สัมมนาวิชาการประจำปี 2547

BOT Symposium 2004

ความเสี่ยงของตลาดอสังหาริมทรัพย์ต่อเศรษฐกิจและ
ภาคธนาคารพาณิชย์: บททดสอบความเปราะบางทางการเงิน

Bank lending, the housing market, and risks: A test for financial fragility

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บทสรุป

ในช่วงที่ผ่านมาธุรกิจอสังหาริมทรัพย์โดยเฉพาะตลาดที่อยู่อาศัยมีการฟื้นตัวต่อเนื่อง ขณะเดียวกัน
สินเชื่อเพื่อที่อยู่อาศัยที่ให้แก่บุคคลทั่วไปของธนาคารพาณิชย์ได้ขยายตัวในอัตราที่สูงมาก อีกทั้งสินเชื่อ
ผู้ประกอบการเริ่มมีแนวโน้มเร่งตัวขึ้น ทำให้หลายฝ่ายเริ่มกังวลถึงความเสี่ยงที่อาจเกิดขึ้นกับเศรษฐกิจและภาค
ธนาคารพาณิชย์จากการปล่อยสินเชื่อเพื่อที่อยู่อาศัยที่มากเกินไป บทวิจัยนี้จึงต้องการตอบคำถามว่าความเสี่ยงใน
ตลาดที่อยู่อาศัยมีความเชื่อมโยงกับความเปราะบางของภาคธนาคารพาณิชย์อย่างไร และหากมีความผันผวนของ
ราคาที่อยู่อาศัยและการปรับขึ้นของอัตราดอกเบี้ยในอนาคตจะมีผลอย่างไรต่อตลาดที่อยู่อาศัยและภาคธนาคาร
พาณิชย์ รวมทั้งนโยบายที่เกี่ยวข้องควรจะเป็นในรูปแบบใดในช่วงวัฏจักรเศรษฐกิจขาขึ้น

บทสรุปผู้บริหาร

ธุรกิจอสังหาริมทรัพย์โดยเฉพาะที่อยู่อาศัย นับเป็นภาคเศรษฐกิจอันดับต้นๆ ที่เห็น
สัญญาณการฟื้นตัวชัดเจน ดังจะเห็นได้จากโครงการก่อสร้างใหม่ที่เพิ่มขึ้น ตลอดจนการซื้อขาย
อสังหาริมทรัพย์ที่กลับมาคึกคักอีกครั้งหลังจากที่ประสบภาวะซบเซาในช่วงวิกฤต โดยการขยายตัว
ในช่วงที่ผ่านมาเกิดขึ้นจากอุปสงค์ที่เพิ่มสูงขึ้นตามภาวะเศรษฐกิจที่ฟื้นตัว ขณะเดียวกันเงื่อนไขทาง
การเงินที่ผ่อนคลาย ทั้งอัตราดอกเบี้ยที่อยู่ในระดับต่ำและสินเชื่อของธนาคารพาณิชย์ที่ขยายตัวใน
อัตราสูง ล้วนเป็นปัจจัยกระตุ้นความต้องการที่อยู่อาศัยของประชาชนให้เพิ่มสูงขึ้น

จากภาวะตลาดอสังหาริมทรัพย์ในปัจจุบัน แม้หลายฝ่ายจะมองว่าการขยายตัวดังกล่าวยังไม่
น่าเป็นห่วง แต่หากตลาดอสังหาริมทรัพย์มีความร้อนแรงเพิ่มขึ้นอย่างต่อเนื่องจนก่อให้เกิดภาวะ
ฟองสบู่ ก็อาจเป็นจุดเริ่มต้นของการย้อนรอยวิกฤตธนาคารพาณิชย์ที่เคยเกิดขึ้นในอดีตอีกครั้ง
เนื่องจากตลาดอสังหาริมทรัพย์มีความสำคัญต่อฐานะของธนาคารพาณิชย์ ทั้งในแง่ของสัดส่วน
ของพอร์ตสินเชื่ออสังหาริมทรัพย์ต่อพอร์ตสินเชื่อรวม ซึ่งอยู่ที่ประมาณร้อยละ 15 ในปัจจุบัน หรือ
การถือครองอสังหาริมทรัพย์ นอกจากนี้ จากการที่หลักประกันของสินเชื่อส่วนใหญ่เป็น
อสังหาริมทรัพย์ ราคาสินทรัพย์ของอสังหาริมทรัพย์จึงมีบทบาทสำคัญต่อมูลค่าหลักประกันและ
การปล่อยสินเชื่อของธนาคารพาณิชย์ ดังนั้น ความเชื่อมโยงที่ใกล้ชิดระหว่างตลาดอสังหาริมทรัพย์
และภาคธนาคารพาณิชย์ ส่งผลให้ฐานะการเงินของธนาคารพาณิชย์และการปล่อยสินเชื่อมีความ
อ่อนไหวต่อภาวะตลาดอสังหาริมทรัพย์และความเคลื่อนไหวของราคาสินทรัพย์

ดังนั้น แนวโน้มการขยายตัวของสินเชื่ออสังหาริมทรัพย์ที่เร่งตัวขึ้น ทั้งสินเชื่อที่ให้แก่
ผู้ประกอบการและสินเชื่อที่อยู่อาศัยสำหรับบุคคลทั่วไป อาจนำมาสู่ความเสี่ยงที่เพิ่มขึ้นของ
ธนาคารพาณิชย์ ซึ่งความเสี่ยงที่เกิดขึ้นกับธนาคารพาณิชย์ย่อมส่งผลกระทบโดยตรงต่อเสถียรภาพ
ของระบบการเงินและเศรษฐกิจในที่สุด

จากความกังวลดังกล่าว บทความนี้จึงพยายามที่จะประเมินผลกระทบที่มีต่อภาคธนาคาร
พาณิชย์ หากต้องเผชิญกับความเสี่ยงของวัฏจักรอัตราดอกเบี้ยขาขึ้นและราคาสินทรัพย์ที่ลดลง
ตามมา โดยทำการทดสอบความเปราะบางของธนาคารพาณิชย์เพื่อตอบ 2 ประเด็นคำถามที่สำคัญ
คือ 1) พอร์ตสินเชื่อเพื่อที่อยู่อาศัยของธนาคารพาณิชย์สามารถรองรับการขึ้นอัตราดอกเบี้ยได้มาก
น้อยเพียงใดโดยธนาคารไม่ต้องขอให้ลูกค้าส่งเงินเพิ่มหรือปรับเปลี่ยนเงื่อนไขของสัญญาเงินกู้ และ
2) ธนาคารพาณิชย์มีเงินกองทุนเพียงพอหรือไม่ที่จะรองรับการลดลงอย่างฉับพลันของราคา
อสังหาริมทรัพย์ร้อยละ 30

จากผลของการทดสอบความเปราะบางทางการเงิน พบว่า ยังไม่ปรากฏสัญญาณอันตราย
ของระบบธนาคารพาณิชย์ในขณะนี้ โดยแม้อัตราดอกเบี้ยจะปรับสูงขึ้น แต่การที่ธนาคารพาณิชย์
คิดอัตราดอกเบี้ยไว้เผื่อความเสี่ยงในระดับหนึ่งแล้ว (interest rate cushion) ก็ช่วยให้พอร์ตสินเชื่อ
เพื่อที่อยู่อาศัยของธนาคารพาณิชย์ไม่ได้รับผลกระทบมากนัก นอกจากนี้เงินกองทุนและการกัน
สำรองที่เพียงพอในปัจจุบันทำให้ธนาคารพาณิชย์ไทยยังสามารถที่จะรองรับกับสถานการณ์ที่ราคา
สินทรัพย์ตกลงอย่างรุนแรงได้

อย่างไรก็ตาม แม้ธนาคารพาณิชย์ไทยโดยรวมจะมีฐานะที่แข็งแกร่งพอที่จะต้านทานความ
เสี่ยงที่จะเกิดขึ้นได้ แต่ก็พบว่าความแข็งแกร่งนั้นมิได้เท่าเทียมกันทุกธนาคาร มีธนาคารพาณิชย์บาง
ธนาคารที่อาจอ่อนไหวต่อการปรับขึ้นของอัตราดอกเบี้ยและความผันผวนของราคาสินทรัพย์
มากกว่า กล่าวคือธนาคารพาณิชย์ที่กำหนดจำนวนเงินงวดที่ต้องผ่อนชำระรายเดือนที่ต่ำ มีขนาด
ของพอร์ตสินเชื่อผู้ประกอบการในสัดส่วนที่สูง มีเงินกองทุนและสำรองหนี้สงสัยจะสูญที่ต่ำ และมี
สินทรัพย์รอการขายเป็นจำนวนมาก จะมีความเสี่ยงที่มากกว่า

แม้ผลการทดสอบความเปราะบางทางการเงินจะยังไม่มีอะไรน่าเป็นกังวล แต่มิได้หมายถึง
จะละเลยปล่อยให้เกิดความไม่สมดุลขึ้นดังที่เคยเป็นมา ดังนั้น ในฐานะของผู้ดูแลเสถียรภาพ
การเงินและสถาบันการเงิน ธนาคารแห่งประเทศไทยจึงจำเป็นต้องติดตามภาวะตลาด
อสังหาริมทรัพย์พร้อมทั้งการขยายตัวของสินเชื่อของธนาคารพาณิชย์อย่างใกล้ชิด ในส่วนของ
ธนาคารพาณิชย์เอง การดูแลคุณภาพสินเชื่อและการบริหารความเสี่ยงที่มีประสิทธิภาพย่อมเป็น
วิธีการป้องกันความเสี่ยงที่ดีที่สุด

1. Introduction

The 1997 crisis brought to light several valuable lessons for policymakers regarding crisis prevention and resolution. With respect to the former, the country's worst economic crisis vividly illustrated how pockets of financial fragility could manifest in a full-blown financial crisis. The task of safeguarding financial stability thus calls for early identification of financial imbalances and appropriate measures against them so as to keep the unwanted situations continually in check.

One of the hallmarks of the 1997 crisis was the interplay between the property market, commercial bank lending, and the economy. In the period leading up to the crisis, economic euphoria induced by strong economic growth and ease of access to financing following the financial liberalization resulted in an overheated property market. Fueled by speculative demand, property prices rose rapidly and became the basis for property developers to obtain new loans. As a result, banks and smaller financial institutions became deeply entangled with developments in the property sector. And when developers began to experience cash flow problems in 1996, the financial sector became vulnerable. The last straw came in February 1997 when one of the country's leading property developers, Somprasong Land, defaulted on its Euro-convertible debenture (ECD), the first Thai company to do so. Somprasong's default set precedence for those of other firms and fear of financial-sector meltdown soon gripped the country. Confidence in the economy quickly eroded and things snowballed into a major crisis.

Now, seven years after the 1997 crisis erupted, the economy has regained its strength. Despite rising oil prices, bird flu, and other unfavorable factors, the economy is expected to grow at least 6% in 2004. The property sector, too, has sprung back to life. Driven by a combination of government stimulus measures, an accommodating financial environment, a rosy economic prospect, and a favorable population dynamics, the property sector has regained its vibrant dynamism. As for the banking sector, although still being plagued by a large overhang of non-performing loans (NPLs) and foreclosed properties, Thai commercial banks are now much stronger than even just two years ago. Banks' profitability has improved markedly and loan growth has resumed.

The resumption of banks' loan growth can be attributed in part to the growth of the mortgage market. Burned by the crisis experience, banks have adjusted their property loan portfolios in favor of mortgages. In general, banks have become cautious to extend credits to

property developers. Nevertheless, recent loan data indicates that, after several years in the shadow, developer loans may be making a comeback.

The trends in the property market and property lending have in recent months raised concerns among observers about the risks involved. Some fear that history is on the way to repeating itself. Questions about real estate bubble occasionally rise. So do questions about risk exposures of financial institutions, particularly the commercial banks.

The goal of this paper is to address some of these concerns with a systematic analysis. We begin by examining the interconnection between the property market and the banking sector and how risks of the former contribute to the vulnerability of the latter. With interest rates on a rising trend, we also look at the impacts of interest rate increases on the property market and fluctuations in property prices using a structural vector autoregression (SVAR) analysis. The focus of the paper however is on the assessment of financial fragility in the current market environment.

In calibrating the risks facing banks, the paper asks two very specific questions. First, how long will banks' mortgage portfolios be able to withstand the upturn in the interest rate cycle without having to ask the borrowers for additional payment contributions? Second, what would be the impact on banks' capital positions if there were a collapse in property prices? To answer the first question, the paper conducts a simple sensitivity analysis to determine the degree of tolerance to future interest rate increases embedded in today's mortgage contracts. For the second question, a high-level stress test of banks' capital positions is employed.

It should be noted that this paper does not in any way attempt to cast judgment on whether there is a real estate bubble at the moment, for we feel that this task is best left to industry experts. Nevertheless, we do discuss a certain set of indicators that will help the authorities identify imbalances in the property market.

The rest of the paper is organized as follows. Section 2 provides a brief account of major developments in the Thai property market with a focus on the residential segment since the early 1970's. Section 3 analyzes the linkages between the property market and banks, as to how the former relies on the latter for financing and how the former influences the latter's financial position. Section 4 shows how monetary policy impacts bank lending and property prices. Section 5 presents an assessment of financial fragility in the current market

environment. Section 6 discusses implications for policy. Finally, Section 7 concludes the paper.

2. Thailand's property market: navigating through boom and bust cycles

Since the early 1970s, Thailand's property market has experienced three boom and bust cycles, with the latest peak occurring just before the 1997 crisis. In the first cycle, more defined property rights laws and the availability of loans for homebuyers from commercial banks and state-owned Government Housing Bank (GHB) created the first boom in the housing market in Bangkok. In 1972, the Revolutionary Party Decree No. 286 (B.E. 2515) on land subdivision was enforced to help set standards for housing development. This Decree provided credibility to both the developers and the consumers in the purchase and sale of housing. The government also established the National Housing Authority in 1973 as a state enterprise under the Ministry of Interior as a developer of government housing. This first boom did not last long, however. In 1973, the first oil shock caused prices of building materials to rise. With the accompanied rise in labor cost and a slowing economy, demand for housing fell, causing a bust.

The second cycle began with the recovery of the housing market in 1976. The National Housing Authority announced a plan to build an average of 24,000 units or 3% of the total housing stock per year. With the expansion of the financial markets, financial institutions provided low interest rates to homebuyers, and by 1977, GHB extended its loan services to housing developers. Since its interest rates were relatively more competitive than those of commercial banks and finance companies, GHB became a major housing bank in Thailand. By the late 1970's, townhouses began to emerge in Bangkok, giving homebuyers greater choices for home ownership. But like the first boom, this boom was ended by the oil shock. During this bust period, the real estate sector underwent several adjustments. Prior booking before actual development is conducted became a widespread practice. Townhouse projects were moved to the outskirts of Bangkok due to cheaper land costs. Nevertheless, the situation was exacerbated by the BoT's 18% limit on bank credit growth during the period. The BoT's rule severely affected credit flows for many real estate development projects. Many on-going projects became incomplete and new projects were shelved as a result.

The third and the largest boom in the property market did not occur until 1986 when the transformation from an agricultural-based economy into an industrial-based economy landed Thailand on a remarkable growth journey. The booming economy together with large

amounts of direct foreign capital inflows and low interest rates for housing loans boosted many activities within this sector. The trend in the market was towards affordable housing, particularly townhouses. During this period, sales of housing projects increased prices as the number of housing units soared. Private residential construction accelerated in 1986 reflecting new supply in the market. Other real estate projects, besides housing also grew. These included golf courses, office buildings, and industrial spaces. Increased activities in these segments contributed to growth in private nonresidential construction, which took off in 1988.

Figure 3.1. Private residential and nonresidential construction, 1980-2002 and permitted construction area, 1984-2003
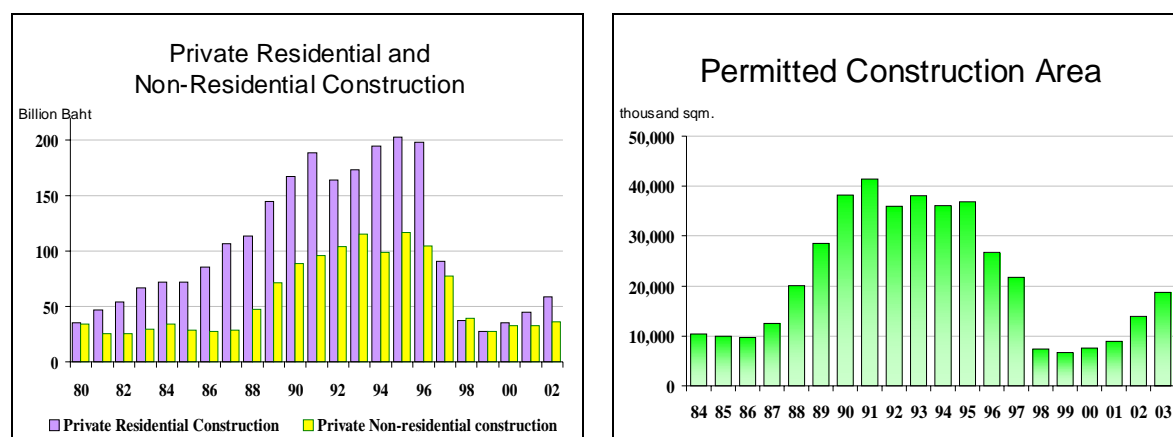

Source: NESDB and Ministry of Interior

With rising prices and strong demand, speculations prevailed in Bangkok and other provinces. Many foreigners paid for the booking fee and by the completion and transfer, found another buyer to buy the units and sell them at higher prices. The heated real estate market slowed down temporary in 1990 due to the Gulf War. Speculative and extravagant real estate projects faced difficulties. Higher priced condominiums and golf course projects were cancelled. With land and other luxurious projects becoming less popular, people began speculating in low-income housing. With low interest rates, many new developers began launching low-income housing projects to accommodate demand.

