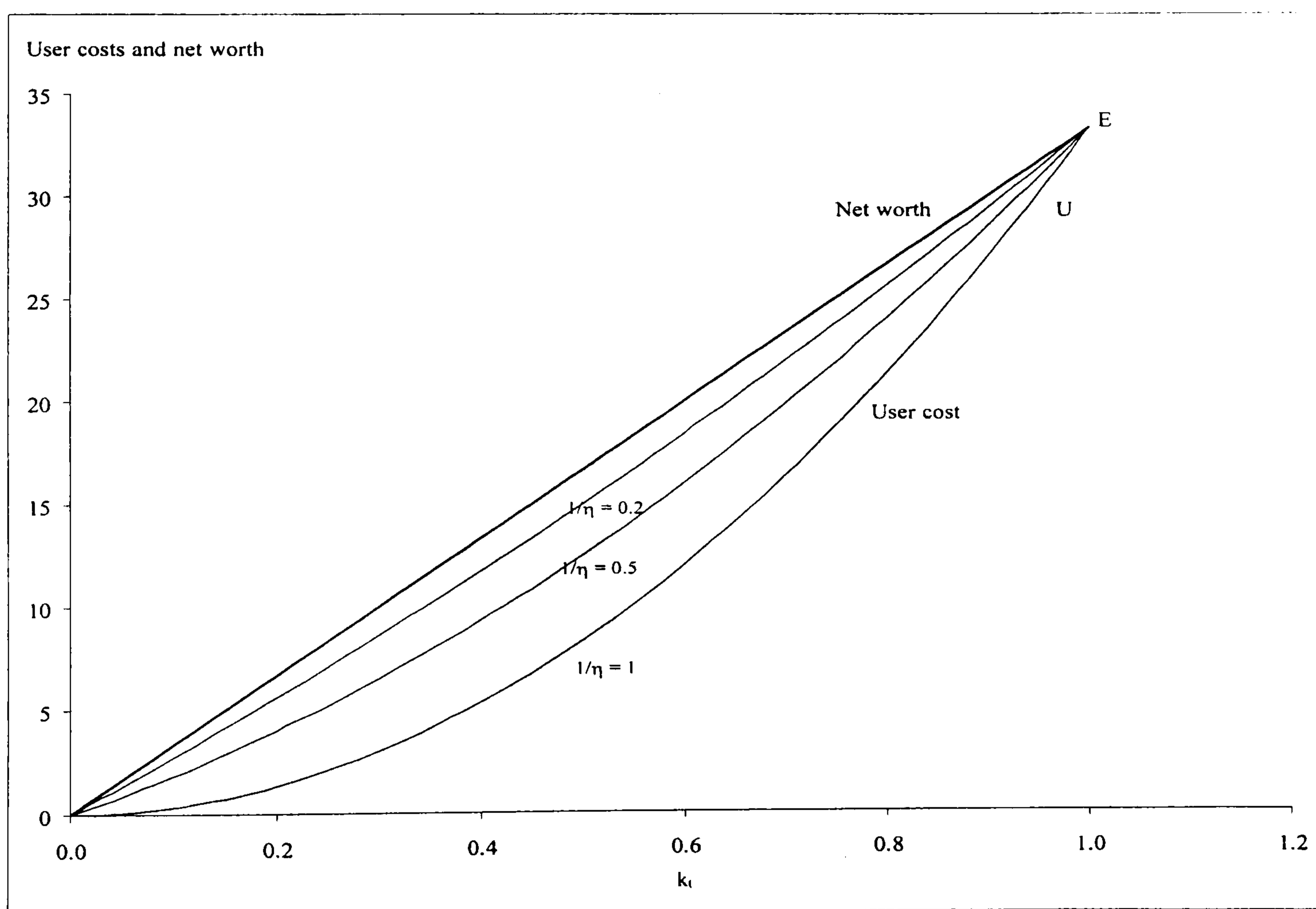
The elasticity of the user cost of land with respect to landholdings by credit-constrained sector is defined as  $\frac{du(k_t)}{dk_t} \frac{k_t}{u(k_t)} = \frac{1}{\eta}$  is  $\frac{\beta' k_t}{\beta' k_t + R\beta_0}$ , which is  $< 1$  for  $\beta_0 > 0$ . And land prices

will be given by

$$q_t = \frac{\beta'}{R} \left( \sum_{s=0}^{\infty} R^{-s} k_{t+s} \right) + \frac{\beta_0 R}{R-1}$$

The effect of lower user cost elasticity will slow the speed of recovery as shown in the Figure 3.4 below (assuming  $R = 1.5$ ): as the elasticity declines, the user cost curve moves towards the net worth line. Since the speed of adjustment is determined by the difference between net worth and user cost, in the limit when the elasticity of user costs goes to zero, line  $OU$  is the same as line  $OE$  and so there will be no knock-on effect. We will discuss the effects of reducing user cost elasticity on the sensitivity of land prices to land sales in Section 3.3 below.

Figure 3.4: Impacts of user cost elasticity on speed of adjustment



### 3.3. The introduction of a margin requirement

As illustrated in the previous section if fully-leveraged, credit-constrained firms have to absorb losses, the model is very fragile. Not only because land prices are sensitive to land sales but they also have very little net worth, only  $ak^*$  in equilibrium i.e. one period flow of

income. So, if land prices drop unexpectedly by a small fraction, they are wiped out. While KM go on to introduce other mechanisms which have the effect of damping the response to exogenous shocks, we stick with their simple model but increase its robustness by reducing the leverage taken on by the property companies.

Specifically, we assume that lenders impose a margin requirement on borrowers requiring owners/managers to hold a margin of  $m$  (i.e. by forcing firms to maintain a certain level of liquidity) and they lend only the fraction  $1 - m$  of the value of land. One motivation for this is suggested by KM (1997, p.221), namely the cost of liquidation: if legal and other costs were expected to be the fraction  $m$  of land values, then bankers looking for complete collateralisation would need to constrain their lending appropriately. While this does probably account for some fraction of observed margin requirements, it is prudential factor which seems to be more relevant here, i.e. to prevent borrowers going bankrupt too often. Another reason for increasing participation of owners/managers might be to combat a form of moral hazard not included in the KM model, namely the incentive that low capitalisation give them to invest in high-variance projects, i.e. the well-known incentive to ‘gamble for resurrection’. [See, for example, Dewatripont and Tirole (1994, Chapter 8); Hellman, Murdock and Stiglitz (2000).]

With a margin requirement denoted  $m$ , the borrowing constraint becomes

$$b_t = \frac{(1 - m)q_t + k_t}{R} \quad (10)$$

This constraint limits the extent to which firms can leverage their debt by forcing them to maintain some certain level of liquidity. Substituting into the budget constraint, (1), and rearranging yields



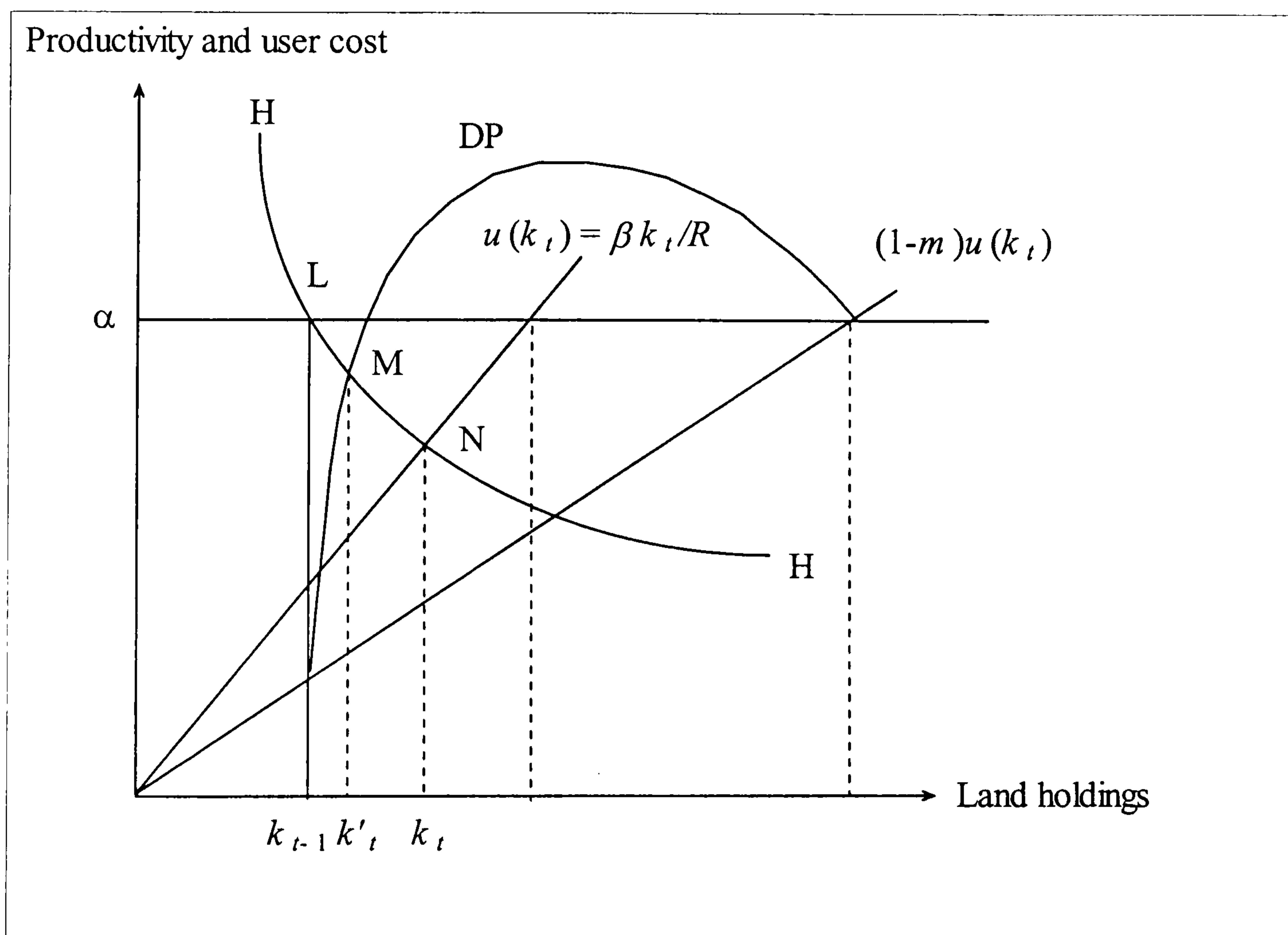
$$u_t k_t = \alpha k_{t-1} + m q_t k_{t-1} - \frac{m q_{t+1} k_t}{R},$$

or,

$$\left[ q_t - \frac{(1-m)q_{t+1}}{R} \right] k_t = (\alpha + m q_t) k_{t-1}. \quad (11)$$

As can be seen from the LHS of (11), a margin requirement implies that the down payment must exceed the user cost of land. How this affects the adjustment can be seen in Figure 5, constructed along the same line as Figure 2 in the previous chapter.

Figure 3.5: Dynamics adjustment where  $m > 0$



With no margin requirement and starting at point L, where  $k = k_{t-1}$ , land purchases would take land holdings to  $k_t$  where the net worth, shown as HH, matches the user cost schedule,  $u(k_t)$ , at point N. With a margin requirement of 50%, for example, the down payment is shown by the curve DP, equal to half of the linear function  $u(k_t)$  plus half  $q_t(k_t - k_{t-1})$ , the

money needed for new land holdings (an approximately quadratic function of  $k_t$ ). As is evident from the figure, the requirement to find half of the money for new land purchases out of current profit slows the recovery, to  $k_t'$  less than  $k_t$ . Solving the linearised difference equations for land holdings and the price of land, assuming  $\phi = (R\alpha/\beta)^{1/2} = 1$ , one obtains the following expression for the slope of stable path as follows

$$\theta' = \frac{\beta}{R - \left[ \frac{1 + \frac{Rm}{(R-1)(1-m)}}{2 + \frac{Rm}{(R-1)(1-m)}} \right]}. \quad (12)$$

Increasing the margin requirement makes land prices more sensitive to land holdings - i.e.  $\theta'$  is increasing in  $m$ . This is because a higher margin requirement slows the speed of adjustment of land holdings. As the margin requirement increases from 0 up to 40%, the parameter  $\theta'$ , which measures the sensitivity of land prices to land sales, and  $\phi$ , the autoregressive coefficient in the process of capital accumulation, also increase as shown in the table assuming 10 percent rate of interest. If  $\theta'$  rises, this means that land prices are more sensitive to land sales and we observe that  $\theta'$  lies just above the margin requirement. (If  $m$  equals 30%, for example, land prices fall below equilibrium by 32.2 times the percentage disposal of land by property companies.) The reason that the higher  $m$  increases  $\theta'$  is that the margin requirement makes it more difficult for a company to expand (as they rely more internal funds and less on bank finance, see Proposition 3 below); this slows the speed of adjustment and moves land prices closer to current user costs. (How markedly adjustment slows down is indicated by  $\phi$ , the coefficient on lagged land holdings, which increases sharply from 0.5 in column one to 0.85 in column three.)

Table 3.2: Margin requirements, land price coefficients, and autoregressive coefficients

	Margin requirements (%)			
	0	20	30	40
Elasticity = 1				
$\theta'$	16.7	32.2	40.2	48.3
$\phi$	0.50	0.79	0.85	0.89

### 3.3.1 Steady state

In equilibrium where  $k_t = k_{t-1} = k^*$  and  $q_t = q_{t-1} = q^*$ , the land-holding by credit-constrained firms,  $k^*$ , is  $\frac{R\alpha}{\beta(1-m)}$ , land price,  $q^*$ , is  $\frac{R\alpha}{(R-1)(1-m)}$ ; and  $(1 - m)u = \alpha$ . It may seem surprising that a high margin requirement raises the equilibrium level in the long run: i.e. when debt capacity of credit-constrained firms is limited to some fraction,  $1 - m$ , of present discounted value of land collateral, the long-run equilibrium land prices and land-holdings *increase* by a factor of  $1/(1 - m)$ . It might appear that, as  $m$  goes towards 1 (i.e. own-equity financing),  $k^* \rightarrow \infty$ . This will not occur because there is a limit of  $m$  that can be allowed without violating the logic of the model (see proof below).

In this respect, the assumption made in KM regarding the existence of non-tradable goods ( $\gamma k_t$ ) in the production function of the credit-constrained sector plays a crucial role here. Since only tradable output can be used for down payment for land purchase, while the non-traded goods is not -- except for own consumption, the equilibrium in this credit-constrained economy is sub-optimal. Specifically, the equilibrium is not determined by  $\alpha + \gamma = G'(k - k^*)$  but at the point where the marginal product of tradable goods equals to the present discounted value of marginal product in the unconstrained sector (i.e. the user cost



of land),  $G'(k - k^*)/R$ , where  $\bar{k}$  is the total supply of land in the economy. The fact that total marginal productivity in credit-constrained sector is greater than that of the unconstrained sector in such an equilibrium implies that these firms will always have incentive to expand their investment to the first best equilibrium if they have enough resource to do so.

With a higher margin requirement, firms are effectively forced to use more of their internal funds for investment and rely less on external borrowings. So they will need to sell land in order to satisfy the margin rule and this effort leads to a fall in land prices and a contraction of their land-holdings in the short run. But the process of rebuilding net worth allows them to make extra profits -- the difference between returns from using land and the user cost of land, as discussed in the previous chapter. Figure 3.6 below shows that the short-run contraction followed by higher long run equilibrium (at  $k^* = 1.33$  and  $q^* = 111.1$ ) when  $m$  increases from 0 to 0.1. (Parameters used:  $R = 1.2$ ;  $\alpha = 16.7$ ;  $\beta' = 6.7$ ;  $\beta_0 = 11.1$ ; and  $1/\eta = 1/3$ ). Initially, the economy is in steady state with value of  $q^*$  and  $k^*$  of 100 and 1 respectively. But when  $m$  increases from 0 to 0.10, they are forced to reduce their land-holdings to satisfy the margin rule and this causes land prices to fall to 98.4, which calls for more land sales; so that first period equilibrium of such land sales reduces by 30 percent (i.e.  $k_t = 0.7$ ). After that, they are able to rebuild their net worth by accumulating more equity from using cheap land, this in turn results in the gradually increase in the net worth and equilibrium land-holdings increases by 30 percent above the initial equilibrium, as shown in Figure 3.7.

Figure 3.6: Short-run contraction and long-run expansion when  $m$  increases

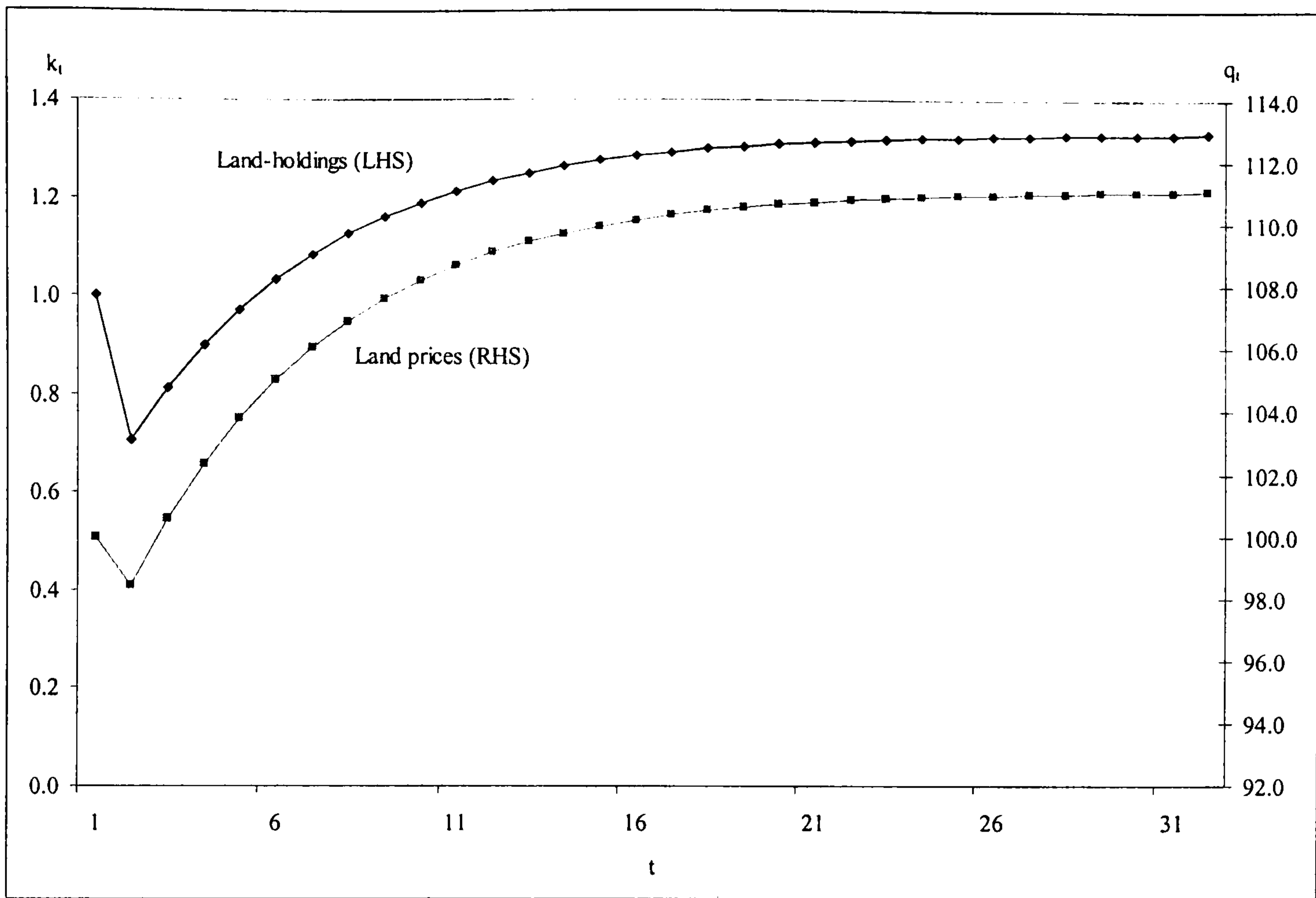
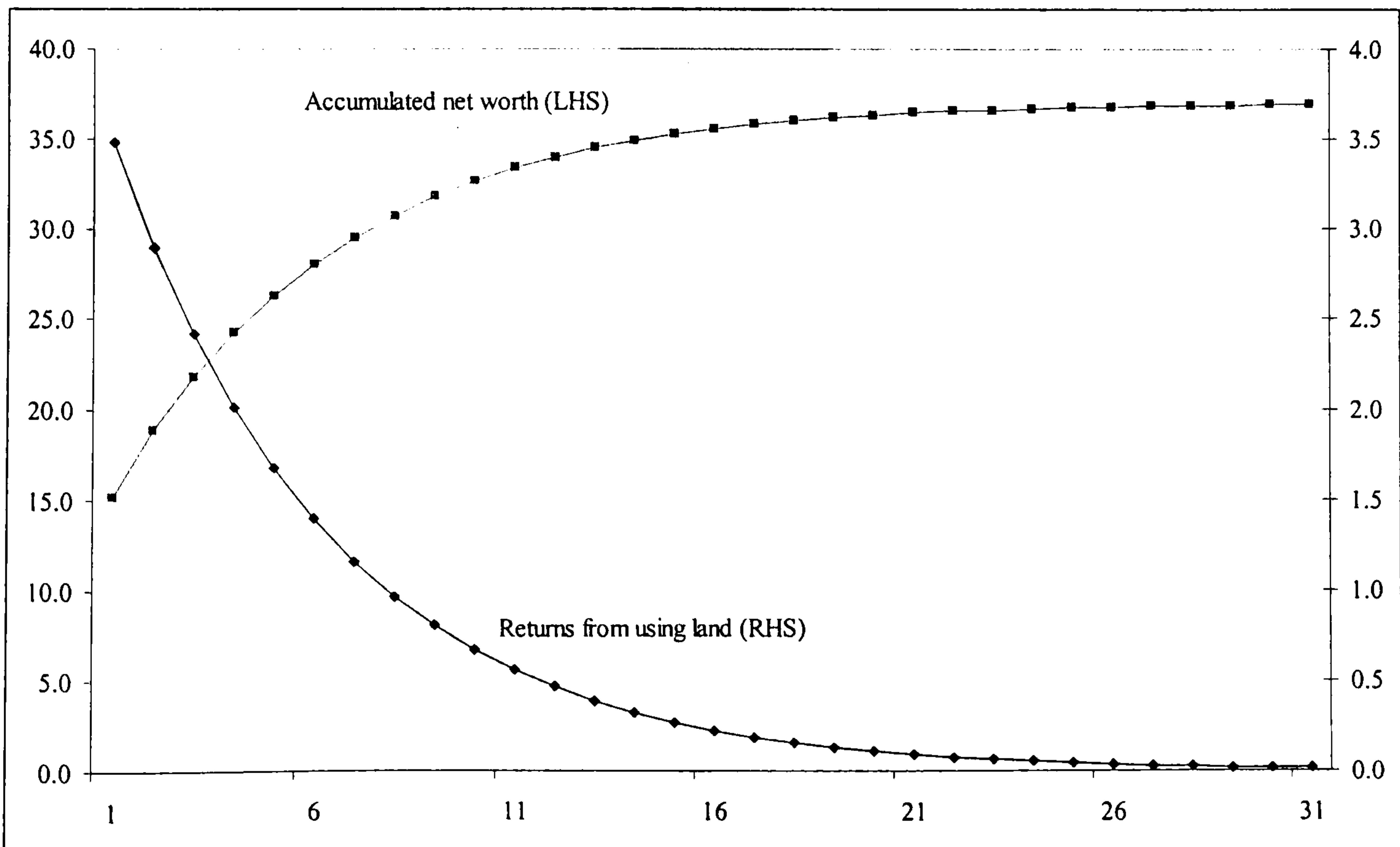


Figure 3.7: The process of rebuilding net worth after  $m$  increases



How large can the margin requirements be consistent with the assumption that firms are credit-constrained in equilibrium? To answer this, we use the same assumption as in KM: i.e. a credit-constrained firm will use all of their tradable goods for investment and consume only non-tradable goods if and only if

$$\frac{\alpha + \gamma}{\alpha} > \frac{1}{\delta} > \frac{1}{\delta'} = R, \quad (13)$$

where  $\delta$  and  $\delta'$  are discount factors in the credit-constrained and unconstrained agents respectively. We compare two consumption paths from two strategies. That is borrowing constraint will always bind if the consumption path of using a marginal unit of tradable goods to buy land yields more utility than consuming it immediately in period  $t$ , i.e.

$$\left[ \frac{\gamma}{DP_t} + \delta \left( \frac{\alpha}{DP_t} \frac{\gamma}{DP_{t+1}} \right) + \delta^2 \left( \frac{\alpha}{DP_t} \frac{\alpha}{DP_{t+1}} \frac{\gamma}{DP_{t+2}} \right) + \dots \right] > 1, \quad (14)$$

where  $DP_t = q_t - \frac{(1-m)q_{t+1}}{R}$ . By replacing  $DP_t = DP_{t+1} = \dots = DP^* = \frac{(R+m-1)\alpha}{(R-1)(1-m)}$  in (14) and

using condition (13), we find the condition for the upper bound of  $m$  that can be summarised as follows.

**Proposition 1:** *The borrowing constraint will be binding if and only if*

$$\frac{R+m-1}{(R-1)(1-m)} > \frac{R\alpha}{\alpha + \gamma} \quad (15)$$

*Proof:* See above.

In other words, margin requirements which do not satisfy this inequality would imply equilibrium landholdings by credit-constrained firm lying beyond the first-best equilibrium. Assuming that  $\gamma$  is greater than  $r\alpha$  allows for some margin requirement, but not too much. (Note that if  $\gamma = r\alpha$ , no margin requirement will be possible. This means that



$\gamma$  needs to be quite large) So if non-traded goods were given, Proposition 1 can be re-written as

$$\gamma > \frac{[R(R-1)(1-m)-1]\alpha}{R-1+m}$$

In KM's simulation exercises,  $\gamma$  is assumed to be equal to  $\alpha$ . Given 50 percent rate of interest, for example, this implies that the maximum  $m$  can only be 0.1. As this is too small for our purposes, for the simulations presented in Section 4, we will assume higher  $\gamma$ .

### 3.3.2 Aggregate productivity shock

How does the inclusion of a margin requirement affect the model's response to a negative shock? In this section, we follow KM's linearised approach which allows us to find closed-form solutions and to analyse some important properties of our modified version more explicitly. As emphasised earlier, however, the possibility of financial collapse is thus ruled out (but this issue is analysed in Section 3.4 which applies the linear-quadratic method).

Suppose the economy is in equilibrium until period  $t - 1$  and an adverse temporary shock occurs in period  $t$  which lowers productivity by  $\Delta\alpha$ . By replacing the modified borrowing constraint (10) into (5), the first-period equilibrium after the shock is determined by

$$\left[u_t + \frac{mq_{t+1}}{R}\right]k_t = [(1 + \Delta)\alpha + q_t - (1 - m)q^*]k^*.$$

To find a closed-form solution for the new equilibrium path, we linearise both sides of this equation around the neighbourhood of the steady state (let  $x_t$  denotes the proportional change from its steady state value, i.e.  $(x_t - x^*)/x^*$ ). Using  $u^* = \alpha/(1 - m) = (R - 1)q^*/R$  and

$\hat{u}_t = \hat{k}_t / \eta$ , one obtains

$$\left[1 + \frac{1}{\eta} + \frac{Rm}{(R-1)(1-m)}\right] \hat{k}_t = \Delta + \frac{R}{R-1} \hat{q}_t. \quad (16)$$

The RHS shows the reduced net worth at the time of the shock, which consists of the direct effect of negative productivity shock ( $\Delta$ ) and the knock-on effects from land sales, which is scaled up by the proportion of  $R/(R - 1)$ . But land sales are reduced with  $m > 0$  as shown in the LHS of (16).

From period  $t + s$  onwards ( $s \geq 1$ ), demand for land is  $(1 - m)u_{t+s}k_{t+s} = (\alpha + mq_{t+s})k_{t+s} - mq_{t+s}k_{t+s}$ . Linearising both sides gives the dynamics of land accumulation after the shock period, i.e.

$$\left[1 + \frac{1}{\eta} + \frac{Rm}{(R-1)(1-m)}\right] \hat{k}_{t+s} = \left[1 + \frac{Rm}{(R-1)(1-m)}\right] \hat{k}_{t+s-1}. \quad (17)$$

The next proposition characterises the dynamic adjustments of land-holdings after shock.

**Proposition 2:** *With  $m > 0$ , the speed adjustment of land-holding by credit constrained*

*firm, defined as  $\phi = \left[1 + \frac{Rm}{(R-1)(1-m)}\right] \left[1 + \frac{1}{\eta} + \frac{Rm}{(R-1)(1-m)}\right]^{-1}$  will be slower than with  $m = 0$ .*

$$\text{Proof: } \frac{\partial \phi}{\partial m} = \frac{\partial}{\partial m} \left[ \frac{1 + \frac{Rm}{(R-1)(1-m)}}{1 + \frac{1}{\eta} + \frac{Rm}{(R-1)(1-m)}} \right] = \frac{\frac{R}{(R-1)(1-m)^2 \eta}}{\left[1 + \frac{1}{\eta} + \frac{Rm}{(R-1)(1-m)}\right]^2}.$$

Since  $R > 1$  and  $\eta > 0$ , then  $\frac{\partial \phi}{\partial m} > 0$ .

The inclusion of margin requirement makes it more difficult for credit-constrained firms to expand since they have to rely more on internal funds and less on external borrowing. As

noted before, as  $\eta \rightarrow \infty$ , the two coefficients in the LHS and RHS of (17) are the same, implying complete persistence.

To find the sensitivity of land sales to land prices, linearising the land price equation (4) gives

$$\hat{q}_t = \frac{1}{\eta} \frac{R-1}{R} \sum_{s=0}^{\infty} R^{-s} \hat{k}_{t+s} = \left( \frac{1}{\eta} \frac{R-1}{R} \right) \frac{1}{1 - \frac{1}{R} \left( 1 + \frac{Rm}{(R-1)(1-m)} \right) \left( 1 + \frac{1}{\eta} + \frac{Rm}{(R-1)(1-m)} \right)^{-1}} \hat{k}_t = \theta' \hat{k}_t \quad (18)$$

where  $\theta'$  represent sensitivity of land price to land sales. This equation is essentially the same as Equation (12) above (except that here  $\hat{q}_t$  and  $\hat{k}_t$  are measured in percentage term while in (12),  $\hat{q}_t$  and  $\hat{k}_t$  are measured in absolute value). The sensitivity of land prices to land sales consists of two components. The first term on the RHS of the equation reflects change in the user costs at date  $t$  while the second term captures the effects of persistence in land-holdings of the firms. It is important to note that the second term plays a dominant role in determining the sensitivity of land sales to land prices. We can summarise the implications of (18) into the following propositions as follows.

**Proposition 3:** *As  $m$  increases, the sensitivity of land prices to land sales ( $\theta'$ ), increases.*

Proof:

$$\frac{\partial}{\partial m} \left[ \left( \frac{1}{\eta} \frac{R-1}{R} \right) \frac{1}{1 - \frac{1}{R} \left( 1 + \frac{Rm}{(R-1)(1-m)} \right) \left( 1 + \frac{1}{\eta} + \frac{Rm}{(R-1)(1-m)} \right)^{-1}} \right] = \frac{R}{[R(m-1-\eta) + \eta(m-1)]^2}$$

Since  $R > 1$ , then  $\frac{\partial \theta'}{\partial m} > 0$ .

The effects of a shock on land-holdings becomes more persistent as  $m$  rises and because user costs will also be lower in the future, which are taken into account into current land



prices and so this leads to higher sensitivity of land prices to land sales. To find out the impact on land-holdings and land prices as a function of the size of shock, substituting (18) into (16), one obtains

$$\hat{k}_t = \left[ \frac{1}{1 + \frac{1}{\eta} + \frac{Rm}{(R-1)(1-m)}} \right] \left[ 1 + \frac{R}{(R-1) \left( 1 + \frac{Rm}{(R-1)(1-m)} \right) \eta} \right] \Delta, \quad (19)$$

$$\hat{q}_t = \frac{\Delta}{\left( 1 + \frac{Rm}{(R-1)(1-m)} \right) \eta}. \quad (20)$$

Figures below reports the impulse responses of equation (19) and (20) to a 10 percent fall in productivity of the credit-constrained borrowers (assuming 10 percent interest rate). We find that the impact effects on  $k_t$  and  $q_t$  is much smaller with the margin requirement of 20 percent, compared to the baseline case -- shown as bold lines -- where  $m = 0$  and user cost elasticity  $(1/\eta) = 1$ . And the effects of the shock become more persistent when the user cost elasticity reduces to 1/3. [It should be noted that our purpose here is to study the impulse responses when key parameters vary. In fact the base case will collapse for  $m = 0$  if we allow for non-linearity.]

