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**Bank Loans and Real Estate in  
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Estate Prices on Lending Behavior  
of Domestic Banks**

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# Bank Loans and Real Estate in East Asia: The Influences of Real Estate Prices on Lending Behavior of Domestic Banks<sup>\*</sup>

Masahiro Inoguchi<sup>†</sup>

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## Abstract

This paper examines if and how fluctuations in real estate prices affected bank lending before and after the crisis in Malaysia, Singapore and Thailand. Since the crisis of 1997, previous literature claimed that the rise and fall in real estate prices affected bank lending and the macroeconomy through its role as collateral in the East Asian countries. This study implements a dynamic model of bank lending and employs a test utilizing panel data of domestic bank balance sheets in order to estimate the influence of real estate prices on new bank lending in Malaysia, Singapore and Thailand. In addition, the paper examines the actual conditions surrounding the role of real estate as collateral in these countries' bank loans. The results of the regression suggest that fluctuations in real estate prices can impact domestic bank lending. The regressions show that domestic bank lending behavior varied after the crisis, interest rates became important for loans of domestic banks after the crisis in Singapore and Thailand, and the rise in real estate prices increased bank lending of domestic banks before the crisis in Malaysia and after the crisis in Singapore. These results may imply that reforms of the banking system after the crisis in these countries could have influenced domestic banking behavior and government regulation of bank loans with regard to real estate had an effect in Singapore.

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## 1. Introduction

Bank lending can affect the macroeconomy through the credit channel of monetary policy.<sup>1</sup> This implies that bank lending may have a more significant role in the fluctuations of economic conditions if a significant number of companies rely heavily on bank loans for financing, which is the case in the Asian countries. Since the 1997 Asian crisis, many researchers have claimed that bank lending suffered from a few problems in the East Asian countries—for example, crony lending, bank loans with real estate collateral, and so on—that resulted in shocks to the economy. However, in general, real estate often plays an important role as collateral in loan contracts to reduce the cost stemming from asymmetric information between borrowers and banks.

Moreover, bank lending with collateral has an impact on the macroeconomy not only in emerging countries but also in industrial countries. Berger and Udell (1990) explored empirically the role of collateral in bank lending from the view of producing information about borrower risk in the U.S.<sup>2</sup> In particular, as Kiyotaki and Moore (1997) described, movements in real estate prices as collateral may influence bank lending and increase fluctuations in the macroeconomy.<sup>3</sup> In fact, Japanese banks usually lend to companies, especially small and medium firms, with land collateral. The bank lending is related to the price of the real estate, since the banks change the quantity of loans according to movement in real estate prices.

In the case of Japan, the growth rate of the economy increased from the latter half of the 1980s to the early 1990s, the period of the so-called “bubble economy”. The growth rate fell sharply after this “bubble economy” period and the Japanese economy experienced a severe depression. Banking firms in Japan had extended loans in the period of the economic boom as real estate prices rose and reduced them in the recession when the real estate market became confused due to the collapse in land prices. In this way, bank lending can exacerbate fluctuations in the economic conditions of a country through their responses to the change in real estate prices which serve as collateral for loans.

Since the East Asian countries that were caught by the crisis of 1997 also experienced economic booms before the crisis and subsequently experienced the currency and financial crises at the time of the collapse of the boom, many researchers have argued that the massive capital flows played an important role in the emergence of the currency and financial crises in these countries.<sup>4</sup> These discussions suggest that foreign capital inflows contributed to expand asset prices and bank lending, while the sudden capital outflows reduced them, which in turn resulted in damage to the financial system and large depreciation in exchange rates. In addition, some researchers have

claimed that a rise and fall in real estate prices affected bank lending behavior through their impact on collateralized loans in the East Asian countries; therefore, the collapse of real estate prices should be one of the important factors that contributed to the severity of the financial crisis.<sup>5</sup> If asset prices like real estate affect bank lending, fluctuations in these prices can be significant for monetary policy in East Asia.