Throughout the late 1980s and early 1990's, a mix of bank lending, expansionary government policy, and inflows of foreign funds contributed to the growth of Thailand's property sector. Within this period, the Thai housing market expanded with the growth of the economy, each averaging approximately 7% per year from 1986-1998.

4

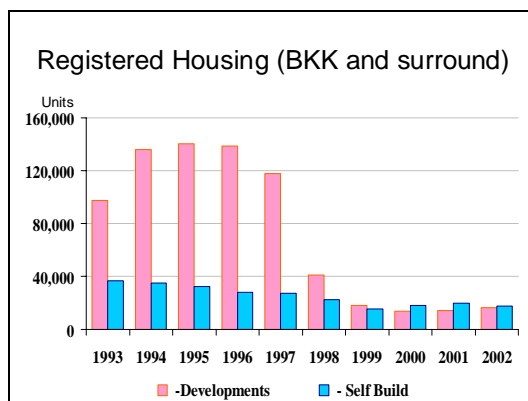**Figure 2.2.** Growth in housing stock and GDP, 1986-1998

Growth in Housing Stock and GDP
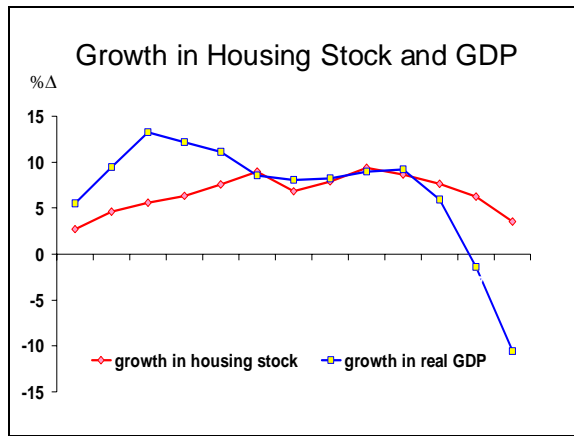
In 1993, the Board of Investment (BOI) encouraged housing developments by offering 5-year income tax exemption to developers who developed low-income housing units (under 600,000 baht/unit). In 1994, approximately 114 projects of 60,894 units worth 30 billion baht were supported by the BOI (Hiebert, 1995, 27-28). Due to massive speculation in the housing sector, by 1995, it was found that half of the 300,000 units in the Bangkok Metropolitan Region were unoccupied condominium (Agency for Real Estate Affairs, 1995:65). The number of units, which were purchased but were unoccupied, doubled within the ten-year period. Despite the figure of the unoccupied housing, almost 300,000 new housing units were launched during 1995 to 1997. These housing developments comprised mainly of townhouses and apartments while self-built housing mostly made up of single detached homes.

Figure 2.3a-d. Selected developments in the housing market, 1993-2002

a. Registered housing (BKK and vicinity)   **b.** Percent unoccupied housing

Registered Housing (BKK and surround)

% Unoccupied Housing

5
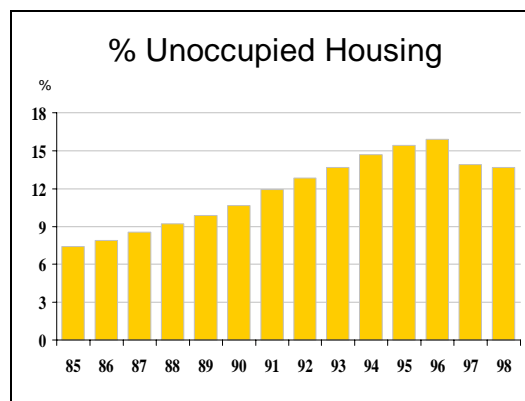
c. Breakdowns of development units   **d.** Breakdown of self-built units

Developments

Self Built

Source: GHB and Agency for Real Estate Affairs
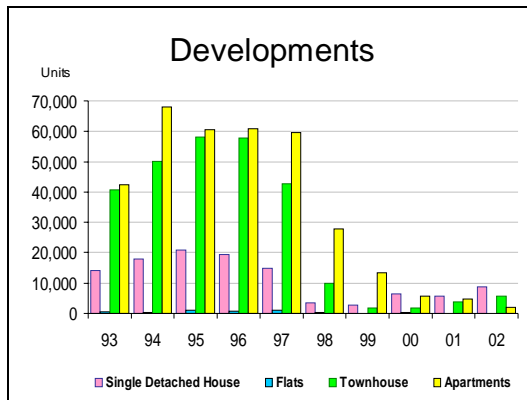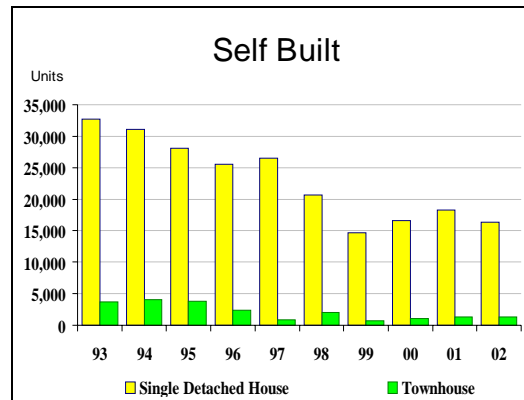
The funding for the new housing units came from various sources. Investments by foreign investors, mainly Japanese, Korean, and Taiwanese investors contributed heavily in the real sector, particularly manufacturing, and the investments also spilled over to higher priced housing such as condominiums and golf courses. The other source of funding came from the inflow of funds as a result of the passage of Bangkok International Banking Facilities (BIBFs) in 1992, which provided opportunities to domestic financial institutions for borrowing foreign loans at low rates and then lending the money to local housing developers.

The uninterrupted period of growth with high prices made developers overoptimistic about market conditions. The injections of foreign funds encouraged new developers to enter the market and thus number of developers and size of their projects continued to increase. There were more than 300 multi-project developers compared to about 40 or 50 today (Lavoie, 2003). Loans from financial institutions to property developers in Thailand totaled 732 billion baht in 1995, up from 606 billion baht in 1994 and 474 billion baht in 1993. By the end of June 1996, the loans reached 796 billion baht.

The mix of easy lending practices and the confidence in the growing economy fueled the demand for property, which in turn led to rising property prices and production. The outstanding property loan to real GDP grew as high as 28 percent in the period leading to the crisis.

Figure 2.3. Outstanding property loans percent of GDP

Property Loans (as % of GDP)

% of GDP

90	91	92	93	94	95	96	97	98	99	00	01	02	03
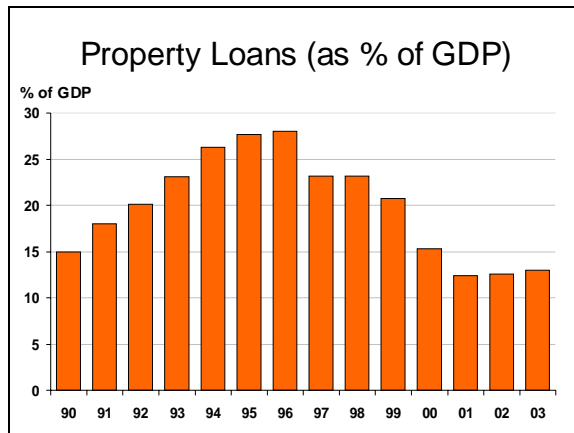
Source: BoT

While the growth of the Thai economy had initially enhanced the housing market, the subsequent downfall of the housing market subsequently impacted other sectors within the economy. Despite excess supply, developers did not lower prices due to the rising construction costs. Since construction of housing takes time, developers face uncertainty about the conditions of the market in the future at the time they choose to start the housing projects.

Figure 2.4. NPLs of real estate loans

NPL of Real Estate
(as % of Real Estate Loans)

% of RE Loans

New Definition

1999	2000	2001	2002	2003
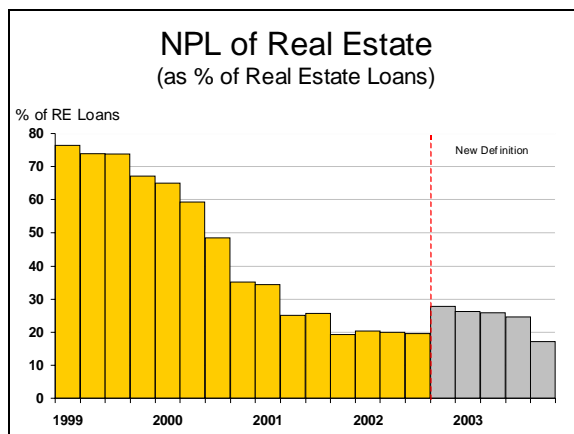
Source: BoT

By 1997, supply exceeded demand in almost all sectors of the property market and the real estate market abruptly halted. Most developers abandoned many of their ongoing projects. The number of non-performing loans in financial institutions skyrocketed. Since approximately 70% of overall real estate developments in Thailand were housing units, the resulting crash in this sector was devastating to the rest of the economy.

7

The new beginning?

The start of 2002 showed some signs of recovery in the residential segment of the property market. The government attempted to stimulate the market with various promotions. Sales of newly launched housing projects, mainly detached houses and townhouses, recovered. There were new projects launched between 2000 and 2001, but most of these projects were by developers who needed to restructure their debt rather than new investors. The government has continuously tried to support growth in the residential market by providing long-term fixed rate mortgage financing through GHB and the Secondary Mortgage Corporation (SMC). Alteration in rules regarding leases and changes in laws on foreign investment in property was also undertaken by the government to stimulate investment and growth in the residential and commercial property markets. Other government stimulus measures included a temporary reduction of special business tax from 3.3% to 0.11% and a temporary reduction in registration and transfer fees from 2% to 0.1% until the end of 2003.

The recovery of the housing market has been further aided by the economic recovery and low interest rates, which raise consumer's ability to purchase housing by increasing the ability to service debt. Favorable population dynamics and the change in living patterns of extended families have also increased the demand for housing. As a result, demand for mortgage loans has ballooned.

Besides demand factors, commercial banks have also competed in extending mortgages as one way to reduce its excess liquidity since it is unable to fully extend credit to the manufacturing sector. Because of this, housing has become the important target sector for commercial banks. Also, mortgage loan is less risky, there is collateral, and there is a lower risk weight as compared to other types of loans (50% versus 100%). Furthermore, the tools used to assess credit risk for customers with a lower line of credit has improved, such as credit scoring, reducing the risk of a loan becoming bad debt.

Although bank credit extension to developers still lacks behind mortgage loans, its growth has recently turned positive after being negative for several years. Still, the extension of credit to developers should not be as aggressive as we saw in the pre-crisis period. Before, developers would use the funds to purchase and accumulate land for further development. Now, there is less accumulation of land for future projects. Small to medium-sized developers tend to be more focused on completing one development at a time before starting

new projects. The construction period has also shortened, owing partly to new technology and the "pre-build" development strategy adopted by most large developers. The pre-build strategy circumvents the problem of alteration demanded by customers and speeds up construction. In addition, by building standardized units, developers enjoy huge cost savings. Nevertheless, the new strategy of building and selling houses after completion means that developers will not have access to down payments and reservation fees until a very late stage. Thus, much of the financing cost (and risk) has been shifted to developers in exchange for faster build time and lower construction costs.

Figure 2.4. Growth rate of bank credit to households and developers
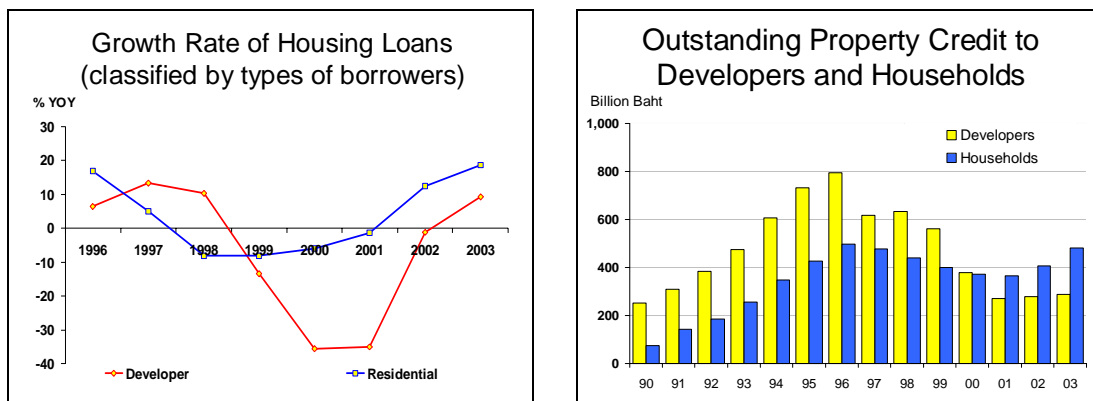
Source: BoT

The renewed activity in the residential sector has led to a rebound in property prices. Figure 2.4 traces out the evolution of the quarterly condominium value index published quarterly by Jones Lang LaSalle (Thailand) Limited. Although the index covers only condominiums in the central business district area, its trend is representative of general residential property prices.

Figure 2.5. Condominium value index, 1994 Q1-2004 Q1
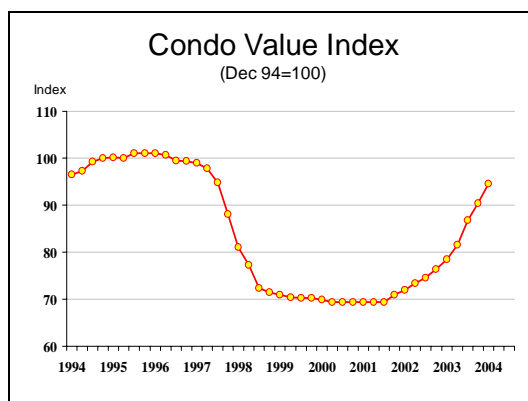
Source: Jones Lang LaSalle (Thailand) Limited

9

With rising housing prices and an upward swing in the property cycle, the renewed confidence in the market brings questions whether the sector may be exposed to another crisis. This is a question that is still debatable. What is certain is that the property market follows a cycle in line with the overall economic cycle and the growth in the sector depends critically on demand. Low interest rates and competitive bank lending behavior are the driving forces. Yet, despite the recovery, there still exist the risks of overinvestment and speculation within the market fueled by bank lending.

Section 3. The interconnection between the property sector and commercial bank

In the previous section, we see that commercial bank lending plays a major role in the property market cycle as well as property prices. At the same time, the property market is important commercial banks as well. This section discusses the interconnection between the two, as to how the former relies on the latter for financing and how the latter's financial position is influenced by developments of the former.

Pre- versus Post-Financing

In the jargon of bankers, the financing of the property sector can be divided into pre-financing and post-financing. If we think of the sale of a property as a reference point, from the construction phase until completion there is pre-financing or sources of fund for developers, which is the supply side of the market. And when the projects are completed and ready for sale in the market, the demand side will also require a source of funding – post-financing.

Pre-financing of property developers comprises many different sources, from debt financing such as borrowing from domestic financial institutions, borrowing from abroad, and issuance of debt instrument and from equity financing such as developers' own capital, stock issuance, and retained earnings from previous projects. In contrast, post-financing for purchasers of housing is derived mostly from borrowing from financial institutions because the purchasers generally have no or limited access to other sources of financing.

Figure 3.1. Breakdown of pre-financing, 1994-2003
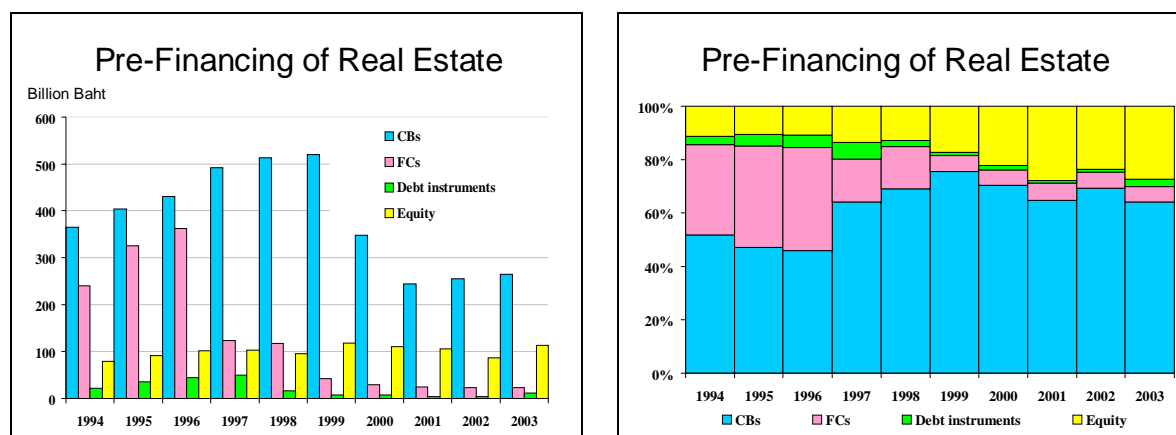
Source: BOT and SET

Figure 3.1 shows the absolute and relative amounts of major sources of developers' pre-financing from 1994 to 2003. In the period before the crisis (1994-1996), loans from banks (including BIBFs) averaged just below 50% of total pre-financing. Loans from finance companies were the second largest item, averaging 37% during the period. Moreover, some of the funding from finance companies was from commercial banks. Thus the role of commercial banks has been even more prominent in financing to real estate market. Stock and debt instrument made up the rest, accounting for 11% and 4%, respectively.