Figure 3.8: Dynamics of land-holdings

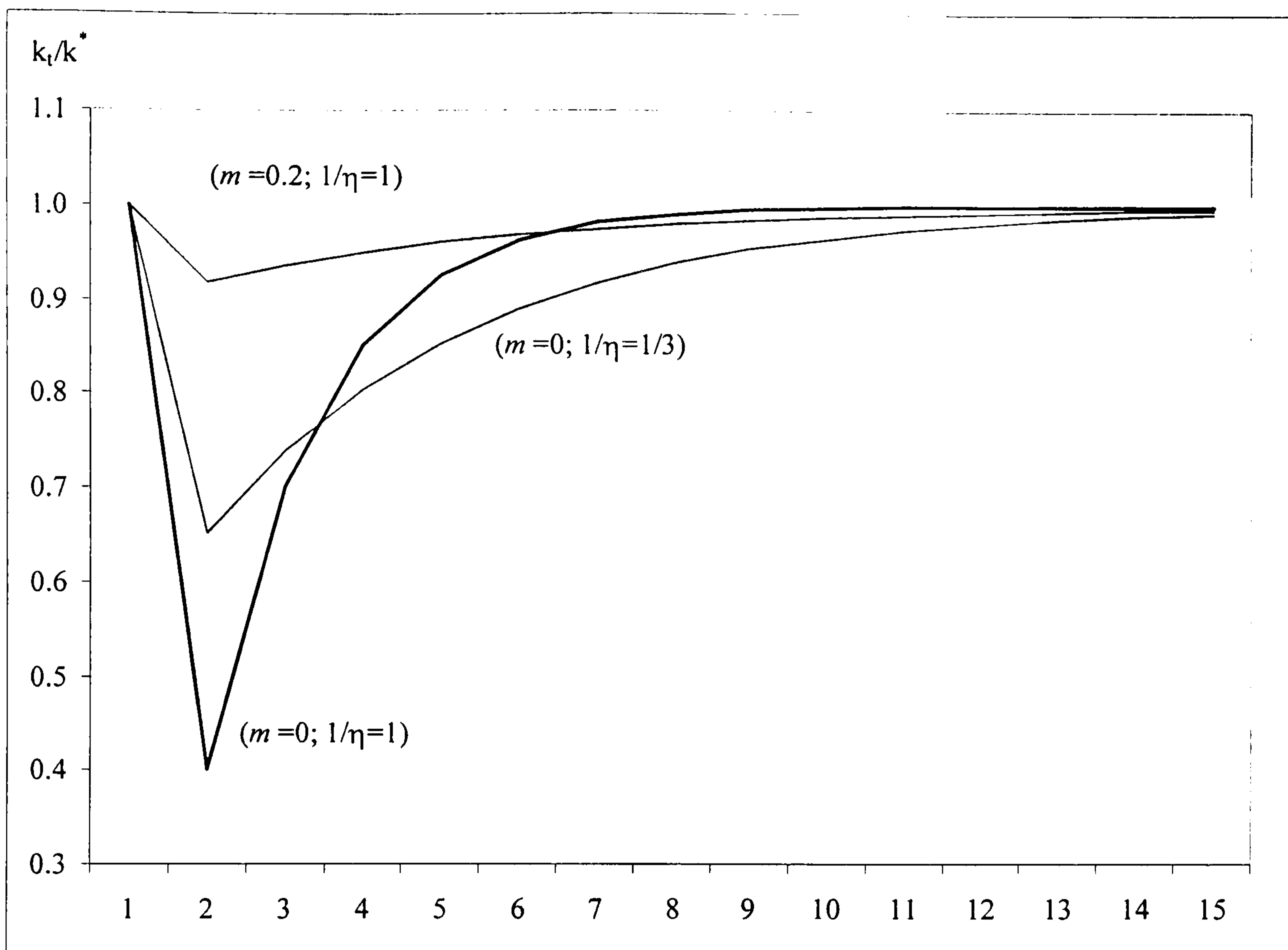
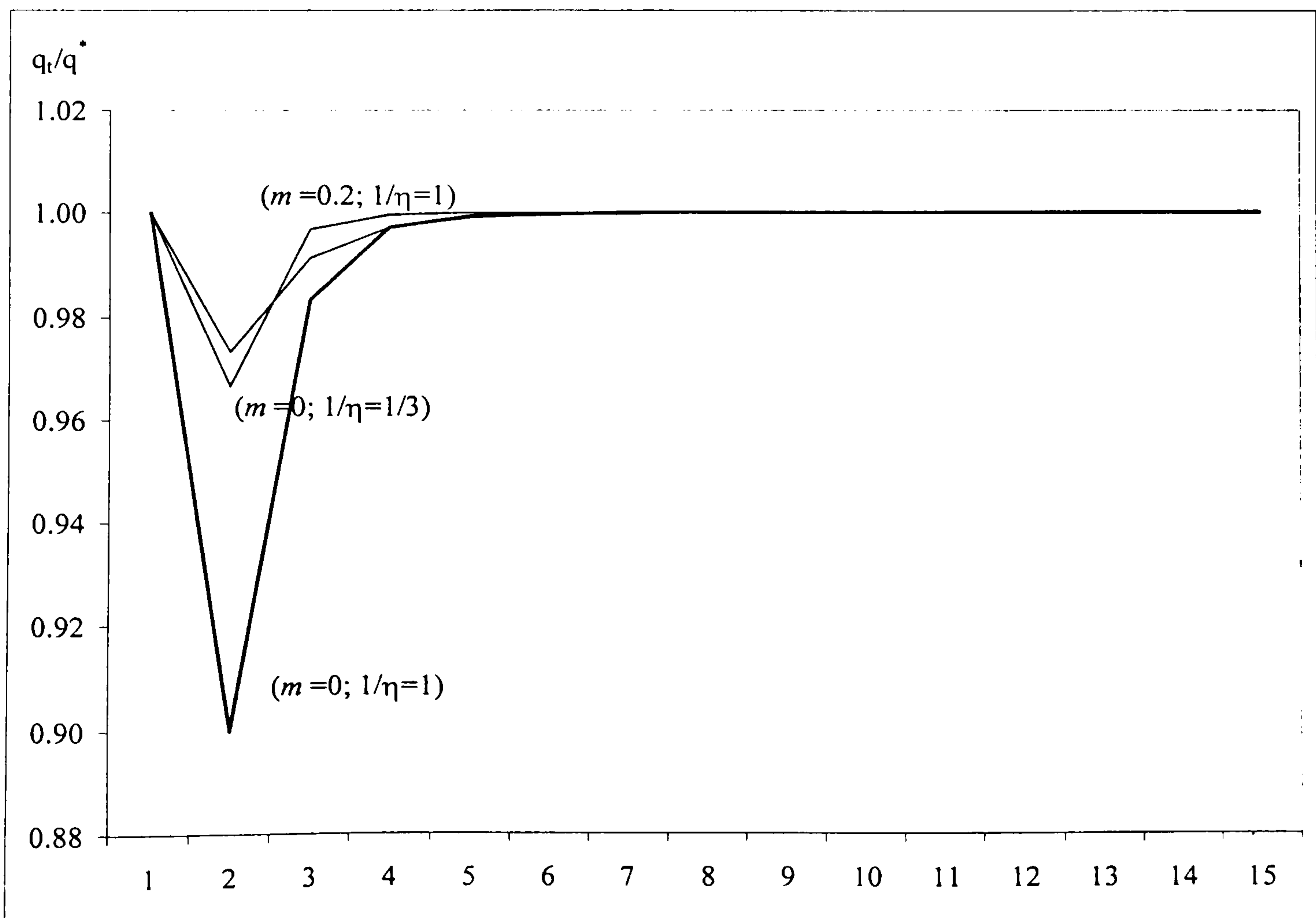


Figure 3.9: Dynamics of land prices



### **3.4. Leverage and financial fragility: Some numerical exercises**

In this section, we use the modified model (i.e. with margin requirements and non-homogenous user cost of land) to examine numerically the impacts of two adverse shocks. First, we look at how vulnerable leveraged companies are to asset price shocks. Our aim here is to show the robustness of the extended model with non-homogenous user costs of land and margin requirements.

The second type of shock is a temporary increase in interest rates on debt obligation (i.e. the case of ‘floating rates’ on short-term debt). The motivation comes from the recent debate in aftermath of the Asian crisis on the policy of using high interest rate to stabilise the currency values and cope with capital outflows.

#### **3.4.1 Asset price shocks**

Table 3.3 below illustrates land prices and land holdings by credit-constrained borrowers before and after the bursting of the largest land price bubble consistent with a return to equilibrium. (The technique of computing the maximum shock is similar to what we discussed analytically in the previous chapter.) Note that our goal here is not to match data, but is rather to provide some important properties of the model and show numerically how robustness of the basic linear quadratic specification increases significantly by a combination of reducing the sensitivity of land prices to land sales and imposing a margin requirement on loans. Note also that since we set interest rates at 10 percent per annum and



assume that  $10\gamma = \alpha$ ,<sup>6</sup> these imply that the upper bound for margin requirements cannot be greater than 0.45.<sup>7</sup>

Table 3.3: Measuring the impact of asset price shocks: Some examples

<i>Key Parameters</i>					
-Interest rates ( $R$ )	1.1	1.1	1.1	1.1	1.1
-Margin requirement ( $m$ )	0	0	0.20	0.40	0.44
-User cost elasticity ( $1/\eta$ )	1	0.2	0.67	0.67	0.56
<i>Landholdings</i>					
-Before crash ( $k^*$ )	1	1	1	1	1
-After crash ( $k_t$ )	0.92	0.06	0.47	0.31	0.15
<i>Land prices (% fall)</i>					
-Initial shock ( $q^* - q^b$ )	-0.1	-1.6	-3.6	-15.0	-24.2
-Knock-on effects ( $q_t - q^*$ )	-1.4	-7.0	-14.2	-26.4	-30.6
-Total crash ( $q_t - q^b$ )	-1.5	-8.6	-17.8	-41.4	-54.8

For fully-leveraged property companies, the first column demonstrates the extreme fragility of the basic KM model with 100 percent leverage: the ‘maximum bubble’ is effectively zero, as already mentioned in Section 1. Even we reduce the elasticity of the user cost to 0.2, as shown in the second column, the maximum shock is still quite low, i.e. only 1.6 percent, but notice that land sales are substantial as shown in the second column. (In their simulations, however, KM assume user costs and land prices are much less sensitive to land sales than assumed here: the elasticity they use is only 0.1. In this case, the negative shock of 3.85 percent will lead the firms to sell all their landholdings.)

<sup>6</sup> As noted by KM, so long as (15) holds, the parameter  $\gamma$  has no effects on dynamics of land prices and landholdings.

<sup>7</sup> Other parameters used to generate the results in Table 3 are as follows. For the first column,  $\alpha=9.1$ ,  $\beta'=10$ . For the second column,  $\alpha=9.1$ ,  $\beta'=2$ ,  $\beta_0=7.3$ . For the third column,  $\alpha=7.3$ ,  $\beta'=6.7$ ,  $\beta_0=3$ . For the fourth column,  $\alpha=5.5$ ,  $\beta'=6.7$ ,  $\beta_0=3$ . For the last column,  $\alpha=5$ ,  $\beta'=5.6$ ,  $\beta_0=4$ . Note that these parameters in each column give equilibrium values  $q^*=100$  and  $k^*=1$ .

As high leverage plays an important role in creating vulnerability of the system, the third column shows how reduced leverage increases robustness. By somewhat reducing the elasticity of user cost, to 0.67, and setting leverage of 20 percent, the maximum bubble is 3.6 percent. The total fall in land prices will of course be a good deal larger than that because of the impact of land sales needed to satisfy the margin requirement after bubble bursts. This leads to a ‘knock-on’ effect of about 14 percent in this case; so the maximum crash in land values (bubble plus knock-on) which can be sustained without wholesale liquidation is a little under a fifth. With a margin requirement at 40 percent, however, the system can withstand the bursting of a bubble of 15 percent, which causes land prices to fall by another 26 percent. The last column shows how the model can be calibrated to accommodate an even bigger bubble without collapsing: when the user cost elasticity falls to 0.56 and margin requirement is set at its near upper bound level of 44 percent, the biggest bubble increases to 24 percent, giving rise to the total ‘sustainable’ crash in land prices of 55 percent.

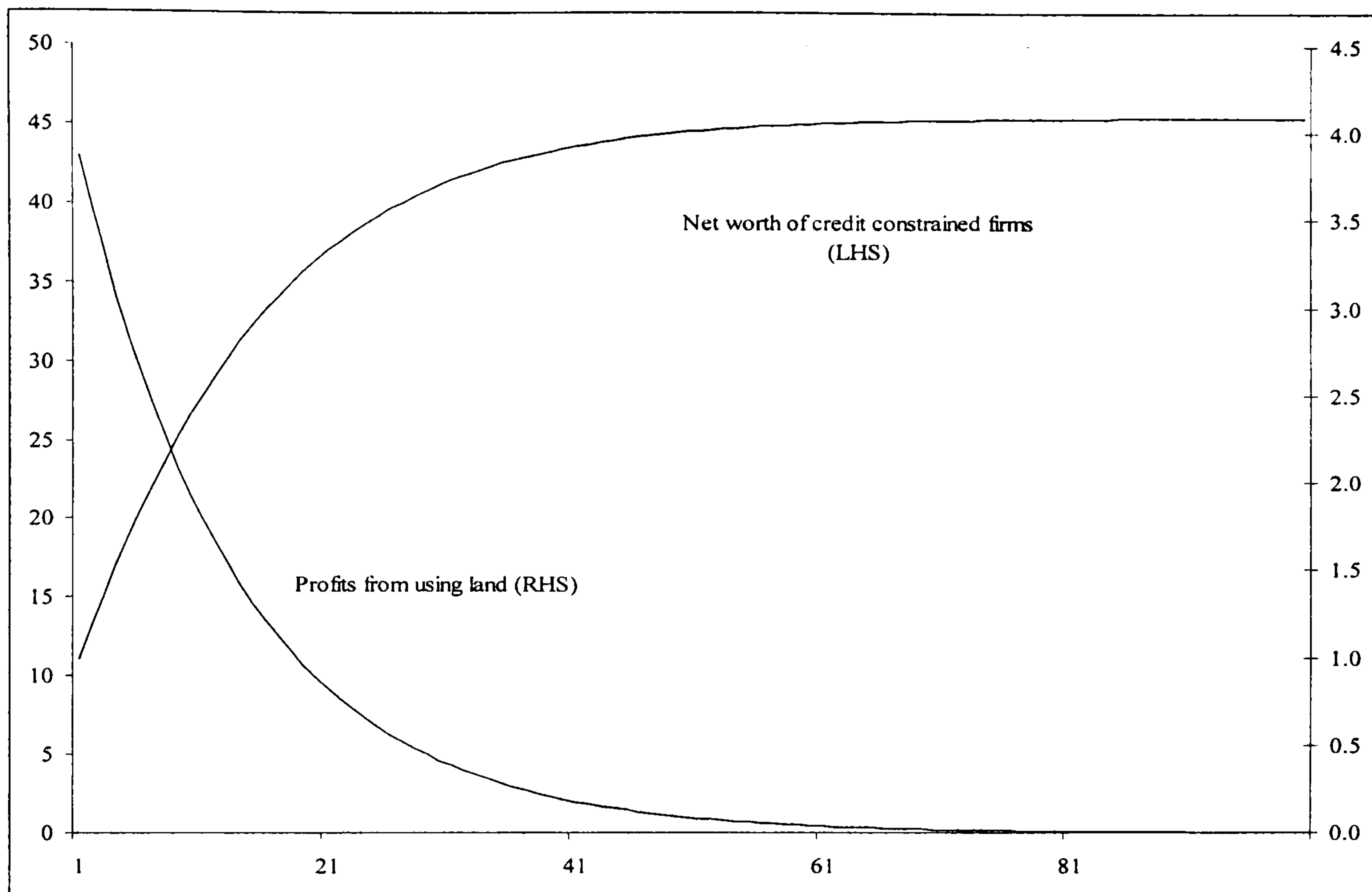
Assuming they survive, it might be useful to see how the credit-constrained firms react to a crash in land values. Consider the sources and uses of funds (which are measured on a scale where the equilibrium value of their land holdings,  $q^*k^*$ , is 100) for partly leveraged firms in the case of column 4. The debt to be repaid, 60 percent of pre-crash land holdings plus interest, amounts to 69. How is this achieved? The answer is primarily from land sales (50.7); secondly from new borrowing (12.8); and hardly at all from current income (a mere 5.5). As lenders cut their financing by 80 percent (so to ensure that it is no more than 60 percent of expected future land holdings at post-crash prices), they become caught in a spiral of tightening credit constraints and falling land values. Indeed, as the table shows,

the credit-constrained companies have to dispose of almost 70 percent their land holdings at knock-down prices.

How do they rebuild their net worth despite selling land at fire-sale prices and later buying it back at higher prices? As discussed previously in Chapter 2, there are two effects at work following adverse macro shocks. First is direct negative effect due to capital losses from initial adverse shock and the subsequent knock-on effects. Second is the indirect positive effect – the increase in profit on remaining land. The first can lead to complete collapse; but, if avoided, the second permits complete recovery. The reason for this positive effect is that a fall in land prices enables the credit-constrained sector to exploit profit opportunity which arises from the difference between the total returns from using land by this sector and the user cost of land determined by the unconstrained sector. Taking the case of column 4 where land prices falls by 40 percent, the figure below illustrates the extra profits made by these credit-constrained firms and the recovery path financed by these profits. Along this path, the net worth quickly rebuilds during the first 20 periods but converts slowly to its long term equilibrium as these extra profits from using land becomes smaller. This numerical simulation here confirms our analytical explanation in the previous chapter.



Figure 3.10: The process of rebuilding net worth after negative shock



### 3.4.2 Interest rate shocks

In aftermath of the Asian financial crisis, the appropriate monetary policy to be used in such crisis has been hotly debated.<sup>8</sup> Some argue that the authorities should raise interest rates to maintain currency value and check capital outflows. Others argue that interest rate cut may be required to bring the economy out of the recession. In this section, however, we do not attempt to settle this debate<sup>9</sup>, but instead to use the model to illustrate how raising interest rate unexpectedly could open another important channel for domestic credit crunch, as emphasised by Stiglitz (1998) and Krugman (1999), for example. Specifically, our main objective here is to understand the impact of the asset price channel in

<sup>8</sup> See, for example, Fischer (2001).

<sup>9</sup> See Aghion et al. (2001) for their analysis of monetary policy in credit-constrained economy. They specifically argue that if credit supply does not strongly sensitive to changes in the nominal interest rate, it is always desirable to increase the nominal interest rate if the aim is to avoid a currency crisis.

circumstances where assets are used as collateral for loans.<sup>10</sup> Another important example is the case of Japan where tight monetary policy in early 1990s was thought to be responsible for the asset price collapse which leads to a prolonged recession.<sup>11</sup>

While there is no explicit role for monetary policy in this model, the exogenous changes in real interest rates can be imposed.<sup>12</sup> The model used here captures some key characteristics of the Thai credit market. As documented in Chapter 1, more than 60 percent of firms used collateral for bank loans which 62 percent of collateral in the were in form of land. During the crisis, the Thai authorities increased short-term interest rates sharply from an average of 11-12 percent during the first half of 1997 to the range of 25-30 percent per annum in the last quarter of 1997.

To see how the model would respond to a temporary increase in real interest rates on outstanding debt obligation, we suppose that interest rate unexpectedly rises to  $R' = [1 + (1 + \Delta)r]$  when the economy is in equilibrium. Since firms' tradable output is just enough to cover interest payment on loans (i.e.  $rb^* = \alpha k^*$ ), a sudden increase in interest expenses from raising interest rates means that firms need to sell land in order to repay their debt. To understand the effects of monetary transmission mechanism at the period of shock, we solve for the market clearing condition of these credit-constrained firms which is given by:

$$\left[ q_t - \frac{(1-m)q_{t+1}}{R'} \right] k_t = \left[ \alpha + q_t - \frac{R'(1-m)q^*}{R} \right] k^* \quad (21)$$

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<sup>10</sup> See Bernanke and Gertler (1995) for their emphasis on the credit channel of monetary policy transmission.

<sup>11</sup> Kwon (1998), for example, finds the evidence that monetary tightening associated with a rise in short-term interest rates produces a significant and persistence fall in land prices in Japan.

<sup>12</sup> "One possible monetary transmission mechanism would be through the redistribution of wealth between debtors and creditors", as noted in KM's footnote 18 (p.228).

The impacts of the interest rate shock on the RHS of (21) are similar to those of an asset price shock, i.e. there are two negative effects on net worth of the firms. The direct effect as mentioned before is due to higher interest payments on existing debt contracts and the indirect effect is due to an unexpected fall in land prices because firms are forced to unload their land holdings in the wake of the shock. There is, however, an additional reinforcing effect which is shown on the LHS of the equation. Higher interest rates reduce debt capacity of the firms as the borrowing constraint becomes more binding. With higher down payment, to be met from their lower net worth (caused mainly by the unexpected fall in land prices), there is a real danger of financial collapse if firms' net worth is too low to satisfy the condition above.

These effects in a numerical example are illustrated in Figure 3.11, which we assume 10 percent real interest rate and 30 percent margin requirements.<sup>13</sup> The horizontal axis is land holdings by credit constrained firms and the vertical axis represents the required down payment and firms' net worth. The equilibrium is shown at point E in the figure and we seek to find the maximum interest rate shock. An unexpected rise in interest rate causes net worth to fall from the equilibrium point E to B and this triggers margin calls. As firms sell land, user costs must also fall for the market to clear. However, such a fall in user cost is matched with an increase in the required down payment: this causes the *DP* curve to swivel upwards to *DP'*. First period equilibrium is shown at the point where the straight line *NN* is tangent to the curve *DP'* at point C. At this point, we find that the maximum interest rate shock is 11.7 percent (i.e. an increase from 10 percent to 21.7 percent), leading the credit constrained borrowers to sell around 60 percent of their land ( $k_c = 0.39$ ) and land

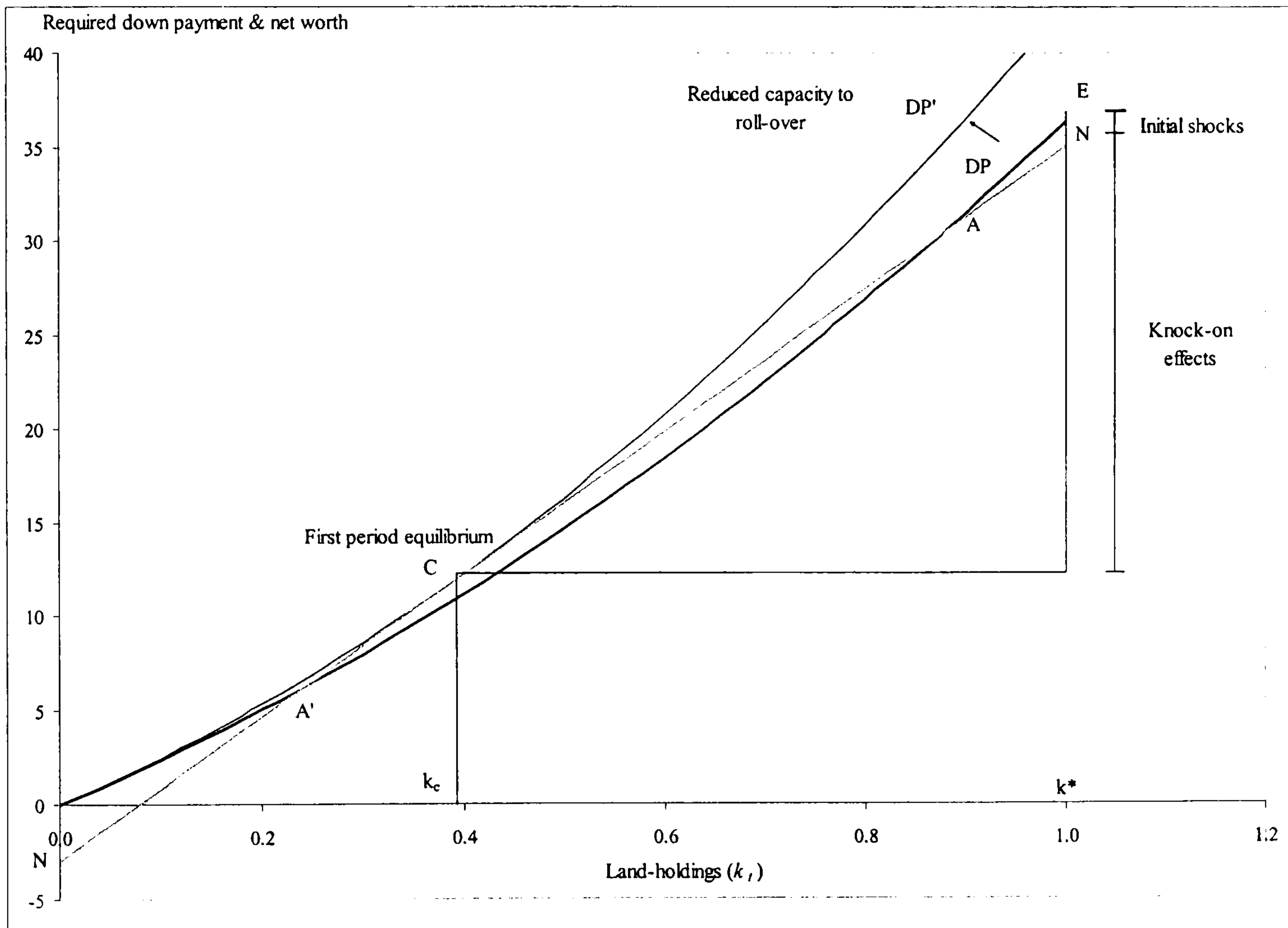
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<sup>13</sup> Other parameters used are  $1/\eta = 2/3$ ,  $\alpha = 6.36$ ,  $\beta' = 6.67$  and  $\beta_0 = 3.03$ , giving  $q^*$  and  $k^* = 100$  and 1.



prices drop by around 23 percent ( $q_t = 76.7$ ). Any bigger shock will cause them to go bankrupt.

Figure 3.11: Impacts of an interest rate shock



The financial system becomes even more vulnerable to interest rate shocks as leverage of the credit-constrained sector increases from 70 to 80 percent (i.e.  $m$  reduces from 0.3 to 0.2). A rise in interest rates of only 5 percent (i.e. from 10 percent to 15 percent) can cause a wholesale bankruptcy of the credit-constrained sector. We conclude that the higher is the degree of financial leverage, the higher is the impacts of monetary policy shocks on asset prices.

As the simulation makes clear, the effects of a temporary shock in interest rate to credit-constrained firms can be very powerful. Indeed, these effects appear to be stronger than those of asset price shocks, given the same initial fall in net worth. Thus, in Figure 3.11 above, if it was asset price shocks (instead of interest rate shocks) that lead the net worth to fall from  $E$  to  $B$ , the first-period equilibrium would be at point  $A$ , where the down payment,  $DP$  equals to the line  $ON$ . At point  $A$ , the knock-on effects and land sales are clearly much lower than  $C$ . (In fact, there is another equilibrium in the asset price shock here i.e. point  $A'$  which is lower than  $C$ .) In the case of interest rate shocks, the swivelling of  $DP$  to  $DP'$  due to higher down-payment clearly plays a crucial role in exacerbating the credit crunch.

The reason for the shift in the required down payment is that higher rate of interest when used to discount the future value of land tightens the credit constraint further, so the ability of borrowers to roll over their debt is *reduced*. This brings to mind a comment made by Joseph Stiglitz (2002, p.110) that: “To discuss monetary policy and finance without bankruptcy is like *Hamlet* without the Prince of Denmark. At the heart of the analysis of macroeconomy *should* have been an analysis of what an increase in interest rates would do to the chances of default and to the amount that creditors can recover in the event of default. Many of the firms in East Asia were highly indebted, and had huge debt equity ratios. As very high interest rate levels, a highly leveraged company goes bankrupt quickly. Even if it does not go bankrupt, its equity (net worth) is quickly depleted as it is forced to pay huge amounts to creditors.” [Italics in original]

So far the analysis highlights the potential risk of pronounced leverage among credit-constrained borrowers in creating financial instability – which suggests a rationale for regulatory policies to discourage such excessive leverage in the first place. But what could

be done to reduce the powerful impacts of such a costly and destabilising decline in asset prices when it occurs? This is the subject of the next section.

### 3.5 Temporary relaxation of a margin requirement

Here, we focus on the following question: With rigid margin requirements leading to asset fire-sales and subsequent financial collapse, is there not a case for temporarily relaxing the margin rules during the crisis?

To understand how such a policy can help mitigate/avoid severe liquidity crunch, we consider two cases. First is the case when the magnitude of asset bubble crash is bigger than maximum shock that the system can stand. In the second case, we examine how knock-on effects could be reduced even when a shock is smaller than the maximum shock.

Starting with the first case and using an example from column 4 in Table 3.3 above (i.e.  $m = 0.4$ ,  $R = 1.1$ ,  $1/\eta = 2/3$ ) where the maximum bubble is 15 percent, we suppose that size of the bubble is 20 percent. While the value of outstanding debt ( $= (1 - m)q^b k^* = 72$ ) is smaller than the value of collateral ( $q^* k^* = 100$ ) just after the bubble bursting, the need to satisfy margin requirements leads to wholesale liquidation. Suppose that the authorities can influence bank lending practices by re-setting  $m$  at the time of bursting bubble, i.e. they can enforce financial institutions to reduce their margin requirements on loans. By setting  $m$  enough to prevent bankruptcy of the credit-constrained sector, the first period equilibrium is determined by

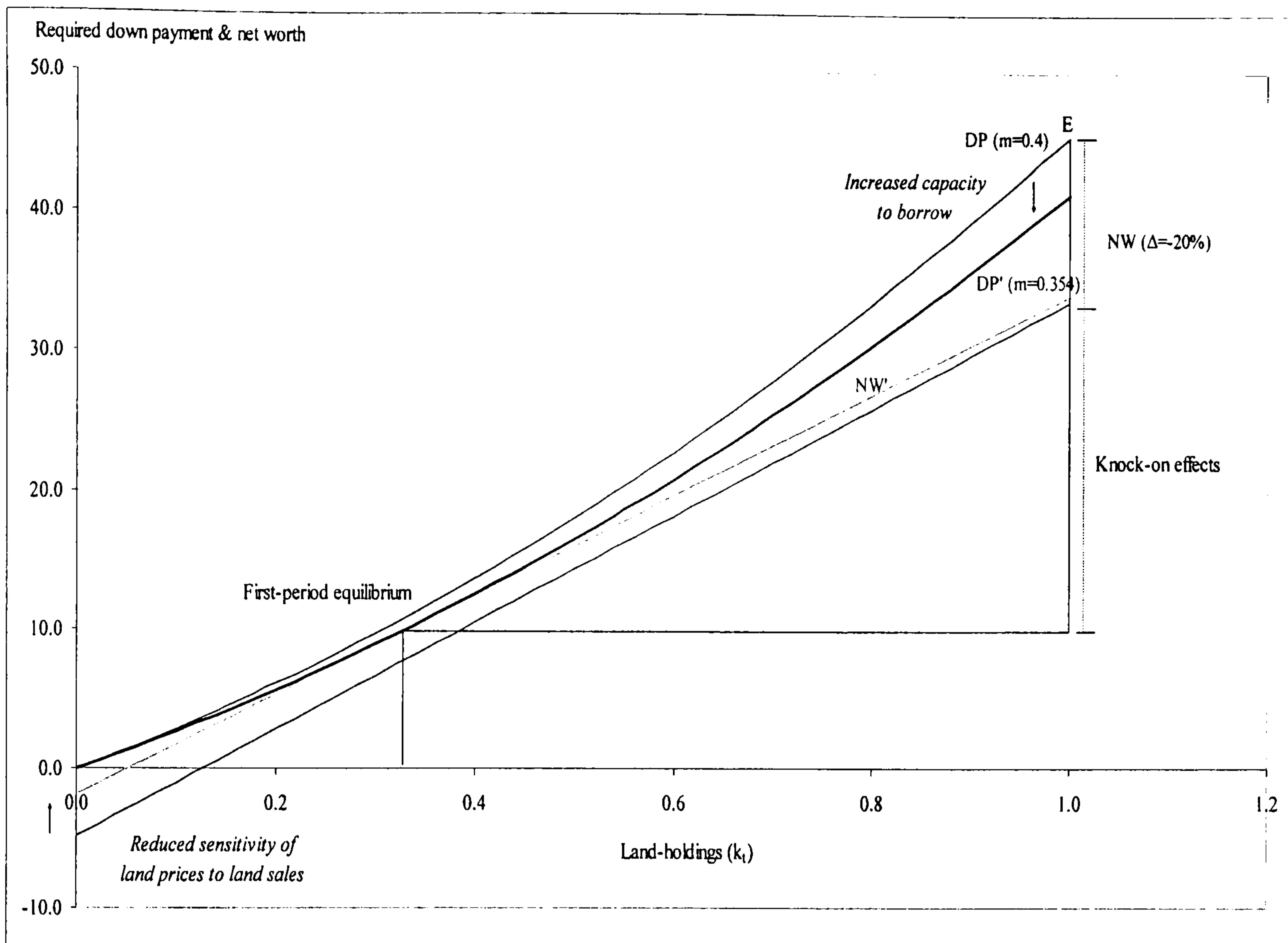
$$\left[ q_t - \frac{(1-m)q_{t+1}}{R} \right] k_t = \left[ \alpha + q_t - (1-\bar{m})q^b \right] k^*, \quad (22)$$



where LHS of the equation represents required down payment and RHS is the net worth of credit-constrained firms. This can be shown more clearly in the figure below. With a 20 percent shock to asset prices, the net worth line ( $NW$ ) falls below the required down payment curve ( $DP$ ), reflecting the inability of the credit-constrained borrowers to meet their margin calls. By reducing  $m$ , there are two effects at work. First is that the required down payment ( $q_t - (1 - m)q_{t+1}/R$ ) becomes smaller, i.e. the curve  $DP$  swivels downward to  $DP'$ . At the same time, the line  $NW$  changes to  $NW'$ , reflecting the reduced sensitivity of land price to land sales when  $m$  declines (for the reason as stated in Proposition 3 above).

Using the same method as before, we can solve for the minimum cut in  $m$  needed for stabilisation. As shown in the figure, we find that by relaxing  $m$  from 0.40 to 0.354, there is a *unique* equilibrium at the point where  $DP'$  touches  $NW'$ : this involves land sales of around two-thirds ( $k_t = 0.33$ ) and the knock-on effects of 24 percent ( $q_t = 76.2$ , i.e. total fall in land prices is 44 percent). [Note that with  $m$  smaller than 0.35, we find that there can be a region of values of margin that results in multiple equilibria. For example, if  $m = 0.34$ , there are two levels of  $k_t$ , i.e. = 0.1 and 0.58.] Unsurprisingly, in the period after  $m$  returns to its normal level, there will be another round of land sales which involves a further drop in land prices. As  $m$  changes back from 0.35 to 0.4, credit-constrained firms need to unload their land-holdings to 0.32 and land prices fall to 74.1. If there is no further adverse shock, however, they will gradually return back to the long-run equilibrium.

Figure 3.12: How relaxing  $m$  can help avert collapse.



Note that the cut in  $m$  required to prevent financial collapse is much *smaller* for low-leverage, credit-constrained economy, given the same initial adverse shock. As shown in Table 4 below<sup>14</sup>, we look at two scenarios: high leverage economy ( $1 - m = 0.6$ ) and low leverage economy ( $1 - m = 0.8$ ). Suppose that these two economies suffer from the same 20 percent bursting of asset bubble but the maximum shocks for the high leverage case is only 3.6. For high leverage economy,  $m$  needs to be cut by 0.16: this involves a quarter of land sales during the relaxation period and land holdings are reduced to 0.39 after  $m$  returns to 0.2.

<sup>14</sup> Other key parameters used for generating this figures are  $R = 1.1$ ,  $1/\eta = 2/3$ .

Table 3.4: High leverage vs low leverage economies

	High leverage (1 - $m$ ) = 0.8	Low leverage (1 - $m$ ) = 0.6
$m$	0.20	0.40
Maximum shock	3.6	15.0
<b><math>m'</math> for survival</b>	<b>0.04</b>	<b>0.35</b>
During period of shock with relaxing $m$		
$k_t$	0.75	0.33
$q_t$	95.9	76.2
After relaxation period		
$k_{t+1}$	0.39	0.32
$q_{t+1}$	83.8	74.1

Turning to consider what happens if the shock is smaller than the maximum. While there is, by definition, no collapse in this case, it is worthwhile to see how knock-on effects can be reduced when margin rules are relaxed. Using the same example as above but keeping  $m$  constant (the case with  $m = 0.4$ ), with asset price shock of 10 percent, land-holdings of the firms will be reduced 0.71 and they will suffer the knock-on effects of 11.2 percent. When  $m$  is relaxed from 0.40 to 0.35, however,  $k_t = 0.95$  and the knock on effects reduce to 1.7 percent ( $q_t = 98.3$ )! (In the next period, after  $m$  returns to 0.4, there will be another round of which causing  $k_t = 0.85$  and  $q_t$  will fall to 94.6). Furthermore, by reducing  $m$  to 0.34, knock-on effects could be completely eliminated during the period of adverse shock. Even when  $m$  returns to 0.4 immediately in the next period after shock, we find  $k_t = 0.88$  and price effect is only 4.7 percent.