In spite of the inferences about the importance of bank lending with respect to real estate collateral in East Asia, not many studies have focused on the relationship between bank loans and real estate prices in the East Asian countries. Chen (2001) discussed the relationship between bank loans and real estate prices or stock prices in Taiwan. Collyns and Senhadji (2002) examined the influences of bank lending and GDP on real estate prices in East Asia. Still, these articles did not circumstantially explore the shocks to bank loans from real estate prices; rather, the issue was discussed as a secondary one. As such, these studies leave some important questions about the influences of real estate prices on bank lending unanswered—for example, did the change in real estate prices affect lending behavior of domestic banks and are there differences between the periods before and after the crisis?

This paper analyzes whether the real estate prices affected bank lending in Malaysia, Singapore and Thailand using panel data of domestic bank balance sheets. The regression uses panel data of each domestic bank and explores whether new loans by domestic banks suffered from fluctuations in real estate prices in these three countries. However, the study cannot cover all domestic banks due to limited data availability. The analysis examines differences in domestic bank lending behavior between the periods before and after the crisis. In the empirical analysis, we implement a dynamic model of bank lending. In addition to the regression analysis, this article describes the actual conditions of the role of real estate as collateral for bank loans to firms in Malaysia, Singapore and Thailand.

The outline of this paper is as follows. Section 2 presents several earlier studies on the relationship between bank lending and real estate prices in the Asian countries and Japan. Section 3 graphically illustrates the trends in bank lending and real estate prices, and describes the research on bank lending with collateral in three countries studied here. Section 4 discusses how real estate prices change the lending of domestic banks, the adoption of dynamic bank lending behavior, and how to estimate the hypothesis using panel data of bank firms. In addition, this section is devoted to an examination of the results to determine whether real estate prices as collateral influenced bank loans in Malaysia, Singapore and Thailand before and after the crisis. Concluding remarks are offered in section 5.

## 2. Related literature

There are a limited number of studies examining the relationship between bank lending and real estate prices as collateral in Asian countries.<sup>6</sup> Chen (2001) demonstrated that asset prices, stock and real estate, could affect bank lending in Taiwan. Collyns and Senhadji (2002) discussed the relationship between bank lending and real estate prices using panel data of Asian countries. They also examined whether real estate prices affected all bank loans in order to corroborate the linkage between bank lending and real asset price inflation using Vector Autoregression (VAR) regression.<sup>7</sup> While they suggest that real estate prices are related to bank lending in the East Asian countries, the study does not answer other important and unresolved questions. For example, do changes in real estate prices affect the lending behavior of domestic banks? Is this influence different from the period before and the period after the crisis? Answers to these questions would be important in building a sound banking system in the future and in implementing effective monetary policy in East Asia.

In contrast to the East Asian countries, there are several studies that have examined the role of real estate as collateral for bank loans in Japan. Utilizing panel data of Japanese banks, Ogawa and Kitasaka (2000) analytically explored bank lending in Japan by distinguishing between type of banks and the sample period. They noted that lending behavior differs depending on the type of banks and firms, and real estate plays a more important role as collateral to small firms and nonmanufacturing firms in major banks than loans to other firms and from other banks.<sup>8</sup> Shimizu (2000) tested the linkages between real estate prices and bank lending in Japan by using time-series data and VAR. Yamazaki and Takeda (1997) employed both time-series data and a panel data set of Japanese banks in order to present the differences between the types of borrowing firms to examine the influence of real estate prices on bank loans.

This paper analyzes whether fluctuations in real estate prices have affected bank lending behavior in Malaysia, Singapore and Thailand by using panel data of domestic banks in these countries. Following Ogawa and Kitasaka (2000) and Elyasiani et al. (1995), this study constructs a dynamic model of bank lending.<sup>9</sup> The purpose of this study is to examine the influence of real estate prices on bank lending of domestic banks and whether differences exist in the two different periods (i.e., before and after crisis).

## 3. Bank lending and real estate prices

### 3.1 An overview of bank loans, real estate prices and interest rates

This section illustrates graphically the fluctuations in bank loans, real estate prices

and interest rates in Malaysia, Singapore, and Thailand. Figure 1-1 illustrates the rate of loan changes of domestic banks in these countries that are examined in the regression analysis. The fluctuations in loan changes of domestic banks in Figure 1-1 are consistent with Figures 1-2, 1-3, and 1-4 which show the claims on the private sector of Malaysia, Singapore and Thailand, respectively.