It is interesting to note that as Thailand embarked on its financial liberalization program, which culminated with the passage of BIBFs in 1992, many property developers turned to lower interest foreign currency financing. To developers, the stability of the prevailing fixed exchange rate regime made exchange rate risk nonmaterial. Borrowing through BIBF accounted for 6% of total pre-financing between 1994 and 1996. In addition, large property developers were able to borrow directly from abroad or issue foreign debentures such as Euro convertible debentures or ECD.

The structure of pre-financing discussed has changed dramatically since 1997. Perhaps the most noticeable change is the markedly reduced share of loans from finance companies. After the crisis, many finance companies went bust and their number went down from 91 to 18. By the end of 2003, share of loans from finance companies has fallen to 6%.

Taking the place once belonged to finance companies are bank and capital market financing. Banks now capture more than 60% share and the capital markets capture another 30%. It should be noted however that looking at the shares alone might be misleading.

11

Taken in total, the amount of pre-financing has been down significantly compared to its pre-crisis level. Although bank loans garner a greater share of total pre-financing, in absolute amount, they have been much less than before.

By the same token, the increase in the share of capital market financing is not due because the amount of capital market financing became greater, but rather the shares from other sources of financing have decreased causing the relative share of capital financing to appear larger. Depressed stock market made it very difficult for developers to tap the equity market. Indeed, it was not until 2003, when the stock market picked up and people had high opinions about the property sector, that the stock market saw the return of initial public offerings (IPOs) and public offerings (POs) in the property sector. Together with the appreciation in the value of property stocks, new equity raised contributed to a marked increase in market capitalization of the property sector.

Figure 3.2. Index and market capitalization of the property sector
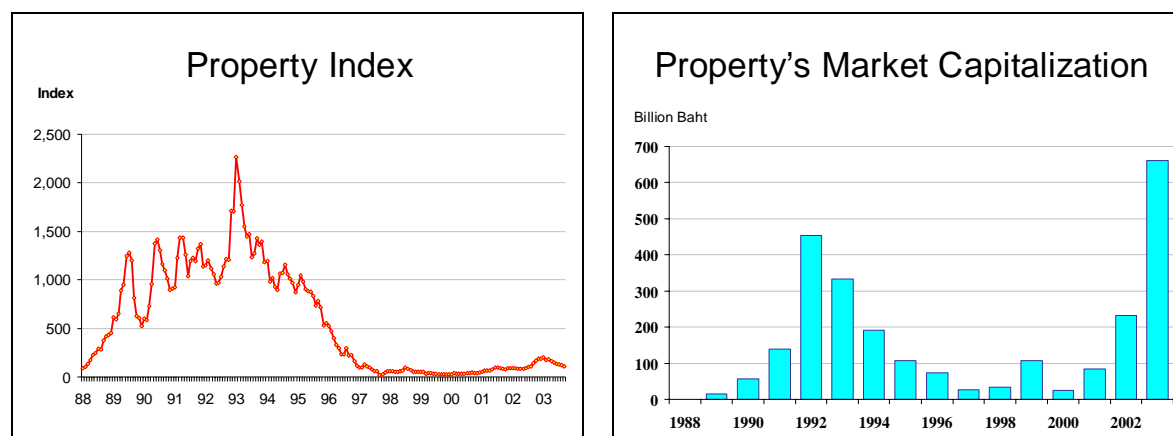
Source: SET

Nevertheless, it is fair to say that capital markets now play an important role in the pre-financing of large property developers. This is due partly to favorable developments in the capital markets and partly to banks' reluctance to extend credit to developers, which forced some companies with potential to look for alternative sources of funding.

Figure 3.3 shows that of the two capital market sources, new flows from debt instrument outstrip those of equity by a wide margin during the last couple years. The low interest rate environment is partly responsible for this, for it allows companies to issue debentures at lower cost than they used to.

12

Figure 3.3. New capital market financing flows, 1994-2003

New Flow of Pre-Financing
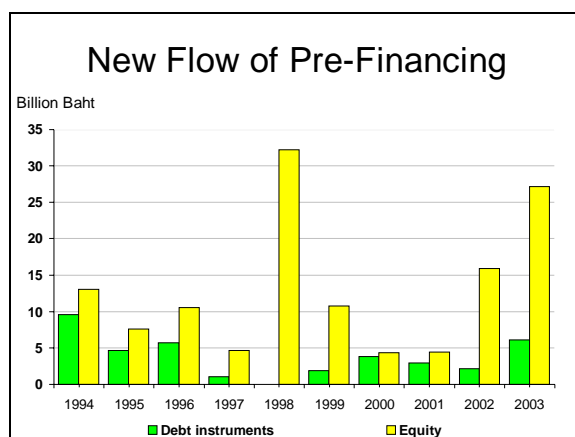
Source: BoT and SET

Finally, although it is not apparent from Figure 3.1 and Figure 3.3, the currency structure of pre-financing also changed dramatically. After the collapse of the fixed exchange rate regime, banks, having learnt a painful lesson, paid off their BIBF loans (Figure 3.4) and avoided borrowing from foreign sources. Foreign currency debentures, in particular, virtually disappeared. After the crisis, many outstanding foreign debentures were either in default or not rolled over. Most of the debentures issued between 1998 and 2001 were from debt restructuring and denominated in baht. More recently, newly issued debentures are also in baht.

Figure 3.4. BIBF's real estate loans

BIBFs' Real Estate Loans
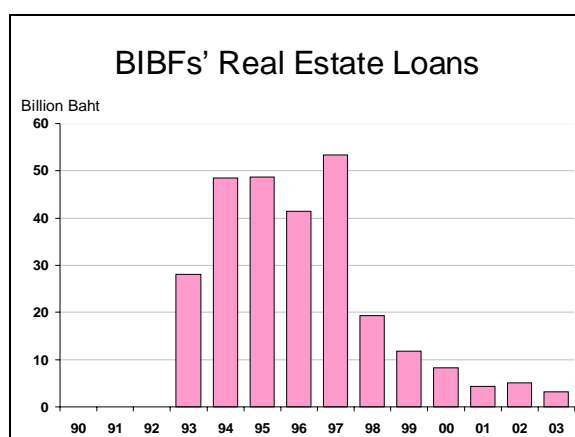
Source: BoT

For post-financing of property, because housing is probably the biggest investment by households, and because buyers have limited access to other sources of financing, most do not have a choice, but to borrow from financial institutions – commercial banks, finance

13

companies, credit foncier companies, GHB, Government Savings Bank (GSB), and cooperatives. About 90% of homebuyers borrow from these financial institutions. Consumers generally borrow 70-80% of the home value with the remainder from their own pockets. The low- to medium-income customer segment is generally served by GHB and GSB, while the medium- to high-income customer segment is served by commercial banks.

Figure 3.5. Breakdown of post-financing, 1991-2003
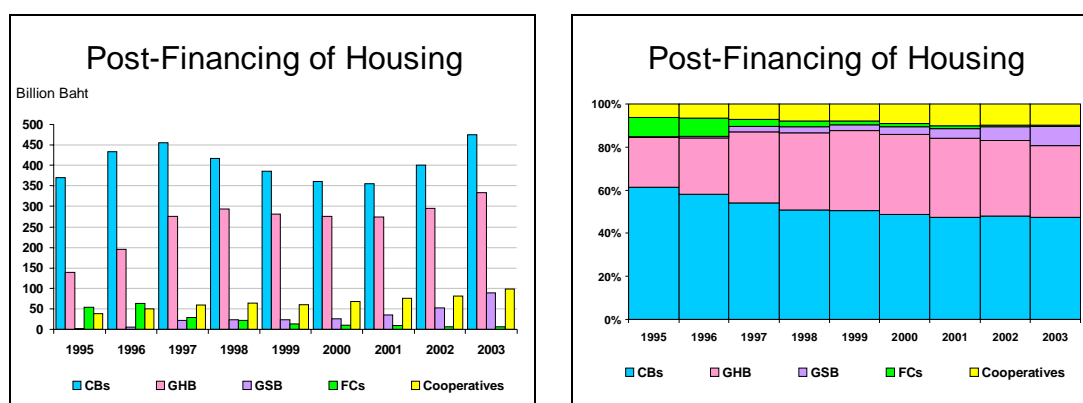
Source: BoT, GHB, GSB and Cooperative Auditing Department

Although commercial banks dominate post-financing with about 60% share, the right-hand panel of Figure 3.5 shows that both GHB and GSB have made a substantial inroad into the mortgage market. This is because of government policy to spurt growth in the low-income segment. In an effort to help low-income families have their own homes, the government not only launched low-income housing projects, but also instructed GHB and GSB to lend out at attractive rates. As a result, GHB and GSB now control together around 40% of the market, nearly doubled from their combined share pre-crisis.

From the structures of pre- and post-financing, one can immediately see that loans from commercial banks are the most important sources of funds of the property sector. From this role, commercial bank lending is important to both supply and demand of the property market and hence property prices. Loose bank credit policy and low interest rates not only generate real demand for property, but also stimulate speculative demand and excessive supply. These drive up property prices and may lead to a speculative bubble. Hence, the acceleration in bank credit to the property sector needs to be watched closely.

14

The changing nature of mortgage finance

If you ask someone who took out a mortgage with a bank before the 1997 crisis, he will tell you that the contract he signed looks rather different than those in the market today. Perhaps the feature of a mortgage contract that changes most visibly is the interest rates charged by banks. Aside from the level of interest rates that have come down sharply, the way banks price their contracts has changed over the years. Back in the early 1970s when the Thai mortgage market was still in its baby stage, interest rates were fixed for the entire contract term (the length of a contract in years). Those are also the times when market interest rates were tightly controlled by the authorities and did not fluctuate much. Later on, when market interest rates began to move more widely, banks learned that the best way to protect themselves from interest rate risks is to pass them on to the customers. Variable- or floating-rate contracts then replaced fixed-rate contracts as the norm of the past era.

The 1997 crisis took a heavy toll on the mortgage market. For a couple years after the crisis erupted, new activities were sparse. High interest rate policy during this period did nothing but to squeeze the life out of the already battered market.

As the economy stabilized and market interest rates came down significantly, the situation started to turn around. With a risk weight of 50%, banks saw mortgages as desirable assets to have, especially during a time of capital crunch. But it was not until banks saw a potential for market rebound that they started to aggressively re-tap the mortgage market. Attractive contract features became necessary to lure potential borrowers.

Today's mortgagers can choose from a variety of interest rate plans. Fixed-rate plans, the remnants of the old past, are still available. But a banker will tell you that very few people, if any, have chosen them. Variable-rate plans are also available, but they too are no longer popular. The majority of mortgage plans today have a fixed-then-float interest rate structure although banks continue to call them fixed rate plans. The distinguishing feature of this type of contract is that interest rates are fixed during the first 1-5 years (number of years depends on plan) and then float with reference to MLR or MRR thereafter. The levels of the fixed rates are lower than the prevailing levels of the variable rates to make the plans even more attractive to potential borrowers. Banks compete fiercely on these fixed rates, driving them down steadily until very recently. In fact, at one time, there were plans with zero interest for the first year of the contracts.

Most fixed-then-float plans have a flat-payment structure, *i.e.*, the minimum monthly payment is constant throughout the contract term. Some plans however have a progressive-payment structure, with the minimum amount of monthly payment increases every year.

Aside from the structure of interest rates, today's contracts have much longer maturities than those signed a few years ago. It used to be the case that 15 years was the longest contract term. Today, most contracts have a 25- or 30-year term. GHB and other state-controlled banks spearheaded this trend, which quickly became a common practice.

As a result of lower interest rates and longer contract terms, the levels of monthly payments have also come down significantly. It used to be the case that taking out a one-million-baht mortgage would require a monthly payment of 12,500-13,000 baht (15-year contract). Today, one can pay as low as 5,400 baht each month for the same amount of money borrowed with a 30-year contract. The markedly reduced debt service allows more people to afford mortgages. Competition also forces the level of monthly payments down. In Section 5, we find that the level of monthly payments, rather than the contractual interest rates, is the key determinant of how long a mortgage contract can withstand the upturn in the interest rate cycle without having to ask a customer for additional payment.

Finally, the way banks approve their mortgage loans also changed. While the loan-to-value (LTV, 70-90%) and the monthly payment-to-income (30-35%) requirements remain basically the same, if not more lenient, banks have become more systematic in mortgage loan approval. Centralized approval process and risk management tools such as credit scoring have been adopted. In addition, banks now routinely rely on information from credit bureaus to ensure that a prospective customer does not have excessive debt burden and also to prevent occurrences of double or triple mortgages. Thus, despite the fact that contract structure and certain conditions are more relaxed, banks' mortgage portfolios by and large appear more prudent than their pre-crisis counterparts.

The vulnerability of commercial bank to the property sector

Besides commercial bank having an important role in the source of funding for the property sector, the property sector also plays an important role for commercial banks and lending behavior of banks through three separate channels.

The first channel is through property loans of the commercial banks. Currently, exposure of lending to the property sector accounts for approximately 15% of total bank

lending. If we include all property-related loans, such as construction and building materials, the exposure of commercial banks to the real estate market will be approximately 25%.

Concentration of loans to the property sector is attractive because there are higher profits compared to prime corporate loans in which the borrowers have more bargaining power. For property loans, most banks charge the MLR rate or small deviation from MLR rate (MLR-minus for mortgage loans, MLR-plus for developer loans) as oppose to some prime corporate loans, which get a little above the money market rate. At the same time, mortgage loans have lower risk since they are considered secured loans.

The second channel relates to assets of commercial banks, which comprise land and building owned as premises and foreclosed properties. At present, banks' property assets account for about 5% of total bank assets.[1]

The last channel is through collateralized properties. Because there is asymmetric information between banks and borrowers, banks generally requires collateral in order to reduce risk that may arise. Since about 80% of collateral are properties[2], any property price fluctuations will reflect back to the value of collateral and consequently lending behavior. For example, if real estate price rises, the net worth of collateral increases and encourages greater borrowing. This is exactly what happened during the pre-crisis period.

The last channel shows that property prices and bank lending have cycles that move together. During the boom of property prices, perceived lifetime wealth of household and corporations holding properties increases, causing consumption and investment to increase. The increase in aggregate demand encourages more borrowing. At the same time, rising property prices increase the net worth of banks. As a result commercial banks will be able to extend more loans. With increased lending, this will stimulate more demand feeding back to economic activities and the asset prices. In the reverse case, if property prices decrease, it will lead to a deterioration of collateral value. Falling net worth of commercial banks and the borrowers discourage banks from lending. And when credit falls, it will decrease aggregate demand and make property prices fall at the end. The chart on the top of the next page shows this relationship.

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[1] Premises are booked at cost or at revalued cost so their values in general do not move with property prices. It is noteworthy however that after crisis many banks had their premises revalued and booked the differences as retained earnings.

[2] From data for loans larger than 20 million baht, which is about 50% of total loans.

Asset Price and Bank Lending Cycle

Asset price boom

Increase in net worth of borrower and bank (collateral)

Acceleration in Private spending and investment

Lending capacity expands

Lending boom
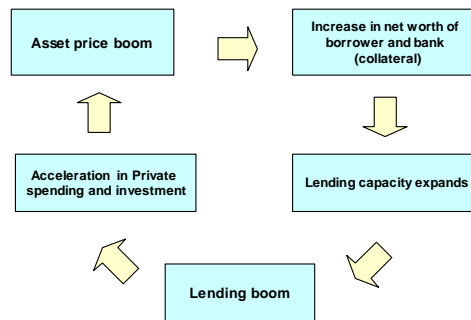
The linkage of the property market and commercial banks makes commercial banks prone to risk from the property market. Banks having high exposure to the property sector will be more sensitive to the volatility of the property market and property prices. In section 5, we will perform a stress test to gauge the vulnerability of the bank's position to the risk of a collapse in property price.

Real estate: some lessons for Thai commercial banks

It is irrefutable that the property sector is one of the important causes of the 1997 banking crisis in Thailand. The pattern is similar to many banking crises in the rest of the world. Although not all property market busts resulted in a banking crisis, international evidence shows that there tends to be a significant correlation between a property market bust and a banking crisis in both developed and developing countries. Two interesting questions are why a banking crisis is caused by the property sector and why the banking sector carries a risk by lending credit to the property sector. The following reasons may answer these two questions and provide lessons for commercial banks.

In a bubbled market, prices increased almost daily due to the optimism about the future. This made real estate investment a golden opportunity for investors. Whether it was residential or commercial property, commercial banks did not view the situation differently from others. When the market was booming, not too many people thought about what would happen if prices fell, if there was a slowdown in sales, or if there was excessive supply of buildings and houses. And because a collapse in property prices occurs quite infrequently, banks tended to underestimate its risks. This is called "disaster myopia". Even worst, during the boom period, the competition between commercial banks in lending to the property sector was intense. Each bank was content with the increased exposure in the property sector. The

herding behavior caused disaster myopia to be even higher.

Another reason for the failure of commercial banks to deal with the property sector properly was due to lack of information and insufficient analysis. Before the 1997 crisis, real estate data were not only of poor quality, but also slow. In addition, there were no price indices that can be used to gauge market temperature and trends. The only prices available were appraised values, which neither reflected actual market prices nor gave indications of the trend of future prices. The data for demand and supply were also very limited. Because of this acute shortage of information, many developers continued to enter the market, thinking everything was still ok even though problems were brewing.