### 3.5.1 Discussion

From our numerical experiments above, it is clear that relaxing margin requirements is effective in avoiding wholesale financial collapse and/or mitigating the impacts of a sharp



decline in asset prices. In this section, we discuss some issues and provide some evidence of using the margin requirement as a counter-cyclical policy instrument.

(i) Moral hazard problems

An important question one might ask is that: would such a relaxation of the margin rule lead to moral hazard problem? In the context of the model used here, the answer is no. So long as the collateral value is worth more than the debt outstanding, there will be no incentive for a credit-constrained borrower to threaten its creditors by leaving the land behind and repudiating the debt contract. In the case of asset price shocks, if the size of the bubble is not too large i.e.  $q^b < q^*/(1 - m)$ , there is a strong case for relaxing the margin rule in the midst of the crisis. While  $m$  could technically reduce to 0, this may, however, lead to another form of moral hazard (the so-called ‘gamble for resurrection’)? While this issue has generally been analysed in the case of financial institutions, (see Dewatripont and Tirole 1994); and Hellman, Murdock and Stiglitz (2000), for example), this form of moral hazard is not included in the case of credit-constrained corporate sector in the KM model.

As relaxing  $m$  can effectively reduce the destabilising effects of a fall in asset prices, another question that one might ask is that: why not allow margin requirements to be contingent on prices themselves so that a price drop would automatically trigger relaxing margin requirements? The problem with implementing such a mechanism is that if agents come to believe that the authorities will provide a safety net when the market experiences an adverse shock, by setting a limit on a floor price, for example, they will have less incentive to limit their own risk. Hence this would essentially create the moral hazard problem which would result in an insurance bubble as analysed by Miller, Weller and Zhang (2002) in the case of the US stock market.

(ii) Rules vs Discretion

One way to avoid the asymmetry of policy may be by raising margin requirement when price increases (so as to prevent bubble from going too big) and relaxing when price falls (to dampen the magnitude of knock-on effects)? In practice, it should be noted that authorities has intervened in the markets by relaxing borrowing constraint from time to time in both equity and property markets. As for property markets, Borio et al. (2001) documented that in 1991, the Hong Kong Monetary Authority (HKMA) required that banks imposed a maximum loan-to-value (LTV) ratio of 70 % of their real estate lending. In December 1996, in the face of the booming property market, the recommended maximum LTV was reduced to 60 percent. During the decline in property values in 1998, although these ratios remained in place, the HKMA introduced a mortgage guarantee scheme which effectively allowed homebuyers to secure mortgage loans of up to 85 % of the value of the property. This limit was further increased to 90 % in July 2000.

In the case of the US stock market, support for such a policy -- at least on a discretionary basis -- is proposed by Robert Shiller who notes that: “The Fed used to change its margin requirements actively as a tool against speculative movements in the stock market, raising the requirement when the market got too hot and lowering it when things cooled. Between 1934 and 1974, the Fed changed this margin requirement 22 times... But for 26 years the Fed has kept the margin requirement constant, at 50%.” However, he goes on to argue that: “While the Fed should be very wary on principle of intervening in markets, increasing the margin requirement today would stand as a warning to investors not to leverage themselves up excessively and would work in the direction of cooling the market. Increasing margin requirements a little, to 60% say, and grand-fathering existing margin credit so as not to

induce an immediate crisis, would send a healthy caution signal.” (*Wall Street Journal*, 10/04/2000).

Charles Goodhart (2003, p. 477) remarks that “Whereas there is always dispute and uncertainty about the existence and size of misalignments, at least the rate of change, relative to recent trends, in asset prices is easily and unambiguously estimated, though the period of time over which one might try to relate regulatory, prudential requirements to the rate of change of asset prices would have to be analyzed and estimated more carefully.”

### **3.6 Conclusion**

In this chapter, we have extended the homogeneous KM model by reducing the sensitivity of land prices to land sales and by incorporating a margin requirement in order to examine the effects of corporate leverage on financial system more explicitly, and discuss policy implications to reduce the risk of such instability.

Two numerical exercises are considered; temporary shocks to asset prices and to real interest rates. In the former, our simulations show that reducing leverage increases the stability of the financial system. This suggests a rationale for regulatory policy to discourage excessive leverage in the first place.

As to the second type of shock, i.e. the impact of an unexpected temporary rise in real interest rates, we show that the higher is the degree of financial leverage, the higher is the impacts of monetary policy shocks on asset prices. In addition, we find that knock-on effects in the case of interest rate shocks turn out to be much stronger than those of asset



price shocks (given that shocks to asset prices and interest rates lead to the same initial drop in net worth). Raising interest rate not only leads to a sudden increase in interest expenses of existing short-term debt obligations (which leads land sales to satisfy the margin requirements), but higher rate of interest when used to discount the future value of land tightens the credit constraint further. In Aghion et al. (2000), the proportion of foreign-currency debt (and the sensitivity of credit supply to changes in interest rates) plays a key role in determining whether raising interest rate might help stabilising exchange rates in the midst of the crisis. While our modified model falls short on this ‘open economy’ dimension, the analysis suggests that the degree of corporate leverage would also be of similar importance and needs to be taken into accounts. If most firms are highly leveraged, the use of high interest rates to stabilise exchange rates can lead to widespread bankruptcy.

In addition, we use our modified framework to shed light on the current debate on the role of prudential regulatory policies as a means of mitigating the impact of an asset price shocks. Our simulation exercises show that the ‘regulatory forbearance’ policy by way of relaxing ‘margin requirement’ can be effective in avoiding and/or mitigating the knock-on effects.

## Chapter 4

# Understanding the Thai Financial Crisis

### 4.1 Introduction

Until 1996, Thailand had enjoyed an outstanding economic growth for half a century: GDP averaged around 7 percent per annum since 1950 (see Table 4.1 below).<sup>1</sup> Income per capita had increased to US\$2,740 in 1997 from US\$720 in 1980. At the same time, social indicators had improved considerably as measured by a major improvement in education and health standards, a lengthening of life expectancy and a decline in the proportion of the population living in absolute poverty. This remarkable performance was well above that experienced in other developing countries, as documented in the World Bank report (1993) on *The East Asian Miracle*.<sup>2</sup>

*Table 4.1: Main Economic Performance since 1950*

	1950-59	1960-69	1970-79	1980-89	1990-96	1997-99
Real GDP (%)	5.4	8.0	7.1	7.3	8.5	-2.4
Saving/GDP	11.5	20.6	21.8	25.1	34.1	31.0
Investment/GDP	13.6	20.8	23.8	28.6	40.7	24.3
Inflation	5.1	2.2	8.0	5.8	5.1	4.7

Source: Jansen (2001).

The financial crisis that hit Thailand and other East Asian countries in 1997 led to a sharp contraction of the economy: real output in 1998 declined sharply ranging from 6.7 percent for Korea and 10.4 percent for Thailand to 13.1 percent for Indonesia. Subsequently, there

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<sup>1</sup> Jensen (2001) notes, however, that there had been very little growth in the century prior to 1950: i.e. per capita income between 1870-1950 grew 0.2 percent per annum!

<sup>2</sup> See also Warr and Nidhiprabha (1996).

has been an unprecedented examination of policies ranging from corporate governance and risk management in both corporations and financial institutions to economic management at macro level. Interestingly, perceptions of the region's economic performance had been dramatically shifted and particularly many factors that were thought to be the key economic success had been identified as the cause of the crisis. For instance, Bosworth and Collins (2000, p.1) observe that: "Discussion of an economic miracle was replaced by claims of severe structural imbalances and policy distortions. Even the high rates of capital formation that were originally stressed as a sign of Asia's strength were seen by a new set of commentators as excessive and often in the wrong sectors of the economy. And what once seen as an important contributor to growth, the intermediation of saving through the banking system became an illustration of 'crony capitalism' and a predictor of crisis. Prior to the crisis, governments were often seen as having made a positive contribution to growth by coordinating private saving and investment. After the crisis, they were blamed for creating situations of severe moral hazard through implicit guarantees on investment and the encouragement of excessive foreign borrowing."

While there is a set of similar factors that contribute to the Asian crisis in general, problems in each country also have its own institutional characteristics which may explain the difference in the nature and severity of the crisis. For example, Corsetti (1998, p.4) wrote that: "A common view attributes the crisis to premature financial liberalization... Such a view identifies a unifying pattern in the crisis region. Thus, it tends to blur structural and policy differences across countries, and implicitly considers the crisis since 1997 as a single episode. Hopefully, future research will shed light on country-specific features that will help fill the many gaps in the currently available explanations of the Asian events." Furthermore, as noted by Furman and Stiglitz (1998, p.12): "any



explanation of the East Asian crisis must deal jointly with the crisis today and the region's remarkable growth and stability in the past. Given their past record, it does not make sense to characterize the East Asian economies as *inherently* vulnerable to crisis, despite their recent experiences. One must therefore identify change, either in the East Asian economies or in the world around them." [italics in original.]

The purpose of this chapter is, therefore, to look at the case of Thailand by discussing some key structural changes in the period before the crisis and then examining what had actually happened during the crisis.<sup>3</sup> But what should serve as the beginning of the Thai crisis? It may be worth emphasising that Thailand first experienced a significant boom in the property markets and the subsequent collapse came with problems in the financial sector (particularly the finance companies), before forcing into currency devaluation. Such a link between real estate markets and banking sector in Thailand is not new but it had happened in many other countries, particularly in Japan and Nordic countries (see, for example, Allen and Gale, 2000; Herring and Wachter, 1999; and Drees and Pazarbasioglu, 1998). Regarding the connection between banking and currency crises (so-called 'twin crises'), Kaminsky and Reinhart (1999) find that financial sector problems often precede the balance of payment crisis. While this sequence of events may not necessarily imply causality, the interaction of such 'triple' crises in Thailand would undoubtedly have a profound impact on the real economy.

In his work, Rajan (2001) examines the relevance of currency crisis theories to the collapse of Thai baht and argues specifically that the currency crisis in Thailand should be seen at two distinct phases; i.e. it was "originally pushed into devaluation by secularly

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<sup>3</sup> Interestingly, during the period of the run-up, Thailand claimed four finance ministers, three central bank governors, and two prime ministers, Nabi and Shivakumar (2001).

deteriorating fundamentals, but it was then pull into outright economic collapse by an international bank panic”, (p. 69).<sup>4</sup> Our focus in this chapter, however, puts less emphasis on speculative attacks on currency. Specifically, we argue that the nature of Thai financial crisis lies in the profound boom and bust in the real estate markets which played a central role in creating tensions on the Thai financial system and causing the severe contraction of the economic activity.<sup>5</sup>

The rest of the chapter is organised as follows. Section 4.2 looks at the boom period (from 1987 to 1996) when Thailand experienced two important structural and cyclical changes; first, it was the period of comprehensive financial liberalisation that led to rapid and large capital inflows and second, it experienced a significant boom in the stock market and real estate markets. In Section 4.3, we examine the crisis period (1996 to mid-1997) when financial sector experienced severe illiquidity/insolvency problems as a result of a sharp deterioration of assets; and the main driving force of economic growth, i.e. exports failed, followed by series of speculative attacks on currency. Section 4.4 concerns the meltdown period after the devaluation of the currency, when the Thai economy was sent into the vicious downward spirals. Section 4.5 concludes with some perspectives on the Thai crisis.

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<sup>4</sup> Rajan uses the first-generation model of speculative attacks (i.e Krugman-Flood-Garber model) as a theoretical support to the former, while the latter is essentially due to Chang and Velasco (1998).

<sup>5</sup> A similar view can be found in Renaud et al. (2000) and Quigley (2001), for example.

## 4.2 The boom (1987 - 1996)

The economic boom went back to the late 1980s when Thailand enjoyed double-digit growth rate for three years running between 1988 and 1990 and maintained high levels of growth between 8-9 percent in the first half of the 1990s.<sup>6</sup> The growth slowed to 5.9 percent in 1996 -- due mainly to the sharp turn-around of export growth from 24.6 percent in 1995 to -1.8 percent in 1996. As shown in Table 4.2 below, with such a high economic growth, standard indicators suggested macroeconomic stability: inflation remained moderate, averaging around 4 percent in 1986-90 and 5 percent in 1991-96. Fiscal policy was consistently conservative as reflected in the budget surplus every year since 1988, with an average of around 3 percent of GDP. One area of concern is that the current account deficit -- owing to shortfalls of domestic savings relative to private investments (see Table 4.1 above) -- had run up persistently. In 1990, it peaked at 8.3 percent, then fell to below 6 percent in 1994 and rose again to around 8 percent in 1995-6. Note that the current account deficits had increasingly been financed by large private capital flows.

*Table 4.2: Selected macroeconomic indicators*

(Annual percentage change unless otherwise noted)

	86	87	88	89	90	91	92	93	94	95	96
Real GDP	5.5	9.5	13.3	12.2	11.2	8.6	8.1	8.4	9.0	9.3	5.9
Inflation	1.9	2.5	3.8	5.4	5.9	5.7	4.1	3.3	5.0	5.8	5.9
Gov't budget balance <sup>1</sup>	-3.5	-1.4	1.9	3.2	4.7	4.9	3.0	2.2	1.8	2.7	2.3
Exports	23.9	31.8	37.1	25.2	15.1	23.6	13.8	13.7	22.1	24.6	-1.8
Imports	1.1	41.5	48.9	27.3	29.8	15.6	6.1	12.5	18.4	31.8	27.3
Current account balance <sup>1</sup>	-0.7	-0.6	-2.4	-3.3	-8.3	-7.5	-5.5	-4.9	-5.4	-7.9	-8.1
Net private capital flows <sup>1</sup>	-0.9	1.8	6.2	8.2	12.9	10.5	7.2	8.2	8.3	12.4	10
International reserves <sup>2</sup>	3.8	5.2	7.1	10.5	14.3	18.4	21.2	25.4	30.3	37.0	38.7

<sup>1</sup> In percent of GDP; <sup>2</sup> US\$ billion.

Source: Bank of Thailand

<sup>6</sup> Human capital was not the main source behind this strong economic performance; but it was the accumulation of physical capital which contributed 61-66 percent to total observed growth of GDP in 1980-1995. For detailed discussion on the sources of economic growth in Thailand until 1996, see Tinakorn and Sussangkang (1998) and Jansen (2001).



Behind this boom was a rapid increase in assets of the financial sector. While nominal GDP grew four-fold between the end of 1985 and the end of 1995, total assets in commercial banks expanded five and a half times in nominal terms. In particular, assets in finance companies expanded by almost 12 times over the same period, Siamwalla (2001). At the end of 1996, total assets of financial system in Thailand reached 8.9 trillion baht (i.e. around 190 percent of GDP), of which the commercial banks accounted for 64 percent (121 percent of GDP) and finance companies for 20 percent (39 percent of GDP). [Note that the Thai financial system consists of many different types of financial institutions, but the most dominated ones are commercial bank and finance companies. Commercial banks were the main players in the system absorbing 81 percent of deposits and accounting for 73 percent of total financial system assets, while finance companies accounted for 9.5 percent and 12.7 percent respectively.<sup>7</sup>]

Two main factors were behind this rapid growth in financial assets; i.e. financial liberalisation that led to substantial capital inflows and the un-precedent boom in real estate sector. In what follows, we focus in details on both of these factors respectively.

#### **4.2.1 Financial liberalisation and capital inflows**

In the past decade, emerging markets around the world had received substantial capital flows from industrial countries. The surge in capital inflows was due mainly to a declining trend of interest rates in developed countries that led investors to search elsewhere for high yield opportunities in emerging markets, and financial liberalisation on the recipient side, Ito (1999). The figures for net private capital inflows to East Asia in Figure 4.1 shows inflows averaging between 1 and 3 percent of GDP in the 1980s, rising to levels ranging

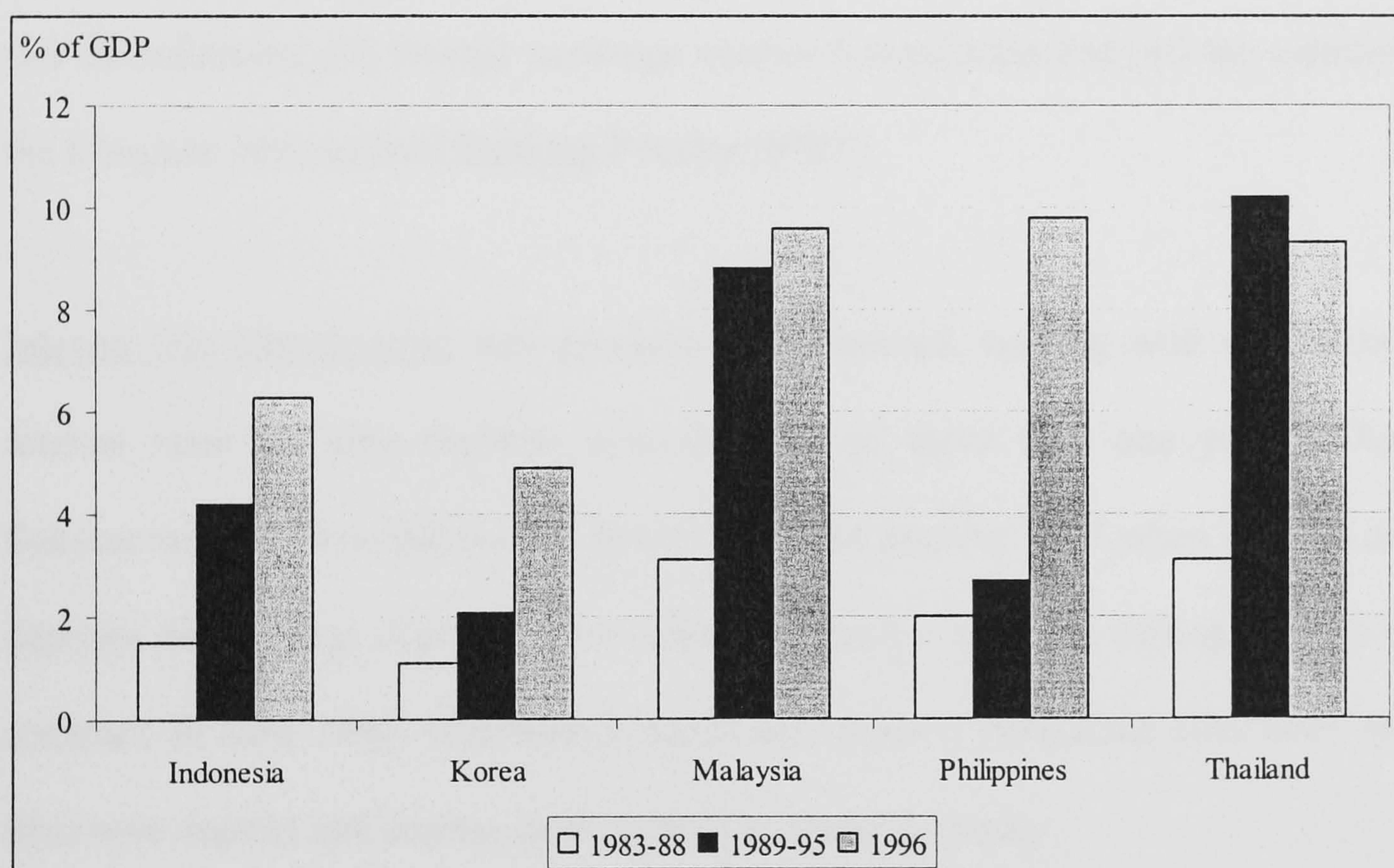
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<sup>7</sup> For a detailed structure of the Thai financial system, see Bank of Thailand, 1998.



from 5 percent of GDP for Korea to almost 10 percent for Malaysia, Thailand and the Philippines by 1996. This surge was both large and persistent. During the six-year period from 1989 to 1995, for example, private capital inflows to Thailand reached around 11 percent of GDP.

*Figure 4.1: Net private capital inflows*



Source: World Economic Outlook, IMF, December 1997.

### **(a) Overview of financial liberalisation in Thailand**

In response to the recognition that the Thai financial system needs to be made more efficient so that it can continue to support the growth of the real economy, the Thai authorities began the process of financial sector and capital accounts liberalisation started in late 1980s and continued to early 1990s -- with three basic objectives (namely, to raise financial market efficiency; to mobilise domestic savings; and to internationalise the domestic financial system).



Financial liberalisation during this period has been the most comprehensive in Thailand's economic history, Nijathaworn (1995). Because it involved all dimensions of the financial system's operations: price (by lifting interest rate ceilings); entry (by granting licenses to foreign banks); scope of operation (by expanding businesses of commercial banks and finance companies); and infrastructure building of the payments and supervision system, Bank of Thailand (1998c). Among the key measures during this period were (i) interest rate liberalisation, (ii) foreign exchange control deregulation and (iii) the establishment of the Bangkok International Banking Facility (BIBF).

Interest rate liberalisation was gradually implemented, starting with the floating of the interest rates on time deposits with maturity of more than one year in June 1989. Subsequent measures followed in March 1990 and January 1992 when ceilings on all time deposits and savings deposits were abolished. Finally, after the ceiling on loan rates was removed in June 1992, commercial banks and finance companies have been able to set their own deposit and lending rates subject to market liquidity.

Prior to the liberalisation of foreign exchange transactions that began in 1990, control on foreign exchange *outflows* were relatively tight<sup>8</sup> while there was no restriction on capital inflows<sup>9</sup>, Nijathaworn (1995). So the liberalisation focused mainly on relaxing the restrictions on the outflows so as to increase flexibility in cross-border movements of funds. Starting with the acceptance of the obligations under IMF Article VIII in May 1990 (resulted in the lifting of foreign exchange controls on current account transactions), three

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<sup>8</sup> For example, residents were not allowed to buy foreign currency over a certain limit and capital transfers other than debt repayment required approval from the authorities.

<sup>9</sup> Except that (i) commercial banks and finance companies were subject to limits on their net foreign exchange exposure; (ii) domestic residents were not allowed to hold foreign-exchange dominated deposits except exporters.



rounds of capital accounts liberalisation had been implemented. [The first round (May 1990) involved allowing commercial banks to authorise foreign exchange transactions in trade-related activities without prior approval from the Bank of Thailand. For the second round (April 1991), most foreign exchange control related to capital account were lifted. In the third round (February 1994), residents were allowed to use foreign exchange proceeds abroad to service their external payments, see Nijathaworn and Dejthamron (1994) for more details.]

The introduction of the Bangkok International Banking Facility (BIBF) in 1993<sup>10</sup> played the most important role especially in attracting flows of funds from overseas to finance domestic investment. Importantly, it allows the new foreign banks to engage, not only in offshore banking activities, but also in onshore lending as well as a number of other international and investment banking businesses; so this puts a greater pressure into the domestic banking system. 46 BIBF licenses have been granted, including 15 Thai banks, 11 foreign banks with branches in Thailand and 20 foreign bank's representative offices (without domestic branches). It should be emphasised that such BIBF license was restricted only to commercial banks, not the finance companies. The main operations of the BIBF institutions on the liability side are deposits or borrowing in foreign exchange from abroad (mainly through inter-bank transactions and inter-office borrowings), and their main activities are lending in foreign currency to Thai residents (so-called 'out-in') and other neighbourhood countries ('out-out'). Furthermore, the BIBF institutions have enjoyed several tax privileges, including a reduced corporate income tax (10 percent instead of a 30 percent normal rate) and exemption from specific business tax, interest

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<sup>10</sup> In May 1994, the government expanded to scope of this facility by allowing BIBF banks to open branches in upcountry provinces (namely, Provincial International Banking Facility, PIBF).

income withholding tax and stamp duties. Importantly, cross border borrowing within the same institution were exempt from withholding taxes.

## **(b) Consequences and policy response**

### **(i) Capital inflows**

Such an increase in openness of the capital account, together with financial sector deregulation, had led to higher degree of capital mobility as reflected in a rapid increase of net inflows from 3 percent of GDP during 1983-1988 to 11 percent of GDP during 1989-95. In particular, from 1993 to 1995, the size of the inflows doubled and the composition shifted towards commercial bank sector after the introduction of the BIBF in 1993. As shown in Table 4.3 below, the net inflows in banking sector – where BIBF played the dominant role – increased substantially from US\$3.6 billion in 1993 to almost US\$14 billion in 1994 and continued to become the largest source of capital inflows in 1995.<sup>11</sup> Note that the negative flows to commercial banks and non-banks in 1993-4 indicated a rebooking through BIBF, Bank of Thailand (1998).

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<sup>11</sup> The increase in short-term capital through the non-resident baht accounts in 1993 was prompted partly by the liberalisation which allows exporters to accept payments from non-resident baht accounts and partly by the increased use of non-resident baht accounts as transitory deposits for other types of investments especially for portfolio investment, Nijathaworn and Dejthamron (1994).

*Table 4.3: Composition of net private capital inflows to Thailand*

(Million of US dollar)

	1992	1993	1994	1995	1996	1997
<b>Banks</b>	<b>1934</b>	<b>3604</b>	<b>13894</b>	<b>11239</b>	<b>5003</b>	<b>-5717</b>
- Commercial banks	1934	-4051	3807	3097	419	-5212
- BIBF	0	7655	10087	8142	4584	-505
<b>Non-banks</b>	<b>7582</b>	<b>6712</b>	<b>-1869</b>	<b>9610</b>	<b>13198</b>	<b>-1906</b>
- Direct investment	2015	1438	904	1169	1455	3180
- Other loans	2846	-2432	-5845	1518	5451	-3688
- Portfolio investment	561	4852	1110	3420	3488	4550
- Non-resident baht accounts	1707	2685	2066	3407	2924	-5812
- Trade credits	305	539	457	154	-145	-382
Others	148	-370	-561	-58	25	246
<b>Total private capital</b>	<b>9516</b>	<b>10316</b>	<b>12025</b>	<b>20849</b>	<b>18201</b>	<b>-7623</b>

Source: Bank of Thailand

However in 1996, as indicated the table above, loans to non-banks increased substantially (from US\$1.5 billion in 1995 to US\$ 5.5 billion in 1996) while the flows of foreign borrowings through commercial banks and the BIBF fell sharply. This is because the authorities imposed a number of restrictive measures to discourage short-term debt and BIBF inflows (more details on policy responses below). Bank of Thailand (1996) reported that the increase in non-bank debt in 1996 mainly came from long-term debt (both loans and convertible bonds) which was channelled to main industry sector particularly petroleum, chemicals, electrical appliances and construction materials. And the major sources of funds in this non-bank sector were Singapore (more than 50 percent of total non-bank borrowings), followed by Hong Kong, the US and the UK, respectively. It should be noted that foreign borrowing by finance companies are recorded under 'other loans' item of the non-bank sector but it was relatively small, compared with direct borrowing by domestic non-financial firms.



*Table 4.4: Thailand's private external debt*

(\$US million)

	1992	1993	1994	1995	1996	1997
<b>Commercial Banks</b>	<b>6263</b>	<b>5279</b>	<b>9865</b>	<b>14436</b>	<b>10682</b>	<b>9141</b>
- Short term	5532	4016	6414	9993	8368	5218
% of total	88	76	65	69	78	57
<b>BIBF</b>	-	<b>7740</b>	<b>18111</b>	<b>27503</b>	<b>31187</b>	<b>30080</b>
- Short term	-	6355	15142	23704	20490	19185
% of total	-	82	84	86	66	64
<b>Non-banks</b>	<b>24290</b>	<b>24917</b>	<b>21176</b>	<b>42491</b>	<b>50072</b>	<b>45973</b>
- Short term	12832	12263	7443	18616	18831	13871
% of total	53	49	35	44	38	30
<b>Total private external debt</b>	<b>30553</b>	<b>37936</b>	<b>49152</b>	<b>84430</b>	<b>91941</b>	<b>85194</b>
- Short term	18364	22634	28999	52313	47689	38274
% of total external debt	60	60	59	62	52	45
of foreign reserves	0.9	0.9	1.0	1.4	1.2	1.4

Source: Bank of Thailand

The figures on outstanding stock of private external debt are shown in Table 4.4 above. *Between 1993 and 1996, short-term foreign-currency debt had increased most rapidly in the BIBF institutions, followed by commercial banks and non-banks respectively.* As mentioned above, lending via BIBF had received many tax benefits: this explains such a sharp increase via this channel. In addition, both commercial banks and BIBF institutions appeared to favour short-term debt more than non-bank sector, reflected in higher share of short-term debt to total external debt in 1996. Interestingly, while the overall share of short-term debt in foreign currency in Thailand was relatively stable (between 50-60 percent), the ratio of short-term debt to foreign reserves – measuring the vulnerability of financial system to a sudden shift in foreign creditor's expectations – had increased to 1.0

in 1994 and 1.2 in 1996; i.e. if all foreign creditors decide not to roll over, foreign reserves will not be enough to repay the debt.

In response to such an increasing size of these foreign flows and the short maturity of external private debts, in 1995, the Thai authorities had imposed a number of measures aiming to (i) control overheating pressures; (ii) create incentives for market to minimise excessive risk taking; (iii) strengthen the regulatory framework of financial institutions. These included raising the policy interest rates in March 1995; requiring finance companies and the BIBF banks to submit their credit plans; and reducing loan-deposit ratios in cases the ratio was above average, IMF (2000). However, as noted by Alba et al. (1999), since Thailand relied mainly on monetary tightening and the sterilisation of capital flows to deal with the overheating pressures, raising interest rates in fixed exchange rate environment encouraged for further inflows.

So the second set of policies was aimed to target directly at financial institutions by increasing their costs of foreign borrowing. For example, commercial bank, BIBF, finance companies were required to maintain a cash reserve equivalent to 7 percent (from 2 percent previously) of their new short-term foreign liabilities and non-resident deposits with maturity of less than one year. In addition, the central bank also set a limit on the net foreign exchange position of the financial institutions (i.e. net asset not exceeding 20 percent and net liabilities not exceeding 15 percent of their capital funds). The effect of this policy, however, was to convert exchange risks into credit risks because these financial institutions could lend to domestic firms in dollars, Siamwalla et al. (1999).

These measures to discourage the inflow of short-term capital proved to be effective in slowing down the net inflows in 1996 and in reducing overall ratio of net capital inflows of the banking sector to those of the non-banking sector to 28:72 in 1996 (from 54:46 in 1995). However, large domestic firms are left freely to borrow directly from overseas and indirectly from commercial banks, with little incentive to hedge.<sup>12</sup>

## (ii) Financial sector

One of the most important consequences of financial sector deregulation was greater competition among financial institutions. Although this was one of the Thai authorities' intentions, the fact that appropriate prudential regulation was not in place and biased towards commercial banks, led finance companies to pursue aggressive lending policies and engage in price-based competition to mobilise funds (as a result of lifting ceiling on deposit and lending rates, mentioned above). Particularly, the regulatory and supervisory framework was such that finance companies could not effectively compete with most commercial bank businesses;<sup>13</sup> so they were left largely with more risky activities (e.g. real estate loans, margin loans for equity investment and hire purchase loans), while being subject to less stringent prudential requirements than banks (i.e. lower the BIS adequacy ratio), Kawai and Takayasu, (1999). In order to compete with commercial bank, they had to offer higher returns so as to attract funds from public. Note that finance companies could not take deposits but instead fund their operations by issuing promissory notes to general public, and borrowing from domestic and foreign banks were also significant sources of funds.

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<sup>12</sup> From March 1993 to August 1996, it was reported that the stock of foreign-currency denominated loans in the corporate sector grew from US\$1.4 billion to US\$ 30 billion, at annual growth rates of around 50%.

<sup>13</sup> Compared to commercial banks, finance companies were restricted from the businesses of (i) mobilising time deposits, (ii) offering overdrafts or credit cards, (iii) offering credit facilities related to trade finance, (iv) providing foreign exchange services and (v) establishing a domestic branch outside Bangkok. Kawai and Takayasu, (1999).



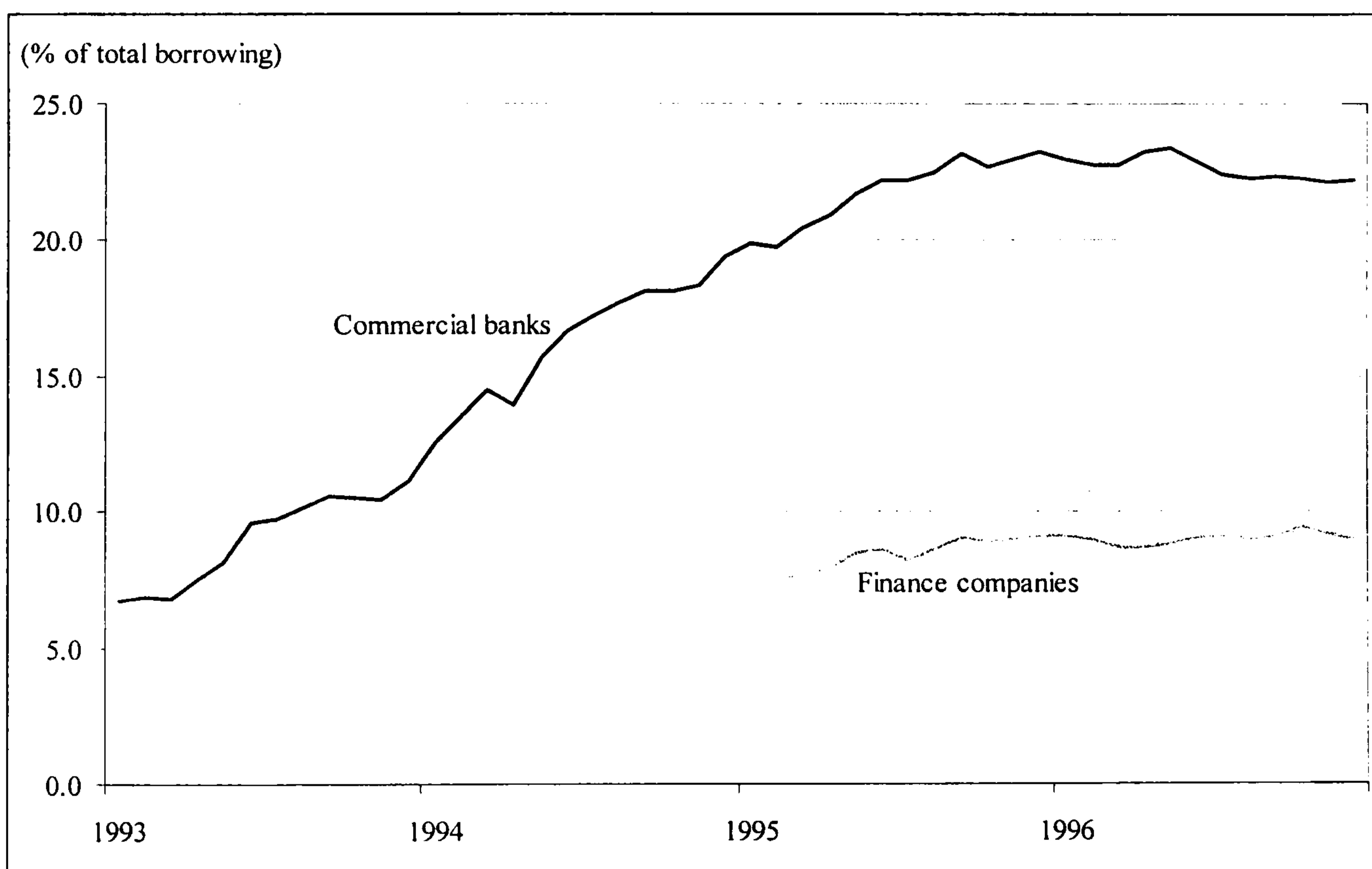
Furthermore, these finance companies had further incentive to lend because of the central bank policy to issue new banking licenses where the size of loans and assets was the main criteria: i.e. the bigger they are, the higher the chance they would get license to do banking business, Alba et al. (1999). These factors had contributed to a lending boom. During 1988-1995, total credit outstanding grew 22 percent on average in real terms. But finance companies lent at an even faster pace of around 30 percent, compared to 20 percent for commercial banks. As a result, commercial banks' lending share declined to 67 percent in 1996 from 75 percent in 1989 but that of finance companies rose to 21 percent from 15 percent in the same period. On the deposit side, deposit share of commercial banks fell from 73 percent in 1989 to 67 percent in 1996, while that of finance companies surged from 10 percent to 17 percent over the same period, Vajragupta and Vichyanond (1998). In effect, these less-regulated finance companies appeared to grow at the expense of highly regulated commercial banks.