Figures 1-2, 2-1, and 3-1 show the claims on the private sector, the real estate price index and lending rates, respectively, in Malaysia. Figure 1-1 illustrates that the increasing rate of domestic bank lending of Malaysia was small in 1997, 1998, 2002 and 2003. As Figure 1-2 shows, claims on the private sector increased slowly from 1998 to 2003. Figure 2-1 shows that the house price index of Malaysia began to expand from 1990 to 1997, then declined in 1998 and 1999, and rose thereafter. Though lending rates rose in the period after the crisis, it has trended downward since the end of 1998 (Figure 3-1). These figures show that the slow increase in bank loans, the fall in the residential price index, and the rise in lending rates are similar in the period after the crisis.

Figures 1-3, 2-2 and 3-2 show the claims on private sector, the real estate price index and the lending rates, respectively, in Singapore. As Figures 1-1 and 1-3 show, domestic bank lending and claims on the private sector declined in 1998 and 2002, and increased thereafter. Figure 2-2 illustrates that the private residential price index of Singapore began to expand from 1993 and was sustained at a high level until the middle of 1996. It then declined from the latter half of 1996 to 1998 and rose thereafter. Though the bank lending rate was high in 1998 following the crisis, it fell to an even lower level in 1999 and was even lower than in 1996 and 1997 right before the crisis (Figure 3-2). These figures show that the reduction in bank loans, the fall in the residential price index, and the rise in lending rates are similar in the period after the crisis, in 1998.

Figures 1-4, 2-3, and 3-3 illustrate the claims on private sector, the housing price index and the lending rate, respectively, in Thailand. As shown in Figures 1-1 and 1-4, domestic bank loans and claims on the private sector followed a rising trend up until the 1997 crisis and decreased from 1998 to 2001, except a small rise in domestic bank lending in 1999. The housing price index tended to rise slowly up until 1997 (Figure 2-3). After the crisis, however, it declined from 1998 to the middle of 1999, and has increased again since 2002. Though lending rates rose in the period after the crisis, it has trended downward since the latter half of 1998 (Figure 3-3). These figures show that there was a reduction (increase) in bank loans, a fall (rise) in the housing price index, and a rise (fall) in bank lending rates after (before) the crisis.

The figures imply that bank loans and real estate prices expanded in the period before the crisis and fell in the aftermath of the crisis. The interest rate rose after the

crisis. However, the fluctuation in bank loans may be smaller than that of real estate prices.

### 3.2 The role of real estate as collateral for bank lending

This section describes bank loan collateral in Malaysia, Singapore and Thailand using previous literature. In Malaysia, Peng (1998) and Bank Negara Malaysia (1999) found that banks lent to firms with collateral and that real estate was used as collateral principally. In addition, the Malaysian government issued guidelines to commercial banks several times in order to increase house ownership. Commercial bank lending was hit when the crisis set in 1997 and the nonperforming loan ratio rose to 7.9 percent in 1998.

In Singapore, banks tend to lend to firms with real estate collateral. Chin and Loon (1996) claim that Singaporean banks could be sensitive to real estate prices when they decide to lend, though they argued that this would occur mainly for housing loans. While real estate prices rose with the high economic growth between 1992 and 1996 in Singapore, Ho and Cuervo (2000) argued that as private housing prices increased, the Singapore government induced several measures in order to moderate this rise in prices. They also noted that the government tried to avoid the shock of property price movements on the macroeconomy.

In Thailand, banks usually use real estate as collateral in the case of bank loans. Renaud (2000) declared that the rise in real estate prices led to an increase in bank loans before the crisis of 1997 and the fall in the prices led to a rise in nonperforming loans after the crisis (although regulations sometimes forced banks into lending money at the fixed rate of real estate prices for property-related loans). He also insisted that bank loans to construction and real estate firms did not decrease before the crisis in spite of the existence of the regulations, though the Bank of Thailand tried to regulate them. The reason for this could be that the regulations were introduced too late and the Bank of Thailand only targeted banks. In addition to collateral lending, some authors suggest the importance of crony lending in Thailand.<sup>10</sup>

## 4. Regression analysis

### 4.1 The methodology

This paper employs domestic bank panel data to examine whether fluctuations in real estate prices affected the lending behavior of domestic banks in Malaysia, Singapore and Thailand. The analysis also tests for differences in the periods before and after the crisis of 1997.