Data unavailability caused the assessment of risk of banks to be miscalculated as well. Banks wrongfully believed that increased real estate credit would improve diversification even though higher concentration of property loans increased the risk to banks even more. In addition, as the market became saturated, the difficulty in selling later projects increased. And with the lag in production, once the banks received the relevant information, it was already too late to adjust.

Banks tend to believe that loans that are well collateralized or over-collateralized will make them safe since it covers the risk. By not considering the effects of the volatility of property prices, banks may feel overly secured by the collateral, causing the evaluation of projects to be flawed, which represents a daunting risk for the banks.

Another risk from collateral is that a bank's exposure in the property sector may be high even though its direct lending to the property sector is low. This is because properties are the most common collateral for all types of loans, property or non-property. In the event of an economic downturn and rising default, what banks get at the end are the collateral. While marked-to-market collateral such as stocks and bonds may seem vulnerable to price changes, they are liquid and subject to margin call. In contrast, property collateral, which are appraised only once or not so often, may actually be riskier for banks when there are abrupt changes in prices because they are highly illiquid and their prices cannot be monitored.

By nature, the property sector, particularly the commercial property segment, has high leverage. Developers will try to use less of their own funds so as to shift the risk to the lender as much as possible. Banks, being in the position of lenders with asymmetric information, therefore require a high loan-to-value ratio for property loans although as we just mention,

property collateral are not risk free. And when disaster myopia sets in, banks believe they can undertake lower LTV and other more lax conditions. Banks become careless especially in time of rising market and high competition.

Furthermore, when a project is near default, developers have no incentives to inject fresh money. Because of this, the lenders will bear the full risk. High leverage and asymmetric information between banks and developers thus create incentives for developers to carry out high-risk investments.

At the same time, what happens to banks will affect both their depositors and creditors. Prior to 1997, implicit deposit and credit guarantee by the governments made both depositors and creditors overlook the risks undertaken by banks. Lack of depositor and creditor monitoring created moral hazard for banks. As a result, banks continued to extend riskier loans with high returns, such as commercial property loans without paying much attention to their risks.

Another source of moral hazard was the false sense of security created by the fixed exchange rate regime. True, banks had hedged their currency mismatch by onlending domestically in foreign currency (Commercial banks' net foreign asset position was actually positive throughout the period). But to the extent that the borrowers might not be able to repay its foreign-currency debt, banks ultimately bore substantial credit risks in the event of sharp depreciation.

These are a few valuable lessons that Thai banks should take heed of. Going forward, they need to make sure that past mistakes are not repeated. Otherwise what happened before could happen again.

4. Impact of monetary policy on property prices

  The BoT's decision to raise its policy rate on August 25, 2004 marked the beginning of an upturn in the interest rate cycle. In this section, we employ a structural vector autoregression (SVAR) analysis to explore the extent to which monetary policy movements – changes in the repurchase rate – affect property prices by altering bank lending and the macro economy. We find evidence of a strong causal link from monetary policy to property prices. The transmission mechanism of this process is as follows: An increase in the policy rate first causes short-term market interest rates to rise which in turn increase the cost of loans and reduce the demand for credit by both developers and consumers. This consequently decreases house buying and planned fixed investment, two components of real output, which in turn contributes to a fall in property prices.

Data

  We estimate the model using quarterly data from 1993 Q4[3] until 2004 Q1. The variables include 14 day repurchase rate (RP14), nominal minimum lending rate (MLR), mortgage lending by commercial banks, real gross domestic product, and the condominium value index. We use the condominium value index to proxy for property prices. Both mortgage lending and real GDP are in billion baht. The basic statistics are provided below. All data was obtained from the BoT website with the exception of the condominium value index, which was obtained from Jones Lang LaSalle (Thailand) Limited.

	CONDOVALUE	RGDPSA	NOMMLR	RP14	MLOANCB
Mean	84.27	756112.01	10.28	6.18	383.39
Median	81.3	751816.51	10.23	3.24	386.29
Maximum	101.1	905168.98	15.38	21.97	481.02
Minimum	69.3	638499.60	5.63	1.25	225.63
Std. Dev.	13.05	62438.47	3.13	5.57	58.40
Skewness	0.10	0.37	0.10	1.15	-0.85
Kurtosis	1.24	2.88	1.55	3.56	3.58
Observations	42	42	42	42	42

Model

  The SVAR methodology assumes that the economy can be approximated by a linear, dynamic system of structural equations. Following the works of Bernanke (1986), Blanchard

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[3] The range of the data was limited by the condominium value index which started in 1993 Q4

and Watson (1986), and Sims (1986), identification is achieved by imposing contemporaneous restrictions, on the structure of the model. Our objective is to obtain non-recursive orthogonalization of the error terms for impulse response analysis. We impose restrictions to identify the orthogonal (structural) components of the error terms.

Let us define the following vector of changes in five variables:

$$x_t = (\Delta r_t, \Delta i_t, \Delta \log l_t, \Delta \log y_t, \Delta p_t),$$

where r is the 14-day RP rate, i is the nominal MLR, l is mortgage lending by commercial banks, y is the log of GDP measured at 1988 prices, and p is the condominium value index. Unit root and cointegration tests confirm that the first difference specification is appropriate.

The VAR(k) model is fitted for this vector x:

$$x_t = \mu + \sum_{l=1}^{k} Z_t x_{t-1} + e_t$$

with intercept μ and a VAR coefficient matrices Z. The vector of error terms is identically and independently distributed with mean zero and covariance matrix $\Sigma = E[e_t e_t']$. This VAR model is a general reduced form for all variables of interest collected in the vector x. Therefore, the error vector e has in general (if the variables are contemporaneously related) no structural interpretation. In order to identify structural shocks we have to formulate additional restriction on the VAR system. Following Amisano and Giannini (1997), the SVAR models that we estimate can be written as $Ae_t = Bu_t$, where e_t is the observed (or reduced form) residuals and u_t is the unobserved structural innovations. A and B are the 5x5 matrices to be estimated. The structural innovations u_t are assumed to be orthonormal, *i.e.*, its covariance matrix is an identity martix. In order to estimate the orthogonal factorization matrices A and B, we impose some short run identifying restrictions. Following Sims (1980) we restrict A to be lower triangular in order to get exact identification.

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 \end{pmatrix}, \ B = \begin{pmatrix} b_{11} & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{pmatrix}$$

By imposing these restrictions, we can identify the orthogonal (structural) components of the error terms. The lag length was set to two, which is optimal according to the Akaike criterion.

Note that given the structure of the matrices A and B, we can rewrite the relation $Ae_t = Bu_t$ as

$$e_r = b_{11}u_r$$

$$e_i = -a_{21}e_r + b_{22}u_i$$

$$e_l = -a_{31}e_r - a_{32}e_i + b_{33}u_l$$

$$e_y = -a_{41}e_r - a_{42}e_i - a_{43}el + b_{44}u_y$$

$$e_p = -a_{51}e_r - a_{52}e_i - a_{53}e_l + e_{54}e_y + b_{55}u_p$$

Result

Table 4.1 reports the SVAR estimation results. It shows that RP14 does not have a contemporaneous effect on mortgage lending by commercial banks, real GDP, and asset prices (*i.e.*, the null hypotheses that a_{31}, a_{41}, and a_{51} are zero cannot be rejected). Also, real GDP does not have a contemporaneous effect on the condominium value index. This is consistent with Moenjak et al. (2004) who find that real GDP tends to lead asset prices. On the other hand, it was found that MLR has a contemporaneous effect on the condominium value index.

Table 4.1. Structural identification estimate

e_r	= 1.566 u_r				
	(8.94)				
e_i	= 0.153 e_r	+ 0.295 u_i			
	(5.13)	(8.94)			
e_l	= -0.000 e_r	- 0.004 e_i	+ 0.009 u_l		
	(-0.31)	(-0.92)	(8.94)		
e_y	= -0.002 e_r	+ 0.004 e_i	+ 0.412 e_l	+ 0.017 u_y	
	(-0.94)	(0.47)	(1.40)	(8.94)	
e_p	= -0.001 e_r	- 0.018 e_i	- 0.143 e_l	+ 0.145 e_y	+ 0.009 u_p
	(-0.54)	(-3.69)	(-0.86)	(1.67)	(8.94)

Note: z-statistics are reported in parentheses.

Figure 4.1 shows the impulse responses of model variables to an innovation in the RP14 rate (Shock 1). For the shock to reach its maximum effect on each variable, it takes 1 quarter for MLR, half a year for real GDP, 2.5 years for mortgage lending, and 1.25 year for property prices. The full impacts of a one-standard deviation or 150-basis point increase in RP14 imply a 23 basis point increase in MLR, a 1 billion baht decrease in mortgage lending, a 1 billion baht reduction in real GDP, and a 1.2% fall in property prices. The responses from the shocks dissipate over time as shown in Figure 4.2. Over a 30-year period, the effect of a one-time monetary policy shock is transitory.

Figure 4.1. Response to an RP14 shock within the short run

Response to Structural One S.D. Innovations ± 2 S.E.
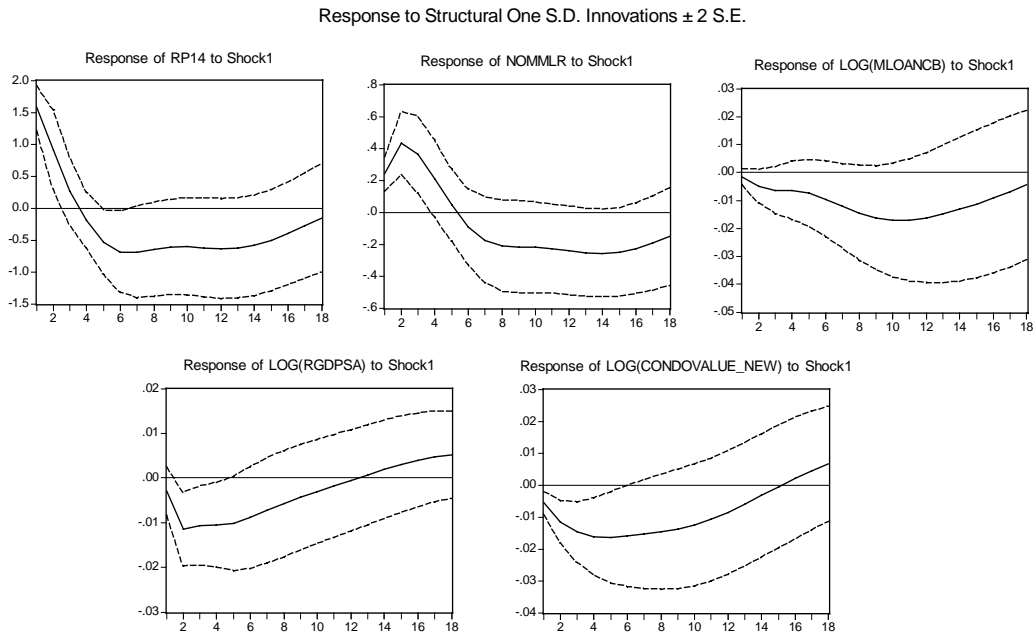
Figure 4.2. Response to an RP14 shock over the long run

Response to Structural One S.D. Innovations ± 2 S.E.
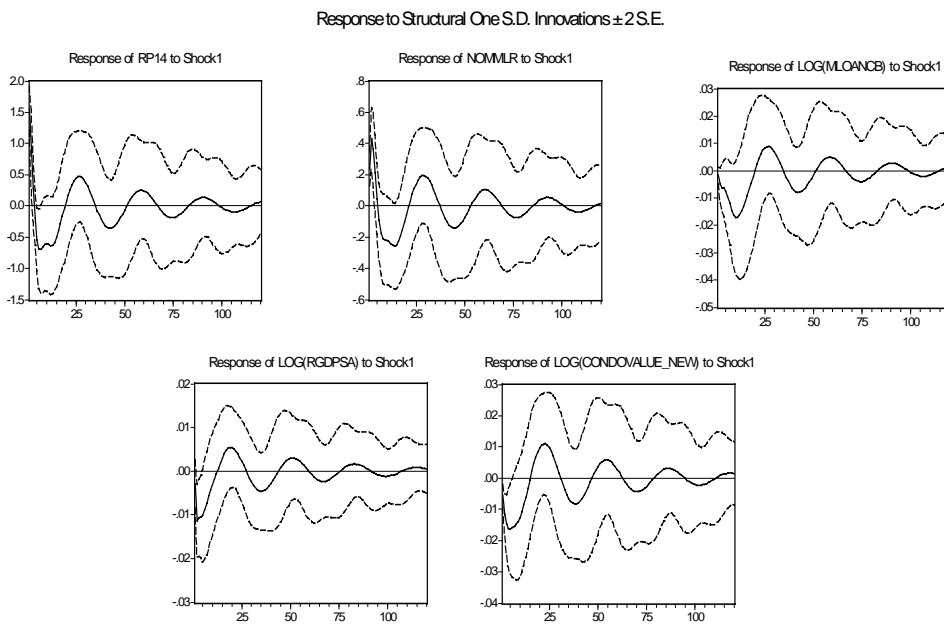
Figure 4.3 traces out the fraction of the n-period forecast error variance for the condominium value index that is attributed to each random innovation in the SVAR model. The result shows that around 40% of the variation in property prices can be explained by variation in MLR and another 30% by variation in RP14. Surprisingly, shock to commercial bank mortgage loans explains less than 5% of variation in property prices.

Figure 4.3. Property price variance decomposition (percent)
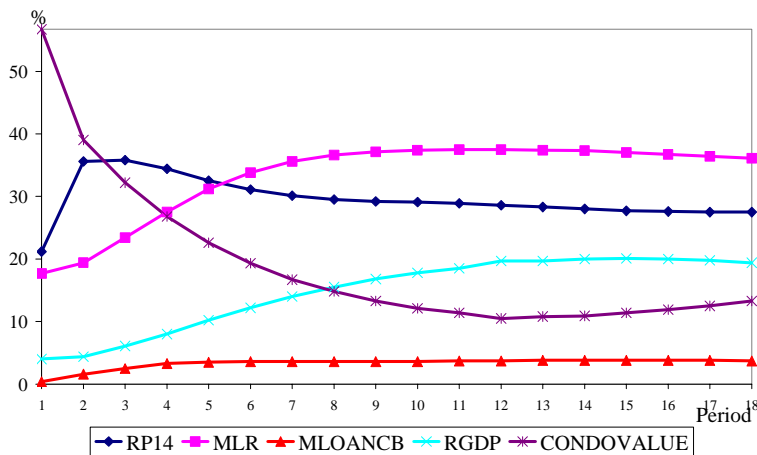
Overall, we find that changes in monetary policy play an important role in bank lending, the economy, and property prices. For this reason, there is a trade-off in applying monetary policy to deal with property prices, as it would affect other sectors of the economy as well.

5. Assessment of financial fragility in the current market environment

The trends in the property market and property-related lending have in recent months raised concerns among observers about the vulnerability of involved financial institutions, particularly commercial banks. From the point of view of the authorities, these concerns are not to be taken lightly. In a country like Thailand where banks dominate the financial system, potential weakness in banks' financial positions could seriously undermine the prospect of continued financial and economic stability.

In light of these concerns, this section seeks to assess the degree of financial fragility associated with bank lending and the property market in the current market environment. In calibrating the risks facing banks, the section asks two very specific questions. First, how long will banks' mortgage portfolios be able to withstand the upturn in the interest rate cycle without having to ask the borrowers for additional payment contributions? Equivalently, what is the degree of tolerance to future interest rate increases that is embedded in today's mortgage contracts? And second, what would be the impact on banks' capital positions should there be a collapse in property prices?

5.1. Measuring sensitivity of mortgage payment plans to interest rate increases

Our first assessment concerns banks' mortgage loan portfolios. The ease of access to post-financing has been one of the major driving forces behind the current property market boom. Rock-bottom mortgage rates, low monthly payments, and other seemingly lax conditions have attracted homebuyers in droves. As a result, mortgage loans have also become one of banks' fastest growing assets. The rapid growth of banks' mortgage loan portfolios has led to concerns about its future implications not only for mortgagers, but also for banks. Notwithstanding mortgage loans' low risk weight, many fear that banks' aggressiveness in pushing off their mortgage plans to customers may, if not already, compromise the soundness of their mortgage portfolios.

The analysis in this subsection centers on the ability of bank mortgage portfolios to withstand the upturn in the interest rate cycle. The current low interest rate environment has been a boon for both banks and mortgagers, allowing the former to aggressively expand their mortgage portfolios and the latter to easily service their debt payments. But the return of inflationary pressure fueled by the booming economy and rising world oil price along with the recent turnaround in the interest rate cycle means that the favorable interest rate environment will likely not last for long.

To see how banks' mortgage portfolios would get into trouble with rising interest rates, consider the following hypothetical mortgage contract. The contract is for a one-million-baht loan with a 20-year contract term. The interest rate is fixed at 3.75% for the first two years and then floats at MLR thereafter. The fixed minimum monthly payment is 7,020 baht. As we mention in Section 3, such a fixed-then-float contract structure is typical of today's mortgage contracts.

For readers unfamiliar with mortgage payments, each monthly payment comprises two components: interest and principal repayment. The interest component covers the interest due for that month. The principal repayment component reduces the outstanding loan balance. The amount of interest payment in each month's payment equals that month's prevailing interest rate times the outstanding principal balance for the past month. For a single-rate mortgage, most of the monthly payments in early years will go to interest payment. Overtime as the loan principal goes down, the proportion of interest payment in a monthly payment will gradually decline. Towards the end of the contract term, most of the monthly payments will be for principal repayment.

Assuming MLR remains constant at 5.75% (the prevailing MLR at the time of this writing), Figure 5.1 plots the payment profile of the hypothetical contract over the 20-year contract term. An interest payment component is shown by the non-shaded area while the principal repayment component is shown by the shaded area.