In response to their declining share of domestic deposits, commercial banks had increasingly resorted to foreign borrowing especially through BIBF where they received benefits from tax incentives. As illustrated in the figure below, the *share of foreign liabilities to total borrowing in commercial banks had risen substantially from 6 percent at the beginning of 1993 to 22 percent at the end of 1996*. On the other hand, while foreign borrowing by finance companies had also increased rapidly by two-fold during the same period, it appeared that less than 10 percent of their sources of funds came from overseas.

The figures for loan portfolios of finance companies and commercial banks are shown in Table 4.7 in Section 4.1.2 below, where we will discuss the potential pitfalls in collateral-

based lending as commonly used by both banks and finance companies. It should be emphasised that while finance companies appeared to expose themselves from their imprudent *domestic* lending especially towards more cyclical and non-tradable sector, commercial banks were exposed in borrowing short term from their large sources of *foreign* funds. As reflected in their loan portfolio shown in Table 4.7 below, finance companies largely lent to real estate sector and personal consumption, but the majority of loans from commercial banks went to the productive sector such as manufacturing and wholesale/retail sectors.

Figure 4.2: Foreign borrowing of commercial banks and finance companies



Source: Bank of Thailand

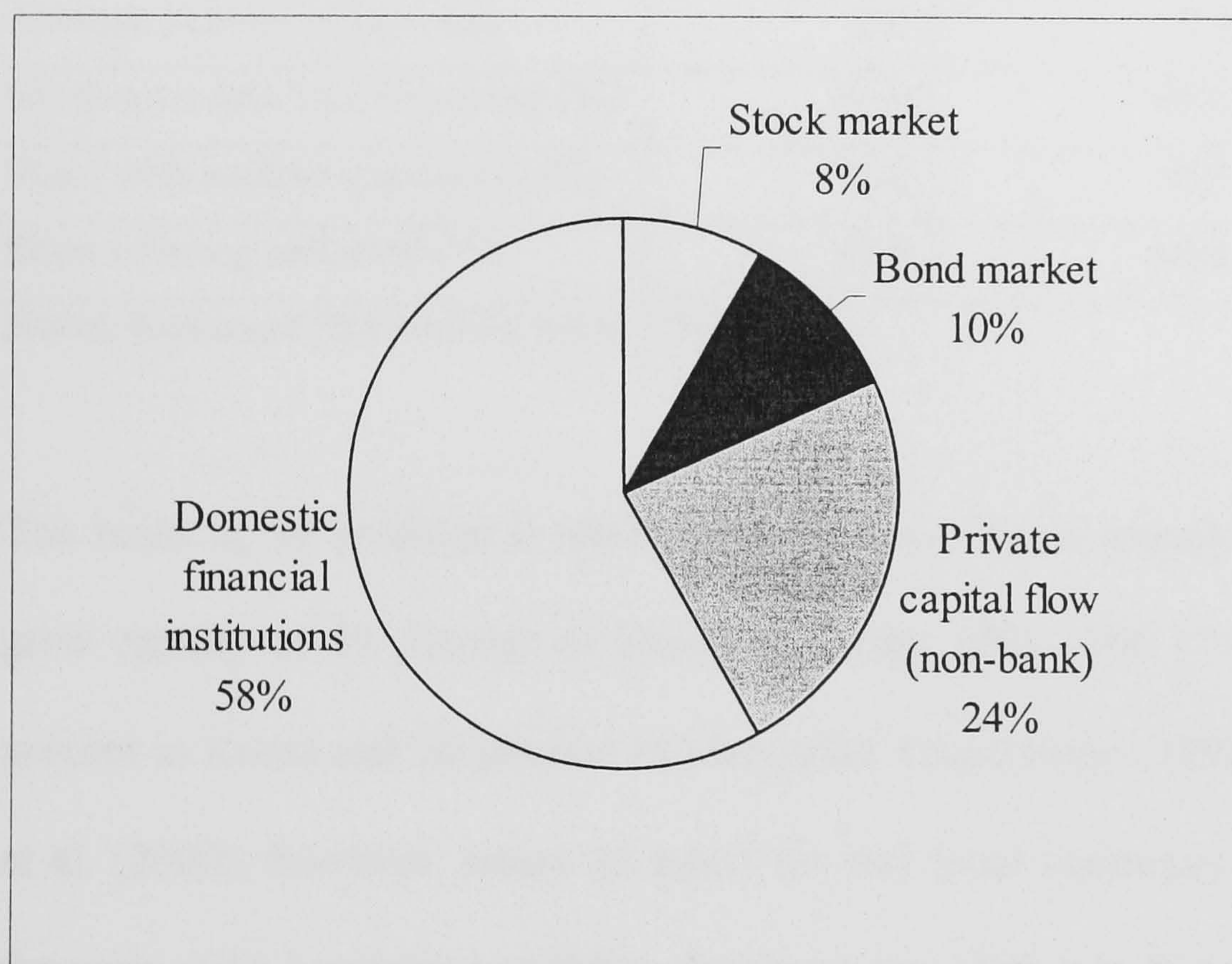
### (iii) Corporate sector

The structure of corporate financing in Thailand was generally geared towards borrowing or leveraging. This is because most Thai companies are family-run so they do not want to dilute their ownership by issuing equity. In addition, they are given tax allowances from debt servicing but not from dividend payments for equity financing, Vichyanond (2000).



The introduction of the BIBF in 1993 gave domestic firms an opportunity to borrow directly from overseas, as shown in Figure 4.3 at the end of 1996, about one quarter of corporate borrowing denominated in foreign currency. Given the belief that fixed exchange rate regimes were unlikely to change also provided a strong incentive to borrow without hedging. However, loans from domestic financial institutions remained the main sources of funds, i.e. around 60 percent of total financing, while equity and bond financings played relatively small role.

Figure 4.3: Sources of corporate funding in Thailand (1996)



Source: Bank of Thailand

Table 4.5 below shows the financial positions of Thai manufacturing firms at the end of 1996.<sup>14</sup> Debt to equity ratio was, on average, around 2.5 at the end of 1996<sup>15</sup>; and unsurprisingly the ratio was higher for the large firms than for smaller firms (because big

<sup>14</sup> Based on 942 companies.

<sup>15</sup> Based on dataset from Fiscal Policy Office and Office of Industrial Economics of Thailand (1999), which covered small and medium-sized enterprises in five major manufacturing sectors, it is indicated that the debt to equity ratio in 1996 was 3.21 times.



firms have greater access to external funds). Moreover, all these firms relied heavily on short-term debt financing which was around 80 percent of total liabilities. Such a high reliance of short-term debt may imply that creditors generally prefer to roll over short term loans, Kawai et al. (2000). As the table shows, while around 60 percent of firms used collateral for loans, only 22 percent of small-sized firms used audited statements, compared to 62 percent of large firms.

Table 4.5: Financial indicators of manufacturing firms in Thailand (1996)

	Small-sized	Medium-sized	Large
Average debt-to-equity ratio	2.0	2.5	2.7
Short-term debt/total financing (%)	84.0	81.0	80.0
Share with audited statements (%)	22.0	36.0	62.0
Share offering collateral (%)	52.0	65.0	59.0

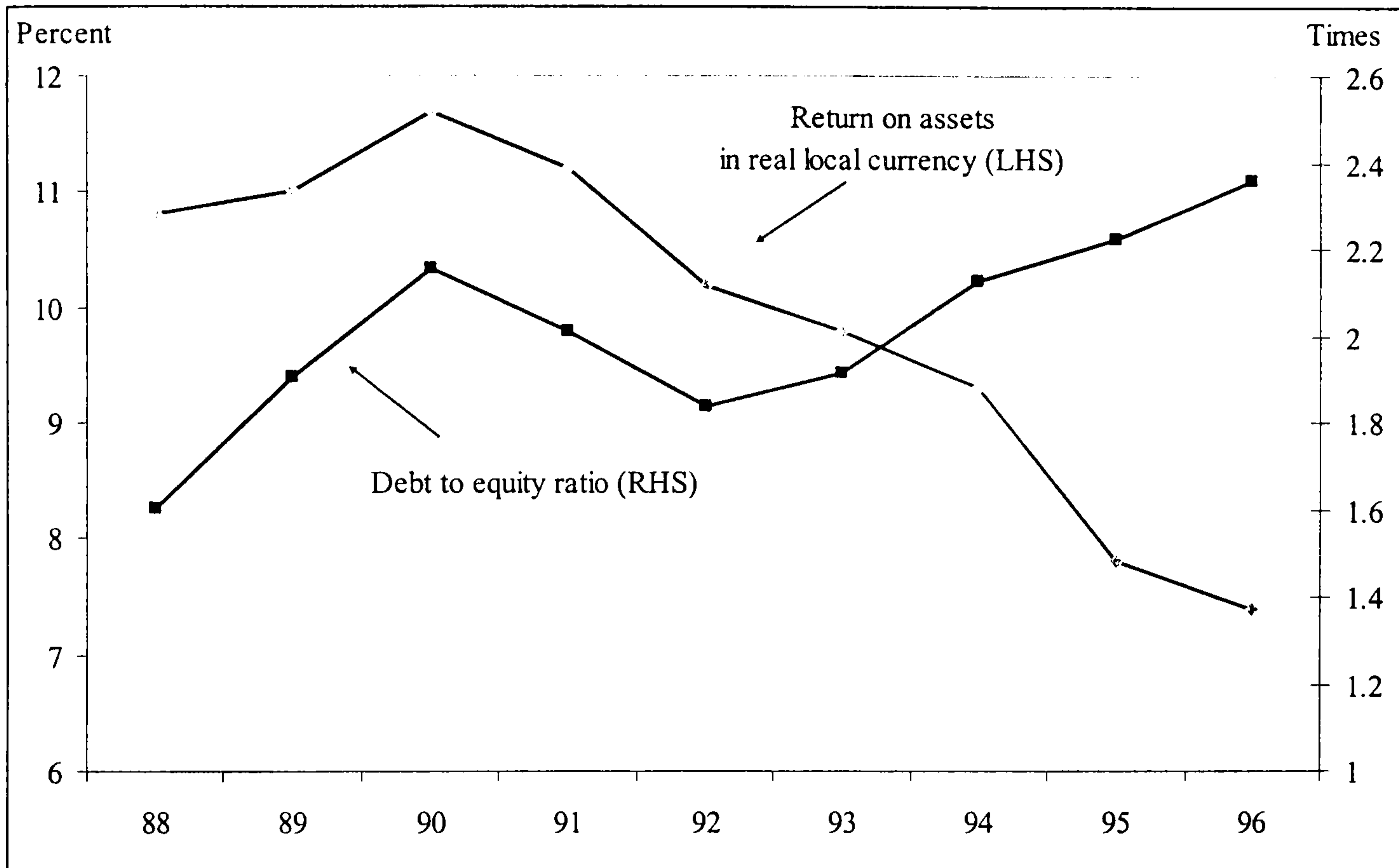
Source: Dollar and Hallward-Driemeier (2000).

The build up of leverage is attributable to financing of acquisition of fixed assets which grew rapidly at 29 percent in Thailand during 1993-1996 (33 percent in Indonesia, 17 percent in Korea and 20 percent in Malaysia), Pomerloano (1998). According to Claessens et al. (2000), however, return of assets (in real local currency) had declined from around the peak of 11.7 percent in 1990 to 7.4 percent in 1996 (see Figure 4.4).

As a result of a decline in profitability (measured by returns on assets) and a rapidly rising debt, the ability of the firms' cash flow to adequately pay interests on outstanding debts declined substantially; the ratio of operating cash flow (before interest, taxes and depreciation) to interest payments on loans fell from 4.6 times in 1992 to only 1.92 times

in 1996, Pomerloano (1998). This puts the corporate sector in a vulnerable position to adverse shocks even before the crisis.

Figures 4.4: Return on assets and debt to equity ratio of listed companies



Source: Claessens et al. (2000)

#### 4.2.2. Asset price boom and bust

Thailand witnessed a rapid surge in property and equity prices since 1987. As shown in Figure 5 below, the magnitude of an increase in prices of land in Bangkok Metropolitan Region (BMR)<sup>16</sup> was phenomenal, even when compared with those in Japan. During the five year period, from 1985 to 1990, land prices in Tokyo Metropolitan Region rose by 2.6 times before the bubble burst in 1991, while the value of land in BMR recorded a significant increase of around 20 times. The momentum was continued (with a slower growth rate) to the peak in 1996: on average, land prices in BMR grew at the annualised nominal rate of 37 percent from 1985 until the peak in 1996 and fell by about 40 percent in 2000. In terms of total stock of the real estate sector, Renaud et al. (2000) estimated that it reached around 2,200 billion baht at the end of 1997. To put this into perspective, it is equivalent to almost half of national GDP and more than twice of the total capitalisation of the Thai stock market.

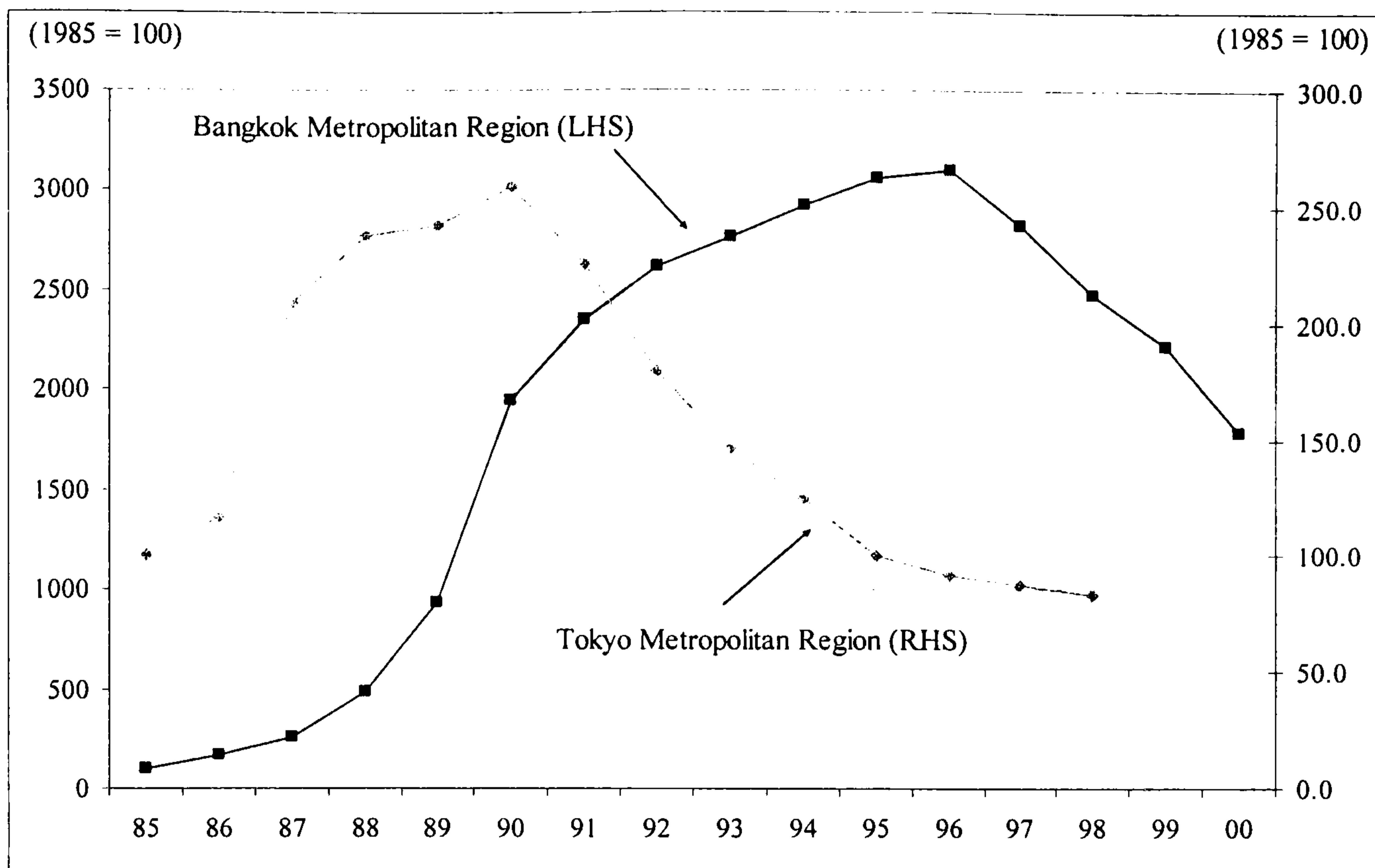
Similarly the value of share prices in the property sector exhibited a sharp increase of around 12 times within one and a half years running from January 1988 to mid 1990 and 22 times from its peak in 1994, this was well above other sectors in the stock market (see Figure 6 below). Closely link to the property sector was the share values of the finance companies, which played the major source of funding for real estate developers.

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<sup>16</sup> It should be noted that most of the assets in real estate sector are concentrated in the BMR, with the exception for housing and hotel, Renaud et al. (2000).

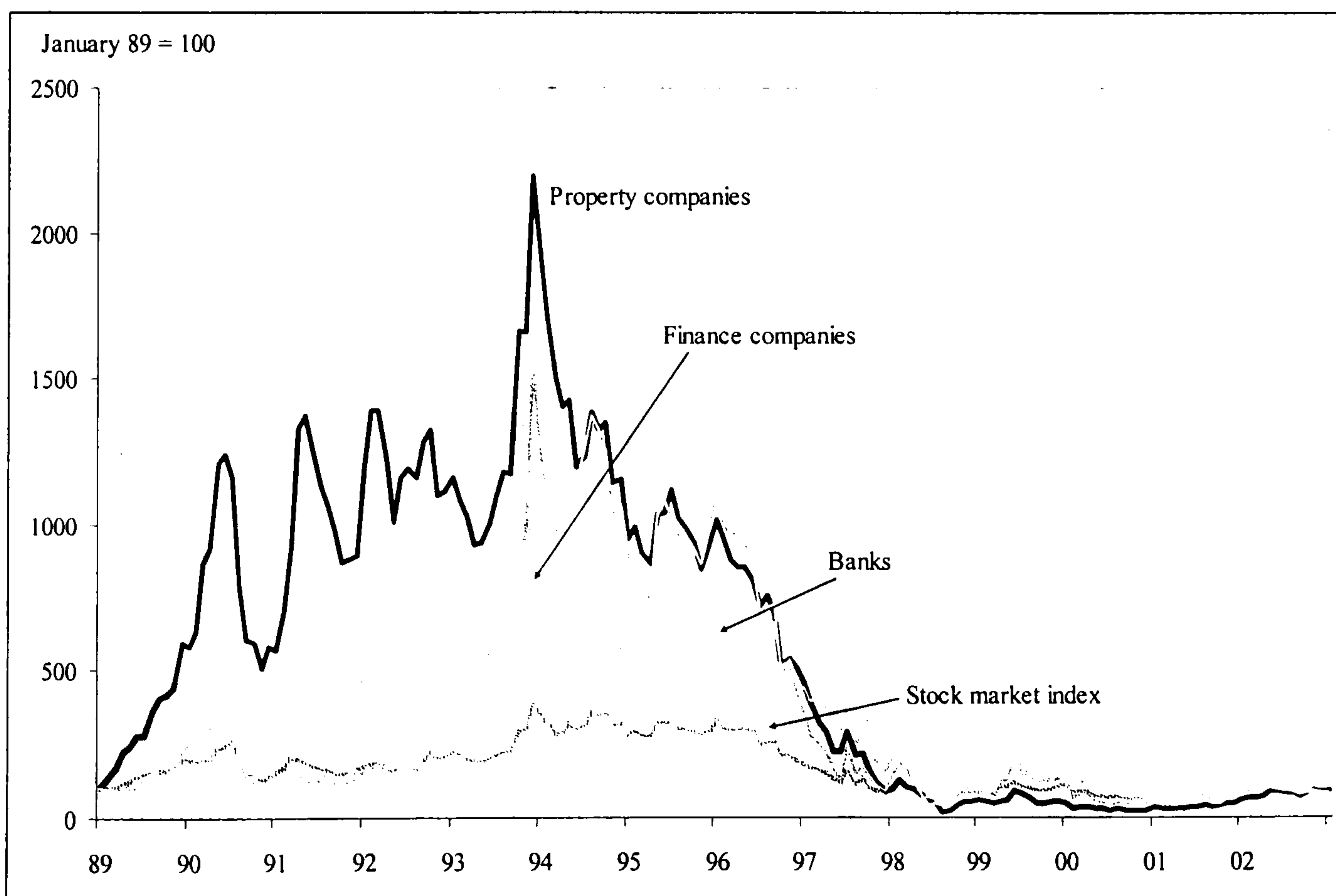


Figure 4.5: Land price index



Source: Agency for Real Estate Affairs (Thailand) and Land Agency of Japan

Figure 4.6: Stock price bubbles



Source: Stock Exchange of Thailand

Despite the substantial increase in land prices, Renaud et al. (2000) argue that the Thai real estate boom had been justified by economic fundamentals until 1992-1993. Based on data from the Urban Land Institute, Herring and Wachter (1999) report that, during the period from 1988 to 1990, new supply of office space averaged 720,000 square metres per annum but the absorption averaging of 880,000 square metres per annum implies near zero vacancy rates. This led to a sharp increase in prime office market rents from \$US 93 per square metre in late 1987 to \$US 269 in 1991 (equivalent to commercial rents in New York at that time). By end of 1994, however, overproduction in the real estate sector became more apparent, as reflected in rising vacancy rates in all segments of the industry. Consequently, profits growth of listed property companies turned negative in 1995 and 1996 before the sector experience a wholesale collapse in 1997 (Table 4.6).

*Table 4.6: Profit growth of listed companies in the stock market (%)*

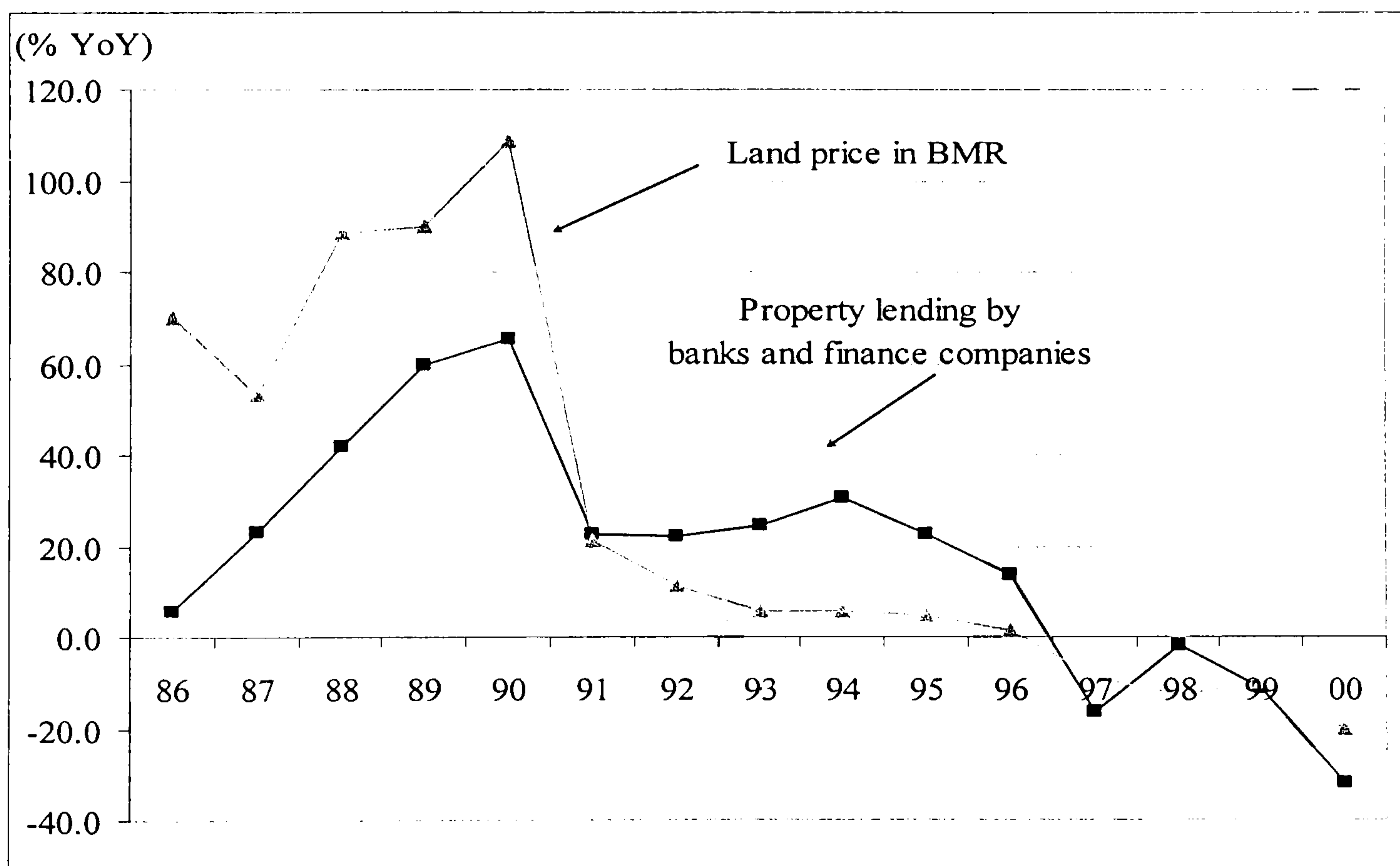
	1994	1995	1996	1997
All listed companies	42.3	5.7	-9.8	-555.7*
<i>Real estate sector</i>	32.9	-26.0	-28.5	-1506.5
Finance companies*	26.2	-25.8	-14.9	-520.3*
* Include only active finance companies.				

Source: Bank of Thailand

In fuelling the rapid growth in values of the property sector, domestic financial institutions played a crucial role. As shown in the figure below, the growth in credit from banks and finance companies to property sector shows a strong correlation with changes in land prices. As the boom continued, there was a growing dependence of the financial sector on property lending: the growth of lending by finance companies to property sector averaged 40 percent per annum, compared with total lending growth of 33 percent per annum during

1988 to 1996. So there was a marked shift in the composition of Thai finance companies' loan portfolio; the percentage share of property loans (including construction) increased from 18 percent to about 28 percent while manufacturing loans declined from 22 percent to 15 percent during 1988-96, see Table 4.7. At this point, it should be emphasised that, in the case of commercial banks, there appeared to be no significant changes in the composition of their loan portfolio over the same period; almost half of their loans concentrated on manufacturing and trade-related sectors.

Figure 4.7: Changes in land prices and property lending



Source: Agency for Real Estate Affairs and Bank of Thailand



Table 4.7: Loan portfolio composition of commercial banks and finance companies  
(Percent of total lending)

Sector	1988		1996	
	Commercial banks	Finance companies	Commercial banks	Finance companies
Agriculture	7.1	1.3	3.9	0.9
<b>Manufacturing</b>	<b>25.8</b>	<b>21.8</b>	<b>26.8</b>	<b>15.3</b>
<b>Construction</b>	<b>4.3</b>	<b>3.5</b>	<b>4.6</b>	<b>3.7</b>
<b>Real estate</b>	<b>6.3</b>	<b>14.8</b>	<b>9.1</b>	<b>24.3</b>
Imports	5.3	2.8	3.2	1.7
Exports	8.3	1.3	4.2	0.8
Wholesale/retail	18.9	12.7	17.8	7.8
Public utilities	7.3	7.3	10.6	7.6
Banking and finance	6.3	9.1	7.5	11.0
Personal consumption	10.3	25.5	12.3	27.0
Total	100.0	100.0	100.0	100.0

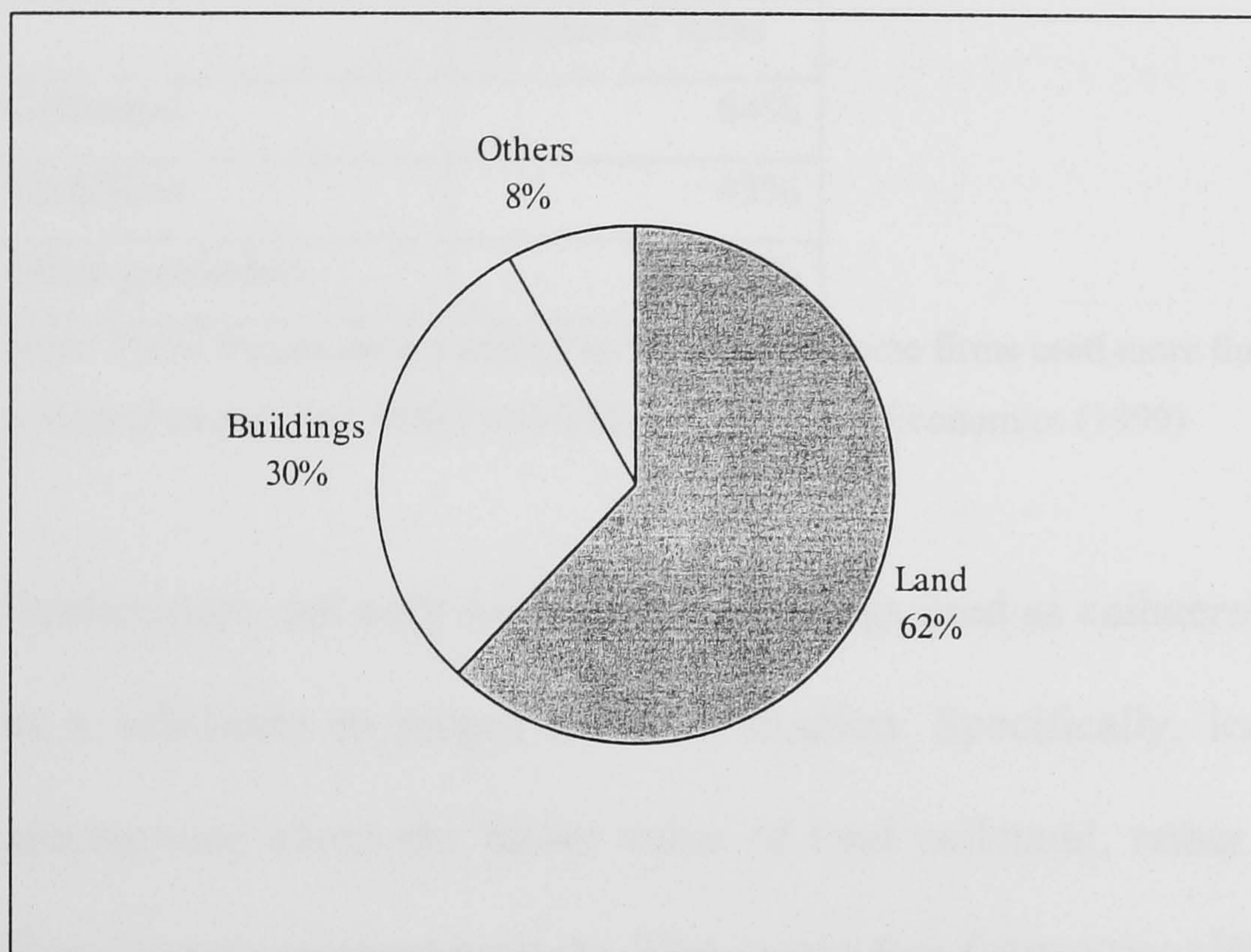
Source: Bank of Thailand

One of the reasons is that commercial banks are subject to more rigid supervision by the central bank and especially the policy which required to channel their funds towards high priority and productive sectors such as manufacturing. So this explains why exposure to property companies (real estate and construction) played a small part in their loan portfolios -- around 13 percent. Note also that it has been argued that commercial banks could also lend into the real estate indirectly through finance companies affiliated to them. From Table 4.7 above, banks' exposure to banking and finance sector did not appear to be significant (i.e. 7.5 percent in 1996). The more important case is that banks can *indirectly* be exposed to real estate sector from the practice of using real estate as collateral which is widespread in other lines of bank lending, especially in form of land (Figure 4.8). Particularly, real estate collateral was perceived to be the safest. For example, Herring and Wachter (1999, p. 60) observe that: "Thailand had never experienced a commercial real



estate cycle and so understandably found it difficult to estimate the probability of a collapse in real estate prices.”

Figure 4.8: Structure of commercial bank collateral



Source: IMF (2001)

To what extent did commercial banks expose to fluctuation in land price? Based on a survey by Fiscal Policy Office and Office of Industrial Economics (1998) from 642 firms in five major manufacturing sectors, it was reported that 64 percent of firms used collateral to receive loans (see Table 4.8 below) and among these firms, 65 percent of loan value was covered by land. As shown Table 4.7 above, commercial banks lent to manufacturing sector by 26.8 percent of total lending. Using two pieces of evidence, a crude calculation implies that 11.1 of the 26.8 percent in total loan portfolio was based on land collateral. (Assume that all lending to real estate and construction sectors were based on collateral in form of land) So adding this with their exposure to real estate and construction sectors, we estimate that around 25 percent of commercial bank loans were exposed to land price



fluctuation. As for finance companies, we find that almost 35 percent of loan portfolio in 1996 used land as collateral.

*Table 4.8: Lending practice in Thailand*

	Percent of firms
Collateral	64%
Cash flow	43%
Other guarantees	33%

Note: These figures do not add up to 100 because some firms used more than one approach to get loans.