Following Ogawa and Kitasaka (2000) and Elyasiani et al. (1995), we develop the intertemporal model of bank lending behavior. The model assumes that banks maximize their profits and determine the quantity of their loans by taking all interest rates as predetermined. For simplicity, this model does not consider variables such as excess reserves. The profits of banks at time  $t$  is defined as,

$$\pi_t = r_t^l L_{t-1} + r_t^s S_{t-1} - r_t^d D_{t-1} - \frac{\alpha_1}{2} F_t^2 - \alpha_2 L_{t-1} - \alpha_3 D_{t-1} \quad [1]$$

where  $\pi_t$  : profit in period  $t$ ,

$r_t^l$  : interest rate on bank loans in period  $t$ ,

$r_t^s$  : interest rate on securities in period  $t$ ,

$r_t^d$  : interest rate on deposits in period  $t$ ,

$L_{t-1}$  : loan stock at the end of period  $t-1$ ,

$S_{t-1}$  : security stock at the end of period  $t-1$ ,

$D_{t-1}$  : deposit stock at the end of period  $t-1$ ,

$F_t$  : net flow of bank loans in period  $t$  ( $F_t = L_t - L_{t-1}$ ),

and  $\alpha_1$ ,  $\alpha_2$  and  $\alpha_3$  are nonnegative constants. While the cost of existing loans and deposits are represented by  $\alpha_2$  and  $\alpha_3$ , the cost of loan levels varies over periods and is expressed by  $\alpha_1$ .

The objective of banks is to maximize the present value of future net profit flow,

$$V_t = E_t \left[ \sum_{j=0}^{\infty} \beta^j \pi_{t+j} \right], \quad 0 < \beta < 1 \quad [2]$$

where  $E$  is the expectations operator and  $\beta$  is the discount factor. The constraint of the bank is expressed as follows:

$$L_{t-1} + S_{t-1} = (1 - \rho) D_{t-1}, \quad 0 < \rho < 1 \quad [3]$$

where  $\rho$  is the minimum reserve requirement ratio. The relationship between the stock and flow of loans is written as  $F_t = L_t - L_{t-1}$ .

The first-order condition for optimal value for bank loan is given by:

$$E_t \beta (r_{t+1}^l + \alpha_1 F_{t+1} - \alpha_2) - \alpha_1 F_t + \lambda_t = 0 \quad [4]$$

where  $\lambda_t$  is the Lagrangean multiplier.<sup>11</sup>

The equation can assimilate the rate of change in real estate prices as a variable of lending cost, because real estate prices may show the collateral value and the expected

cost of default for bank loans. Following Ogawa and Kitasaka (2000), the parameter of loan costs can be expressed as a linear function of the rate of change in real estate prices. In addition, the interest rate on bank loans less the call rate is used as the explanatory variables of the regression. Since we assume that banks form expectations rationally, the regression equation of this paper is as follows:

$$F_{t+1} = \gamma_0 + \gamma_1 F_t + \gamma_2 (r_{t+1}^l - r_{t+1}^c) + \gamma_3 (p_{t+1} / p_t) + v_{t+1} \quad [5]$$

where  $r_{t+1}^c$  is the call rate,  $p_{t+1}$  is the real estate price and  $v_{t+1}$  is residual error. Though there may be an existing identification problem since real estate prices can explain the demand factor, the call rate is subtracted from the interest rate on bank loans in this regression and the call rate does not appear in the demand equation. Equation [5] is termed the loan supply equation in this paper.

The loan supply equation is estimated by panel data in order to examine the relationship between domestic bank lending and real estate prices. In other words, the estimations with panel data of domestic bank balance sheets explore bank lending behavior of domestic bank firms whose shares are listed on the stock exchange. The test also examines differences before and after the crisis.

#### 4.2 Data and panel regression

The real estate price index and lending rates are obtained from the CEIC database. The call rate comes from the *International Financial Statistics* (IFS).<sup>12</sup> The panel data of listed domestic banks are from the Mergent database and Bankscope database. Since domestic banks that have defects in panel data are removed from the corresponding regression, the number of banks depends on the periods of tests.