Figure 5.1. Payment profile of a hypothetical mortgage contract when MLR remains at 5.75%
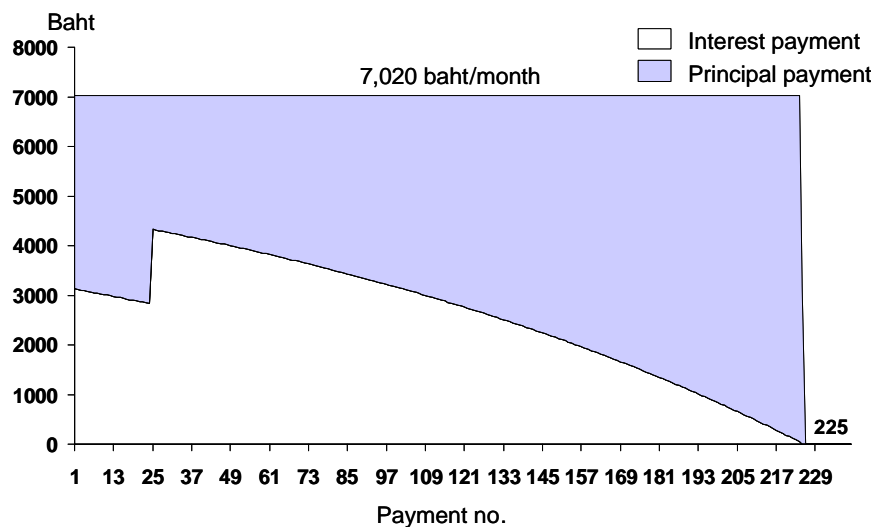
Figure 5.1 reveals two important observations. The first is the disproportionate amount of principal repayment during the first two years of the contract. The low fixed interest rate during this period allows more principal to be reduced upfront.

The second observation is a direct consequence of the first. By having more principal reduced at the beginning of a mortgage contract, a bank may not have to wait until the end of the contract term to recoup the initial principal. Under the assumed scenario of unchanged MLR, the hypothetical contract is completely paid off more than a year in advance. The last monthly payment is the 225th one, not the 240th as one might have thought given the 20-year term.

All fixed-then-float mortgage plans in the market share a similar payment profile as our hypothetical contract, namely extra upfront principal reduction and early contract termination under the unchanged MLR scenario. The possibility of early contract termination does not mean that banks get the pricing wrong, however. On the contrary, it reflects banks' anticipation of future interest rate increases. As we will see shortly, the odd of early contract termination in actuality is quite small.

More needs to be said about the amount of fixed monthly payments. This is an important feature of mortgage contracts that are not reported in typical mortgage plan comparisons. A low level of monthly payments allows mortgagers to service the debt with ease, making the contract very attractive to would-be borrowers. This in turn allows banks to market such plan easily. But there is no free lunch here, however. The drawback for banks that offer such contracts is that a low level of monthly payments results in a slower reduction of outstanding principal. And as we shall see, this makes these contracts more vulnerable to future interest rate increases.

When a prospective customer visits a home loan officer, she is usually presented with a schedule detailing how much she has to pay each month given the amount she wants to borrow and the contract term. Behind such a payment schedule is a basic present value calculation for an annuity. In coming up with the schedule, the bank assumes a single interest rate to be used for the entire contract length. The monthly payments are the amounts that, when discounted with the assumed interest rate, their present value will be equal to the total amount borrowed. In fact, if one knows the interest rate that a bank is assuming, one can easily find out the amount of the monthly payment using only a hand-held financial

calculator.[4] Some banks even have a mortgage calculator on their websites. To find out the required monthly payment, prospective borrowers only need to enter the underlying rate, the amount of mortgage loan, and the contract term.

For our hypothetical contract, the assumed underlying interest rate is 5.75%, same as the prevailing MLR. At present, not all banks use MLR as their underlying rate. Some banks uses higher rates and some banks use lower rates. The choice of the underlying rate is bank-specific policy. To find out what underlying interest rate a bank is using, one can work backward using the bank's payment schedule. The assumed underlying rate is the rate that equates the present value of the monthly payments to the amount borrowed.

The fact that the amount of monthly payments is predetermined but the contract interest rate is variable for most of the contract life means that interest rate movements have a direct impact on principal repayment. During the variable-rate period, a higher level of interest rate means that a higher proportion of monthly payments will be for interest payments. With less reduction in the outstanding principal, banks run the risk of not being able to recoup the entire principal within the contract term.

Here we see the benefit of having a chunk of principal reduced during the fixed-rate period. The more the principal has been repaid before the reference interest rate rises, the less the underwriting bank has to worry about the slower rate of principal reduction. In essence, the amount of principal reduced during the fixed-rate period acts as a "cushion" shielding the mortgage loan from future interest rate increases.

How long can banks' mortgage portfolios withstand increases in interest rate depends on the size of the built-in cushion and the future path of the reference variable rate. To illustrate the risk that banks are exposed to, we perform a simple sensitivity analysis on our hypothetical mortgage contract. In this analysis, we assume that, by the end of the second year into the contract, MLR will have risen from the current level of 5.75% to x% and remain there for the rest of the contract term.[5] What we are interested to know is the threshold value of x such that the loan is exactly paid off at the end of the contract term (*i.e.*, the value of x such that the outstanding principal after the 239th payment is exactly 7,020 baht).

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[4] In the case of a progressive payment schedule, calculating monthly payments is much more complicated, for one also needs to know the yearly incremental payment increase that the bank assumes. Nevertheless, the task can be accomplished with help from a spreadsheet program.

[5] Since the mortgage rate is fixed during the first two years of the contract, what happens to MLR during this period is irrelevant. What matters in this case is the path of MLR from year three onward.

Figure 5.2. Outstanding principal under different assumptions of MLR path
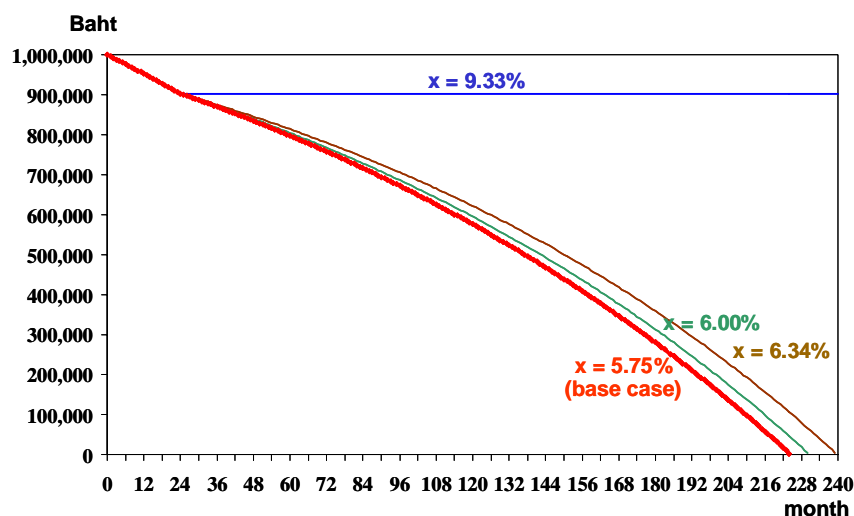
Figure 5.2 plots, for different values of x, the outstanding amounts of loan principal over time. The thickest line to the left corresponds to the base case where MLR remains unchanged at 5.75% forever. The lines to its right correspond to different cases of x. As the value of x increases, a greater number of monthly payments are needed to pay off the loan. For the hypothetical contract, this threshold value of x is 6.34%. At x equal to 6.35%, the 240th monthly payment will not cover the outstanding principal. Thus, under the assumed scenario, our hypothetical contract can tolerate just below a 60 basis point increase in MLR.[6]

Applying the same analysis to actual mortgage plans currently offered in the market, we find that the built-in "interest rate cushions" range from as low as 10 basis points to nearly two percentage points, with the majority falling between 50 and 100 basis points.[7] A rule of thumb is that the larger the size of monthly payments, the larger the interest rate cushion is.

We can take our analysis one step further by asking, for what value of x, loan principal after year 2 will never be reduced. That is, we want to know the value of x such that the entire monthly payments after year 2 will only be for interest payment. For the

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[6] Analytically, the threshold interest rate r^* solves

$$P_0\left(1+\overline{r}\big/12\right)^{24} - M\sum_{i=1}^{24}\left(1+\overline{r}\big/12\right)^{i-1} \;=\; \sum_{i=1}^{216}\frac{M}{\left(1+r^*\big/12\right)^i} \;,$$

where P_0 is the initial principal, $\overline{r}$ is the fixed annual interest rate, and M is the amount of monthly payments. The left-hand side of the equation equals the remaining principal at the end of the two-year fixed-rate period while the right-hand side equals the present value of the remaining 216 monthly payments discounted by r^*.

[7] In the case of fixed-one-year plans, we assume that MLR during year two of the contract is halfway between 5.75% and x.

hypothetical contract, this happens when x equals to 9.33% and is represented graphically by the horizontal line in Figure 5.2.[8]

Figure 5.3. Real MLR, 1992:6-2004:6

Percent
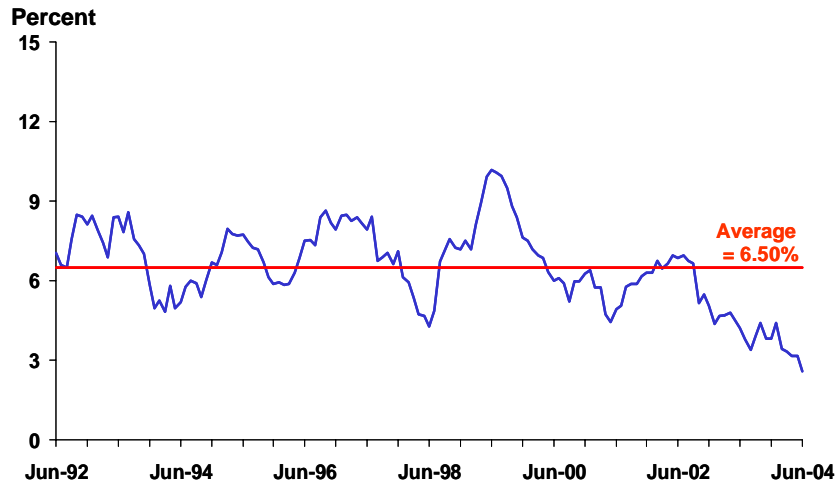
Note: Real MLR deflated using contemporaneous headline inflation rates

To put these threshold values in perspective, we need a rough estimate of average nominal MLR over the long run. One way to do this is to add expected long-run inflation rate to the historical average of real MLR. Figure 5.3 plots movements of real MLR from 1992:6 when the regulatory ceilings on bank lending rates were removed to 2004:6. The average real MLR during this period, which covered both the up and the down of the Thai economy, is 6.50%. Given that the Bank of Thailand's inflation target is 0-3.5%[9], we add 1.75% on top of it to get 8.25% as the rough estimate of average nominal MLR going forward, or about 250 basis points above its current level.

Given this projected long-run average of MLR, the possibility of the all-for-interest-payment scenario is remote. On the other hand, the possibility of existing contracts failing to cover the initial principal is very real, particularly for plans with low interest rate cushions. To find out what will happen if MLR or other reference rate rises to the point that a bank believes the contractual monthly payments will not be adequate to pay off a loan, we conducted interviews with a number of loan officers. In general, banks plan to deal with this problem in two ways. First, they will ask their customers to contribute additional money so

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[8] For actual mortgage plans in the market, the same analysis yields values of x between 8.57% and 10.66%.
[9] The Bank of Thailand targets core inflation. Nevertheless, our method is valid as long as both core and headline inflation rates move together over the long run.

31

as to repay more principal. The additional contribution can be in the form of add-on monthly payments or a one-time lump-sum payment. Second, they may extend the contract term for the customers. Of the two, the first option appears to be the preferred one. Ultimately, however, what option banks will choose will depend on each customer's future debt service capability. Either way, the customers end up with a higher interest burden.[10]

The fact that borrowers will be the ones who absorb the increased interest burden does not mean that banks' mortgage portfolios are totally immune to interest increases. Greater debt burden will make it more difficult for borrowers to service their debt. In effect, banks end up with higher credit risk. Bank's customer selection is therefore essential for a resilient mortgage portfolio. A bank that offers mortgage plans with thin interest rate cushions needs to be certain that their customers will be able to chip in the extra payments. Otherwise, its mortgage portfolio will run into troubles sooner or later. On the other hand, a bank that is unsure about their customers' ability to service higher debt may want to price in large cushions so that the trigger point for additional payments is not reached easily.

Will mortgagers be able to afford the increased debt burden?

Our analysis may give an impression that there is an enormous hidden risk associated with banks' mortgage portfolios as the majority of mortgage plans will require additional payment contribution should market interest rates rise more than 200 basis points. In this box, we investigate further the additional debt burden that the mortgager of our hypothetical contract will have to bear should MLR rise to 8.25%, our rough projection of average long-run nominal MLR.

Banks' current lending practices place a limit on how much a prospective customer can borrow given his income. In general, there is a ceiling on the amount of the monthly payment not exceeding 30-40% of borrowers' monthly income. The maximum amount that a customer can borrow is then calculated as the present value of a stream of the maximum monthly payments discounted by a bank's underlying rate.[1] To borrow more than this amount (which is not uncommon), the customer must put in additional collateral or show somehow

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[10] The availability of these two options means that banks may delay taking action until the projected shortfall reaches a certain amount. This is best illustrated by the case of a one-time, lump-sum payment. If the extra payment can be assured and there are no other uses of funds that offer better risk-adjusted return than the underlying mortgage, banks will be better off to wait until the last payment date to collect the additional contribution.

that he can service more than this amount.

To give a numerical example, suppose that a bank that offers the hypothetical contract has a 35% monthly payment-to-income policy. Suppose further that the mortgager who signs the hypothetical contract have borrowed up to his limit, *i.e.*, his income at the onset of the contract is about 20,000 baht per month. That is, we are looking at the worst-case scenario. If the 7,020-baht payment is below the 35% ceiling (the borrower has more income), the risk for him not being able to afford the increased debt burden will be lower.

Next, suppose that in year three, MLR rises to 8.25% and stay there forever. It can be shown that if the contract term remains at 20 years, then the hypothetical contract requires an additional 1,020 baht each month on top of the 7,020-baht contractual monthly payment from year three onwards to pay off the loan. The 1,020-baht additional payment is equivalent to 5.1% of his monthly income today.

Given that income of most people increases over time, the increased debt service should not put much burden on our hypothetical mortgager. Suppose that his income rises 5% every year. By the time he is asked to contribute more, he will have more than enough debt service capacity to absorb the increased debt burden.

To summarize, while the risk is there, it is not so high. A bad sign is when an interest rate cushion is thin, a mortgager has borrowed beyond his income limit, and his future income stream does not look promising. A prudent bank will not let these things happen at the same time.

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[1] Provided that the LTV constraint is not binding. Otherwise the LTV constraint supersedes the payment-to-income constraint.

5.2. Stress testing banks' capital positions

Stress testing the vulnerability of financial institutions to exceptional but plausible (tail-end) events is a key element of macroprudential analysis. A number of central banks and financial regulators around the world routinely use stress tests to monitor and anticipate potential vulnerabilities in their financial systems. The IMF's Financial Sector Assessment Programs (FSAPs) require, with varying complexity, stress testing of financial institutions' resilience to macroeconomic shocks. Other examples of stress tests used by regulators include Frayland and Larsen (Norges Bank, 2002), Hoggarth and Whitley (Bank of England, 2003), and Esho (APRA, 2003).

Originally developed as a risk management tool for financial institutions, stress testing is a generic term describing various techniques used by these institutions to measure potential losses of their portfolios or business units as a result of a shift in risk factors (exchange rates, interest rates, equity prices, or in our case, property prices, etc.). Broadly speaking, stress testing can be divided into two types on the basis of the number of risk factors involved (BIS, 2001). A sensitivity stress test involves a move in a single risk factor while a stress test scenario concerns simultaneous moves in a number of risk factors.

In this subsection, we employ a very simple sensitivity stress test to gauge the impact of a fall in property prices on banks' capital positions. Our interest in the impact of a property price decline is motivated by Esho (2003), who subjects mortgage portfolios of authorized deposit-taking institutions (banks, building societies, and credit unions) in Australia to a similar stress case. Our analysis however goes beyond Esho (2003) to look at banks' overall exposures to property prices, not just mortgage portfolios. Our primary objectives in the stress test are to see whether Thai commercial banks would be able to withstand a collapse in property prices without breaching the capital adequacy requirement and also to identify institutions judged to be more at risk than others in the event of a property market downturn.

Following Esho (2003), property prices are assumed to fall precipitously 30% across the board.[11] The magnitude of the assumed fall in property prices comes from a recent study of 20 episodes of housing price crash in 14 industrialized countries by the IMF (2003), which finds an average decline in real house price of 30%. The 30% decline is also in line with Thailand's experience post 1997 (See Figure 2.5).

In addition, our stress test focuses solely on the impact of the price shock, not on its potential causes. This is also the approach taken by Esho (2003). Although the SVAR analysis in Section 4 shows that property price movements are influenced by macroeconomic conditions, we do not attempt to simulate the future path of interest rates, GDP growth, credit growth, or other exogenous macroeconomic factors that could lead to the assumed collapse. We note however that monetary policy tightening alone will not precipitate a property price collapse. Based on the results of Section 4, it will take several hundred basis points of interest rate increases to bring about a sharp downfall in property prices.