Source: Fiscal Policy Office and Office of Industrial Economics (1999)

Furthermore, not only are land and buildings used as collateral for loans, but they are used as a substitute to proper credit evaluation. Specifically, loans are generally based on assumptions about the future value of land collateral, rather than on the estimated cash flow from investment projects. This means that firms were able to borrow for risky or low-return projects on the basis of rising value of collateral. Bank of Thailand (1998, p.14) reports that: “A significant portion of lending by financial institutions in Thailand is collateral-based. With the property and stock price boom in full swing, financial institutions did not spend resources on valuing the underlying collateral because of the widespread belief that the gains would be substantial should a need to foreclosure arise. Banks were also under pressure from shareholders to take on risky investments in return for potential profits and attractive dividend payments. This, in turn, made them less vigilant in monitoring and taking appropriate actions against borrowers once they showed signs of financial deterioration. The growing risks inherent in the system were, unfortunately, over-shadowed by the real estate and/or stock market boom and the banking system was ripe for asset deflation.”



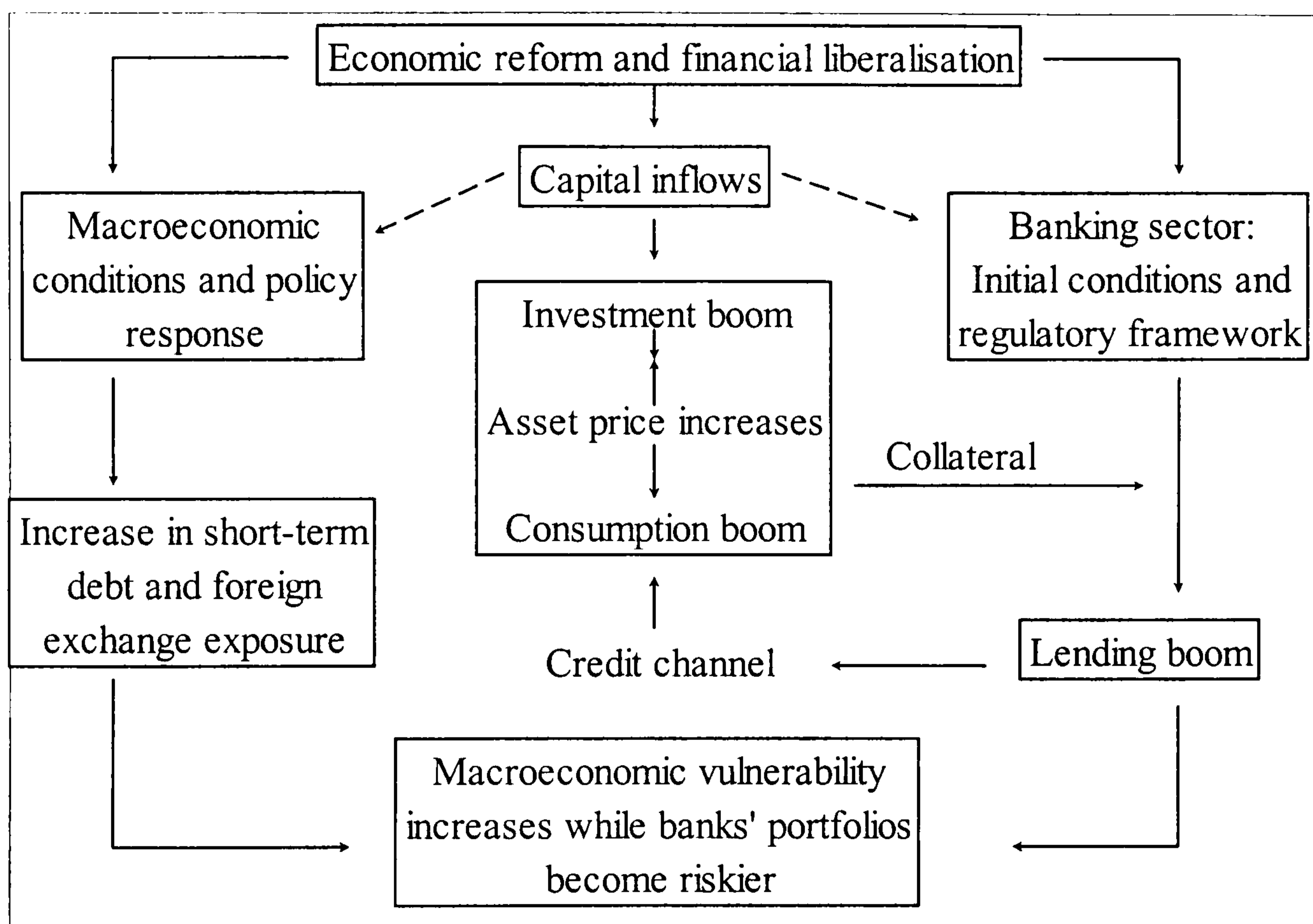
It is worth emphasising here that the collapse of asset prices had also played a crucial role in explaining Japanese financial distress. Cargill, Hutchison and Ito (2000) note that the relationship between stock market and banking system was especially strong. This is due to a special characteristic in Japanese financial system that allowed banks to count equities of their corporate customers as part of near-capital or tier II capital in the Basle capital adequacy requirements. This means that banks were able to increase lending at the same time as equity prices increased. On the other hand, the collapse in the stock market after 1990 led to a severe shortage of capital.

In the Thai case, banks and finance companies did not only expose to real estate sector but they are indirectly exposed to changes in land prices from their collateralised lending practice. (It is in this sense that Thailand is similar to Japan. But in Japan, banks are exposed to change in the stock market as they are allowed to use equities as their capital base.) Secondly, as land prices increase, lending can expand and so this led to an increase in leverage at firm level.

By way of summarising the consequence of financial liberalisation, we use diagram below to show how liberalisation can lead to rapid build-up of vulnerability. On the right hand side of the flow chart, financial liberalisation resulted in a surge in private capital inflows and rapid credit expansion, which in turn led to a boom in investment and asset prices. Since loans are made on the basis of collateral, an increase in asset prices means that more loans are available. These reinforcing effects increase exposure of financial institutions toward more cyclical sectors, which make them vulnerable to asset price shocks. On the left hand side of the chart, the flow of short-term foreign borrowing resulted in high

leverage at the economy wide level by increasing exposure to currency mismatch that make the economy vulnerable to sudden reversal of foreign capital.

Figure 4.9: Self-reinforcing dynamics resulting in increased vulnerability



Source: Alba et al. (1999)

### 4.3 Run-up to the crisis (1996 – mid 1997)

#### 4.3.1 Real estate and finance company crises

In 1996, Thai economy experienced a sharp decline in export to 1.8 percent from the 24.6 percent growth in previous year. Note that this sudden stop was also observed in most countries in the region, indicating that there may be a set of common external factors. One of these factors was the overvaluation of the currency that pegged their value to the US dollar: as the dollar appreciated against the yen (by 50 percent from mid-1995 to 1997), this led to an increasing loss of trade competitiveness.

While such a drop in exports may trigger some concerns to foreign investors over the size of current account deficits and the exchange value of the baht, the real estate sector was the first to collapse, followed closely by insolvency of the finance companies. As mentioned earlier, share prices of property companies fell sharply in 1994 and subsequently, property companies began to record losses in 1995 (26 percent losses from the profit growth of 33 percent in 1994). This pattern was similar to finance companies. However, this was not the case for commercial banks: their share prices only began to fall in mid-1996.

The collapse in real estate sector was due mainly to the oversupply situation, as well as the results of the tightening of monetary policy in 1994-5 (to curb with capital inflows). In addition, in 1995 real estate firms were further depressed by the regulation of the Bank of Thailand to limit the use of collateral in extending new loans, which required that if a debtor was unable to make interest payments, creditors cannot advance additional amounts to the borrower on the basis of the same collateral, Herring and Wachter (1999). Since property companies were highly leveraged, both high interest rates and the tightening margin requirements meant that they were required sell assets which were already in oversupply situation. Consequently, these companies ran into serious illiquidity.

By 1996, it appeared that rising number of non-performing real estate loans, together with falling land prices were rapidly undermining not only some finance companies but the stability of the whole financial system. This had led the Bank of Thailand to change its policy by relaxing financial constraint in the real estate sector and to launch a number of measures to alleviate property loan problems and stimulate market demand, see Table 4.9 below. These included encouraging financial institution to extend loan and interest



payments period for financially-troubled property developers. It also established the Resolution Property Trust Fund (RPTF), with contributions from the financial institutions (totalling 50 billion baht) to be used to purchase debts and assets from financially-distress property companies. However this project never materialised and was subsequently replaced by the establishments of the Property Loan Management Organisation (PLMO) in April 1997, Siamwalla (2001). The objective of PLMO is to increase liquidity of financial institutions by buying their property loans that could not find enough working capital and help them to complete the project.

*Table 4.9: Measures to revive the real estate sector*

<b>Measures to alleviate financial constraints</b>	<b>Measures to revive market demand</b>
<p>1. The setting up of the <u>Resolution Property Trust Fund</u>: The fund would purchase assets and mortgage loans at a discount from real estate companies. The assets of the fund would be managed by professional managers.</p> <p>2. The setting up of <u>Property Trust Funds</u>: each fund for retail investors amounts to 500 million baht. Funds for institutional investors are larger.</p> <p>3. Expediting the enactment of the <u>Securitisation Law</u>.</p> <p>4. The setting up of the <u>Property Loan Management Organisation</u> (PLMO): the organisation would purchase property loans from financial institutions. Operating fund of PLMO came from three sources: initial capital of 1 billion baht allocated from the government budget; contribution from the member financial institutions of 1 million baht each; and the issuance of PLMO bond worth 1 billion baht.</p>	<p>1. Capital gains tax exemption for residential properties transferred in 1997 and sold by 2007.</p> <p>2. Home mortgage loans for civil servants and state enterprise employees.</p> <p>3. Matching the existing excess supply of property with the planned property acquisition or lease by government agencies and state enterprises.</p> <p>4. The operation of the Secondary Mortgage Department (SMD) by Government Housing Bank.</p> <p>5. Relaxing the rule of the maximum for foreign ownership of condominiums.</p>

Source: Annual Economic Report, Bank of Thailand, 1997.

However, many finance companies were in serious trouble before PLMO appeared to be fully operational, Ito (1998). While a first sign of the tensions in financial sector began with the collapse of one commercial bank (Bangkok Bank of Commerce) in May 1996, which arose from massive fraud, *the critical area of concern in the financial system during the first half of 1997 was not commercial banks themselves but finance companies*. Since the beginning of 1997, some finance companies experienced runs on their liabilities. But note that it was driven by fears of insolvency in specific finance companies (which had exposure on real estate lending), not by illiquidity of the whole financial sector.<sup>17</sup> As shown in Figure 4.10 below, fund outflows from Thai finance companies began in early January 1997 and sharply accelerated in May. On the other hand, aggregate deposits at commercial banks had risen throughout the year. Specifically, finance companies experienced an outflow of around 500 billion baht since May 1997 while commercial banks received deposits of around 400 billion baht during the same time.

Such a fear of depositors appeared to be justified, since 16 and 42 finance companies had their operations suspended subsequently on June, 27 1997 and August, 5 1997 (with only 33 finance companies remaining). However, the runs did not cause the illiquid finance companies to become insolvent. In fact the problems of insolvency had already been incurred (after having their operations suspended, 56 of the 58 finance companies was found to be insolvent later in the year) before the panics took place. So it was the existing

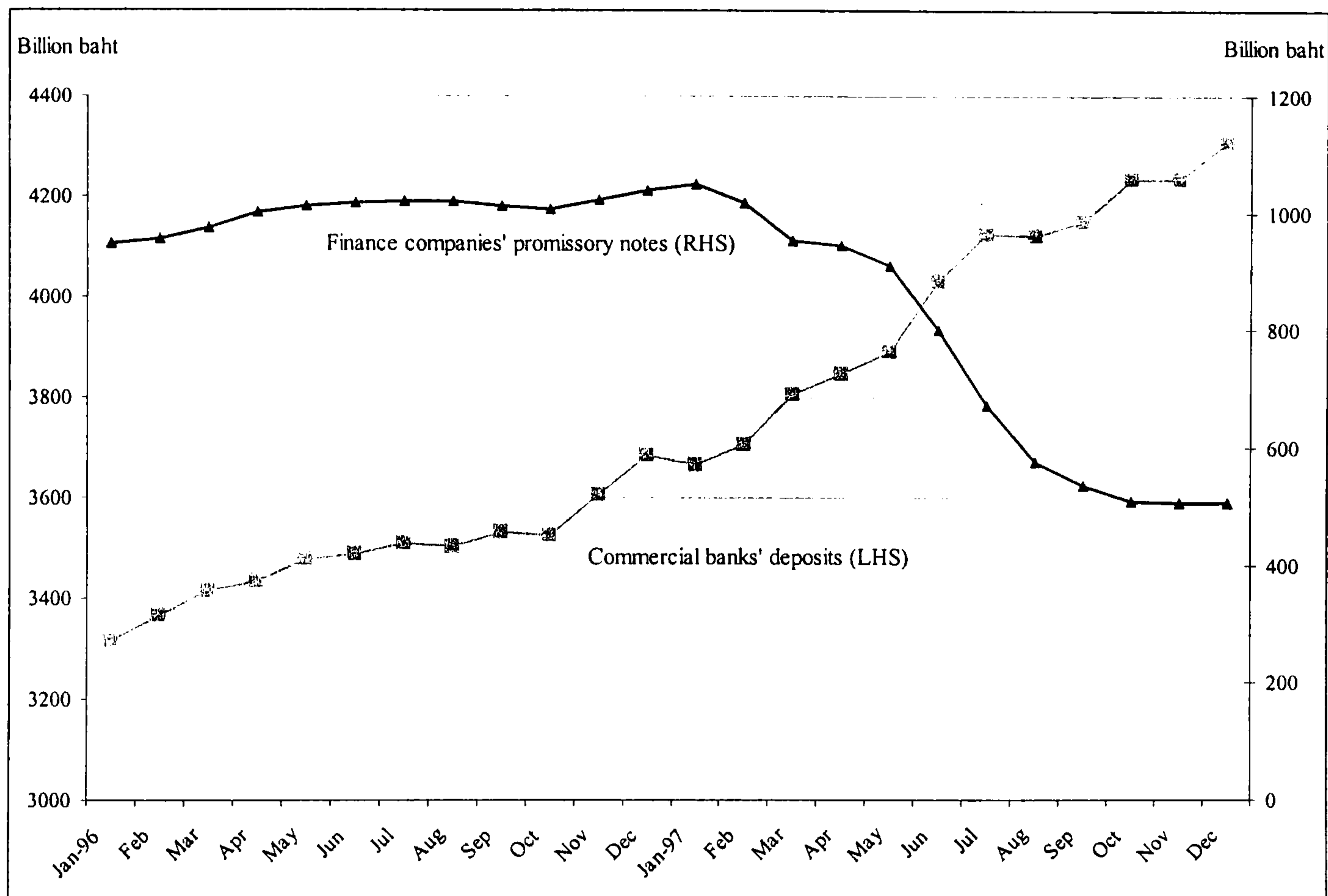
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<sup>17</sup> The ratio of money supply (M2) to foreign reserves has been used by Chang and Velasco (2002) to indicate the possibility that domestic residents might liquidate their claims and convert the proceeds into foreign currency. Given this condition, a bank run by local depositors would result in either the collapse of the financial system or the abandonment of the fixed exchange rate. Chang and Velasco (2002, Table 8) show that this ratio at the end of 1996 was high in Indonesia (6.50) and Korea (6.51) but relatively moderate in Thailand (3.90) in fact it was falling. They note that: "The behaviour of Thai ratio most likely indicate that the relevant measure of the liabilities of Thailand's financial system to domestic residents should include the promissory notes of the finance companies, which are not include in M2 but become increasingly important" (p. 433). However, we find that the inclusion of finance companies' promissory notes increases the ratio to 4.96 which is relatively small, compared to Indonesia and Korea.



insolvency problem of these finance companies that caused the run. One important difference between the 16 and 42 finance companies, and 33 surviving finance companies was the quality of their loan portfolios: more than 40% of the loans from the 16 finance companies were directed to the real estate sector, as opposed to 25% for the 42 companies and less 33 companies, Ito (1998).

Figure 4.10: 'Flight to quality' by domestic depositors



Source: Bank of Thailand

In addition, the Thai authorities appeared to *throw good money after bad* by recycling liquidity to these insolvent finance companies. That is, commercial banks and finance companies were requested to lend to the Liquidity Pool (by way of bonds issued by the Financial Institutions Development Fund, FIDF<sup>18</sup>) in proportion to an increase in their

<sup>18</sup> Established in 1985, the Financial Institutions Development Fund (FIDF), is part of the government's mechanism for implementing financial-support measures and rehabilitating financial institutions in order to maintain stability in the system. The primary role is (i) to provide liquidity support for distressed financial institutions; (ii) to purchase increased share capital where there is insufficient capital funds as a result of accumulated losses caused by mismanagement or sustained high volume of bad debts. (Generally, FIDF will order the troubled financial institution to reduce its capital before buying its new shares); (iii) to act on behalf of the government as guarantor for depositors and creditors.



deposits. These lender financial institutions received interest at the rate of 7-day repurchase (which at the time around 20 percent) plus a margin of 1.5 percent per annum and financial institutions borrowing from the Liquidity Pool were charged at the same rate. While the stronger financial institutions were gaining their excess liquidity at the expense of the weaker ones, the policy of liquidity recycle has proved to be costly because it was not enough to check the depositors' panic on these insolvent institutions. [On December 8, 1997, the government allowed only 2 of the 58 suspended finance companies to resume business. The remaining 56 companies -- with total assets of about 860 baht, i.e. 11 percent of the financial sector's total assets -- were closed and liquidated under the supervision of the Financial Restructuring Authority (FRA).]

In addition, despite the arrangement of a compensation scheme for creditors of the 58 suspended finance companies<sup>19</sup> (by exchange of promissory notes and certificates of deposit issued by these 58 finance companies for those issued by state-owned financial institutions), it appeared that withdrawal of funds in remaining financial institutions continued. This led the government to announce a blanket guarantee (in local currency terms) for both depositors and creditors of the remaining financial institutions. Such guarantee was implemented through the state-owned Financial Institutions Development Fund (FIDF) and it covered full principal and full (or partial) interest payments, Bank of Thailand (2000).

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<sup>19</sup> Depositors of the 56 closed companies can exchange their promissory notes for those issued by state-owned financial institutions. But creditors of the first 16 companies have no choice but to wait for the liquidation outcome. As for the creditors of the 40 finance companies, they have the option of exchanging their notes for the negotiable certificate of deposit of the state-owned bank or await the outcome of the liquidation process.

According to estimates undertaken by an IMF advisory mission in mid-July 1997, Lindgren et al. (1999), it is indicated that “many, if not most, of Thailand’s 91 finance companies were insolvent, while banks as a group were solvent, but undercapitalized. In the absence of detailed supervisory information on the individual institutions, there was an expectation that the five largest banks (representing about two-thirds of the banking system) were among the strongest in the system, so that several of the small- and medium-sized banks most likely were insolvent.”

### 4.3.2. Currency devaluation

The first round of speculative attacks on Thai baht began in December 1996, but massive attacks started in May 1997.<sup>20</sup> While there was some warning from the IMF – in confidential with Thai authorities – that baht was overvalued and needed adjusting, the Thai authorities continued to defend its *de facto* dollar peg (see Nukul Commission, 1998). In preventing a sharp rise in domestic interest rates, Bank of Thailand chose to defend its currency by using foreign exchange swaps.

In addition, selective capital controls were also imposed in order to reduce foreign speculators’ access to domestic currency market: for example, foreign exchange transactions with non-residents were limited to those with genuine underlying commercial and investment activities. These measures effectively led to two-tier foreign exchange market, i.e. the onshore market where there was normal supply of baht and the offshore where baht was scarce. Immediately after the imposition of control, Thai baht overnight interest rates in the offshore market rose to over 1000 percent, Bank of Thailand (1998).

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<sup>20</sup> In January 1997, Thailand’s foreign exchange position was relatively healthy, ranking 8th in the world at around \$40 billion dollar, Kaosa-ard (1998).

As reported in IMF (1997) reported that the increase in offshore financing costs resulted in losses of between US\$1 and 1.5 billion to speculators at the end of June 1997.

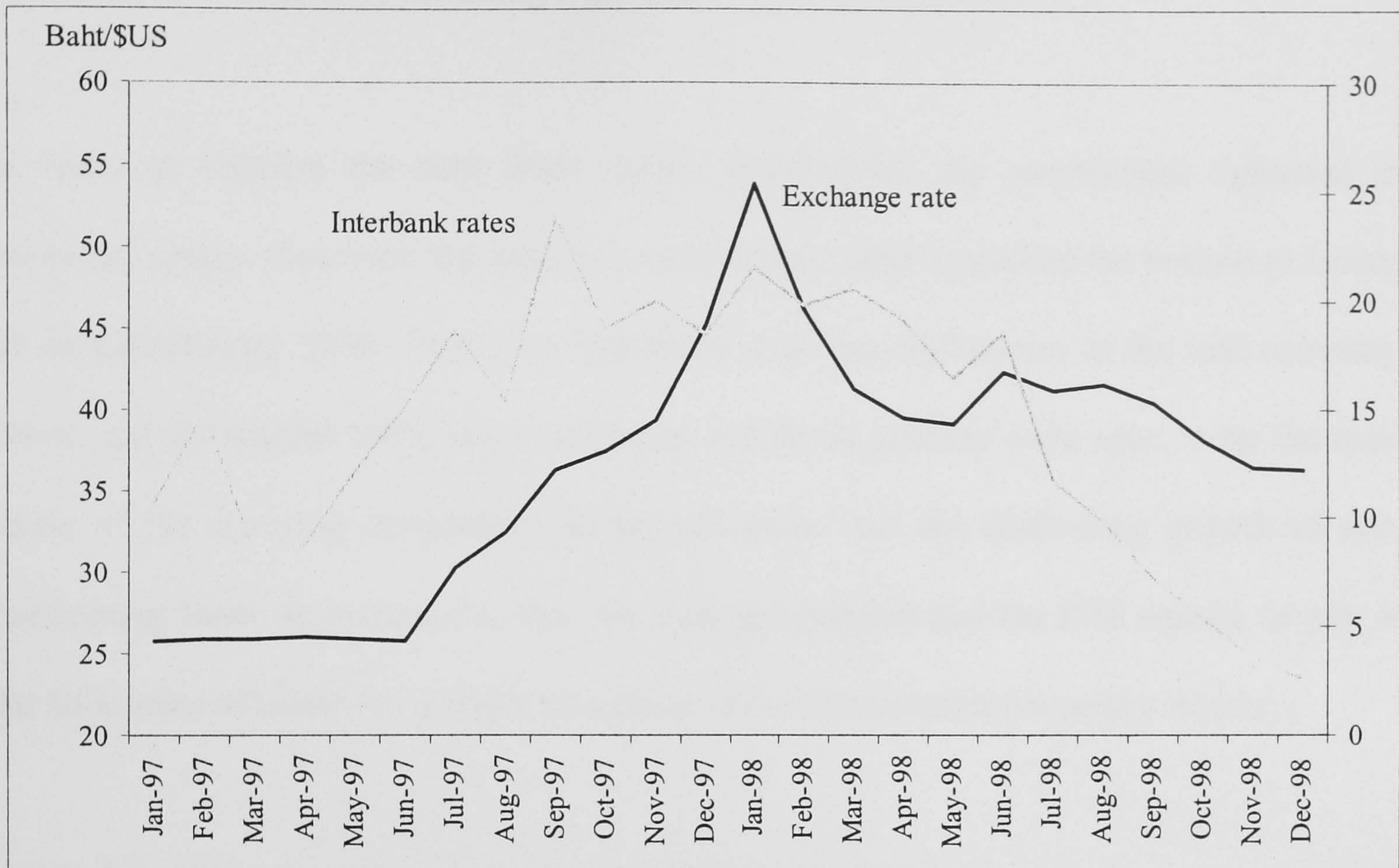
Although these measures appeared to be successful in punishing non-resident speculators, the extensive use of forward foreign exchange market caused the central bank to accumulate large short foreign exchange positions and this constrained its ability to prevent the pressure that came from domestic residents. Bank of Thailand (1998, p. 27) reports that in the wake of Foreign Minister's resignation, domestic capital flight began by the rush of local corporations to buy US dollars to hedge against their foreign currency dominated debt; this resulted in a heavy loss of international reserves. Consequently, net foreign reserve (gross reserves less the forward obligations) -- which stood at around US\$ 40 billion in September 1996 -- declined from over US\$30 billion in May 1997 to its lowest level at US\$ 1.1 billion in July 1997. The baht was subsequently floated on July 2, 1997 and immediately depreciated against US dollar by 17 percent.

It may be worth emphasising that movements in the baht were relatively calm after floating. In case of Mexican peso, however, the devaluation of 15 percent on December 20, 1994 was followed by massive capital outflows which caused the crash in currency of 50 percent in one week. This was not the case in Thailand: after one month, the baht was still within 20 percent range, Ito (1998). However, as capital outflows accelerated sharply in the fourth quarter of 1997, the US dollar reached a peak at 56.06 baht on 26th January 1998 (Figure 4.11).



Figure 4.11: Exchange rate (Baht/\$US) and interbank rates

(Monthly average)



Source: International Financial Statistics, IMF.

#### 4.4 The financial collapse

After the beginning of the currency crisis, in August 1997 the Thai government asked for financial support from the IMF and obtained a US\$17.2 billion rescue package. However, such rescue came with a series of rigid conditionalities, including budgetary cash surplus, tight monetary policy, and comprehensive financial reforms and the subsequent macroeconomic regime in Thailand had been dominated by IMF policy (covering 8 Letters of Intent from August 1997 until September 1999). Such regime developed with the IMF went through three relatively distinct phases from August 1997. The first phase was mainly the standard IMF tight monetary policy (and fiscal policy) to stabilise the baht devaluation.



The second phase aims at restructuring financial sector; and the third phase concerns various structural reform, including legal reforms and privatisation.<sup>21</sup>

In order to stabilise the baht from further devaluation, the government tightened its monetary policy. However, the baht fell continuously until it reached the bottom at around 56 in mid January 1998. They also had led to a severe contraction of the real economy. (Note that by August 1998, strict monetary and fiscal policies were seen to be the main cause of the alarming contraction of the real sector and the continuing growth of non-performing loans. In response to this, the Thai government and the IMF agreed, as part of the fifth letter of intent, on a major relaxation of the macroeconomic policy regime.)

#### **4.4.1 Foreign investor panics on commercial banks**

Unlike finance companies which had suffered losses since 1995 and subsequently brought down by wholesale collapse of real estate sector in 1996, the operations of commercial banks as a whole remained unaffected until the floatation of the baht in July 1997. Indeed, as shown in the table below, Thai banks recorded net profits both in 1996 and the first half of 1997 but had been severely hit in the second half of the year. [This was in contrast to foreign bank branches which performed better than Thai banks because they did not suffer from shortage of foreign funds.]

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<sup>21</sup> For details, see Ministry of Finance (1999).

Table 4.10: Net profit and loss of commercial banks and BIBF operation (billion baht)

	1996	1997			1998		
		1H	2H	Total	1H	2H	Total
Thai banks (including BIBF)	50.3	29.9	-108.4	-78.5	-163.9	-206.9	-370.8
Thai banks (excluding BBC)	-	31.2	-94.0	-62.8	-153.5	-195.4	-348.8
Foreign bank branches (including BIBF) <sup>1</sup>	7.9	5.7	1.8	7.5	-1.3	-6.0	-7.3
Other BIBF units <sup>2</sup>	1.4	0.5	-1.4	-0.9	-1.4	-2.5	-3.9
Total	59.6	36.2	-108.0	-71.9	-166.6	-215.3	-382.0

Note: <sup>1</sup> In 1997, net profit included branches of 6 new foreign banks which started their operations in that year and the BIBF operation of 6 existing financial institutions. <sup>2</sup> In 1997, net profit excluded 6 BIBF operations which became full branches in that year but included 6 BIBF operations which were newly appointed and started their operations in the same year.

Source: Bank of Thailand, Annual Economic Report, 1998.

The most important reason for this was due to the loss of confidence of foreign creditors, by refusing to roll over foreign currency denominated debt. This forced banks to recall their loans from local corporations of their BIBF operations. Table 4.11 below clearly illustrates that *the outflows in the second half of 1997 were due mainly to repayments of short-term loans; and this came mostly from commercial bank sector (including BIBF) with the turnaround of almost \$US 10 billion, while non-bank experienced loan recalls to the lesser extent.* Such reversals intensified throughout 1998. The flow of non-resident baht accounts which were essentially foreign currency deposits at banks also turns negative. Foreign direct investment appeared to be the most stable form of capital flows, which recorded surplus in 1997 and even increased more than double in 1998. In addition, portfolio investment had even increased during the second half of 1997 because Thai stocks became cheaper in dollar terms to foreign investors after the baht depreciation. *It appears that both foreign lenders and foreign depositors had lost confidence primarily towards commercial bank sector.*



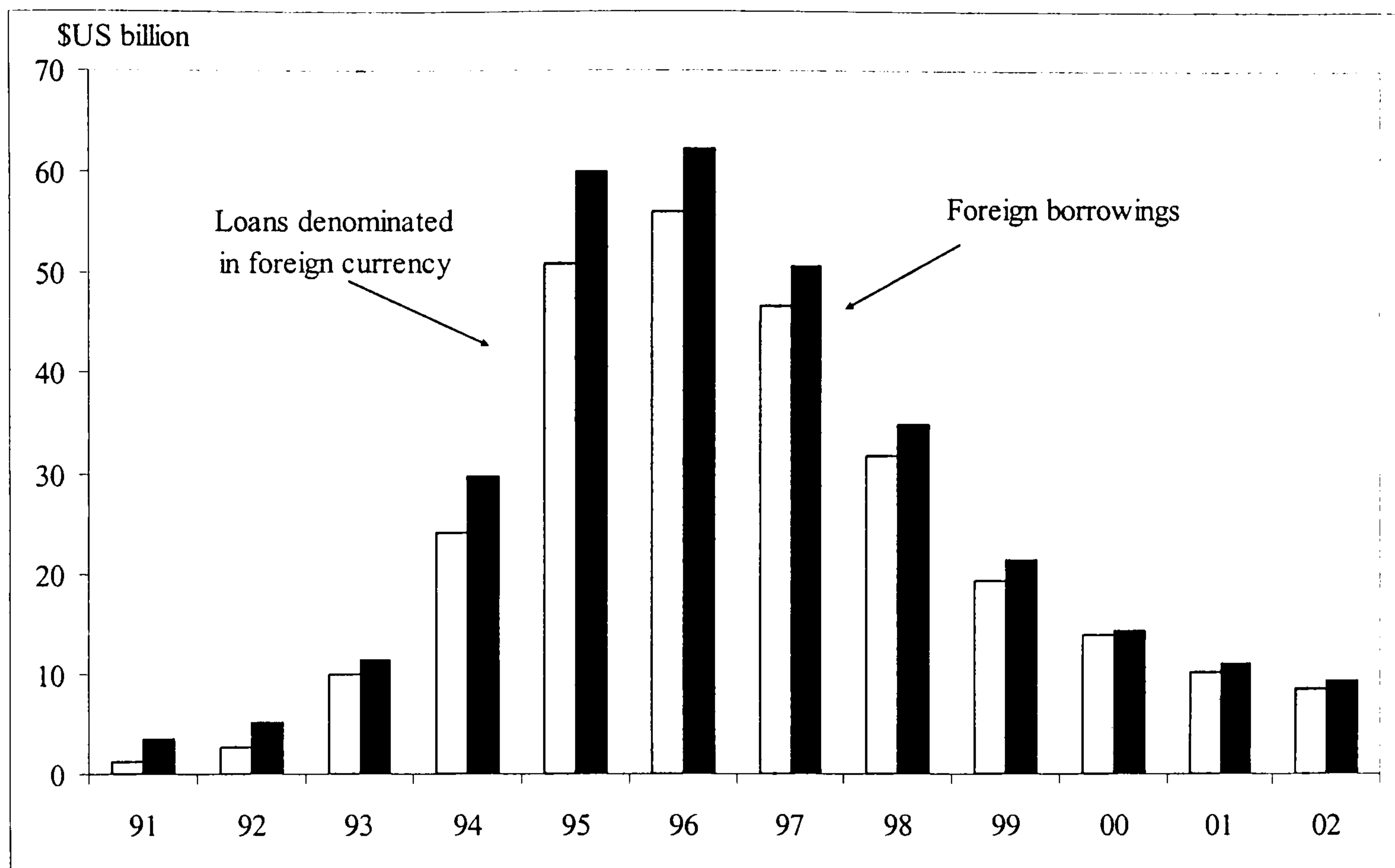
Table 4.11: Net private capital outflows (\$US Million)

	1997			1998		
	H1	H2	Total	H1	H2	Total
Direct investment	829	2536	3366	4962	2144	6836
<i>Loans</i>	<i>1859</i>	<i>-9156</i>	<i>-7297</i>	<i>-7467</i>	<i>-8053</i>	<i>-15421</i>
- Banks	2820	-6332	-3512	-4569	-6644	-11214
- Commercial banks	1380	-3653	-2273	-243	-1389	-1632
- BIBF	1440	-2680	-1239	-4326	-5255	-9581
- Non-bank	-961	-2824	-3785	-2798	-1409	-4207
Portfolio	1424	2965	4389	180	-175	4
Non-resident baht account	-3485	-2328	-5813	-1092	-1699	-2791
Others	301	-3048	-2746	-2507	-1750	-4256
<b>Total</b>	<b>929</b>	<b>-9031</b>	<b>-8102</b>	<b>-6095</b>	<b>-9533</b>	<b>-15628</b>
Bank	2405	-8689	-6284	-5050	-8558	-13608
Non-bank	-1476	-342	-1818	-1045	-975	-2020

Source: Bank of Thailand

Note that Thai financial institutions were subject to Bank of Thailand's regulation that net foreign exposure cannot be greater than 20 percent of their capital funds; so commercial banks did not suffer directly from the risk of currency depreciation. However, it was transferred to their corporate customers, which in turn increased the banks' credit risk. As shown in the figure below, borrowing and lending in foreign denominated currency had risen dramatically since 1993 and the decline since 1997 had reflected the refusal to roll over debt by foreign creditors. Therefore, *in addition to the collapse in the real estate sector, which had already brought down more than half of finance companies, Thai commercial banks had indirectly suffered from serious consequences of currency devaluation in terms of rising non-performing assets.*

Figure 4.12: Lendings and borrowings of Thai commercial banks in foreign currency (including BIBFs)

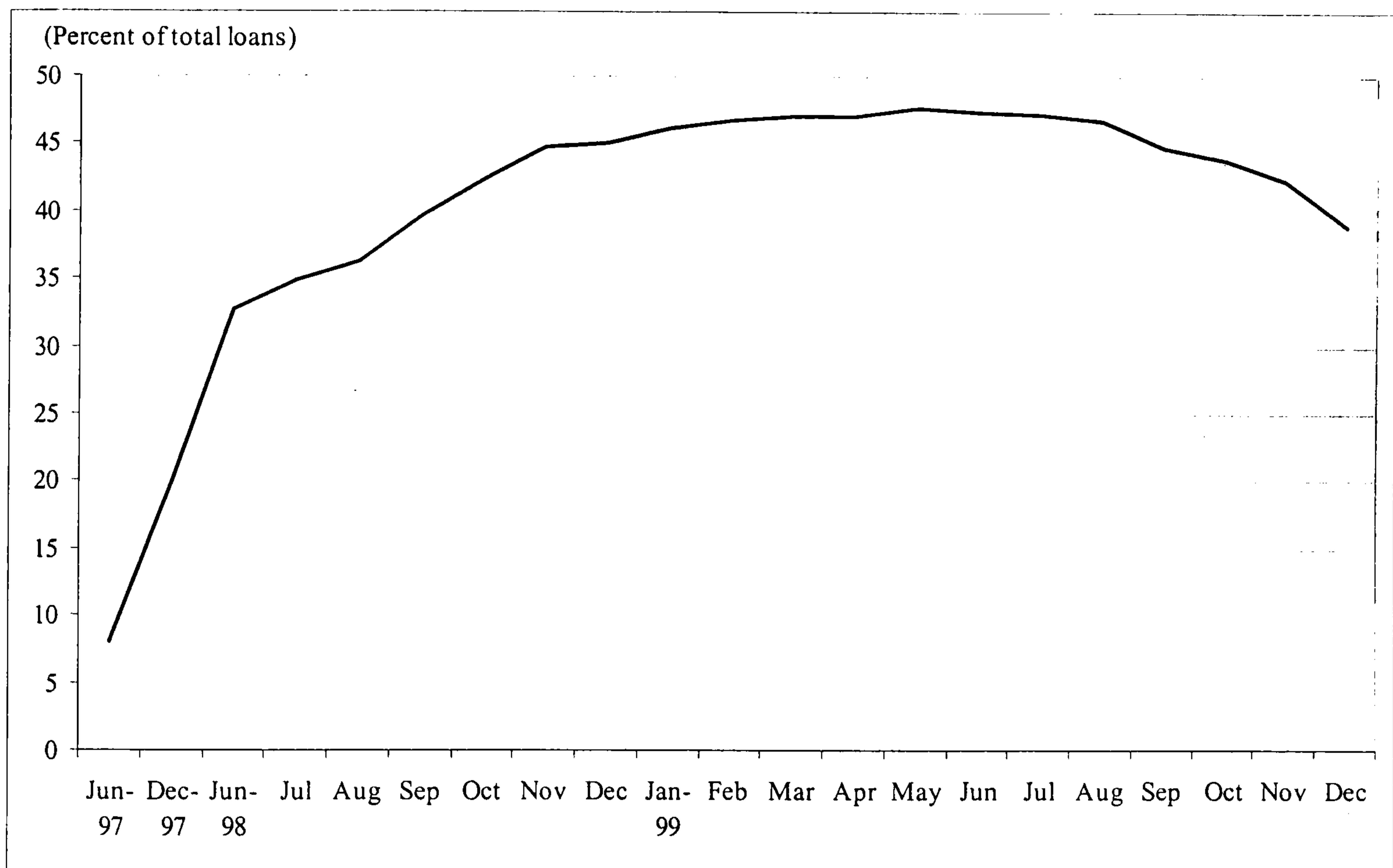


Source: Bank of Thailand

Together with the deterioration in the quality of their assets, the capital position of commercial banks was suffered by tightening prudential regulations. Since the devaluation in July, the Bank of Thailand had no longer accommodated the banks' loan problems by practicing 'regulatory forbearance', Siamwalla (2000). In contrast, the regulation standard had been even more stringent. For example, the definition of non-performing loans was changed to cover past due loans with 3 months, instead of the previous 6 and 12 months. More loan loss provisions were also required: for doubtful debts from 50 percent to 100 percent and for substandard loans from 0 percent to 15 percent. Such new standards effectively forced banks to increase their capital which was scarce in the midst of the crisis. So they could hardly extend credits because their huge existing non-performing loans had to be backed up by capital funds. This pushed non-performing loans even higher. As seen in the figure below, non-performing loans in the financial system rose considerably from 8

percent of credit outstanding in mid-1997, to 20 percent in December 1997 and to 45 percent in December 1998 (or 59 percent of GDP) until the peak in the second quarter of 1999. As for the composition of these non-performing loans, it turned out that real estate sector suffered the hardest from the crisis. At the end of 1998, almost 70 percent of total real estate lending in the financial system were non-performed.