This regression uses the private residential price index in Singapore and the housing price index in Malaysia and Thailand as the real estate price index due to data availability.<sup>13</sup> The flows of bank loans are computed as the current-end period stock minus the previous period. The panel estimation employs the interest rates on loans which are calculated as the interest receipts on loans divided by the loan stock in the previous year.

The regression periods are from 1993–2003 in Malaysia, from 1992–2004 in Singapore, and from 1992–2003 in Thailand due to data availability. The regression periods before and after the crisis are defined as 1992–97 and 1998 or later, respectively.<sup>14</sup>

This test employs the panel techniques and data of listed domestic banks in

Malaysia, Singapore and Thailand to analyze the effects of real estate prices on the lending behavior of domestic banks. Since regression equation [5] is a dynamic equation, this estimation uses the dynamic panel regression method of Arellano and Bond (1991). The analysis utilizes the equation in first differences and the orthogonality condition.<sup>15</sup> The sign of the real estate price index is expected to be positive when domestic bank lending expands according to the rising of real estate prices as collateral value which should reduce the cost from asymmetric information. The expected sign of the interest rate is positive, because the rise in lending rate which is less call rates can induce an increase in new bank loans.

The regressions employ different numbers of domestic banks for each period because of data availability (Table1). Since the data of some banks are lacking, the estimation from 1992 or 1993 to 1997 cannot use the data for these banks. For the regression from 1998, some banks were dropped since they either merged or disappeared after the crisis. The number of domestic banks in the tests for all periods is four in Malaysia, four in Singapore, and sixteen in Thailand. The number of domestic banks in the tests for the period before the crisis are eleven in Malaysia, nine in Singapore, and eleven in Thailand, while the number after the crisis are eight in Malaysia, four in Singapore, and thirteen in Thailand.

#### 4.3 Regression results

Tables 2, 3 and 4 report the results of the estimation using panel data of domestic bank firms whose shares are listed on the stock exchanges in Malaysia, Singapore and Thailand, respectively. In the regression outcomes of Malaysia (Table 2), the coefficient of the real estate index is significantly positive before the crisis. In addition, the constant is significantly negative after the crisis, and the coefficient of lagged bank loan flow is significant before the crisis. These results imply that real estate prices had an influence on lending of domestic banks before the crisis and that bank lending behavior changed after the crisis.

Table 3 reports the results of the estimation for domestic bank firms whose shares are listed on the stock exchange in Singapore. The coefficients of the real estate index and interest rates are significantly positive and negative, respectively, after the crisis in Singapore. In contrast, before the crisis, the coefficient of the interest rate is not significant and that of real estate is significantly negative. These results suggest that real estate prices and interest rates affected lending of domestic banks after the crisis in Singapore, and policies for mortgage loans before the crisis may have been effective. In other words, the results are not inconsistent with the fact that regulations on loans for

real estate were partly effective before the crisis in Singapore.

In the regression outcomes of Thailand (Table 4), the coefficient of the interest rate is significantly positive after the crisis and that of the real estate index is significantly positive over the entire period. While the sign of the constant is significantly negative before the crisis, it is not significant after the crisis. However, the overidentifying restriction is not satisfied for the regression before the crisis if we judge it at the 10 percent critical level.<sup>16</sup> These results suggest that interest rates affected lending behavior of domestic banks after the crisis. Though the results can not deny that real estate prices may have been important in Thailand, it is difficult to explain the nonsignificant real estate coefficients before and after the crisis.<sup>17</sup>

These results suggest that real estate prices had an influence on bank loans of domestic banks through real estate collateral before the crisis in Malaysia and after the crisis in Singapore.<sup>18</sup> The implication that real estate prices did not affect bank lending behavior before the crisis in Singapore is consistent with monetary policy which regulated bank lending responses to fluctuations in real estate prices. The results that the interest rates have an impact on domestic loans after the crisis in Singapore and Thailand may support that the view that restructuring of the banking system after the crisis was effective in both countries.<sup>19</sup> In contrast, the results for the influence of real estate prices in Thailand are difficult to interpret; however, there is the possibility that differences between banks and periods contributed to differences in their lending behavior.

## 5. Conclusion

This paper analyzed whether real estate prices affected domestic bank lending behavior in Malaysia, Singapore and Thailand. Prior to the empirical tests presented in this paper, the research on bank lending suggests that banks did lend to firms using real estate as collateral in these three countries when they arrange the collateral for loans. In contrast, the governments regulated bank lending based on real estate prices in Singapore and Thailand, because they were trying to prevent extreme expansion of bank loans that could result from booms in real estate prices.