34

A caveat is in order here. Our interest in property price correction does not mean that we think they will occur anytime soon. If past cycles are any good indication of the future, the probability of a major price correction in an immediate horizon is remote. But this is exactly what stress testing is for – assessing the impact of a tail-end event. This type of "what if" exercise potentially helps regulators to identify risk exposures of individual financial institution and the system as a whole.

Before delving into the mechanics of our stress test, it is worth to have a detailed look at banks' exposures to the property sector. What one may not realize is that banks' property-related loans constitute only a fraction of banks' total property exposures. To get a complete picture of banks' total property-sector exposures, one must consider also collateral used in the calculation of loan provisions and foreclosed properties that banks possess.

Table 5.1. Thai banks' property-sector exposures[12], December 2003

	Million baht
Housing loans (mortgages)	436,327
Property development and construction loans	383,478
Value of properties being used as loan collateral (estimated)	1,957,392
Properties foreclosed (net)	146,694
(Cf. Total assets = 6,118,017) Total	2,983,291

Source: Banks' annual reports and authors' estimate

Table 5.1 shows the outstanding amounts of Thai commercial banks' property-sector exposures at the end of 2003. Except for the collateral item, others are compiled from individual banks' 2003 annual reports. To get the estimated value of properties being used as collateral, we use 80%, the ratio of property collateral to total collateral for loans larger than 20 million baht, as a proxy ratio for all loans and multiply it with the total value of collateral used in the calculation of required allowances for doubtful accounts reported in the notes to financial statements.

Taken together, Thai banks' property-sector exposures are enormous, amounting to nearly 50% of their combined asset base. The largest exposure by far is the collateral used in

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[11] There is a slight difference between our assumption and Esho's. Here we assume a fall in *nominal* property prices whereas Esho assumes a fall in *real* prices.
[12] Excluded from Table 5.1 are land and buildings owned by banks as premises. Although their values are sizeable, they are booked at cost or at revalued cost (less accumulated depreciation for buildings). Thus, for the purposed of our analysis, they do not represent banks' exposure to the property sector.

the calculation of required provisions, which accounts for more than two-third of banks' total exposures. The size of this item is directly related to the size of Thai banks' loan portfolio. The fact that bank credit have accelerated since the beginning of 2004 means that this item is now larger than the figure indicated in Table 5.1.

Net properties foreclosed represent the smallest of the four items in Table 5.1. There relative size to other exposures however understates their significance. Figure 5.4 plots the amount of net foreclosed assets on Thai banks' balance sheets and their percent of total assets from 1997:1 to 2004:6. Since mid-1999 crisis, banks' properties foreclosed have ballooned. Most of these properties foreclosed were previously collateral of loans than had turned sour. They now represent about 2.5% of Thai banks' total assets. The corresponding figure for foreign bank branches is 0.1%. Having such sizeable non-income-generating and highly illiquid assets on balance sheets entails significant costs for Thai banks.

Figure 5.4. Thai commercial banks' net foreclosed assets, 1997:1-2004:6
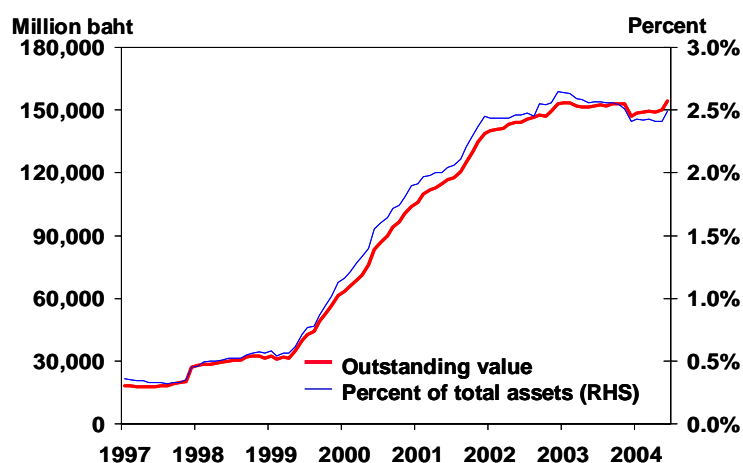
Source: BoT

To clearly grasp the logic behind our stress test, knowledge of the BoT's regulations regarding loan classification and required provisions is essential. According to the current regulation, bank assets are to be classified as pass (or normal), special mention, substandard, doubtful, doubtful of loss, and loss. At first cut, bank loans are classified according to the period that a loan is past due. Pass loans have no interest overdue (or have overdue not more than 1 month in the case of overdraft loans). Special mention loans have interest overdue more than 1 month, but not more than 3 months. Substandard loans have interest overdue more than 3 months, but not more than 6 months. Doubtful loans have interest overdue more

than 6 months, but not more than 12 months. Doubtful of loss loans have interest overdue more than 12 months. Additional classification criteria look at projected future cash flows and the ability of the debtor to repay the debt in entirety. In 2004, the BoT started to enforce these secondary criteria very seriously as it felt that some interest-yielding loans were more at risk than the others. Finally, loss loans are loans considered to have no possibility of being recovered and must be written off. Readers interested in fine details of the BoT's classification rules should consult the BoT's notification regarding worthless or irrecoverable assets and doubtful assets that may be worthless or irrecoverable dated August 26, 2004

For prudential purposes, all loans on bank's balance sheet are required to maintain minimum reserves or provisions against them. Pass, special mention, substandard, doubtful, and doubtful of loss loans are required to maintain a minimum of 1%, 2%, 20%, 50%, and 100% provisions. Effective August 26, 2004, doubtful of loss loans that have not been restructured or taken to court and overdue for more than two years will need an additional provision for the part of the loan that had not yet been provisioned. Essentially, banks will be required to make provision in full, regardless of the collateral value, for doubtful of loss loans older than four years. Non-performing loans (NPLs) are defined as the sum of substandard loans, doubtful loans, and doubtful of loss loans, plus fully provisioned loans that had previously been written off, but not yet recorded in the accounts.

Figure 5.5. Distribution of bank loans by loan class, December 2003
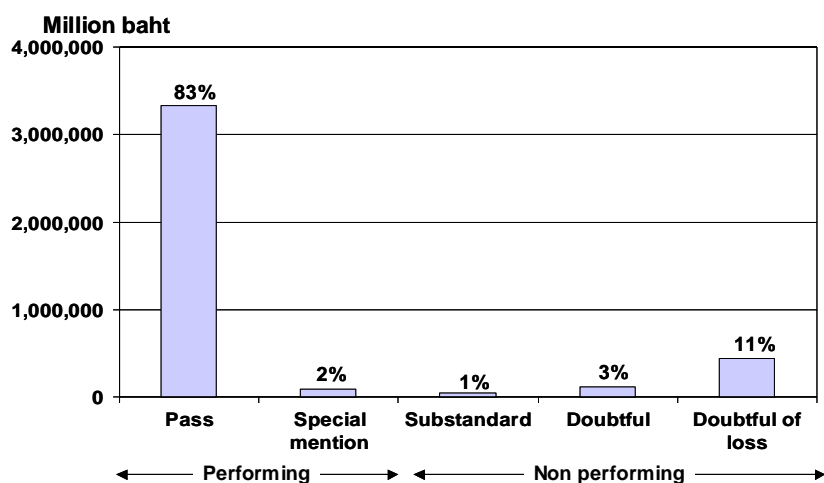
Note: Not including loans to financial institutions

Source: Thai banks' 2003 annual reports

Figure 5.5 shows the distribution of bank loans by loan class at the end of 2003. We see that most of non-performing classified loans fall under the doubtful of loss category. These are essentially "die hard" NPLs that have been on bank balance sheets for years.

It should be noted that Figure 5.5 represents a snapshot of the situation before the Bank of Thailand started to tighten its classification rules in 2004. While new figures of classified loans are not yet publicly available, it is conceivable that a considerable amount of loan classified as pass in Figure 5.5 were reclassified as non-performing, requiring some banks to put in additional provisions as a result.

An important detail that cannot be overlooked is the fact that required provisions are calculated net of collateral values. As mentioned by Disyatat and Nakornthab (2003), such calculation method has two major problems. The first is that, if not appraised frequently enough, book values of these collateral may become out of line with their fair market value. The second is that the method ignores the time value of money. Currently, asset foreclosure takes several years during which a bank will not be able to realize any cash flow from it. As such, the current provision calculation method allows some banks to delay realization of losses and the necessity to increase capital.

To alleviate these problems, the BoT stipulates criteria for the amount of collateral that can be deducted in the calculation of provisions. For property collateral, up to 90% of the appraised value of collateral can be used for deduction. We note however that the 10% haircut will not commensurate with the time value of the foregone income stream in the event of loan loss.

The BoT currently has a plan to phase out completely the use of collateral value deduction in the calculation of required provisions to bring Thailand's prudential standard up on par with international best practices. So the problems mentioned will eventually become things of the past. The new provisioning rule introduced on August 26, which requires additional provisions for doubtful of loss loans aged older than two years that have not been restructured or taken to court, is the first step.[13] The rationale behind this is that disallowing

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[13] Although the 26 August notification represents at first glance a much tougher requirement than the one it replaced, its has not affected the banks' overall provisions much. The crucial keyword is "not yet restructured or taken to court." The BoT has forewarned banks of this tightening for quite some time. So, by the time the notification took effect, many of these loans have been taken to court.

collateral deduction for this group of loans will also give banks incentives to speed up their NPL resolution.

Having discussed the relevant aspects of the BoT's regulation, we now turn to how our stress test model works. To assess the impact of a property price collapse on banks' capital positions, we construct a financial model based on simplified unconsolidated income statements and balance sheets of thirteen Thai commercial banks. All inputs used are taken from public sources, mainly the annual reports. In this model, banks' capital losses result from expenses charged against retained earnings over the immediate accounting year. These expenses come from the following five sources.

1. <u>Increase in required loan-loss provisions</u>. When property prices tumble, two things happen in our model. First, the qualities of property-related loans deteriorate and existing performing loans become non-performing. Second, regardless of loan class, the values of collateralized properties decline. Both of these things result in a higher level of required provisions for banks. To the extent that banks' existing provisions are below the new level of required provisions, banks are required to put up additional provisions to cover the shortfall. The extra provisioning amount is charged as an expense on the income statement.

In coming up with how much of the existing performing loans would turn non-performing, we simply assume a default rate for each specific loan group. Lack of information on historical default data and certain loan characteristics such as loan-to-value (LTV) ratio, borrower's profile, and TDR (troubled debt restructuring) status prevents us from performing meaningful statistical work on loan default rates. Nevertheless, we try to make certain that our assumptions on default rates are sensible through cross checking with international experiences and industry interviews.

We begin by dividing bank loans into three groups based on their nature of connection to the property sector and data availability: housing loans, property development and construction loans, and other loans. For housing loans, we assume that 4% of existing loans would turn non-performing under the hypothetical stress (This and other assumptions used in our stress testing are summarized in Appendix A.). In arriving at this number, we add 0.5% to the estimated default rate of 3.5% in the case of Australia (Esho, 2003). We were actually tempted to assume a lower default rate for Thailand because (1) a much higher percentage of home loans in Thailand goes to owner-occupiers as opposed to Australia where nearly 50% of new home loans go to property investors which make these loans riskier and (2) our

industry interviews gave an impression that Thai mortgagers are more inclined to hold on to their properties than their western counterparts when facing with a price decline. So we are being conservative in assuming a higher default rate than Australia.

The 3.5% or 4% number may at first glance appear quite small if we compare them to actual domestic and international experiences. Readers should be reminded however that in this exercise we only concern about the impact of a price shock. Actual default rates also reflect the effects due to other macroeconomic factors, which we assume away in this exercise.[14]

For property development and construction loans, we have a totally different story. The decline in property price would directly affect the cash flows of property developers. One senior banker told us that we could reasonably expect to see between 30-50% property developers to fold up were property price to fall 30% precipitously. Based on this information, we assume a 40% default rate for property development and construction loans.

For all other loans, the fall in property prices should have a minimal impact on them. Most loan contracts do not require borrowers to put up extra collateral should the values of their collateralized properties decline.

These assumed default rates are then applied uniformly across banks. In reality, banks with more lax lending practices and/or higher percent of TDR loans are more likely to experience a higher incidence of defaults in the event of a property price collapse. Available public information however does not allow us to differentiate banks objectively in this respect. Nevertheless, we try to account for variations in default likelihood by assuming ranges of default rates (as opposed to single rates) for each bank in our robustness check.

For the value of collateral used in the calculation of required provisions, we assume a 30% decline in the value of property collateral, but no change in value for other types of collateral.

2. Loss of interest income. When performing loans become non-performing, their interest payments cease. As a result, banks' net interest margins fall, lowering banks' profitability. In our model, this "interest-in-suspense" is recorded as expenses in banks'

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[14] Other readers may wonder why there would be defaults by mortgagers at all if the decline in property price were the only thing that happens. Intuitively, if the market value of a property owned by a mortgager is far below the amount that he owes a bank, the mortgager may find himself better off to give the property back to the bank rather than incurring the unrealized loss. This default behavior can be formally modeled using a binary option-pricing approach. See Sanders (2002) for detail.

income statements. In addition, the BoT's regulation requires that accrued interest receivables on loans for which repayments are more than three months in arrears be reversed. To account for reversals of accrued interest receivables, we first calculate the average default rates for the entire loan portfolios and then multiply them to the amount of outstanding accrued interest receivables on banks' balance sheets.

3. Increase in NPL resource costs. When NPLs rise, banks incur certain additional costs. For most banks, these are costs incurred by the collections department to manage a greater volume of loans in default. In this model, we assume that these costs are proportional to the amount of new NPLs.

4. Losses on impairment of properties foreclosed. Properties foreclosed are generally recorded at lower of cost or market value. When banks consider that there is a decline in net realizable value of foreclosed properties, the impairment is recognized in banks' income statements as non-interest expenses. In our exercise, we assume that banks write down the value of properties foreclosed by a full 30%

5. Losses from bank-owned AMCs. Several private banks have set up asset management companies (AMCs) to manage some of their bad debts. Assets transferred to bank-owned AMCs are considered "removed" by the BoT and are examined independently of their parent banks. But to the extent that all of these AMCs are 99.99% or 100%-owned subsidiaries, their well being directly impacts their parent banks. An efficiency issue aside, a bank with 20 billion baht of NPLs is not much different from a clean bank that owns an AMC with 20 billion baht of NPLs. Good analysts usually look at consolidated NPL figures when assessing a bank's capital vulnerabilities.

To account for private banks' ownership of AMCs, we subject these AMCs to the same stress as their parent banks. Losses incurred on AMCs' books are then recorded as losses from subsidiaries on the parents' income statements.

The schematic diagram in Figure 5.6 summarizes the important links in our financial model.

Figure 5.6. Schematic representation of the stress test model
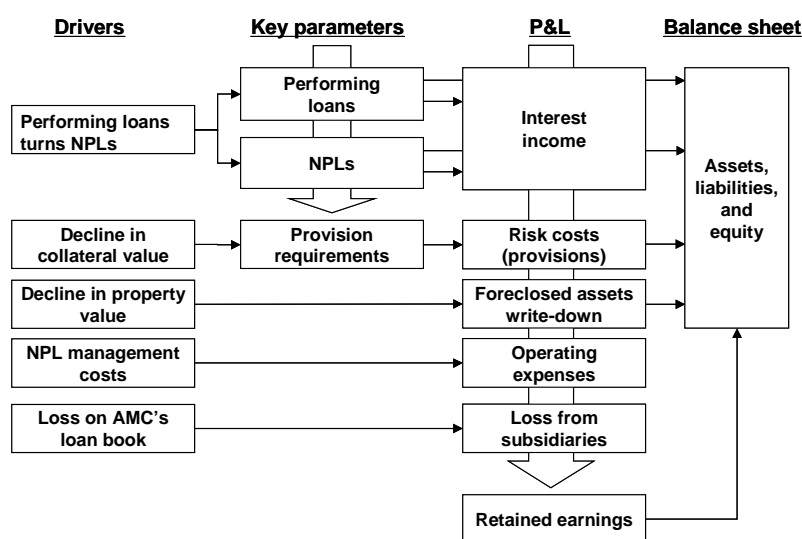
By applying a certain set of common assumptions (see appendix A) to the actual balance sheet of each of the thirteen Thai banks, our stress test model provides a readily comparable projection of defaults, losses, and resulting impact on each bank's capital position. The results allow us not only to see which banks are more at risk than the others in the event of a property market downturn, but also to identify the factors that make them more vulnerable.

The key results of our stress testing exercise can be summarized as follows.

First, Thai commercial banks as a group have enough capital to absorb the losses induced by the severe price stress. Figure 5.7 reports itemized expenses charged to Thai banks' aggregate income statement under the hypothetical stress case. As we would expect from such an extreme event, the combined loss for all thirteen Thai banks is enormous. The 62-billion-baht capital loss is equivalent to about 12% and 16% of total regulatory capital and tier-1 capital, respectively. Nevertheless, the sizable capital base of Thai banks would provide enough cushions for the hypothetical capital loss. The right-hand panel of Figure 5.7 shows that both the capital adequacy and the existing-provisions-to-required-provision ratios after shock remain unbreached. The post-shock CAR, in particular, remains well above the 8.5% level required by the authorities, despite being reduced by one-and-a-half percentage point.[15]

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[15] By construction, the aggregate results represent the average impact on Thai banks. The median results are 1.6% decline in CAR, 35% drop in the actual-to-required provision ratio, 3.3% increase in NPLs, and 19% fall in the provision-to-NPL ratio.