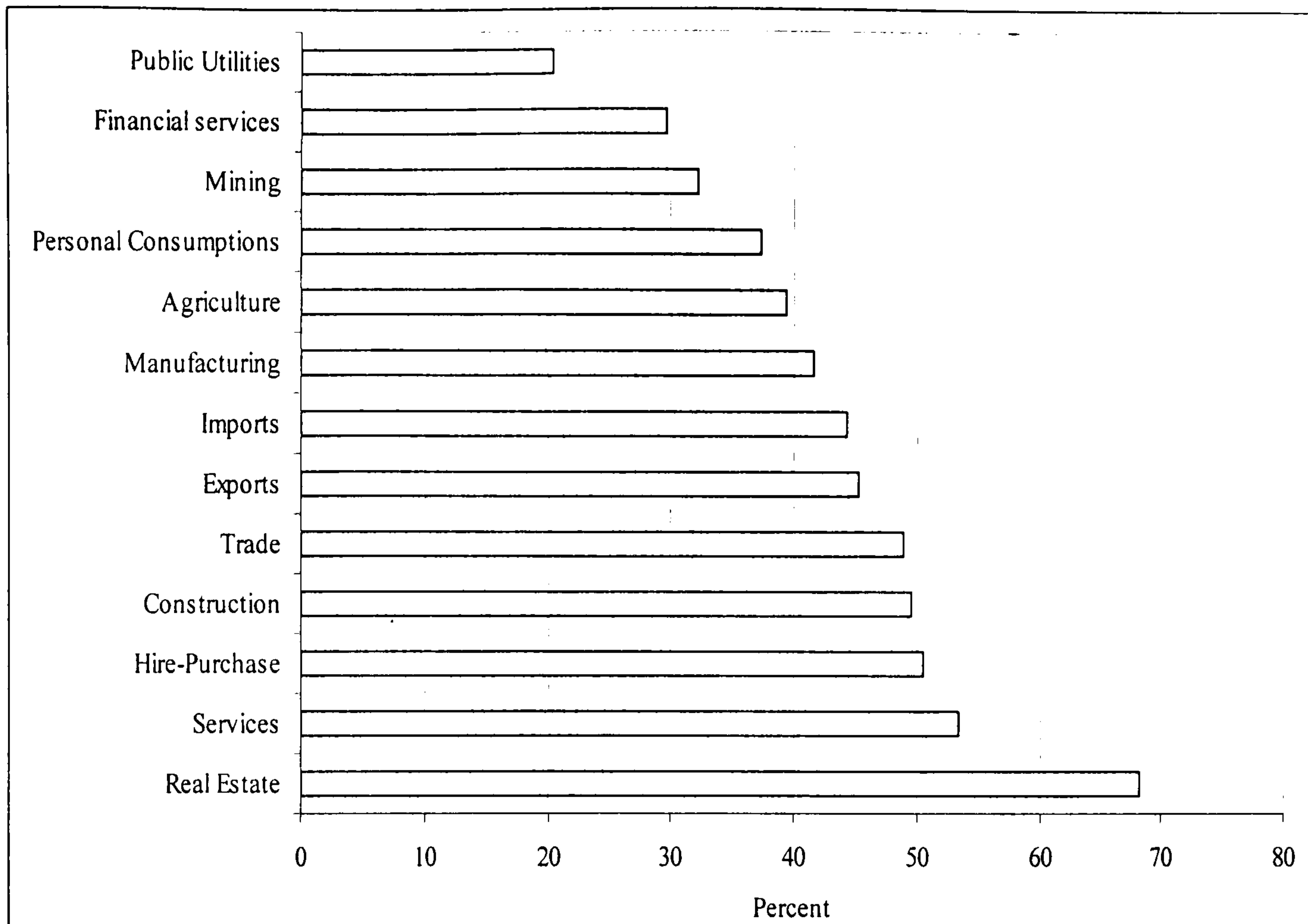
*Figure 4.13: Non-performing loans in financial system*



Source: Bank of Thailand



Figure 4.14: Non-performing loans by sectors (end 1998)



Source: Bank of Thailand

Unsurprisingly, there was substantial consolidation and ownership change in financial sector between June 1997 and December 1999. As illustrated in Table 4.12 below, finance companies suffered the hardest hit: 56 out of 91 were liquidated and the others had been intervened by the government. Thus far, the number of finance companies has substantially reduced to 23 companies, with the share of assets reduced from 24 percent to only 4 percent. As for the 15 commercial banks, one bank was closed down, 6 banks were intervened (through nationalised, merged and privatised). The remaining ones are recapitalise which resulted in a significant dilution of ownership stakes; the three largest banks (with over 40 percent of total assets) have substantial foreign ownership, ranging between 30-39 percent.

Table 4.12: Consolidation of the Thai financial sector (June 1997 and December 2000)<sup>1</sup>

	Finance companies		Commercial banks	
	Number	Share of assets	Number	Share of assets
<b>June 97</b>	<b>91</b>	<b>24</b>	<b>15</b>	<b>76</b>
Total assets of \$163 billion	State share negligible		State share 10% of total assets Foreign-owned: 0% of total assets	
Closures	56	14	1	2
Government interventions	13	4	6	14
<b>December 2000<sup>2</sup></b>	<b>23</b>	<b>4</b>	<b>13</b>	<b>96</b>
Total asset of \$133 billion	State share negligible		State share 28% of total assets Foreign-owned: 6% <sup>3</sup>	

<sup>1</sup> Excludes foreign bank branches and specialised financial institutions. Dollar figures are at a constant exchange rate of 44 baht/dollar.

<sup>2</sup> Figures exclude \$23 billion of finance company assets taken over by FRA.

<sup>3</sup> Further, the three largest private banks, with over 40 percent of total assets, have high foreign ownership (30-39 percent).

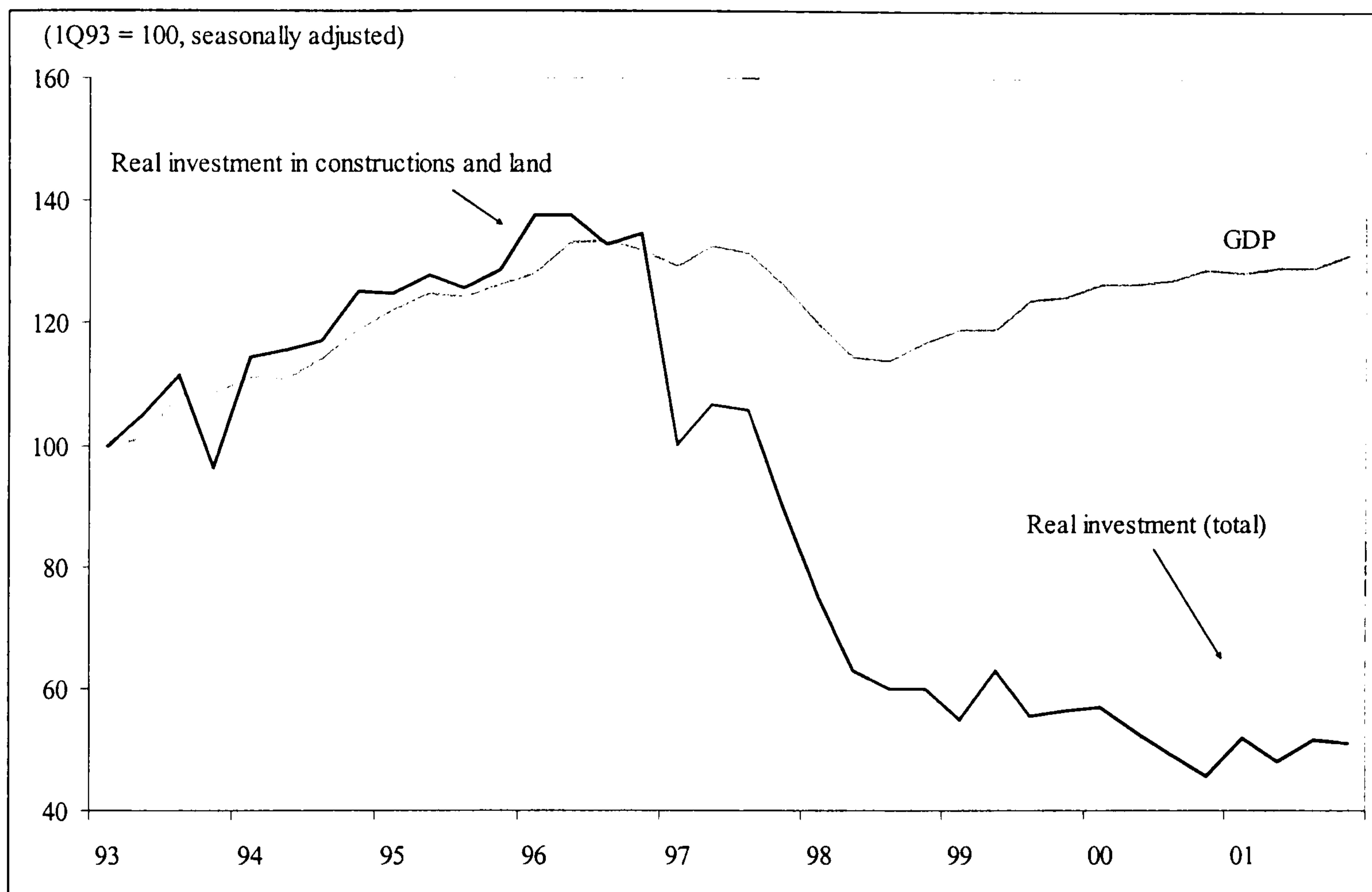
Source: IMF (2001).

#### 4.4.2 The meltdown

As a result of bubble bursting in land prices in 1996 (see Figure 4.5 above), capital stocks in constructions and land -- which also reached its peak in the first quarter of 1996 -- fell sharply by around 30 percent in the first quarter of 1997, even before the currency crisis took place in the mid of 1997, see Figure 4.15 below. But *the effects of high interest rates in the second half of 1997, together with currency depreciation, worsened corporate balance sheets even further; and this led corporate firms to reduce their capital stocks so as to repay rising debts.* The extent of recession (and recovery) has been amplified by adjustments in capital stocks until 1999. The total cumulative fall in investment from 1996 to 1999 was around 60 percent. However, adjustment on constructions and land continued until reaching the bottom in the end of 2000; capital stocks on constructions and land of corporations reduced to around 30 percent from what they hold at the peak. Note that recovery in total output took place in the second half of 1998 and, at the end of 2001,

remain the same as the pre-crisis level. The main factors were due largely to increase in private consumption and exports.

Figure 4.15: Boom, Bust and Recovery

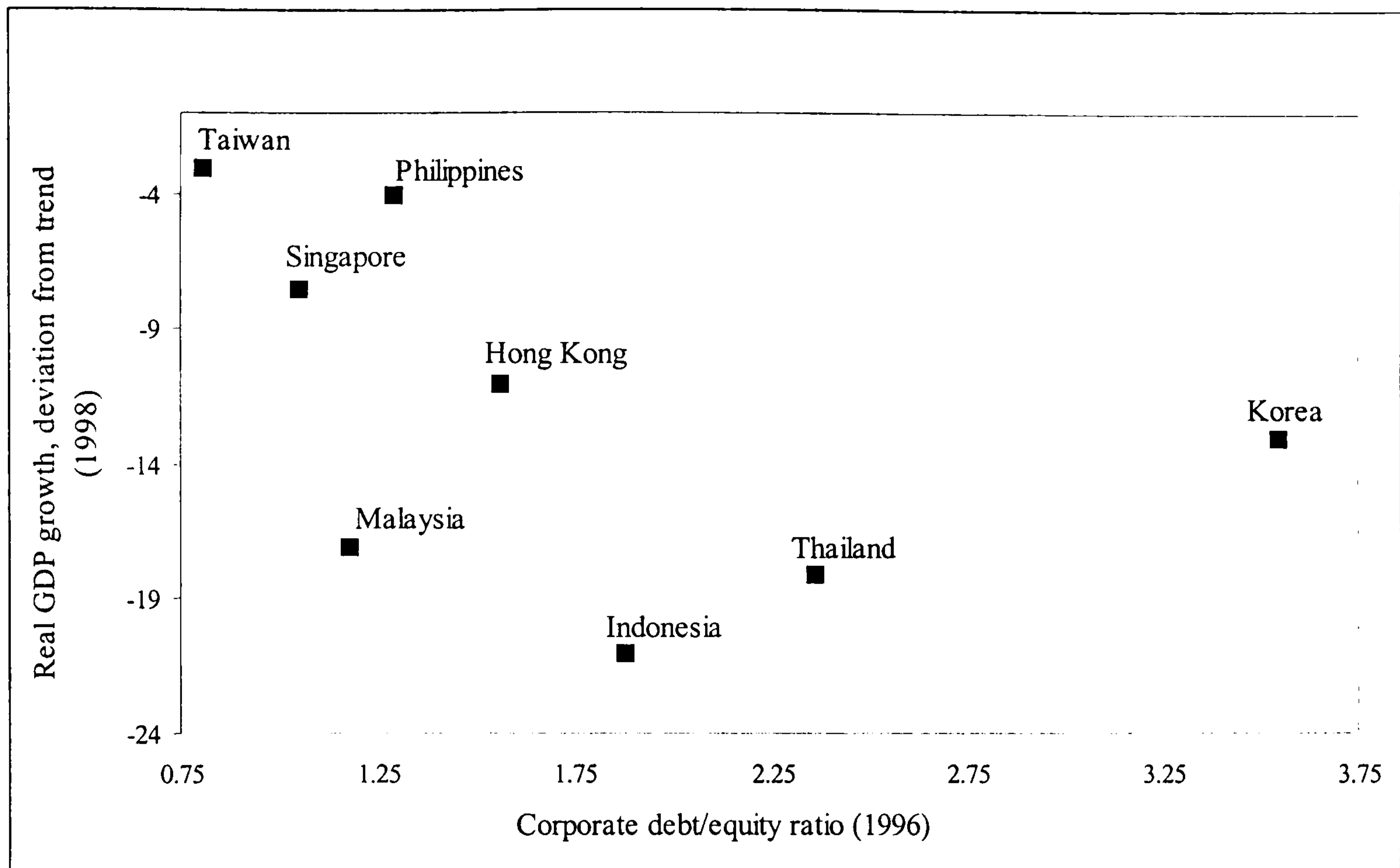


Source: National Economic and Social Development Board of Thailand.

Figure 4.16 below demonstrates an important role of corporate leverage in explaining the depth of the crisis, by plotting average debt to equity ratio of listed companies in 1996 together with real GDP growth deviation from trend in 1998 in Asian countries. Specifically, output contraction became more severe for countries which had high initial levels of leverage.



Figure 4.16: Corporate leverage and the 'balance sheet' effect



Source: Gray and Stone (1999).

#### 4.5 Concluding remarks: Some perspectives on the Thai crisis

As mentioned in the Introduction, the Asian financial crisis has often been seen and analysed as a single episode from a set of common factors. Even though the analysis in this chapter is neither theoretical nor empirical, by examining the evidence in some details for the Thai case, it is not difficult to see that there were some specific institutional characteristics (together with government policies) which had played a key role in contributing to the 1997/8 Thai crisis; and they may also shed some light on the three main competing explanations of the crisis in Asia. That is, (i) moral hazards in financial markets where implicit government bailout guarantees; (ii) self-fulfilling financial panic; (iii) balance sheet effects of credit-constrained firms. [Note that the third one does not need to be in conflict with the first two because it aims to explain the severity of the crisis and puts

emphasis on corporate sector.] In what follows, we look at the relevance of these theories on the Thai case.

Regarding the debate on the first two hypotheses, we find that both had their part in the Thai crisis but through *different* types of financial institutions. Problems in finance companies are caused by moral hazard; and the case for financial panics (especially from foreign investors) applies most to commercial banks. We argue that the reason for this is due to *un-balanced and inadequate* supervision and regulation between these two institutions.

Specifically, in contrast to commercial bank, finance companies in Thailand were subject to less stringent regulation and had limited scope of offering banking services. But when the authorities allowed these finance companies to apply for banking license on the basis of asset's size (i.e. the bigger they are, the higher chance they will be commercial bank), one way to achieve this under the competitive environment was by shifting their lending towards cyclical sector such as real estate sector (as asset prices increase, they can lend more on the basis of collateral, which in turn leads to higher asset prices). So their lending grows as asset prices increased; hence these finance companies become increasingly and directly exposed to real estate sector and asset price shocks.

Because of interest rate liberalisation, these finance companies offered higher interest rates as their investments were riskier than those of commercial banks. In effect, they gained more share in domestic source of funds at expense of the commercial banks. But the establishment of BIBF allows banks to attract cheaper funds from overseas (with tax

incentives), these pushed banks to toward short-term foreign borrowings, which in turn made them more vulnerable to a sudden reversal of capital flows and exchange rate risk.

The implication of our account of the Thai case is that there was unique equilibrium of the crisis in real estate sector and finance companies but not for the commercial banks where collapse needs not have happened.<sup>22</sup> Consequently, policy to deal with problems in finance companies and in commercial banks should have been different, i.e. insolvent finance companies needed to be closed down while banks needed liquidity. In contrast, the ways that the Thai authorities chosen to deal with these problems appeared to be the opposite, namely that of by recycling liquidity out from the banks towards the finance companies during the run up to the crisis. It turned out that the insolvent finance companies were eventually closed down while the solvent commercial banks became undercapitalised. The effects of such policy not only pushed commercial banks towards the collapse equilibrium but it also led to unnecessarily high costs of financial restructurings when the crisis came. Another policy lesson we draw in this chapter is that the Thai central bank underestimated the risk of asset price deflation due to the collapse of real estate sector.

The problems in Thailand did not end with the collapse of finance and real estate companies. There is one important institution that also plays a crucial role in the dynamics of the crisis, namely the widespread use of collateral for loans. When finance companies continued on lending to real estate firms so as to increase the size of their assets, these real estate firms use borrowed funds to speculate on land and property which are generally used as collateral for loans in other lines of businesses. This in turn increased the capacity to borrow in other sectors. Since Thai firms always have tendency towards debt financing, it

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<sup>22</sup> Based on our evidence, we do not find that loan portfolios in commercial banks were obviously unsound.



was not surprising that corporate leverage increased across the board. This is where the 'third explanation' (i.e. the 'balance sheet' effects) of the crisis is most relevant here. The use of tight monetary policy during the second half of 1997 to stabilise the currency turned out to be costly, as it opened another channel for a domestic liquidity crunch which led to widespread bankruptcies of corporate sector.

## Chapter 5

# Managing corporate debt crisis: Lessons from Thailand

### 5.1 Introduction

The institutions of bankruptcy have been a subject of the discussion at both national and international levels. Following the 1997/8 Asian financial crisis, one important issue is how to deal with simultaneous insolvency of domestic firms, owing to sharp currency depreciation and collapse in asset prices, (see, for example, Stiglitz 2001). In another part of the world, the recent crisis in Latin America has demonstrated the need for efficient mechanisms to handle sovereign bankruptcy. To ensure that debt restructuring is done in an orderly fashion, the framework of the corporate reorganisation law used in the US has received much attention in both cases. Indeed, the US Chapter 11-typed law has been imposed (as part of the IMF structural reform programme) in Asian countries and has been used as a basis for Sovereign Debt Restructuring Mechanisms (SDRM), proposed by Krueger (2001).<sup>1</sup>

The purpose of this chapter is to explore the issue relating to systemic bankruptcy in corporate sector, based on the Thai experience. The focus is on some macroeconomic implications of domestic bankruptcy reform and the policy actions taken to deal with large-scale corporate debt overhang. While domestic bankruptcy law reform would clearly help balance creditor's rights and debtor's rights, it was not an adequate response to the crisis. As argued by Miller and Stiglitz (1999), in the context of economy-wide shocks, even

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<sup>1</sup> For development and debate on such mechanism in resolving the sovereign debt, see Miller (2002).

well-managed firms can easily go bankrupt; so the mechanisms designed to handle domestic firms in normal times and during crises should be different.

In investigating the extent of corporate balance sheet problems in five Asian countries following currency and interest rate shocks, Claessens et al. (1999) find that 63 percent of the Asian firms were illiquid (i.e. earning less than debt service) and 31 percent technically insolvent (i.e. outstanding debt greater than asset). As shown in the table below, Indonesia suffered the most, where 77 and 65 percent of firms in the country were illiquid and insolvent, respectively. This was followed by Thailand with two-thirds of all firms illiquid and around a quarter were technically bankrupt. These figures suggest that liquidity problems in Thailand were much more pervasive than insolvency.

*Figure 5.1: Corporate distress in East Asia (as of 11/99)*

	Illiquid firms (%)	Insolvent firms (%)	Non-performing loans (% of GDP)
Indonesia	77	45	29.9
Korea	50	41	24.8
Malaysia	63	5	14.4
Philippines	57	16	7.1
Thailand	65	23	27.9
Average	63	31	20.8

If the private sector could voluntarily work out debts by themselves, then there would be no need to concern about size of the problems stated above. However, as argued by Hart (2000) for example, such renegotiation may be difficult, which suggests that we cannot rely purely on private solutions. Effective and orderly procedures in bankruptcy law are needed.



While there are many types of bankruptcy procedures, they fall into two main categories i.e. liquidation and reorganisation (Hart, 1995). [In the US, these two processes are known as Chapter 7 and Chapter 11, respectively.] Which bankruptcy policies to use depend on whether illiquid firm are economically viable or non-viable. If a firm is economically viable -- i.e. its value as going concern (continuation value) is greater than the value of the assets sold on a piecemeal basis (its liquidation value) -- the best outcome for it is to continue operation, since its capital has no higher value use. If, on the other hand, if a firm is non-viable, the best outcome is for its assets to be liquidated, hence releasing its assets to higher value users. Although these two procedures may be viewed as relatively distinct from each other, there are linkages between them. When a creditor initiates a liquidation proceedings against a debtor, debtors have an option to seek for bankruptcy protection by commencing a rehabilitation proceeding. Conversely, this proceeding can be converted into liquidation proceeding if it appears that a successful rehabilitation is not possible. That is, liquidation will run its course if rehabilitation efforts have failed, IMF (1999).

In the case of Thailand, prior to 1998, Thai bankruptcy law oriented towards liquidation procedure and there was no legal protection to new financing for financially-distressed firms. Following the financial crisis which began in July 1997, Thailand reformed the law by introducing a Chapter 11-typed rehabilitation procedure to prevent business from being driven into unnecessary bankruptcy because of temporary liquidity problems.

The rest of the chapter is organised as follows. Section 5.2 discusses some potential incentive problems that may arise if borrowers and creditors are left alone to work out their claims. To investigate this issue, we specifically look through the lens of the framework

analysed in Chapter 2 where we show that debt roll-overs and write-downs can be used to avoid credit crunch. In this section, however, we find that such methods may not function without extra legal powers; and this seems to be a good case for the authorities to provide ‘off the shelf’ bankruptcy procedures.

Before turning to the details of the formal insolvency processes and recent reforms, Section 5.3 takes a brief look at history of property rights in Thailand, along with political factors and cultural attitudes – which appear to play an important role in limiting the capacity to implement the law. We then show that, when the efficiency of legal system is taken into account (particularly the built-in delay involved in the judicial process), a *creditor-oriented* bankruptcy law may effectively turn into *debtor-friendly* regime. Given the extent of macroeconomic shocks that hit Thailand in 1997/8, delay may not be the worst outcome. This is because the delay helps preventing wholesale liquidation of domestic firms. However, it can create efficiency losses as efficient firms are also prevented from being restructured. Specifically, we argue that – in the situation where there exists only liquidation process (as was the case in Thailand) – strengthening the enforcement of property rights in midst of the crisis *without* ensuring that the new reorganisation law has been put in place, would potentially be dangerous. This is because it would potentially lead to downward spiral of loan recall, as analysed previously.

Since court-supervised restructuring law was not established in sufficient time to deal with the crisis, the needs for a quick resolution led Thai authorities to construct a modified version of the out-of-court workouts (based on the ‘London Approach’). Of one particular feature in the Thai out-of-court approach – which appears to be innovative in resolving systemic debt overhang in the financial system – is the degree in which the Thai authorities

help co-ordinating workout between financial institution creditors and big and viable businesses that have the most impact on the economy. We argue that this feature did help increase efficient outcomes of systemic debt resolution in midst of the crisis. This is the subject of Section 5.4 and we conclude in Section 5.5.

## **5.2 Will voluntary renegotiation avert the credit crunch?**

In their paper, Kletzer and Wright (2000) observe that sovereign states participate in mutually beneficial lending without collateral; and they develop a model to show that voluntary renegotiation may be possible. In their account, all loans are publicly recorded in ‘tombstone’ messages displayed for all to see, so any debt repudiation is visible and can be ‘punished’. Could the same logic not be applied domestically, so that when collateral values have fallen, the credit crunch is nevertheless averted by voluntary private renegotiation?

Consider the idea that creditor might roll over part of the loan, which the firm promises to repay from the traded goods available in the next period. This is an attractive prospect (as analysed in Chapter 2). For the creditor, it avoids a potentially costly liquidation and offers the prospect of repayment in full. For the debtor, the surrender of future traded goods will slow their rate of expansion, but it will ensure survival.

Will this extra lending -- ex hypothesi not collateralised -- be repaid? If the proceedings were under the supervision of the courts, as under Chapter 11 of the US Bankruptcy Code for example, then legal powers could be used to ensure repayment. But what if the only legal provisions are for the seizure of collateral? On the assumptions of the model of Kiyotaki and Moore, for example, repayment is surely in doubt. For if the self interest of



borrower and lender were sufficient to support lending without collateral in a crisis, why not at other times? Why the need for complete collateralisation under normal circumstances?

The rationale for demanding collateral for loans in the KM model is spelled out in Hart and Moore (1994) who draw the distinction between human and physical assets (i.e. property rights over physical assets can be traded but human capital is not). In Hart and Moore's model, firms cannot pre-commit their labour but they can promise to hand over control of the physical assets in the case that they fail to meet debt repayments. Collateral has a desired incentive as the threat of seizure induces firms to repay their debt. To check on why collateral is required, consider the bargaining conditions that prevail between lender and borrower, after the original loan was made but before the labour had been committed. The lender, it is assumed, has the powers of seizing land in pursuit of his claim.<sup>2</sup> So seizure is a credible outside option for the creditor. What about the borrower? What is the outside option in that case? It is assumed by Kiyotaki and Moore that the borrower can threaten to repudiate the loan by taking down-payment and labour and leaving; and that this threat is sufficiently credible that the lender only expects to receive his/her outside option value, i.e. the lender dare only lend up to value of the collateral, minus the legal costs of seizure.

It is implicit in this account that the borrower expects to be able to recommence negotiations with another lender, without adverse effects from earlier repudiation, i.e. *borrowers are anonymous*. This is a significant departure from the 'common knowledge'

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<sup>2</sup> It should be noted that under Hart and Moore's assumption, traded goods cannot be seized even when default occurs. This is because debtor simply runs away with whatever output they have and starts new business elsewhere. Under the provision of the US Chapter 7 provision, however, creditors may be allowed to grab traded goods if collateral value is less than debt obligations. So there could be some prospect of rollover allowed in the KM model if one assumes Chapter 7 provision.

assumption needed by Kletzer and Wright to sustain non-collateralised lending. Theirs may be appropriate assumption for sovereign states, as there are less than 200 countries in the world; and it may well be relevant for countries like the US where running a credit check is a standardised procedure. But it is not generally appropriate for the reason discussed by Hart and Moore, lenders will expect any voluntary rollovers to be repudiated: so -- like un-collateralised loans before the crisis -- they will not take place.

If pressing for repayment leads to the liquidation of the firm, will there not be an incentive for creditors to write down debt so as to allow for the survival of firms hit with a temporary macroeconomic shock? After all, mass liquidation will lead to a large fall in asset prices, i.e. to low liquidation values. But the problem here is that no individual lender internalises the pecuniary externality attached to his or her liquidation. If other make concessions and stabilise land prices, the incentive for the last to take land prices as given and to seize whatever is available at those prices, rather than making concessions. In short, there is a *free-rider problem*.

The above analysis implies an important role for Chapter 11-style bankruptcy institutions. As well-functioning bankruptcy law plays an important role for an efficiency market economy, the goal of the institutions of bankruptcy is to balance these bargaining powers to ensure that, on the one hand, the rights of creditors are well protected, and, on the other hand, economically viable firms are not liquidated prematurely (Stiglitz, 2001). In what follows, we look at the case of Thailand.

## 5.3 Formal legal mechanisms in Thailand

In this section, we discuss formal bankruptcy procedures in Thailand; but before getting into details, it is important to see issues in historical perspectives.

### 5.3.1 Legal origins and history of property rights in Thailand

Generally, commercial laws used around the world can be grouped into two broad traditions: common law, which is English in origin, and civil law, which originates from Roman law. Within the civil tradition, there are three major families that modern commercial laws derive from: French, German, and Scandinavian. La Porta et al. (1998) study the impact of historical origin of the legal codes on the protection of investor's rights and contract enforcement efficiency. They find that common-law countries give creditors stronger legal protections against managers. And the quality of law enforcement is the highest in Scandinavian and German-civil-law countries, next highest is common-law countries and the lowest is French-civil-law countries.

The legal system in Thailand, however, has been influenced from many sources.<sup>3</sup> Though first influenced by English common law, it has a body of codified French civil law. The commercial law, namely the Civil and Commercial Code, is derived from Germany via Japan, Siamwalla (2000): but the Thai Bankruptcy Act of 1940 appears to have been influenced by English bankruptcy law models. For example, it contains a series of 'presumptions of insolvency' which is similar to the English law concept of 'acts of bankruptcy' (Asian Development Bank, 2000a). Finally, following the 1997/8 financial

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<sup>3</sup> Most of its judges are trained in the common law tradition



crisis, Thailand has adopted the model of the US Chapter 11-typed reorganisation process, as part of the structural reform programme by the IMF.

There are, moreover, various *sui generis* factors in the Thai society that might limit the capacity to implement the law. We briefly consider two of them, namely patronage system and cultural influences.

Norton (2000) provides a historical account for the prevalent use of 'connection' in the Thai society. He argues that "The society of Thailand still carries, in various socially indirect ways, the 'baggage' of the feudal system, the Sakdi Na system, that burdened the poor and benefited those well-born and well-connected", (p. 17). He explains that under this system, the monarch owned land, labour and other economic resources. There was no private land ownership but the monarch could grant aristocrats the right to use and benefit from land. So the amount of land would reflect the power, rights and obligations of the aristocrat. Since trade was monopolised by the monarch, businessmen needed to conduct their business under the auspices of an aristocrat. A patron-client relationship between the aristocrats and businessmen was form in which the businessmen received protection from the aristocrats, and the aristocrats received pecuniary benefits in return.

In recent times, businessmen-Senators use their influence in an attempt to resist legal reforms -- particularly the foreclosure bills that would force them to liquidate their assets to pay debts, Laird (2000). Norton (2000, p.20) also reported that "when the bankruptcy law was being amended in March 1998, the legislation was unduly held-up in the Senate for several months. These legislation amendments would make it more difficult for a few

creditors to hold up the insolvency process and simpler for secured creditors to realize upon debtor's assets.”