This study implemented dynamic model of bank lending and used panel skilled regression in order to show the influence of real estate prices on domestic bank lending. The results of the regressions using listed domestic bank balance sheet data show that the rise in real estate prices increased bank lending before the crisis in Malaysia, after the crisis in Singapore, and over the period in Thailand. This does not conflict with real estate playing a role as collateral for bank loans. While the results support the view that

lending behavior of domestic banks changed after the crisis in Malaysia, Singapore and Thailand, interest rates are important for bank loans after the crisis in Singapore and Thailand.

From these estimation outcomes, the influence of real estate prices on lending behavior of domestic banks in Singapore occurred more clearly in the period after the crisis than in other periods. This is consistent with the government regulation of bank loans with regard to real estate before the crisis in Singapore. In Malaysia, since real estate prices affected the loans of domestic banks before the crisis, the rise in real estate prices could have played an important role in economic booms before the crisis. In addition, after the crisis and under the modified regulation and reforms, domestic banks lent to firms in response to interest rates in Singapore and Thailand.

## References

- Arellano, Manuel and Stephen Bond (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies* 58(2): 277–97.
- Bank Negara Malaysia (1999), *The Central Bank and the Financial System in Malaysia*, Kuala Lumpur: Bank Negara Malaysia.
- Berger, Allen N. and Gregory F. Udell (1990), "Collateral, Loan Quality, and Bank Risk," *Journal of Monetary Economics* 25:22–42.
- Bernanke, Ben and Mark Gertler (1995), "Inside of Black Box: The Credit Channel of Monetary Policy Transmission," *Journal of Economic Perspectives* 9(4): 27–48.
- Bester, Helmut (1987), "The Role of Collateral in Credit Markets with Imperfect Information," *European Economic Review* 31:887–99.
- Chen, Nan-Kuang (2001), "Asset Price Fluctuations in Taiwan: Evidence from Stock and Real Estate Prices 1973 to 1992," *Journal of Asian Economics* 12:215–32.
- Chin, Lim Yan, and Yip Hai Loon (1996), "Consumer Finance: Property and Property Related Finance," *Commercial Banking in Singapore*, Ng Kah Hwa, ed., Reading, Mass.: Addison-Wesley Publishing.
- Collyns, Charles and Abdelhak Senhadji (2002), "Lending Boom, Real Estate Bubbles and The Asian Crisis," *IMF Working Paper*, WP/02/20.
- Diamond, Douglas W. and Raghuram G. Rajan (2000), "Banks, Short Term Debt and Financial Crisis: Theory, Policy Implications and Applications," *NBER Working Paper*, 7764.
- Eisenbeis, Robert A, Paul M. Horvitz and Rebel A. Cole (1996), "Commercial Banks and Real Estate Lending: The Texas Experience," *FRB Finance and Economics*

*Discussion Paper*, 1996-15.