Figure 5.7. Aggregate stress test results

Expense items	Million baht
Additional provisions	19,541
Loss of interest income	13,780
New NPL resource costs	3,244
Impairment of properties foreclosed	49,059
Loss on AMCs' books	2,818
Total	88,442
Total decrease in capital = total expense*(1-tax rate)	61,910

Prudential ratios

CAR
Before	13.4%
After	11.9%

Existing provisions to required provisions
Before	138%[1]
After	105%

NPL ratio
Before	13.5%
After	17.5%

Existing provisions to NPLs
Before	72.4%
After	55.5%

(1) As reported in CB 1.1

Second, the five expense items take a toll on banks' capital positions with varying degrees of magnitude. Losses on impairment of properties foreclosed hit banks the hardest, accounting for more than half of total expenses charged. One lesson from this result is that banks should try to unload these assets to reduce vulnerability as soon as possible while taking into account the effect of the sales of these assets on the general price level. Additional provisions and loss of interest income represent the second and third largest expenses, respectively. Although losses from AMCs' appear non-material in aggregate, for banks that owned them, losses from AMC are quite sizable.

Third, had there not been because of the substantial amount of provisions that banks currently have in excess of the BoT regulation, the story would have turned out differently. As of December 2003, Thai banks as a group carried on their books about 120 billion baht of excess provisions. As a result, more than half of Thai banks would not have to increase their provisions at all in our stress testing exercise.

Fourth, mortgage loans are not the vulnerability spot. This is not simply because the assumed default rate is small. Given the assumed LTV of 70%, mortgage loans portfolios are heavily collateralized. So the impact of the 30% decline in collateral values does not result in additional provisions for banks' mortgage loans.

Finally, certain factors make a bank perform worse in the stress test. Five main levers are identified in our stress test. The larger the proportion of property development and construction loans in the total loan portfolio, the higher the amount of properties foreclosed, the higher the level of collateral coverage[16], the lower the amount of excess provisions, and

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[16] That a higher level of collateral coverage makes a bank more vulnerable after the price collapse may appear perverse. After all, the higher the level of collateral coverage, the lower the loss given default (LGD) is. So, the reasoning goes, a bank with a lot of collateral should experience a smaller loss. This reasoning is true if we

the lower the capital base, the more a bank is vulnerable to the decline in property prices. Indeed, not all banks would be covered by existing surplus capital. Nevertheless, no banks come close to failing in our stress test exercise.

Taken together, the results of our stress test exercise are reassuring. They demonstrate that Thai commercial banks, despite their heavy exposures to the property sector, would be able to withstand a substantial correction in property prices.

There are nonetheless several important caveats to our stress test results. The first is that the data used here are as of December 2003. Since then, banks' exposures to the property sector have continually increased while excess provisions have decreased. But while these developments would leave Thai banks more susceptible to property price, we do not think that the results would be qualitatively different given the short elapsed time.

Perhaps more important is the fact that our stress test does not take into account the consequence of a property price collapse on general economic activity. As mentioned in Section 2, the downfall of the property market also impacts other sectors in the economy. Accompanying deterioration in general economic conditions would result in higher default rates, especially for loans to other sectors, which we assume to be minimal affected by property price collapse. On the other hand, the stress test does not factor in any responses by banks to signs that the credit environment was becoming tougher.[17] If conditions were to turn, banks would be taking steps to beef up their capital positions in anticipation.

On a more technical note, our analysis assumes away performing loan growth, recovery of existing NPLs, and sales of marketable securities, all of which would offset the impact of the net income losses induced by the stress. In addition, by assuming that the values of collateralized properties and properties foreclosed decline by a full 30%, we may overstate the impact of the stress.

As a robustness check of the above results, assumed default rates and percent decline in collateralized properties and properties foreclosed are allowed to vary in range before the

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only focus on loan portfolio losses after write-off. Here, we assume that none of the new NPLs is written off within one year after the price collapse and thus additional required provisions, which are calculated net of collateral values under the current BoT regulation, dominate.

[17] As part of our robustness check and also to make the stress scenario look internally consistent, we increase the default rate of mortgage loans to 10% and default rate of other loans to 20%. Even in this case, Thai banks as a group will still have enough cushioning capital. Nevertheless, more banks will see their capital requirement breached and nearly 150 billion of additional provisions will have to be raised.

aggregation of individual banks' results. We find that the aggregate capital loss is most sensitive to the extent that properties foreclosed is marked down. Nonetheless, qualitatively, we would still have the same conclusions as the above.

6. Implications for policy

Although the results of Section 5 are reassuring, it is important that the authorities do not become complacent. Left unattended, a small crack can sink a mighty battleship. In this section, we discuss four policy arsenals to guard against the build up of financial imbalances associated with the property sector. They are (1) use of monetary policy, (2) development of an effective monitoring and early warning system, (3) promotion of sound credit risk management practices by banks, and (4) use of prudential regulation and supervision.

6.1. Use of monetary policy

Our inclusion of monetary policy as one of the policy arsenals is not because we think that monetary policy is an effective tool against an asset price bubble, but rather because employing monetary policy at the very late stage of the bubble or leaving it completely out of the picture has much more damaging consequences when the imbalances unravel.

Monetary policy is not an effective tool against an asset price bubble because it also affects short-run real economic activity and inflation. Monetary policy responses to financial imbalances potentially add to the volatility of the economy, especially when the economy at the time of the monetary intervention is in a fragile state. In addition, the risk of destabilizing the economy may be compounded by the uncertainty in the magnitude of the effect of interest rate increases. A small interest rate hike may not be enough and, as Yamagushi (1999) points out, may even fuel the boom further if the market wrongfully believes that the problem is cured. On the other hand, large interest rate increases may overdo the job and tip the economy into an unnecessary recession.

But these arguments should not preclude the use of monetary policy to look after financial imbalances. As Borio and Lowe (2003) argue, the consequences of failing to act early enough can be very serious. There is a risk that a boom will be followed by a crash. In this regard, a property price bubble is much worse than an equity price bubble and the grounds for responding to a property price bubble are therefore more compelling. This is because property is used as collateral for a considerable amount of bank loans. The bursting of a large property price bubble thus can have serious effects on financial intermediation. In

this case, making sure that monetary policy stance is not contributing to the accumulation of imbalances (*e.g.*, by fueling speculative behavior) can be interpreted as an insurance against future instabilities in the financial sector.

In certain circumstances, such an insurance policy may require the authorities to consider a preemptive strike. A preemptively tight monetary policy would be optimal if the risk of a crash, including adverse effects on the real side of the economy, is significant, and if monetary policy eliminates this risk without large costs. To evaluate the relative costs and benefits of a preemptive strike objectively, the authorities need to know, among other things, how sensitive the financial system is to a severe fall in property prices. The stress test is Section 5 represents one way to make the assessment.

Nevertheless, monetary policy alone will not do much to contain a bubble. We need other policies to complement it. And this is where the other three policy arsenals come in.

6.2. Development of an effective monitoring and early warning system

An effective monitoring and early warning system is an important policy arsenal to assess the build up of imbalances. Thailand's past experience, where there was an acute shortage of information on the property market, points to the need to continually check the temperature of the property market and related bank flows.

The recent establishment of the Real Estate Information Center (REIC) is a welcome step to make up for past negligence. Backed by the Ministry of Finance and run by the Government Housing Bank, the goal of the REIC is to develop and maintain a central database that will serve as an early warning system for an oversupply of real estate development and assist financial institutions in their decisions to lend to real estate developers and individuals. The information from the new center will also enable the government to more effectively control the expansion of the property sector. Seven areas of information are covered: land and housing permits, housing starts, housing completions, home sales, housing transfers, housing price index, and housing finance. Some of these data are already available, but have not been systematically collected. Three new indicators, housing starts (available March 2005), home sales (March 2005), and the housing price index (August 2004), will greatly help the assessment of the condition in the property market.

It is important to recognize that an effective monitoring system needs more than the aforementioned indicators. Drawing from experiences of other countries that have gone through similar property boom and bust cycles, we report here a list of selected indicators

used by these countries in their monitoring systems that we think is relevant in the Thai context.

- Affordability index (monthly mortgage repayment divided by the median household income). A rise in the index represents deterioration in households' capacity to afford a mortgage.

- Buy-rental gap, which compares the cost of purchasing and maintaining a residential unit to a cost of renting it.

- Cancellation of future projects

Because the main source of fund of the property market comes from bank loans, additional attention should be paid to the lending behavior of banks and their risk exposures. Distinction should be made between mortgages and loans to property developers. Among banking indicators that the authorities may want to look at are outstanding loan amount, value and number of new loans, loan growth, and their shares in total loan portfolios. For mortgage loans, LTV profiles (cross-section and time series), mortgage payment delinquency rates, and the percentage of mortgage loans in negative equity are also valuable pieces of information to attest the quality of portfolios. In some countries, the regulators also survey mortgagers regularly to gain more insight into their use of mortgage loans and possible risks.

One measure that the authorities should consider implementing is a periodic survey of banks' lending practices. A publicly disseminated supervisory-designed survey will help the authorities as well as the industry gain more understanding of banks' credit underwriting standards. Knowing that banks are loosening or tightening credit policy will also provide a powerful indicator for property market temperature.

An important piece of information that tends to be overlooked by the authorities is listed property companies' financial data. In terms of number, listed property companies may represent only a small fraction of the market, but in terms of market shares, they are the large majority, especially in the Greater Bangkok area. So their health more or less reflect that of the entire industry. In fact, many doomsayers of the Thai economy in 1996 and early 1997 pointed to troubles of listed property companies as imminent signs of an upcoming systemic meltdown.

The analysis of listed developers' balance sheets can identify potential liquidity problems and signal developers' abilities to meet future financial obligations. For regulators, a look at the property sector's aggregate ratios (as opposed to ratios of individual companies)

47

should suffice to discern the general market trend. Cash position, current ratio, quick ratio, and working capital are good measures of a company's short-term liquidity. Margins show profitability and asset turnover reflects the effectiveness of the industry's use of its asset base. Finally, the debt-to-equity ratio indicates solvency weakness. Property companies' D/E rose from 1.5 in 1994 to 2.0 at the dawn of the 1997 crisis, reflecting increasing balance sheet fragility. Even worse is that a lot of developers' debt was dominated in foreign currency, another thing that we may want to look at even though most developers have probably learned a painful lesson. After the crisis, the baht depreciation and earnings collapse resulted in a sharp increase property companies' D/E ratio, which peaked at 40 at the end of 1999 Today, the D/E ratio of listed property developers has come down significantly and is now below the pre-crisis average of 1.8.

Figure 6.1. Debt to equity ratio of listed property companies, 1994-2003
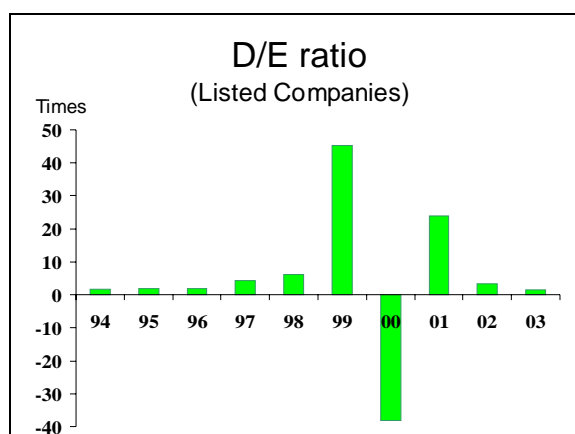
Note: The D/E ratio turned negative in 2000 due to negative equity.
Source: SET and BoT

Although increased earnings certainly help, much of the decrease in listed companies' D/E is due to debt restructuring. A sizeable amount of the debt was converted into equity. This conversion makes the property companies safer, but leaves banks that hold the converted equity vulnerable to adverse shocks. In the context of the stress test in Section 5, the converted equity would represent another source of income losses, for their value would be affected by the fall in property prices.

Predicting housing price peak and the size of hosing price bust using macroeconomic variables

All indicators mentioned in Section 6.1 are microeconomic in nature. Using data from 13 developed countries, Borio and McGuire (2004) find that housing price peaks and the sizes of their subsequent busts have a strong statistical association with certain macroeconomic variables. Using a series of probit regressions, they report that the following variables help predict housing price peaks within the next 4-12 quarters – a preceding equity price peak, a dummy of financial imbalances (defined as a situation when the deviations from trend in both the credit-to-GDP ratio and real equity prices exceed certain critical thresholds), lagged level of short-term nominal interest rates, and measures of real economic activity (lagged GDP growth and unemployment rates). For the size of the housing price bust, the predictive OLS variables are the size of the boom in housing prices, the financial imbalance dummy, changes in nominal interest rate and GDP growth after the peak in housing prices.

Table 6.1 Application of Borio and McGuire (2004)

Predicting housing price peaks	
Equity peak	**Yes** (Peaked in January 2004 although may be temporary.)
Financial imbalances	**No** (Credit-to-GDP ratio is still significantly below trends.)
Short-term nominal interest rate	**Low to moderate** (Expected to increase over the next 4 quarters.)
Macroeconomic activity	**Strong** (Economy expected to weaken in 2004 H2, but not by much)
Overall signals	**Likely, but may be temporary (local maxima)**

Predicting the extent of the housing price decline	
Size of housing price boom	**Small** (Property prices grew 10% +/- in 2003)
Financial imbalances	**No** (Credit-to-GDP ratio is still significantly below trends.)
Change in nominal interest rate	**Rising** (Expected to increase over the next 8 quarters)
Change in GDP growth	**Moderating** (Concensus Forecasts)
Overall signal	**Mild**

Table 6.1 applies Borio and McGuire's findings to the current situation in Thailand. The question of interest is whether housing prices have peaked or are about to peak, and if so what would be the extent of the subsequent housing price decline. Overall the results suggest that there could be a softening in housing prices in the immediate horizon. (But nothing would be as dramatic as our assumed price collapse in Section 5!)

6.3. Promotion of sound credit risk management practices by banks

As important as regularly monitoring property and related financial indicators is ensuring that banks have sound credit risk management practices. In Section 5, we mentioned that customer selection is key to a robust mortgage portfolio. But mortgager screening is just one of many applications of banks' credit risk management.

Sound credit risk management goes a long way to keep financial imbalances in check. For banks, sound credit risk management enables optimization of return and risk. In an ideal world where each borrower is charged according to his risk, bank's risk-adjusted return on capital (RAROC) is maximized. But even when this is not feasible, there will be less excessive risk-taking behavior by banks. In addition, there is a need for Thai banks to move away from collateral-based lending to risk-based lending practices. Before the crisis, banks lent out aggressively, believing that they would be buffered by the considerable amount of collateral. When the crisis hit, they were stuck with an incredible amount of NPLs along with a huge pile of depreciating assets with little liquidity. Risk-based lending, which emphasizes a borrower's future cash flow *in addition to* the borrower's collateral, will provide a better cushion for banks in a general economic downturn.

For developers, sound credit risk management means that projects will no longer get funding at indiscriminate costs. Good projects will be rewarded, while doubtful projects may never get off the ground. The difficulty to obtain financing for high-risk developers should deter excess supply in the property market, thereby reducing the probability of imbalances.

At the heart of sound credit risk management is the availability of quality data (current as well as historical) that can be used to develop and validate credit risk models. In this regard, Thailand is still several years behind international best practices in credit risk management. Nevertheless, we note that several Thai banks are currently working on their credit risk models and the estimation of their owned probability of default (PD).[18]

Having good data and credit risk models will allow banks to conduct a full-fledged stress test of their property loan portfolios. Portfolio tress testing will greatly add to risk managers' understanding of their portfolios' risk exposures. To build a meaningful analysis, data on certain loan characteristics should also be collected. In the case of mortgage portfolio

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[18] It is probably unrealistic to expect Thai banks to also have their own estimates of loss given default (LGD) and exposure at default (EAD). Having owned PD data is already very good in the case of Thailand.

stress testing, data on LTV at origination, loan age, loan size, and loan type (owner-occupied or investment) are useful.

It has been pointed out that individual banks' databases may be too small for meaningful statistical analyses. Pooled database may be a solution to this problem. The establishment of two credit bureaus post crisis was a leap forward towards the development of comprehensive credit information infrastructure for the country. The current pending merger of the two bureaus will expand the data pool even further. Nevertheless, issues around information sharing will have to be resolved for the expanded data set to be used by individual banks for the purpose of credit risk modeling.

One way to speed up bank's development of credit risk management capabilities is through the move towards risk-based supervision and the adoption of Basel II (Pillar Two of the new accord, which deals with supervisory review process, is really where risk-based supervision is implemented in practice.). Regulation should be incentive compatible and give banks certain room to innovate rather than faithfully following what are written word for word. Emphasis on risk assessment together with risk-based regulatory capital requirements will create pressure for banks to invest in skills and technology to ensure that their capital is aligned with risk.

On this dimension, it should be noted that the Bank of Thailand is developing prudential standards and risk-focused examination practices and manuals so that each supervisor can work on a common structured approach to risk analysis. This will also serve as a preparation for future implementation of Basel II.

Another way to promote prudent credit risk management at banks is through the removal of the blanket deposit guarantee. At the mentioned earlier, there is a moral hazard problem associated with lending when banks do not have to worry about deposit run. The institution of deposit insurance will provide market discipline for banks to be more careful when making loans. In fact, with the strength of Thai banks today, it is a good time to introduce the long-delayed Deposit Insurance Agency (DIA) to administer limited deposit insurance scheme for Thailand.

Finally, the authorities should try to find a way to expand the country's minute securitization market. Lack of securitized loans trading means that banks bear both the counter-party (credit) and liquidity risks. The existence of an actively traded securitization

market will provide banks with the ability to make loans and the option to retain them within their own portfolios or to sell them through securitization process.