An interview with an ex Finance Minister of Thailand who was in charge during the time of the crisis confirmed that such stonewalling has carried away right up to present day.<sup>4</sup> In order to relieve the backlog in courts, he set up the *court compromise process*. It consists of a group of mediation experts to sort out the debt renegotiation problem between debtors and lenders, the so-called Mediation Centre for Financial Disputes (MCFD). (However, such process appears to play relatively small role, compared with out-of-court debt restructuring which is the subject of our discussion in the next section.)

In addition, commercial society in Thailand is dominated by a cultural attitude that may restrict dispute resolution and the use of strict legal procedures. As described in Asian Development Bank (2000a, p. 79): “Thais are characteristically non-confrontational and conflict averse in their approach to business. Negotiation and compromise are the expectation and practice”. Moreover, Laird (2000) wrote that: Thai culture is considered a ‘soft’ culture as opposed to the ‘hard’ one like Singapore, which has more rigid values regarding good and bad. Enforcers of the law in Thailand always face a dilemma of whether to uphold the principle or to be compromised.

Litigation is also reverted to relatively infrequently, although more so in recent years e.g. it is common practice for banks to require and directors to give personal guarantees as security for corporate lending, but there has been a notable reluctance for banks to sue on such personal guarantees, as opposed to looking at other alternatives - extending the term

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<sup>4</sup>As listed in Appendix III, the interview with the ex Finance Minister (November 1997-February 2001), Mr. Tarrin Nimmanhaeminda, was conducted on 4<sup>th</sup> September 2000.

or repayments, etc. This cannot be explained by legal difficulties for creditors, as there are few defences available to guarantors under Thai law, Asian Development Bank (2000a).

### **5.3.2 Creditor vs debtor and efficiency of judicial system**

The Thai bankruptcy law, prior to 1998 was oriented towards a liquidation procedure and there was no legal protection or new financing for financially-distressed firms. Since the only way to deal with financially distressed firms was to liquidate, it might appear that the Thai law was strongly in favour of creditors. This is not the case, however, when account is taken of legal process of enforcing property rights and the built-in delays it involves.

To put this into perspective, we use data from La Porta et al. (1998) who presented country scores for measuring quality of law enforcement. Table below provides comparative information for measuring efficiency of judicial system and creditor rights protection for 7 Asian countries plus the United States and the United Kingdom. The US and UK provide a benchmark score of 10 for efficiency. But note that score for creditor rights is 1 for the US and 4 for the UK, reflecting the fact that the US has debtor-oriented law while the UK has creditor-oriented law. As shown in the table, Thailand appears to have a relatively strong creditor rights protection with the score of 3 (out of 4) while the overall average creditor rights score for 49 countries is 2.3. However, the quality of judicial process in Thailand was given a score of 3.25, compared with the average of 7.67 in 49 countries around the world. This implies that the speed of enforcement is very slow in Thailand.



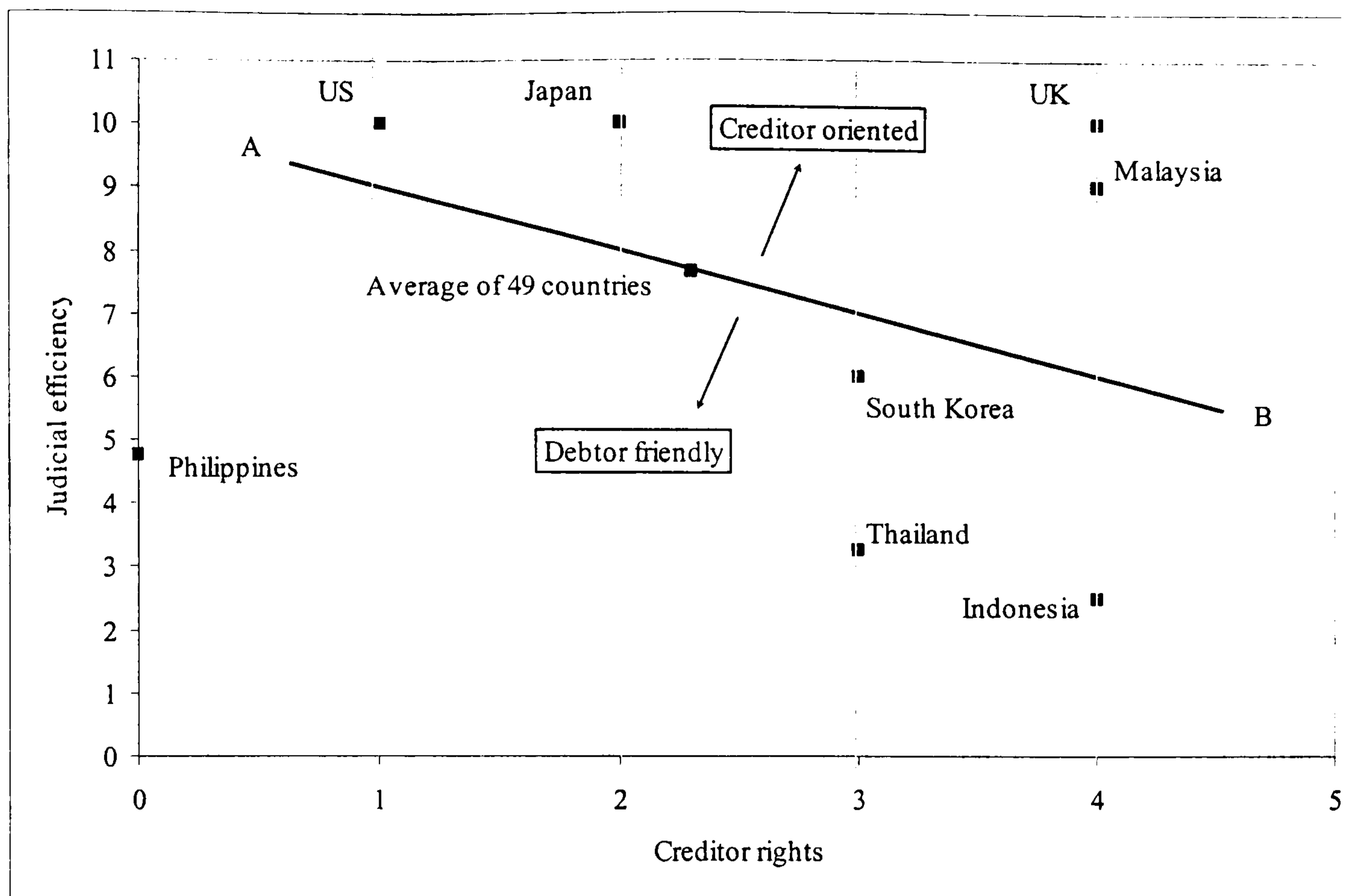
Table 5.2: Efficiency of judicial system and creditor rights

	Efficiency of Judicial System	Creditor Rights
Indonesia	2.5	4
Malaysia	9	4
Philippines	4.75	0
<b>Thailand</b>	<b>3.25</b>	<b>3</b>
Singapore	10	4
South Korea	6	3
Japan	10	2
United Kingdom	10	4
United States	10	1
<i>Average of 49 countries</i>	<i>7.67</i>	<i>2.3</i>

Source: La Porta et al. (1998)

Clearly from the creditor perspective, there is a trade off between nominal strength of property rights and the speed of enforcement. Heuristically, using data from the table above, this can be seen in the figure below. The vertical axis represents the efficiency of judicial process; the higher the judicial efficiency, the faster the speed of enforcement. The horizontal axis measures the strength of creditor rights. To understand such a trade off, we draw a benchmark line for “creditor's indifference curve between bankruptcy regimes”. Shown as AB, which passes through the average score of 49 countries, above this line, creditors are better off, below this line creditors are worse off. Its negative slope reflects that creditor is willing to substitute the strength of property rights for the speed of enforcement on a one-to-one basis. As shown in the figure, Philippines, Thailand, Indonesia creditors are worse off that the average of 49 countries. From the creditor point of view, UK is the best and Philippines is the worst in this sample.

Figure 5.1: Trade-offs between bankruptcy regimes



In addition, we can use the figure to illustrate some important points relating to financial stability. As stressed by Eichengreen (1999, p. 31), “threat to financial stability arises not from the letter of the law but from how the law is (or is not) enforced.” From the figure, when line AB moves vertically upwards, creditors are better off as it becomes more efficient in speeding up recovery of loans secured with collateral. But when AB moves downward -- despite strong creditor's property rights -- debtors are better off since they could enjoy the benefits from the delays in the actual provision of the assets (i.e. by hiding their assets or output elsewhere). During financial crisis, incentives to pay debt may well be undermined by such a weak legal regime. Mako (2001, p. 4) observes that “In Indonesia and Thailand, which had debtor-friendly legal environments, debtors achieved financial stabilization on a do-it-yourself basis, simply by unilaterally imposing a moratorium on debt servicing.” Furthermore, as a number of insolvent cases are rising which might exceed the capacity of the court to handle, then AB could move to downward to reflect lowering

quality of judicial process. According to the World Bank's calculation reported above, 65 percent of Indonesian firms and about 23 percent of Thai firms were technically bankrupt in 1998. So it is not difficult to see from the figure that any reduction in the judicial efficiency in Indonesia and Thailand would push it close to zero, implying that there is little chance for creditors to recover their loans back.

### **5.3.3 Legal and Judicial Reform in Thailand**

Formal insolvency mechanisms in Thailand are currently governed by the Bankruptcy Act 1940. This legislation went through five amendments. The first three amendments were mainly on specific details (concerning minimum threshold of debts required to file for a bankruptcy petition, for example). Prior to 1998, bankruptcy law contained only liquidation process (Chapter 7-styled).<sup>5</sup> It gave no prospect for reorganisation, particularly there was no legal protection to new financing for financially-distressed firms. Following the financial crisis which began in July 1997, Thailand reformed the law by introducing a Chapter 11-typed rehabilitation procedure to prevent business from being driven into unnecessary bankruptcy because of temporary liquidity problems. This reform was made in April 1998 (Bankruptcy Act No. 4) and came into operation from August 1998. In April 1999, further amendments to the Act (Bankruptcy Act No. 5) were made to strengthen the rehabilitation process and to reduce impediments pertaining liquidation process. In addition, the Thai government established a specialised court, the Bankruptcy Court, to handle all bankruptcy and reorganisation cases, removing these cases from the jurisdiction of civil courts. The Bankruptcy Court commenced its operations in June 1999.

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<sup>5</sup> There was also a composition process for debt to be compromised but 50 percent of the creditors and 75 percent of the total claims of creditors must support a petition and the court must approve the petition. This make the contract renegotiation to be costly, Foley (2000). More importantly, debtor-in-possession finance was not allowed.



It should be noted that such problems were recognised before the crisis, but there had been little incentive to reform the laws. As observed by Siamwalla (2000, pp. 10-11): “Decades of continuous growth before 1997 meant that the problems posed by the bankruptcy of firms were never serious enough to warrant a close examination of Thai bankruptcy laws.” More importantly, he argues that “Worse than the bankruptcy laws were the foreclosure procedures - an important consideration, given the important role that collateral played in Thai banking. It could take from three to five years to foreclose on a mortgage. [I]n the era of high growth, this created little problems, because the carrying cost caused by the delay would be partly, and sometime more than compensated by the appreciation of the land price”.

In what follows, we examine the ‘Thai- styled’ liquidation procedures, before considering the new reorganisation law influenced by the US-typed Chapter 11.

#### **(a) Liquidation procedures**

In Thailand, a secured creditor is not entitled to automatically enforce the secured property even though the debtor is in default of payment. The creditor requires the judiciary to exercise its rights. In contrast, liquidation cases in Britain, for example, are generally managed by secured creditors rather than by the bankruptcy court. When the firm defaults, the creditors have the right to appoint receivers. Only when there are assets left over does the bankruptcy court appoint a liquidator, who takes charge of selling the remaining assets to repay unsecured claims, White (1996). In Thailand, however, two main steps are required for the debt collection process: first the creditor requests a court order for seizure of collateral; and second proceeds from the sale of the collateral under court-administered

process of appraisal and public auction will be directly distributed to the creditor to the extent of the value of the secured debt, Asian Development Bank (2000b).

Under this process, there are two options for creditors to enforce their claims. They can go to the civil court (under the Civil and Commercial Code) to force debtor to sell assets to pay back loans or they can file for the bankruptcy case (under the Bankruptcy Act). The distinction between these two channels is fundamental. The main purpose of the foreclosure law under the Civil and Commercial Code is to provide means for collection of a single default debt. So it deals with action on the complaint of one single creditor and provides creditor an avenue to pursue payment of the obligation owed to it. In enforcing the rights of one creditor, however, this foreclosure law used in the civil court does not address the *collective action problem*. So there is a strong incentive for each secured creditors to be the first in line (i.e grab race), which would force solvent firm into premature liquidation.

In bankruptcy case, however, there is an *automatic stay*. This is because it deals with a ‘presumption’ of default on every obligation the debtor owes; the creditors must prove *insolvency* of the debtor.<sup>6</sup> While normal ground for this presumption is simple i.e. the failure to pay debts after a statutory demand set by a creditor, the determination of insolvency is not. Under Thai law, debtor will not be adjudicated bankrupt if s/he can prove that his or her assets exceed liabilities. Therefore, creditors can be prevented from seizing debtor’s assets if the default debtor can show that s/he is solvent. This feature appears to be in contrast to modern bankruptcy laws elsewhere; so long as debtor is unable

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<sup>6</sup> The original Thai text in the 1940 Bankruptcy Act, the term ‘insolvency’ may literally be translated as ‘excessive indebtedness’. World Bank office in Thailand (1999, p.19) reports that: There have been very few instances between 1940 and 1997 in which courts have had to interpret this criterion.”

to repay its debts when they fall due, the proceedings can automatically be commenced, IMF (2001).

While the liabilities of a debtor can easily be identified, the determination of asset values can become the major source of uncertainty, especially during the period of financial crisis. As argued by Shleifer and Vishny (1992), for example, when the industry- or economy-wide experiences an adverse shock, valuation of assets is difficult and can fall below their value in first best. This is because potential buyers in the same industry would also suffer themselves. In this situation, the ambiguity can happen when debtor prefers to use the 'first-best value' but creditors would use the 'current market value' which, during the crisis, could well be below debt outstanding to prove insolvency of the debtor. Ultimately the judgement remains at discretion of the court; as mentioned earlier, Thai courts are generally reluctant to adjudge debtors as insolvent. For example, Foley (2000, p. 3) notes that "The Thai Supreme Court has on more than two occasions upheld the additional requirement that total liabilities exceed total assets. Therefore creditors cannot use the law to threaten bankruptcy if a solvent firm fails to make a debt repayment. As seen in the 1998 Nikko Hotel Mahanakorn case, this interpretation has prevented creditors from placing into bankruptcy or reorganization a recalcitrant debtor that has significant land holdings".

Once insolvency of a debtor is established, the liquidation procedures under bankruptcy law are as follows.<sup>7</sup> The court will issue a receiving order appointing an official receiver to take charge over the debtor's property. The debtor may propose a composition to the creditor's meeting during this time, but requires a special resolution at the creditors'

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<sup>7</sup> Detailed processes can be found in Ministry of Justice (2000).



meeting.<sup>8</sup> If the debtor fails to secure a composition, the court will adjudicate the debtor a bankrupt. The official receiver will sell the property belonging to the debtor's estate and distribute the proceedings to creditors. Note that bankruptcy disputes, in contrast with the foreclosure law, do not share the debtor-versus-creditor orientation but the disputes centre on who is entitled to shares of the debtor's assets and how these shares are to be divided. This liquidation process under Thai bankruptcy law is similar to that of Chapter 7 in the US.

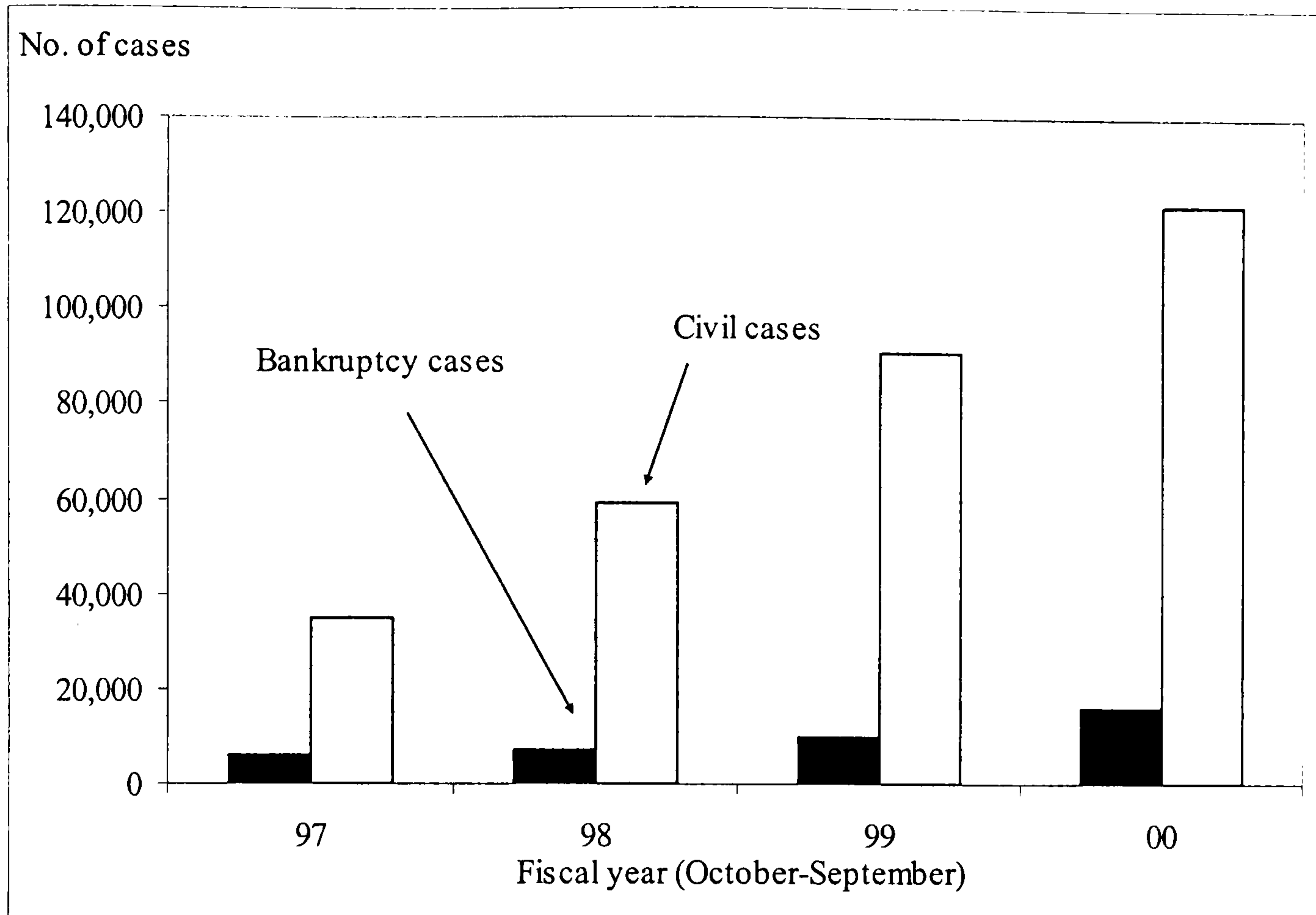
In sum, there are two main reasons that secured creditors prefer to exercise their property rights *outside* the bankruptcy law. First, the bankruptcy process, which is designed to consider the rights of more than two parties, would be costly and time-consuming. It requires more detailed factual inquiries into both the circumstances of the debtor and the conflicting claims of many creditors than does the foreclosure process under the Civil and Commercial Code in the civil courts. Second, more importantly, the main test for insolvency in Thailand has been a comparison of assets against liabilities. If assets exceed liabilities, the firm is judged to be solvent and the case will be no longer a matter for the bankruptcy court, so the creditor would have to take their claims to a civil court instead.

Unsurprisingly, as shown in the figure below, the civil court plays a major role in debt collection and enforcement of security rights in Thailand. The utilisation of the civil court is much greater than that of the bankruptcy court, as evidenced by around 120,000 cases at the end of September 2000, compared with less than 20,000 cases at the bankruptcy court over the same period.

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<sup>8</sup> I.e. one-half of the creditors in number and three-fourths of the creditors in value.

Figure 5.2: Liquidation cases in Thailand



Source: Legal Execution Department, Ministry of Justice.

However, one major impediment to the enforcement of property rights in the civil court is the *delay in the judicial process*. While the 1999 amendments have shortened the completion time of all court processes down to 33 from 42 months (from 60 to 42 months if the case is appealed), it still takes longer than three years if the process of auctioning collateral is included, World Bank (2003).

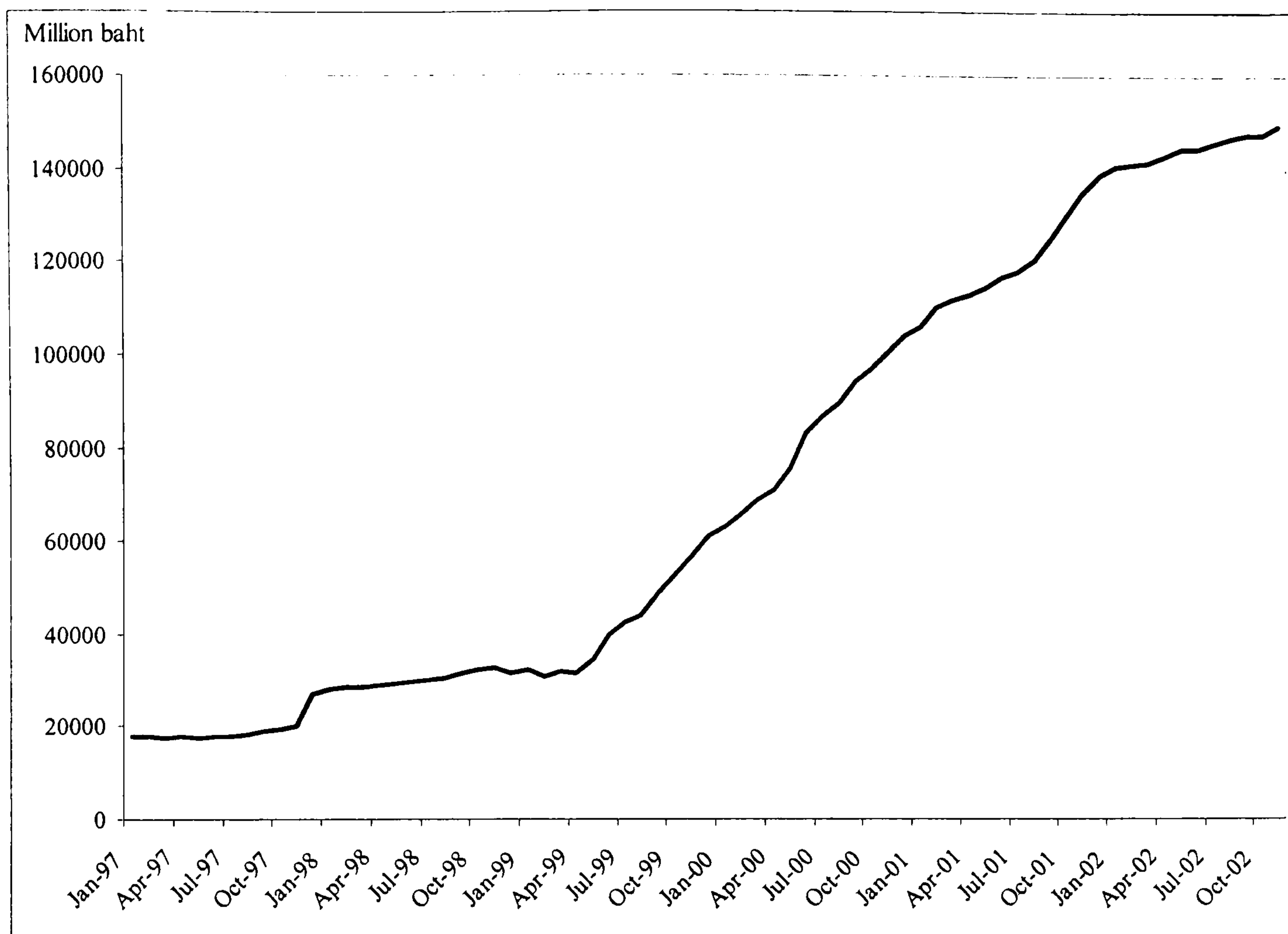
Nevertheless, given the extent of macroeconomic shocks that hit Thailand in 1997/8, delay may not be socially inefficient. It should be noted that the new reorganisation procedures did not exist in Thailand until August 1998, i.e. one year after the crisis began in mid 1997; and there is no automatic stay in enforcing property rights in the civil court. If there were no delay, not only non-viable companies but viable firms (which would otherwise be reorganised) would have been liquidated. In this situation, strengthening Chapter 7-typed

liquidation and speeding up the judicial process in civil court without ensuring that Chapter 11-typed reorganisation law is in place, can lead to vicious spiral of loan recalls and collapsing asset prices. The figure below clearly illustrates the potential danger of speeding up the process of enforcing property rights. Since April 1999, when the enforcement of property rights began to be strengthened, collateral foreclosed by the Thai commercial bank has increased considerably; however this was one year after the introduction of the reorganisation law in April 1998.

To be sure, the costs of such delay depend on proportion of viable firms in the economy. If a number of firms are economically non-viable, the delay will result in unjustified postponement of liquidation of these firms and thus preventing re-allocation of resources. But, if majority of firms are viable but temporarily unable to repay debt, the delay in the judicial process would help to avoid inefficient liquidation. In systemic crisis, *excessive* delay may, however, leave creditors unable to resolve their own balance sheets and hence incapable of resuming normal lending which is necessary for economic recovery, Westbrook (2001). This justifies the need for the Chapter-11 type reorganisation law.



Figure 5.3: Property foreclosed by Thai commercial banks



Source: Bank of Thailand

### (b) Court-supervised reorganisation law

The process of business reorganisation under the new law is most similar to Chapter 11 of the US Bankruptcy Code. The aim is to promote reorganisation of economically viable firms as going concern and thereby avoid inefficient liquidation of distressed firms. The procedures under the new law start with the filing of a petition for restructuring (by either debtor, creditor or government agencies) but insolvency test is also required as a trigger mechanism of the process. (Figure 4.4 below provides a summary of the reorganisation process, together with the liquidation process under the new Thai bankruptcy law.) In what follows, we describe the main elements of the new bankruptcy law<sup>9</sup>, before turning to discuss their implications during the crisis.

<sup>9</sup> Detailed processes can be found in Ministry of Justice (2000).

1. Automatic Stay: When the court approves the application, it gives the debtor protection by declaring an automatic stay. The stay will prevent both secured and unsecured creditors from pursuing their debts by enforcing their civil judgment or filing a bankruptcy petition against the debtor. During the stay but before the reorganisation order is issued, the existing management remains in control of the company subject to the limitation that it can only conduct company on the ordinary course of business. The stay will be effective until (a) the expiration of period of time for implementation of the plan, (b) the date on which the plan is accomplished successfully, or (c) the date on which the court dismisses the petition, disposes the case, repeals the order for a business reorganisation, cancels the business reorganisation, or issues a receiving order.

2. Debtors-in-possession finance: A creditor who advanced funds to an insolvent debtor for the purpose of allowing the debtor to continue its operations, has the *priority* to file a claim in bankruptcy to recover such funds.

3. Planner selection and the plan: If the court is satisfied that the debtor is insolvent and has the potential of achieving success in business, the court will then issue the reorganisation order. Once the reorganisation order is issued, the court will have to appoint a planner to form a reorganisation plan. Unlike the US Chapter 11 (in which incumbent debtor generally runs the company) and the UK Administrative Receivership (in which independent practitioner takes control),<sup>10</sup> the Thai reorganisation law gives priority to debtor in choosing his/her planner but creditors can reject this and select their own planner with a vote amounting two-third of the debt value. The plan must be prepared within three

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<sup>10</sup> This feature is one of the main differences between the US and the UK reorganisation laws, Hart (1995).

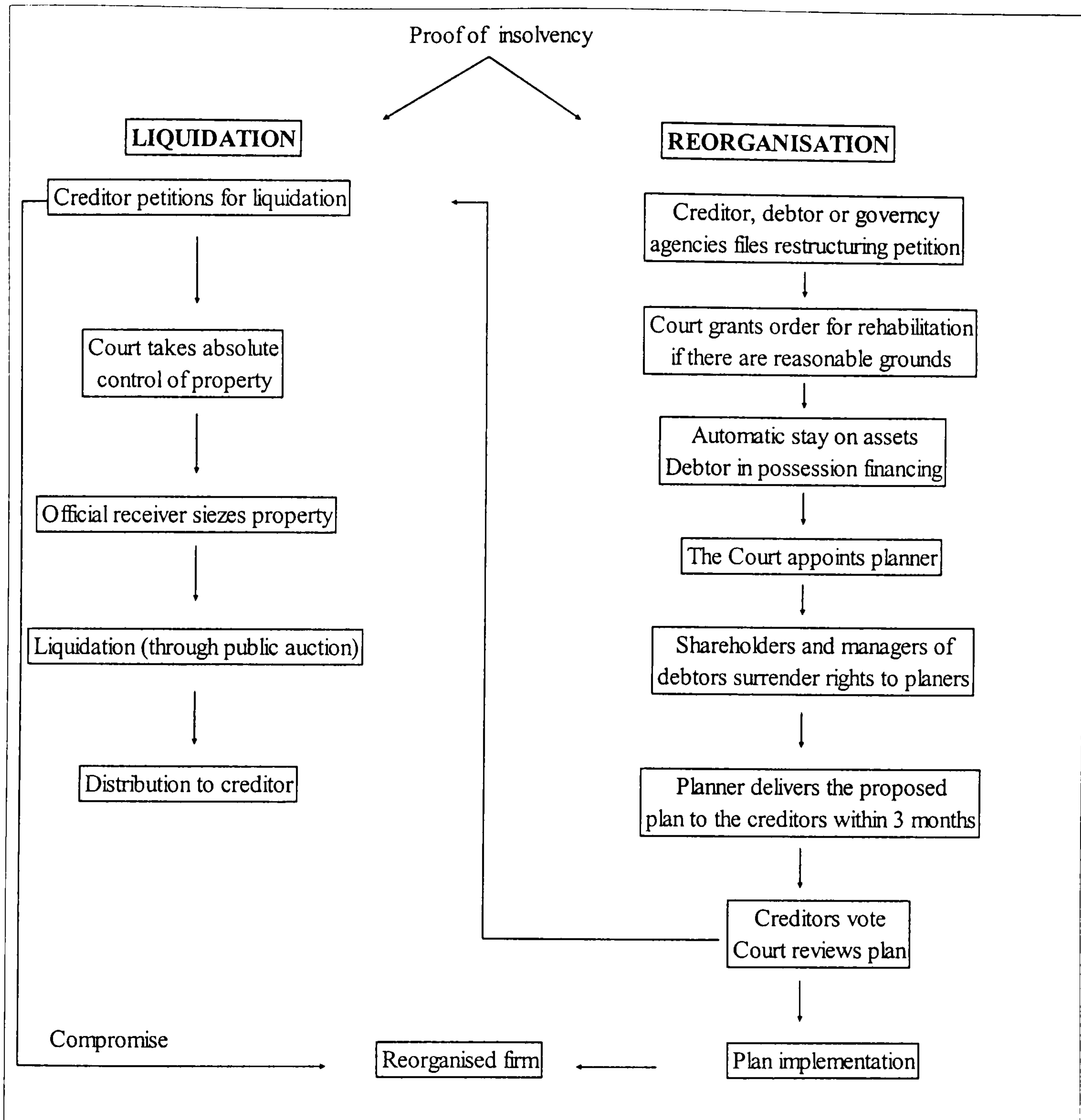
months of appointment. The planner will also have the power to run the business during the reorganisation under the supervision of official receiver and the court.

4. Classification of creditors and 'cram down': If the plan receives the approval from creditors (passed by any creditor class or a group of creditors owed at least 50 percent of the total debt), it will then be submitted to court for a confirmation. The time period limitation for the plan is five years but may be extended by the court. If the process fails to help the business, the court could declare the enterprise bankrupt and the liquidation under the bankruptcy law will follow.

Despite the reform, the utilisation of court-supervised reorganisation law in Thailand has been very low. Since the establishment of the Central Bankruptcy Court in June 1999, the total number of filings for business organisation from June 1999 to December 2002 was only 316 cases (i.e. 8 cases per month). One of the main reasons is that debt enforcement mechanisms in Thailand are subject to a long delay and hence debtors do not face an *immediate threat* of having their assets seized by creditors.



Figure 5.4: Summary of the Thai Bankruptcy Law



Source: Foley (2000).

## 5.4. Dealing with systemic bankruptcy

While reforming bankruptcy procedures is necessary so as to ensure that debts have been worked out in an orderly fashion, they have played a limited role in the resolution of corporate debt crisis in Thailand. This is because *time* will be required for the bankruptcy rules and institutions to become effective in the country where they have only recently been introduced, Claessens et al. (2001). Second, *cultural and political factors* may have reduced the capacity to implement to law.

Third and more importantly, the *nature of the bankruptcy law* itself is not designed to deal with the large scale debt problems. Specifically, Stiglitz (2001), and Miller and Stiglitz (1999) argue that even though a perfect bankruptcy system has been in place, it would not be sufficient to deal with large macroeconomic shocks, so procedures for handling bankruptcies in normal times and during crises should be different. This is because normal bankruptcy procedures which deal with individual cases might fail to internalise the price effects of the asset fire-sales. They argue for a case of a “super Chapter 11” -- a new provision where firms can automatically write off debt increases, due to devaluation, in excess of a given limit. However, such proposal has not been put into test. Furthermore, Claessens et al. (2001) observe that a super Chapter 11 may be unnecessary for East Asia. This is because not many firms were prematurely liquidated or had gone through bankruptcy procedures, as the normal bankruptcy regime ceases to work properly due to overwhelming cases in court and hence no significant loss of value seems to have occurred as a result of not adopting such a super bankruptcy rule.

In this section, we examine the actual policy response used in Thailand to address the systemic debt problems, i.e. the establishment of an out-of-court framework for debt

restructuring. This framework is a variant of the ‘London Approach’, developed by Bank of England in 1970s. In what follows, we begin with some brief background on the London Approach and then discuss in details on the modified framework used in Thailand.

#### **5.4.1 A brief history of the ‘London Approach’<sup>11</sup>**

The London Approach was first created by the Bank of England in response to the recession in the mid-1970s when a number of industrial companies was having problem servicing their debts to commercial banks. The aim was: to minimize losses to creditors and other parties; to avoid unnecessary liquidations of fundamentally viable debtors; and to prevent failure of attempts to provide financial support to viable debtors. The main role of the Bank was by co-ordinating among banks and debtors; and arranging major bank lenders to play the lead role. Then, at the meetings, the position of all banks was put on the table so as to see what actions needed to be done. Not only banks who wished to call their loans were persuaded not do so, they were also asked to provide the new money to companies in trouble (with or without security or priority of claim). Company’s management often had to change either by agreement or a condition imposed by bank creditors or institutional shareholders. In this case, the Bank of England also helped to find suitable people to take the appointment. It should be noted that the success of the London Approach appears to depend on the level of ‘trust’. As noted by Kent (1997, p. 3): “companies are normally, and properly, reticent about discussion their affair with anybody except their professional advisers and their bankers. When approached, however, they were willing to confide in the Bank of England for two reasons. First, the Bank was trusted.

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<sup>11</sup> Further details on the London Approach can be found in Kent (1997), where this section draws heavily from.



Second, they knew that the Bank's approach would be impartial, independent and confidential.”

During the 1980s, financial environment in the UK had changed, in particular many corporate firms found themselves benefited from competitions among banks and hence leveraged up their balance sheets by short-term borrowing (associated with the financing of mergers and acquisitions). Consequently, towards the end of the decade but before the onset of the recession, many firms were highly leveraged and had their sources of financing from many banks. On another side of the coin, Kent notes that “many banks entered the recession with a corporate loanbook which had grown rapidly during the previous five years and which included exposures to companies which they knew little about”, (p. 5). When the economic downturn began in 1989, banks began to protect themselves by calling in loans which created severe liquidity problems for firms. In contrast with the 1970s experience, the Bank of England reduced its direct contact with companies in trouble but instead designed a generally-agreed restructuring framework so as to leave it entirely with financial institutions and companies in trouble. Note that the Insolvency Acts had just been revised and the changes had not been put into place. Kent (p. 6) writes that: “An important consideration for the Bank of England was whether any role was justified. Was there a market failure which created a public interest justifying an official role? It concluded that there was”.

At this time, there was a debate whether the Bank of England should formalise its framework into a written document. However, “many foreign banks felt that if the framework were formalised in this way, it would invite legal challenge, and perhaps

scrutiny from their own domestic supervisors”, Kent (p. 7). So the Bank decided to leave the framework unwritten and flexible.

The London Approach, therefore, is a general guidance on how bank creditors should respond when their borrowers are in financial troubles. The main elements of the London Approach are: (i) bank should keep in place the facilities of their borrowers and not appoint receivers; (ii) decisions should only be made on the basis of comprehensive information; (iii) banks should work together on what terms firms should be given a financial lifeline; (iv) the seniority of claims should be recognised.

Since the London Approach were voluntary by nature and involvement of the central bank’s intervention was limited, the need for a quick resolution had led many Asian countries to modify the framework in many ways: for example, by adopting time-bound deadlines and penalties for non-compliance, and creating formal arbitration mechanisms, Asian Development Bank (2001).

But such modifications are varied between countries. As shown in the table below, both Korea and Thailand appear to be the most advanced framework, followed by Malaysia which provides only a platform for renegotiation but the committee does not have legal powers. Note also that severity of penalties has varied among countries.

Table 5.3: Overview of out-of-court workouts in East Asia (12/2000)

Out-of-court procedures	Indonesia	South Korea	Malaysia	Thailand
All or the majority of financial institutions signed on to accord	No	Yes	Yes	Yes
Formal process of arbitration, with deadlines	Yes	Yes	Yes	Yes
Provision of penalties for non-compliance	No	Yes	No	Yes

Source: Asia Economic Monitor (2001)

### 5.4.2 The Bangkok Approach

The Thai Corporate Debt Restructuring Advisory Committee (CDRAC), setting up in June 1998, works as a special out-of-court mediator to restructure debt of target groups of businesses proposed by members of CDRAC.<sup>12</sup> In the first stage, they were principally large businesses, ranked by level of debt outstanding. After one year of operation, the scope of target groups was later expanded to include small and medium businesses.

Since Thailand has never experienced such a large-scale debt restructuring before, CDRAC has initially adopted a set of principles for voluntary workouts (the so-called “Bangkok Rules”, see Appendix I for details) based on the London Approach, as mentioned above. The aim is to provide a guideline for debt restructuring involving multiple creditors and large debtors. This framework is a market-based approach and has no legal binding for debtors and among creditors. The Bangkok Rules contains the following 3 important elements: (1) Automatic stay of existing financial facilities; (2) Appointment of lead institution or steering committee to co-ordinate the entire process and discussion; (3)

<sup>12</sup> It consists of five associations, namely representatives from the Federation of Thai Industries; the Thai Bankers' Association; the Foreign Bankers' Association; the Finance Companies' Association; and the Board of Trade.



Debtor-in-possession finance so that new loans can be extended during the restructuring process and receive either priority or fair treatment status. In addition, since the main objective of CDRAC is to reduce non-performing assets in the financial sector, the restructuring process focuses only on creditors that are financial institutions and trade creditors are excluded.

To speed up the resolution of conflicts among creditors and so to expedite the restructuring process, in March 1999, the Bangkok Approach was further complemented by (i) Debtor-Creditor Agreement on Debt Restructuring Process (DCA) and (ii) Inter-Creditor Agreement on Restructuring Plan Votes and Executive Decision Panel Procedures (ICA).

Note that while these two agreements are on voluntary basis but once signed they are legally binding. The ICA is a process for inter-creditor arbitration within certain time limits and has enforcement mechanism for non-complying creditors (e.g. the penalty of up to 50 percent of their claims if breaching the contract). In addition, if creditors are unable to agree on restructuring plan, CDRAC can use its special authority to resolve disputes among financial institution creditors, and fine creditors (up to 10 percent of their claims if failing to vote either for or against a proposed plan or to support an approved plan). Such agreement aims to reinforce out-of-court debt workout of large businesses and to reduce conflicts among multiple creditors.

The DCA has also set out the limit timeframe for debtors and creditors to complete debt restructuring (a five-to seven-month schedule for developing and agreeing on a workout plan) and the requirement that debtors are exempted from being charged at default rate during debt restructuring. In order to press for full participation and cooperation, debtors who refuse to sign the DCA will be filed for bankruptcy by creditors within two months

from the agreement date. In addition, debtors are required to provide full information as regards all their financial status and obligations so that debtors and creditors have a clear timeframe to prepare restructuring plans. Note that the terms and conditions in the ICA and DCA are basically set up along the line with the court-supervised reorganisation procedures, but the out-of-court workout by CDRAC contains less procedures and the approval process of a restructuring plan is easier than that of a case filed in court. CDRAC also requires creditors to choose between voluntary restructuring, court-supervised reorganisation or bankruptcy within 90 days of the initial meeting between main or lead creditors and debtors. This process is intended to produce agreement on a restructuring plan, submission to inter-creditor arbitration, or petitions for foreclosure or insolvency within six to eight months.

Furthermore, a number of incentives to attract both creditors and debtors to come to negotiating table are introduced.<sup>13</sup> The main measures include the following: (1) Financial institutions are allowed to *reclassify their non-performing loans* back to normal/performing loans once a restructuring agreement is signed among creditors and debtor. This permission could significantly lessen banks' non-performing loans and hence their loan loss provision requirements. (2) *Regulatory forbearance on equity ownership*: to facilitate debt-equity swap as one solution for debt workout, equity participation by banks in debtors' companies above the regulatory ceilings is now permitted for up to 3 years. Normally, banks are not allowed to invest over 10% of a company's equity, and altogether over 60% of their own capital. (3) *Tax and fee relaxation*: various taxes and fees on the transactions arising from debt restructuring (usually involving deals and transactions on collateralised properties) are exempted to lessen the cost of debt workout.

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<sup>13</sup> See Appendix II for more details.

CDRAC has played a very active role in helping to resolve the non-performing debt problem in Thailand. CDRAC targeted 689 cases for debt restructuring under DCA process in the. These 689 companies represent around 1.5 trillion baht, i.e. 56 of the total non-performing in Thailand (as of July 1999). The remainder of Thai non-performing loans were in small and medium-sized or individual cases. In the year 2000, the number of restructuring cases resolved total 178,487 cases, compared to 148 reorganisation cases in the bankruptcy court over the same period.

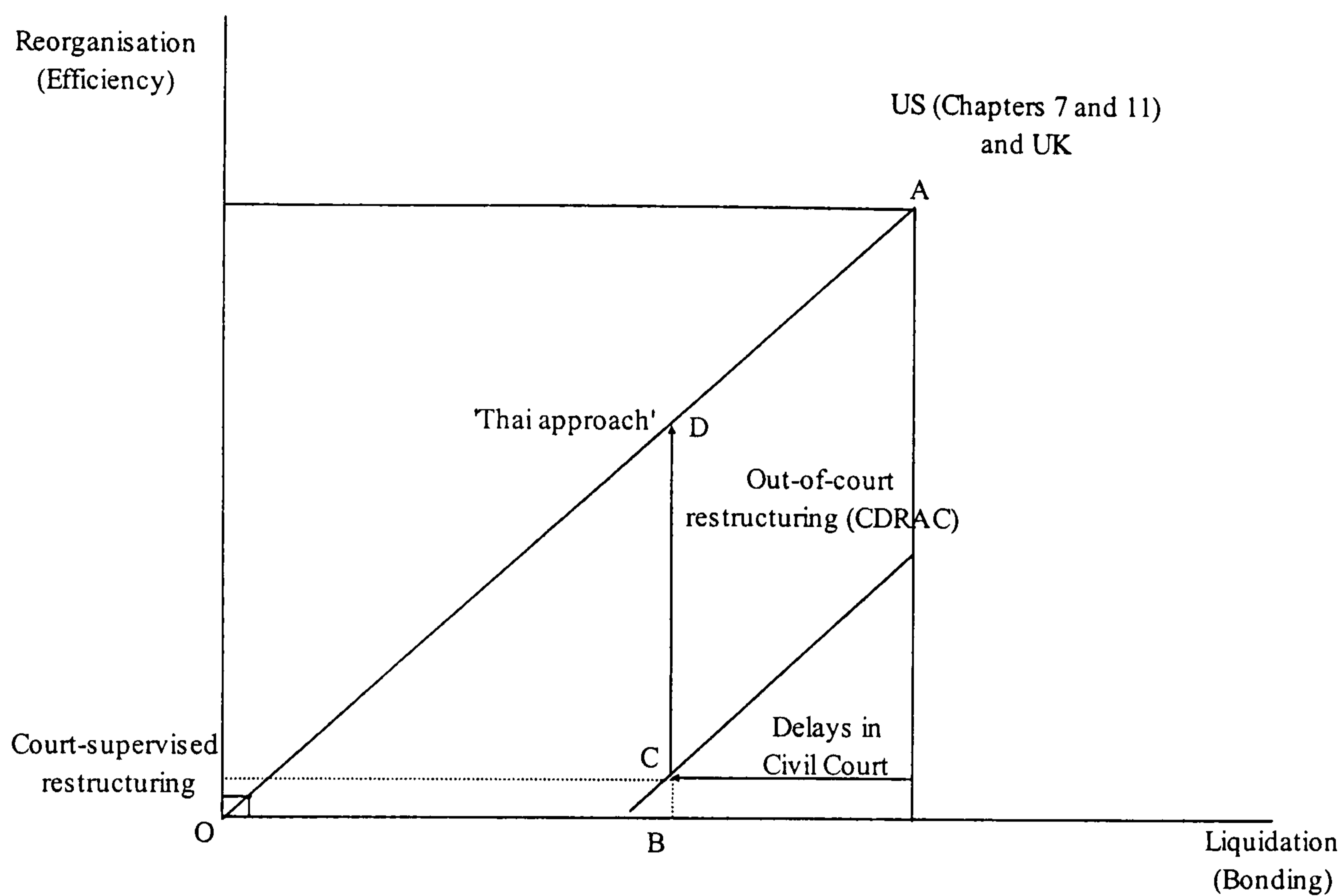
### **5.4.3 CDRAC as ‘filtering device’**

How out-of-court restructuring might improve efficiency in resolution of the crisis in Thailand can be illustrated graphically in the figure below where vertical axis represents reorganisation and the horizontal axis is liquidation. As noted in Hart (1995), a good bankruptcy procedure should preserve: (i) ex post efficiency so as to maximise value of the proceedings available to creditors (and debtors); and (ii) the bonding role of debt by penalising firms adequately in bankruptcy states.<sup>14</sup> Moreover, it should balance the rights between creditor and debtor; so any point lying on the 45 degree line OA should ensure that bankruptcy procedures deliver efficient outcome i.e. a firm should be reorganised if its continuation value is greater than liquidation and should be liquidated otherwise. Any point above OA would give rise to strategic default by debtors and any point below OA would lead to excessive liquidation.

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<sup>14</sup> and (iii) preserve the absolute priority of claims





As previously mentioned, the liquidation process was subject to a long delay and, prior to the crisis, there was no reorganisation prospect for economically viable firm, point B in the figure captures this situation, implying that all firms would be liquidated. Point C in the figure illustrates the situation when Thailand has introduced a new reorganisation law and strengthened its judicial process. However, given the widespread corporate distress, the attempt to speed up debt collection has been undermined by increasing number of cases. So in this figure, we assume that the time required to liquidate non-viable firms essentially remain unchanged. However, the out-of-court workouts through CDRAC contain less procedures and the approval process of a restructuring plan is faster than that of a case filed in court. Even though the capacity of CDRAC to facilitate debt restructuring cases would also limit, the selection of only large and viable companies that have the most impact to the economy can greatly improve efficiency, corresponding to point D in the figure.

#### 5.4.4. Some practical issues

(i) Despite the renegotiation progress through CDRAC has been fast, the method in which debts have been restructured may be of concern. It appears that the focus primarily was on temporary easing of debt servicing rather than operational restructuring (e.g. asset sales, debt/equity swaps and debt write-downs). As shown in the Table below, during the past three years, more than 60 percent of debt outstanding had been through maturity extension and grace period. In many such cases, there is concern that corporate debt classified as restructured could return to non-performing status once grace periods have been exhausted.

*Table 5.4: Summary of debt restructuring approaches (in percent of total debt)*

	1999	2000	2001
Rescheduling	41	41	40
Grace period	20	21	24
Interest rate reduction	22	20	17
Debt writedowns	6	6	9
Debt-to-asset swap	6	5	6
Debt-to-equity swap	3	4	3
Others	2	3	2

Source: CDRAC.

(ii) Although the Bangkok Approach framework and ICA and DCA agreements were well developed, there are still weaknesses. The critical one is the degree of enforcement, especially the power to enforce debtors to cooperate. As noted in Hart et al. (1997, p.6): “even when out-of-court settlements can be agreed, the bargaining position of creditors is compromised by the lack of an effective collective procedure.”

## 5.5 Concluding remarks

This chapter examines some key issues that could arise in coping with large-scale corporate bankruptcy. The Thai experience has shown that the extent to which an insolvency system to be effective depends crucially not by the letter of law but whether they can be implemented. It also needs to consider along with factors regarding political and cultural influences which are varied in each countries. Thailand has a long history of pro-debtor bias – together with cultural attitude that restricts dispute resolution; this was further aggravated by the limited efficacy of the judicial system. While some of these deficiencies have since been corrected and the formal reorganisation procedure has now been introduced, it is not adequate to resolve the systemic debt problems.

As for macroeconomic implication of bankruptcy reform, we suggest that *sequencing* foreclosure and reorganisation laws needs to be delicate. By strengthening enforcement mechanism without ensuring that reorganisation procedures are in place can set in motion the general equilibrium effects of loans recalls and falling asset prices. However, it is also important that once reorganisation law has put into place, the enforcement mechanism will need to be ‘activated’.

We have shown that when the efficiency of legal system is taken into account (particularly the built-in delay involved in the judicial process), a creditor-oriented bankruptcy law may effectively turn into debtor-friendly regime. In the case of systemic debt crisis, while such build-in delay may help prevent fire-sales of assets, it can also create efficiency losses as efficient firms are prevented from being restructured. This justifies the need for Chapter 11-style reorganisation law. But the latter played a minor role in the resolution of the debt crisis in Thailand. An alternative mechanism that turned out to be effective in Thailand is



the establishment of out-of-court restructuring framework. We find that there are two important features in this Thai-style framework that can greatly help increase efficiency and might be an alternative to the court-supervised reorganisation; namely (i) first priority in restructuring is given to large and efficient companies that have the most impact to the economy; (ii) the focus is on resolving debt owned by financial institutions, so that normal lending can be resumed and economic recovery facilitated.

## Appendix I

### Framework for Corporate Debt Restructuring in Thailand: A Summary<sup>15</sup>

#### A. The “Bangkok Approach”

This framework is non-binding and non-statutory *but* is a statement of the approach that is expected to be adopted in corporate workouts involving multiple creditors. The framework exists based on general market acceptance and its practices may be altered or amended to serve the needs of the business and financial communities. The basic premise is to ensure that a business can survive if there is a reasonable possibility that it is viable. The framework is designed to promote a spirit of timely co-operation amongst concerned stakeholders for their mutual benefit. There is no intention within this approach to force any creditor to forgo any rights. The aim is to (i) minimise losses to all parties through co-ordinated workouts; and (ii) avoiding companies being placed unnecessarily into liquidation, thereby preserving jobs and productive capacity wherever feasible.

The guidelines containing 19 principles are as follows:

1. Any corporate debt restructuring should achieve a business, rather than just a financial restructuring to further the long term viability of the debtor.
2. Priority must be given to rehabilitate assets to performing status in full compliance with Bank of Thailand regulations.
3. Each stage of the corporate debt restructuring process must occur in a timely manner.
4. From the first debtor-creditor meeting, if the debtor’s management is providing full and accurate information on the agreed schedule and participating in all creditor committee meetings, creditors shall “standstill” for a defined, extendable period to allow informed decisions to be made.
5. Both creditors and debtors must recognise the absolute necessity of active senior management involvement throughout the duration of the debt restructure.
6. A lead institution, and a designated individual within the lead institution, must be appointed early in the restructuring process to actively manage and coordinate the entire process according to defined objectives and deadlines.
7. In major multi-creditor cases, a steering committee representative of a broad range of creditor interests should be appointed.

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<sup>15</sup> Source: CDRAC, Bank of Thailand

8. Decisions should be made on complete and accurate information which has been independently verified to ensure transparency.
9. In cases where accountants, attorneys and professional advisors are to be appointed, such entities must have requisite local knowledge, expertise and available dedicated resources.
10. While it is normal practice to request the debtor to assume all the costs of professional advisors, lead institutions and creditors committees, creditors have a direct economic interest, and hence a professional obligation, to help control such costs.
11. The Ministry of Finance (MoF) and the Bank of Thailand (BoT) should be kept informed on the progress of all debt restructuring to aid the review and regulatory and supervisory framework and to facilitate corporate debt restructuring.
12. The role of the Corporate Debt Restructuring Advisory Committee (CDRAC) (i) shall follow-up developments in debt restructuring; (ii) shall review and implement policies to facilitate debt restructuring for the public good; and (iii) may also act as an independent intermediary in the restructuring process where cases are particularly difficult or where other efforts have failed. The committee may well be a catalyst to activate sluggish negotiations.
13. Creditors existing collateral rights must continue.
14. New credit extended during the restructuring process above existing exposures as of the standstill date on reasonable terms in order that the debtor may continue operations must receive priority status based on title orientated security, inter-creditor agreements or indemnities.
15. Lenders should seek to lower their risk and hence their requisite returns, through an improved security package and profitability-based benefits rather than increased interest rates and imposition of restructuring fees.
16. Debt trading is appropriate under certain conditions but the selling creditor has the professional obligation to ensure the buyer does not have a detrimental effect on the restructuring process.
17. Restructuring losses should be apportioned in an equitable manner which recognizes legal priorities between the parties involved.
18. Creditors retain the right to exercise independent commercial judgement and objectives but should carefully consider the impact of any action on the Thai economy, other creditors and potentially viable debtors.
19. Any of the principles or implementing policies contained in this framework can be waived, amended or superceded in any particular restructuring with the consent of all participating creditors.



## **B. The Debtor-Creditor Agreement**

1. Allows any creditor, the debtor, or CDRAC to convene the first meeting of creditors to attempt a restructuring under the two agreements.
2. Requires the debtor to sign the Debtor-Creditor Agreement prior to the first meeting of creditors or face liquidation or collection lawsuits.
3. Requires the appointment of a lead institution and a designated individual to manage the workout process according to a fixed schedule of approximately 5-7 months, extendable by up to 2 months.
4. Provides standard confidentiality, debtor standstill and indemnification undertakings.
5. Requires the debtor to submit preliminary information within 7 days, and all other information and a draft business plan within 2 months, of the first meeting of creditors.
6. Provides for mediation between debtors and creditors in the event of an impasse in negotiations.
7. Requires all creditors to seek the debtor's liquidation or reorganisation under new management in the event of three unremedied breaches by the debtor.
8. Imposes penalties of up to 10% of a creditor's claim only for failure of a creditor to vote either for or against a proposed plan or to support an approved plan.

## **C. The Inter-Creditor Agreement**

The Inter-Creditor Agreement addresses the second part of the restructuring process and covers votes by creditors if and when a proposed restructuring plan is developed under the Debtor-Creditor Agreement.

1. Requires creditors voting against a proposed restructuring plan to provide specific objections.
2. Requires creditors signing the agreement to support in any future proceedings a proposed plan approved by such number of creditors holding such percentage of all outstanding credit to a debtor that would bind all creditors to a court-approved plan under the Bankruptcy Act.
3. Refers a proposed plan for a binding decision to be made by the independent executives (one appointed by each of the three creditor associations) if the plan obtains approval from at least 50% of all creditors but does not meet the plan approval requirements.
4. Requires that the executives' decision be a simple, unanimous approval or disapproval of a proposed plan.

5. Requires creditors to commence legal action against the debtor if a proposed plan (after one possible modification) cannot achieve approval by the creditors or executives.
6. Imposes penalties of up to 50% of creditor's claim in the workout for a material breach of the Inter-Creditor Agreement by a creditor.
7. Allows any creditor to opt-out of the Inter-Creditor Agreement (including the provisions concerning fines) whenever the relevant debtor's total credits to all creditors of any kind exceed one billion baht in principal obligations.

## Appendix II

### Legislative Measures to Facilitate Debt Restructuring

Legislative Measures	Effective Date
1. Tax concessions for the debtor, financial institution creditors, and other creditors on income received from debt restructuring with regards to income tax, VAT, specific business tax, and stamp duties.	1 Oct 99-31 Dec 01
2. Financial institution creditors and other creditors may use the amount of debt forgiven in debt restructuring as a tax-deductible expense in calculations of taxable income.	1 Oct 99-31 Dec 01
3. The establishment of reasonable grounds which the Revenue Department may take account of in tax calculations, for example, a creditor's reduction of interest rates for a debtor.	1 Oct 99-31 Dec 00
4. The Purchase Tax from the construction of a building which is a taxable item for companies liable for VAT, may be used as a tax-deductible item on the sale or rental of the building to a firm not liable for VAT.	1 Oct 99-31 Dec 01
5. Allow financial institution creditors and other creditors to use Sales Tax calculated from loan losses on debt restructuring as a tax-deductible item in the month that loan losses were written off.	1 Oct 99-31 Dec 01
6. With regards to tax calculations, financial institution creditors shall stop using the accrual income recognition principle where debtors have failed to make repayments for over 3 cumulative months (changed from 6 months).	From 1 Jan 98 onwards
7. Tax concessions for debt restructuring following court reorganisation of the debtor under the Bankruptcy Act. - Income arising from debt forgiveness - Income from the transfer of assets, sale of goods or services, and issue of financial instruments.	From 1 Jan 98 onwards
8. Creditors under court reorganisation of the debtor under the Bankruptcy Act may use the amount of debt forgiven in debt restructuring as a tax-deductible expense in calculations of taxable income.	From 10 April 98 onwards
9. Registration fee concessions on the transfer of land, property or condominium ownership with regards to debt restructuring as follows. - Financial institutions, for the transfer of land, property, or condominiums from a debtor, or the return transfer of land, property, or condominiums to a debtor. - Financial institution debtors, for the transfer of land, property, or	5 Nov. 99 - 31 Dec. 01



<p>condominiums to a third party for repayment of debt owed to financial institutions.</p> <ul style="list-style-type: none"> <li>- Financial institutions, for the registration of additional mortgage of land, property, or condominiums from the debtor.</li> <li>- Non-financial-institution creditors with common debtors to financial institutions, for the transfer of land, property, or condominiums from a debtor, or the return transfer of land, property, or condominiums to a debtor.</li> <li>- Creditors, for the transfer of land, property, or condominiums from a debtor, or the return transfer of land, property, or condominiums to a debtor under the Bankruptcy Act.</li> </ul>	
<p>10. - Allow finance companies to purchase or hold a greater proportion of equity in limited companies than that allowed under existing legislation.</p> <ul style="list-style-type: none"> <li>- Allow commercial banks to purchase or hold a greater proportion of equity in limited companies than that allowed under existing legislation.</li> </ul>	<p>4 April 01-31 Dec 04</p> <p>16 Mar 98-31 Dec04</p>
<p>11. – Allow commercial banks to undertake hire-purchase and hire-purchase leasing businesses ensuing from debt restructuring.</p> <ul style="list-style-type: none"> <li>- Allow IBFs to undertake hire-purchase and hire-purchase leasing businesses ensuing from debt restructuring.</li> <li>- Allow finance companies to undertake hire-purchase and hire-purchase leasing businesses ensuing from debt restructuring.</li> </ul>	<p>9 Dec 99-31 Dec 01</p> <p>9 Dec 99-31 Dec 01</p> <p>1 Jan 00-31 Dec 01</p>
<p>12. Allow financial institutions to use debt write-offs as tax-deductible items in tax calculations where institutions have written-off debts classified as Loss or Doubtful of Loss with 100% provisioning in line with BOT regulations.</p>	<p>From 21 Sept 99 onwards</p> <p>From and including the accounting period ending 31 Dec 99</p>
<p>13. Registration fee concessions for ownership transfers of rental rights over crown property to be considered on a case-by-case basis.</p>	<p>Varies on a case-by-case basis</p>
<p>15. Allow the transfer of BOI privileges to a new equity investor in the debtor company.</p> <p>1. Cases covered by existing regulations.</p> <p>1) For ownership transfers of machinery aged over 5 years, the recipient is not liable for tax on the machinery.</p> <p>2) Exemption of stamp duty on import of</p>	<p>From 15 Mar 95 onwards</p>

<p>machinery for debtors under the BOI assistance scheme in cases where machinery is transferred to the creditor as part of a leasing or hire-purchase contract.</p> <p>3) The recipient of a company or business under the BOI assistance scheme may benefit from remaining BOI privileges on continuation of the firm's business operations.</p> <p>2. The BOI shall consider concessions with regards to ownership transfers of machinery aged under 5 years to financial institutions or another company not intending to continue original business operations on a case-by-case basis.</p>	<p>From 29 July 98 onwards</p>
<p>16. Financial institutions should reclassify problem loan accounts under the Pass asset classification following debt restructuring without waiting for repayment test period of 3 months or 3 installments where debt restructuring of cases satisfies any one of the following conditions.</p> <p>1) The Debtor is able to repay interest at a rate equal to or above the market rate without need of a grace period;</p> <p>2) Debtors for which financial institutions have taken a 20% haircut or higher based on the book value of credit outstanding.</p> <p>3) Debt restructuring is for a multi-creditor syndicate loan ;</p> <p>4) The court has passed verdict following the out-of-court agreement between debtor(s) and creditor(s), or the court has issued a writ accepting a request to restructure or a debtor's business reorganisation plan.</p> <p>5) The financial institution has undertaken debt restructuring with the approval of the Bank of Thailand or the Corporate Debt Restructuring Advisory Committee.</p>	<p>From the first accounting period of 1999 onwards</p>
<p>17. Allow commercial banks, finance companies, and finance and securities companies to increase their holding period for land, property, and condominiums up to 10 years, effective from 1st January 97 to 31<sup>st</sup> December 2001.</p>	<p>From 24 Dec. 99 onwards</p>

**Appendix III**  
**Research visit to Thailand: List of interviews**

With the financial support from the Centre for the Study of Globalisation and Regionalisation, Prof. Marcus Miller and Mr. Pongsak Luangaram visited Thailand for research purposes. Thanks to the expert help of Dr. Teerana Bhongmakapat (Chief Economic Advisor to the Deputy Prime Minister, Dr. Supachai Panichpak) and Mr. Sunthorn Arunanondchai (Chief Executive Officer of the CP Land Limited), seven visits were arranged: for the first four visits, Prof. Miller and Mr. Luangaram were both present; for last three visits, Mr. Luangaram was on his own.

Date	Place	People met
30 <sup>th</sup> August 2000	Office of Corporate Debt Restructuring Advisory Committee (CDRAC), Bank of Thailand.	- Mr. Pakorn Malakul Na Ayudha (Deputy Governor of the Bank of Thailand) - Mr. Tumnon Dasri (Director of CDRAC)
1 <sup>st</sup> September 2000	Department of Economics, Chulalongkorn University	Academic faculties
4 <sup>th</sup> September 2000	Securities and Exchange Commission (SEC)	- Mr. Prasarn Trairatvorakul (Secretary-General) - Dr. Pichit Akrathip (Director of Research)
4 <sup>th</sup> September 2000	Ministry of Finance	-Mr.Tarrin Nimmanhaeminda (Finance Minister)
12 <sup>th</sup> September 2000	Financial Restructuring Authority (FRA)	Data collection
13 <sup>th</sup> September 2000	Central Bankruptcy Court and Legal Execution Department, Ministry of Justice	Data collection
15 <sup>th</sup> September 2000	Agency for Real Estate Affairs	Data collection



## Chapter 6

### Conclusion

In this thesis, we have examined the nature and mechanisms of the Thai financial crisis in 1997/8. In the first part, we have employed the model of credit cycles developed by Kiyotaki and Moore (1997) to study both the dynamics of financial contraction and techniques of crisis management. The framework used is one where collateral plays a central role and adverse exogenous shocks can trigger a vicious spiral of falling asset values and loan recalls. The second part of the thesis looks at the case of Thailand, examining developments in financial sector and property markets from boom to bust, and discussing macroeconomic implications of bankruptcy law reform in the aftermath of the crisis.

In Chapter 2, we have analysed the role of highly-leveraged institutions in contributing to the severity of economic downturn. Specifically, when an asset price bubble bursts which cuts the value of land being used as collateral, the sudden fall in collateral value can create the possibility that firms' net worth is entirely wiped out and the whole financial system collapses. This is due to the powerful feedback effects in that forced selling may well further depress prices, setting in motion a downward spiral of asset prices and loan recalls. We then show how wholesale financial collapse can be avoided by co-ordinated loan roll-overs in the form of a general financial freeze; and how the breathing space gained in this way can be used to arrange for loan write-downs or capital injections.

In Chapter 3, we have modified the basic KM model used in the previous chapter. We find that, by reducing the sensitivity of land prices to land sales and by imposing a margin requirement on loans (requiring borrowers to hold some equity margin), robustness of the model improves considerably. Numerical exercises are based on two kinds of temporary unexpected shocks, namely the bursting of an asset bubble and a sudden increase in real interest rates. We find that the knock-on effects arising from monetary policy shocks are much more profound than the case of bubble's bursting, given that both shocks lead to the same initial fall in net worth of the credit-constrained firms. The reason is that the latter's borrowing capacity is tightened further from the fact that with higher interest rates, the amount of loans being rolled over -- calculated from the discounted value of collateral -- declines. In addition, we show that the higher is the degree of financial leverage, the higher is the impact of monetary policy shocks on asset prices. Regarding the debate on the use of high interest rates to stabilise the currency, while we cannot provide a definite answer to this, our analysis indicates that if the economy is highly leveraged as in Asia, raising interest rates by small amount can have powerful impacts on asset prices and may cause widespread bankruptcy of the credit-constrained sector.

In addition, we use our modified framework to shed light on the current debate on the role of prudential regulatory policies as a means of mitigating the impact of an asset price shocks. Our simulation exercises show that the 'regulatory forbearance' policy by way of relaxing 'margin requirement' can be effective in avoiding and/or mitigating the knock-on effects.

In Chapter 4, we provide a detailed account of economic developments in Thailand from 1988-1998. The aim is to examine some key structural changes in the period prior to the crisis and to examine what actually happened during the crisis. We argue that the nature of the Thai financial crisis lies in the profound boom and bust in real estate sector which played a central role in creating tensions in the financial system and causing severe contraction of the economic activity.

In Chapter 5, we have explored some main issues relating to systemic bankruptcy in corporate sector in aftermath of the Thai crisis. Two key lessons can be drawn: (i) the extent to which an insolvency system to be effective depends crucially not on the letter of law but on how it is implemented; (ii) when the efficiency of the legal system is taken into account (particularly the built-in delay involved in the judicial process), a creditor-oriented bankruptcy law may effectively turn into debtor-friendly regime. In the case of systemic debt crisis, while such build-in delay may help prevent fire-sales of assets, it can also create efficiency losses as efficient firms are prevented from being restructured. This justifies the need for Chapter 11-style reorganisation law. But the latter played a minor role in the resolution of the debt crisis in Thailand. An alternative mechanism that turned out to be effective in Thailand is the establishment of out-of-court restructuring framework (CDRAC). We find that there are two important features in this Thai-style framework that can greatly help increase efficiency; namely (i) first priority in restructuring is given to large and efficient companies that have the most impact to the economy; (ii) the focus is on resolving debt owned by financial institutions, so that normal lending can be resumed and economic recovery facilitated.



## Future research

The research carried out in this thesis suggests three lines for future study.

(i) As mentioned previously, Aghion et al. (2000) combines exchange rates with balance sheet problems in form of dollar exposure. They find that raising interest rates can stabilise exchange rate if the proportion of foreign currency debt is high and credit supply is not too sensitive to changes in nominal interest rate. The framework of Kiyotaki and Moore could be an alternative, micro-founded model for the third generation model of currency crises.

(ii) In the context of the Kiyotaki and Moore model, we have shown that a wholesale financial collapse can be avoided by debt roll-ups, write-downs and temporary finance. While the model can be solved to find the minimum amount required, it is based on the assumption that the equity base of the lending institution is able to sustain the shock. In systemic crisis, however, banks may not be able to write the debts down to realistic levels without themselves becoming insolvent. To study this, it would be necessary to disaggregate the financial intermediary from the ultimate wealth owners. This should allow treatment of issues like bank recapitalisation and role of the capital adequacy ratios (which have played an important role in the Japanese debate). See, for example, Holmstrom and Tirole (1997) and Chen (2001). It may also raise issue of moral hazard in banking, as in Hellmann, Murdock and Stiglitz (2000).

(iii) The shocks we considered above are once-for-all events. If, however, the shocks are repeated, this raises an interesting issue of institutional design where the distinction between idiosyncratic and macroeconomic shocks needs to be made more clearly. While it makes sense for creditors to provide loans up to 100 percent of the collateral value in the case of idiosyncratic shocks, our results indicate that for macroeconomic shocks, margin

requirements are needed to prevent financial collapse (and if the shock is far too large, the government need to step in). If the only instrument is collateral, there appears to be a trade-off between low margin requirements to promote economic activity in the small business sector in the face of idiosyncratic shocks and the high margin requirement needed for systemic stability. So it will be interesting to analyse this trade-off by looking at the impact of margin requirements on the speed of adjustment and stability as a function of the variance of macro shocks

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