Related to mortgage securitization is mortgage default insurance. Mortgage insurance is one of the reasons behind the rapid growth and spread of the residential mortgage-backed securities market in the U.S. Mortgage insurance protects lenders and investors against losses arising from borrower default, thereby leading to better management of mortgage credit risk. Nevertheless, there are drawbacks to mortgage insurance (such as moral hazard) and certain preconditions will need to be met to have a well-functioning mortgage insurance market (Blood, 2000). In this respect, a special regulatory framework for mortgage insurance and government participation in implementing mortgage insurance is essential.

6.4. Use of prudential regulation and supervision

Prudential policy is the primary instrument for financial stability just as monetary policy is the primary instrument for price stability. In its broadest meaning, the scope of prudential regulation extends to information disclosure and corporate governance. The goal of all prudential regulations is to provide safeguards for the financial institution system, but still give financial institutions incentives for adequate risk taking.

Currently, there are three major prudential measures concerning the property sector. The first measure, which also applies to other sectors as well, is the enforcement of loan classification standards and the tightening of provisioning requirements mentioned already in Section 5. Historically, it so happens that loans to property developers are most prone to special treatments and frauds. Part of this is probably due to the practice of collateral-based lending by Thai banks. Knowing this, developers have incentives to overvalue their land banks. Requirement for an independent appraiser is a key to mitigate this problem. But some time things slip and prudential supervision is needed to take care of these miscues. As for the more stringent provision requirement, it gives incentives for banks to clear up their existing NPLs, which will make banks more resilient to future shocks. Also, in the context of our stress test, the new rule can be viewed as a more aggressive discount of collateral value. Such will make banks' capital position less sensitive to the decline in property prices. And in the future when the allowance for collateral deduction is completely phased out, banks will not have to put in more provisions as a result of the decline in collateral values.

The second measure is the restriction on the maximum LTV of 70% for mortgage loans larger than 10 million baht. The goal of this measure is put a constraint on bank

lending, thereby limiting the impacts on banks in the event of default and, as a byproduct, cooling down the sizzling housing market. This measure however does not apply to GHB and GSB. Although both GHB and GSB do not traditionally serve the high-end customer segment, extending the restriction to GHB and GSB will not only limit the potential risks for the two banks, but will also ensure a level playing field for all players.

The third measure is the mandatory disclosure requirement for houses valued more than 100 million baht. Banks are required to disclose certain information (*e.g.* location, collateral, sources of funds, and project D/E) about these loans to the BoT on a quarterly basis. The purpose of this measure is twofold: it allows the BoT to check the integrity of these loans and consequently puts pressure on banks to be careful when approving them.

In a bubbled property market, the aforementioned measures may not be enough. One measure that can be adopted is the limit on property lending to total loans. In the 1990s, Hong Kong used this measure to limit the exposure of their banks to the property sector. The measure was complemented by a universal restriction on LTV and a guideline on the maximum debt service-to-income ratio (Gerlach and Peng, 2002).

All prudential measures entail certain costs to banks. But Hong Kong's experience suggests that, taken together, the benefits outweigh the costs. Despite a major collapse in property prices after 1998, the Hong Kong banking sector remains generally sound compared to those in other countries that underwent major property market crashes.

It should be noted that timely intervention is essential to effective prudential measures. Acting too late may fail to stop the bubble from growing larger, but acting too prematurely may dampen sentiments in the market and the economy. Here, the regulators will find an effective monitoring and early warning system of great value.

7. Concluding remarks

The property market and the banking sector are probably two sectors in the economy that matter most to financial stability. In this paper, we look at how their risks intertwine. Because bank loans are the main source of financing of the property market, their expansion fuels the boom while their contraction disrupts the market. On the other hand, because the property market operates in a cycle of boom and bust, its cyclical swings have a direct bearing on the health of the banking sector. And when these two sectors go, the rest of the economy also goes with them.

Recent trends in the property market and property lending have caused concerns among observers about the return of financial instability. In light of these concerns, this paper sets out to assess the degree of financial fragility associated with bank lending and the property market in the current market environment. The core results of the paper indicate that, as far as the stability of the banking sector is concerned, there is no cause for undue alarm. All banks have priced in future interest rate increases in their mortgage plans, which should help them withstand the upturn in the interest rate cycle for a while. Moreover, Thai banks as a group have enough capital and loan-loss reserves to withstand the impact of an isolated 30%-decline in property prices.

At individual bank level, we find that some banks are more vulnerable to interest rate increases or a property market downturn than the others. Banks with low monthly payment plans and heavy exposures to the property sector are generally more at risk. Still, no banks would fail under the stress scenario.

These positive results notwithstanding, there is a need for the authorities to continue to closely monitor developments in the property market and banks' lending practices and to stand ready to adopt appropriate measures when necessary. The paper discusses four policy arsenals that the authorities can adopt to assess and manage the risks to financial stability coming from the property sector.

Ultimately, banks should also find their own way to protect themselves from fluctuations in the property market. There is so much that the authorities can do in this regard. Effective risk management and routine stress testing will help banks optimize risk, return, and shareholders' wealth. Careful analysis of borrowers' risk profiles together with effective internal credit rating systems will help banks withstand future property market fluctuations with relative ease.

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Appendix A. Key assumptions used in the stress test

Percent drop in property price	30%	
Percent of performing loans turn NPLs after price shock		
Property and construction loans	40%	
Housing loans	4%	
Other loans	1%	
Loan rates (for interest-in-suspense)		
MLR	5.75%	
Property and construction loans	7.75%	MLR+2%
Housing loans	5.25%	MLR-0.5%
Other loans	6.75%	MLR+1%
Collateral coverage (%)		
Housing loans	143%	LTV = 70%
All loans	Actual as in annual reports	
Property as percent of collateral		
All loans	80%	

Distribution of <u>new</u> NPLs: 40% substandard, 40% doubtful, and 20% loss

NPL resource cost (% of new NPL)	2%
Income tax rate	30.0%

Also assume no performing loan growth, no NPL recovery, no NPL write-off, and no sales of marketable securities.

Appendix B. Selected profiles of Thai commercial banks, end 2003

	BBL	KTB	KBANK	SCB	BAY	SCIB	TMB
Total assets	1,358,849	1,134,451	820,876	736,257	515,938	469,446	379,147
Loan and accrued interest recievables	849,891	990,802	531,575	507,964	399,133	325,257	304,631
Housing loans	67,969	84,742	55,555	95,792	34,612	7,009	36,888
(% of total loans)	8%	11%	10%	19%	9%	2%	12%
Property development and construction loans	75,498	90,148	34,138	65,331	46,579	16,003	25,981
(% of total loans)	9%	12%	6%	13%	12%	5%	9%
Net foreclosed asset	26,008	21,472	10,860	11,107	15,819	13,723	16,325
(% of total assets)	1.9%	1.9%	1.3%	1.5%	3.1%	2.9%	4.3%
NPL ratio*	24.7%	8.0%	12.8%	17.5%	15.1%	2.7%	9.9%
CAR	15.9%	9.5%	17.5%	12.9%	13.9%	11.6%	10.6%
Actual provisions to required provisions*	138%	122%	136%	144%	104%	149%	123%
Collateral coverage	52%	59%	63%	49%	73%	79%	60%
Owned AMC	Yes	No	Yes	Yes	Yes	No	Yes

	BT	BOA	DTDB	SCNB	NBANK	UOBR	All
Total assets	256,215	169,528	101,139	61,684	58,305	56,182	6,118,017
Loan and accrued interest recievables	126,037	122,407	82,266	58,101	33,029	46,183	4,377,276
Housing loans	1,111	19,495	8,438	83	8,637	15,997	436,327
(% of total loans)	2%	16%	10%	0.3%	26%	35%	11%
Property development and construction loans	9,760	7,327	7,771	420	3,332	1,190	383,478
(% of total loans)	17%	6%	9%	2%	10%	3%	9%
Net foreclosed asset	9,739	13,964	6,885	24	626	142	146,694
(% of total assets)	3.8%	8.2%	6.8%	0.0%	1.1%	0.3%	2.4%
NPL ratio*	6.3%	19.1%	10.5%	2.7%	5.8%	3.7%	13.5%
CAR	14.2%	13.3%	11.0%	13.2%	26.9%	12.8%	13.4%
Actual provisions to required provisions*	426%	132%	121%	125%	260%	108%	138%
Collateral coverage	48%	57%	53%	18%	64%	79%	60%
Owned AMC	No	No	No	No	No	No	N.A.

Note: Loans and accrued interest receivables for KTB includes SAM, for BT and NTB include CAPs with FIDF. Percentages of housing loans and property development and construction loans in total loans are calculated without loans in SAM and CAPs

Source: 2003 annual reports, December 2003 CB 1.1 (NPL ratio and actual provisions to required provisions)

Appendix C. Pre-financing of developers, 1991-2003E

Million Baht	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003/E
Commercial banks	207,871	254,829	309,048	364,356	403,742	431,037	491,909	513,395	519,402	348,920	244,427	254,906	264,000
Finance companies	99,454	127,926	163,757	239,673	325,923	362,841	123,933	117,391	41,453	28,624	24,631	22,271	23,514
Credit Foncier companies	877	1,117	1,385	1,975	2,289	2,373	2,255	2,287	1,039	1,075	2,458	3,456	543
Financial institutions	**308,202**	**383,872**	**474,190**	**606,004**	**731,955**	**796,251**	**618,096**	**633,073**	**561,894**	**378,619**	**271,515**	**280,633**	**288,057**

% of Total Loans	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003/E
Commercial banks	10.7	10.8	10.8	10.5	9.5	8.9	8.1	9.8	10.1	7.6	5.7	5.5	5.5
Finance companies	23.9	23.4	22.3	23.8	25.0	24.4	23.3	25.2	22.2	19.4	14.5	12.5	9.9
Credit Foncier companies	23.2	21.8	22.5	33.0	34.8	35.2	36.7	40.8	28.5	32.3	62.8	73.2	43.3
Financial institutions	**13.0**	**13.2**	**13.2**	**13.5**	**13.2**	**12.5**	**9.4**	**11.1**	**10.6**	**8.0**	**6.1**	**5.8**	**5.7**

Share	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003/E
Commercial banks	67.4	66.4	65.2	60.1	55.2	54.1	79.6	81.1	92.4	92.2	90.0	90.8	91.6
Finance companies	32.3	33.3	34.5	39.5	44.5	45.6	20.1	18.5	7.4	7.6	9.1	7.9	8.2
Credit Foncier companies	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.2	0.3	0.9	1.2	0.2
Financial institutions	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

%YoY	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003/E
Commercial banks	15.3	22.6	21.3	17.9	10.8	6.8	14.1	4.4	1.2	-32.8	-29.9	4.3	3.6
Finance companies	37.7	28.6	28.0	46.4	36.0	11.3	-65.8	-5.3	-64.7	-30.9	-14.0	-9.6	5.6
Credit Foncier companies	48	27	24	43	16	4	-5	1	-55	4	129	41	-84
Financial institutions	**21.8**	**24.6**	**23.5**	**27.8**	**20.8**	**8.8**	**-22.4**	**2.4**	**-11.2**	**-32.6**	**-28.3**	**3.4**	**2.6**

% of GDP	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003/E
Commercial banks	8.3	9.0	9.8	10.0	9.6	9.3	10.4	11.1	11.2	7.1	4.8	4.7	4.4
Finance companies	4.0	4.5	5.2	6.6	7.8	7.9	2.6	2.5	0.9	0.6	0.5	0.4	0.4
Credit Foncier companies	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Financial institutions	**12.3**	**13.6**	**15.0**	**16.7**	**17.5**	**17.3**	**13.1**	**13.7**	**12.1**	**7.7**	**5.3**	**5.1**	**4.9**

Note: 2003 figures of commercial banks are estimates.
Source: BoT

Appendix D. Post-financing of homebuyers, 1991-2003

Million Baht	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Commercial banks	125,446	165,380	225,640	305,425	369,820	431,544	446,603	416,164	385,442	360,887	355,629	400,557	475,123
Finance companies	14,913	17,983	27,930	40,671	54,205	62,617	28,695	22,177	12,648	10,887	9,675	6,562	6,609
Credit Foncier companies	1,739	2,460	2,701	2,346	2,584	2,576	2,392	1,865	1,362	1,107	268	226	191
SFIs	36,914	50,416	70,242	98,985	140,807	200,763	297,891	318,235	303,950	302,581	309,494	347,541	422,436
GHB	36,260	49,788	69,594	98,217	139,321	195,776	275,803	294,011	280,884	275,737	274,454	294,843	332,699
GSB	654	628	648	768	1,486	4,987	22,088	24,224	23,066	26,844	35,040	52,698	89,737
Cooperatives	N/A	N/A	N/A	N/A	37,599	49,268	58,735	64,690	59,984	68,343	75,606	81,950	98,121
Financial institutions	**179,012**	**236,239**	**326,512**	**447,427**	**605,015**	**746,768**	**834,316**	**823,131**	**763,386**	**743,804**	**750,672**	**836,836**	**1,002,480**

% of Total Loans	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Commercial banks	6.5	7.0	7.9	8.8	8.7	8.9	7.4	7.9	7.5	7.8	8.3	8.7	9.9
Finance companies	3.6	3.3	3.8	4.0	4.2	4.2	5.4	4.8	6.8	7.4	5.7	3.7	2.8
Credit Foncier companies	45.9	48.0	43.8	39.2	39.2	38.2	38.9	33.3	37.3	33.3	6.8	4.8	15.2
SFIs	67.6	70.0	68.1	74.3	77.6	78.8	75.1	72.1	73.5	70.8	61.1	61.0	66.6
GHB	91.3	93.0	96.7	97.7	98.1	98.6	99.0	99.3	98.9	99.0	98.9	95.4	95.6
GSB	4.4	3.4	2.1	2.3	3.8	8.9	18.8	16.7	17.8	18.1	15.3	20.2	31.4
Cooperatives	N/A	N/A	N/A	N/A	25.4	26.4	26.6	25.3	22.2	23.2	23.0	22.6	24.3
Financial institutions	**7.4**	**7.9**	**8.8**	**9.7**	**10.3**	**11.0**	**11.6**	**12.8**	**12.7**	**13.6**	**14.1**	**14.6**	**16.5**

Share	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Commercial banks	70.1	70.0	69.1	68.3	61.1	57.8	53.5	50.6	50.5	48.5	47.4	47.9	47.4
Finance companies	8.3	7.6	8.6	9.1	9.0	8.4	3.4	2.7	1.7	1.5	1.3	0.8	0.7
Credit Foncier companies	1.0	1.0	0.8	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.0	0.0	0.0
SFIs	20.6	21.3	21.5	22.1	23.3	26.9	35.7	38.7	39.8	40.7	41.2	41.5	42.1
GHB	20.3	21.1	21.3	22.0	23.0	26.2	33.1	35.7	36.8	37.1	36.6	35.2	33.2
GSB	0.4	0.3	0.2	0.2	0.2	0.7	2.6	2.9	3.0	3.6	4.7	6.3	9.0
Cooperatives	N/A	N/A	N/A	N/A	6.2	6.6	7.0	7.9	7.9	9.2	10.1	9.8	9.8
Financial institutions	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

%YoY	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Commercial banks	98.6	31.8	36.4	35.4	21.1	16.7	3.5	-6.8	-7.4	-6.4	-1.5	12.6	18.6
Finance companies	45.0	20.6	55.3	45.6	33.3	15.5	-54.2	-22.7	-43.0	-13.9	-11.1	-32.2	0.7
Credit Foncier companies	8.4	41.5	9.8	-13.1	10.2	-0.3	-7.2	-22.0	-27.0	-18.8	-75.8	-15.8	-15.6
SFIs	N/A	36.6	39.3	40.9	42.3	42.6	48.4	6.8	-4.5	-0.5	2.3	12.3	21.5
GHB	N/A	37.3	39.8	41.1	41.9	40.5	40.9	6.6	-4.5	-1.8	-0.5	7.4	12.8
GSB	N/A	-4.0	3.2	18.5	93.5	235.6	342.9	9.7	-4.8	16.4	30.5	50.4	70.3
Cooperatives	N/A	N/A	N/A	N/A	N/A	31.0	19.2	10.1	-7.3	13.9	10.6	8.4	19.7
Financial institutions	**138.5**	**32.0**	**38.2**	**37.0**	**35.2**	**23.4**	**11.7**	**-1.3**	**-7.3**	**-2.6**	**0.9**	**11.5**	**19.8**

% of GDP	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Commercial banks	5.0	5.8	7.1	8.4	8.8	9.4	9.4	9.0	8.3	7.3	6.9	7.3	8.0
Finance companies	0.6	0.6	0.9	1.1	1.3	1.4	0.6	0.5	0.3	0.2	0.2	0.1	0.1
Credit Foncier companies	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
SFIs	1.5	1.8	2.2	2.7	3.4	4.4	6.3	6.9	6.6	6.1	6.0	6.4	7.1
GHB	1.4	1.8	2.2	2.7	3.3	4.2	5.8	6.4	6.1	5.6	5.3	5.4	5.6
GSB	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.5	0.5	0.5	0.7	1.0	1.5
Cooperatives	N/A	N/A	N/A	N/A	0.9	1.1	1.2	1.4	1.3	1.4	1.5	1.5	1.7
Financial institutions	**7.1**	**8.3**	**10.3**	**12.3**	**14.5**	**16.2**	**17.6**	**17.8**	**16.5**	**15.1**	**14.6**	**15.3**	**16.9**

Source: BoT, Cooperative Auditing Department, GHB, and GSB