- Elyasiani, Elyas, Kenneth J. Kopecky and David Van Hoose (1995), "Costs of Adjustment, Portfolio Separation, and the Dynamic Behavior of Bank Loans and Deposits," *Journal of Money, Credit and Banking* 27(4): 955–74.
- Hilbers, Paul, Qin Lei and Lisbeth Zacho (2001), "Real Estate Market Developments and Financial Sector Soundness," *IMF Working Paper*, WP/01/129.
- Ho, David K.H. and Javier C. Cuervo (2000), "Singapore: Containing the Real Estate Boom," in *Asia's Financial Crisis and the Role of Real Estate*, Koichi Mera and Bertrand Renaud, eds., Armonk, NY: M.E.Sharpe, pp. 209–17.
- Ito, Takatoshi (1999), "Asia Tukakiki no Haikei [The background of Asian crisis]," *Kaihatuenjyo Kenkyu* [research on development aid] 5(4): 102–29. (In Japanese).
- Kaminsky, Graciela L. and Carmen M. Reinhart (1996), "The Twin Crisis: The Causes of Banking and Balance-of-Payments Problems," *Board of Governors of the Federal Reserve System International Finance Discussion Papers*, No. 544.
- Kiyotaki, Nobuhiro and John Moore (1997), "Credit Cycles," *The Journal of Political Economy* 105(2): 211–48.
- Miller, Marcus and Joseph Stiglitz (1999), "Bankruptcy Protection Against Macroeconomic Shocks: The Case for a 'Super Chapter 11'," Centre for the Study of Globalization and Regionalization.
- Peng, Leong Toong (1998), *The Business of Banking in Malaysia*, Petaling Jaya Selangor Darul Ehsan, Malaysia: Pelanduk Publications.
- Ogawa, Kazuo and Sin-Ichi Kitasaka (2000), "Bank Lending in Japan: Its Determinants and Macroeconomic Implications," in *Crisis and Change in the Japanese Financial System*, Takeo Hoshi and Hugh T. Patrick, eds., Boston, London: Kluwer Academic, pp. 159–200.
- Renaud, Bertrand (2000), "How Real Estate Contributed to the Thailand Financial Crisis," in *Asia's Financial Crisis and the Role of Real Estate*, Koichi Mera and Bertrand Renaud, eds., Armonk, NY: M.E.Sharpe, pp. 183–207.
- Shimizu, Yoshinori (2000), "Convoy Regulation, Bank Management, and the Financial Crisis in Japan," *Institute for International Economics*, Ryouichi Mikitani and Adam S. Posen, eds., Special Report September.
- Traisorat, Tull (2000), *Thailand: Financial Sector Reform and the East Asian Crisis*, Tha Hague, Boston: Kluwer Law International.
- Yamazaki, Fukujyu and Yosuke Takeda (1997), "Tochi no Tanpokachi to Ginko no Kashidashikodo [The collateral value of land and bank lending behavior]," in

*Gendai Macro Keizaidougaku* [Modern dynamic macroeconomics], Kazumi Asako and Masayuki Otaki, eds., Tokyo: Tokyo University Press, pp 351–75. (In Japanese)

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<sup>1</sup> Previous papers have examined the credit channel. See, for example, Bernanke and Gertler (1995).

<sup>2</sup> Bester (1987) also discussed the role of collateral in credit markets.

<sup>3</sup> Miller and Stiglitz (1999) discussed the influence of foreign liability on economic conditions in developing countries.

<sup>4</sup> While many previous articles presented the crucial role of international capital flows in the crisis, Diamond and Rajan (2000) focused on foreign borrowing of domestic banks. They analyzed how foreign capital flows influenced the economic condition trough of domestic banks in East Asian countries.

<sup>5</sup> Ito (1999) noted that real estate prices increased when the macroeconomy expanded in the 1990s before the crisis in Thailand.

<sup>6</sup> Hilbers et al. (2001) argue the relationship between the soundness of individual banks and real estate prices.

<sup>7</sup> They reported only the results of the Granger causality tests and the Impulse response function.

<sup>8</sup> They also suggested that regional bank lending is more sensitive to deposits.

<sup>9</sup> Elyasiani et al. (1995) employed the dynamic model and panel data set of banks to consider U.S. bank behavior of lending and borrowing.

<sup>10</sup> Traisorat (2000) noted that Thailand bank loans were lacking in collateral due to crony lending.

<sup>11</sup> The transversality condition is supposed to be satisfied.

<sup>12</sup> The claim on private sector (the data in Figure 1-2, 1-3, 1-4) comes from the IFS.

<sup>13</sup> The housing price index in Thailand includes land.

<sup>14</sup> As the figures show in the previous section, the fluctuations in the variables tend to change in 1998 and the period 1997 is included in the regressions of periods before the crisis.

<sup>15</sup> The valid instruments are third lagged dependent variables.

<sup>16</sup> At the 5 percent critical level, the overidentifying condition is satisfied for the regression of the periods after the crisis.

<sup>17</sup> We can guess that one of the reasons for the nonsignificant coefficients before the crisis may support the effects of regulation on bank loans related to real estate.

<sup>18</sup> The existence of an influence of real estate prices on bank lending is not full evidence for collateral loans.

<sup>19</sup> Since the financial reforms after the crisis in Thailand were related to the IMF conditionality, this restriction from the IMF might not be unnecessary after the crisis.

Figure 1-1

Rate of domestic bank loan change

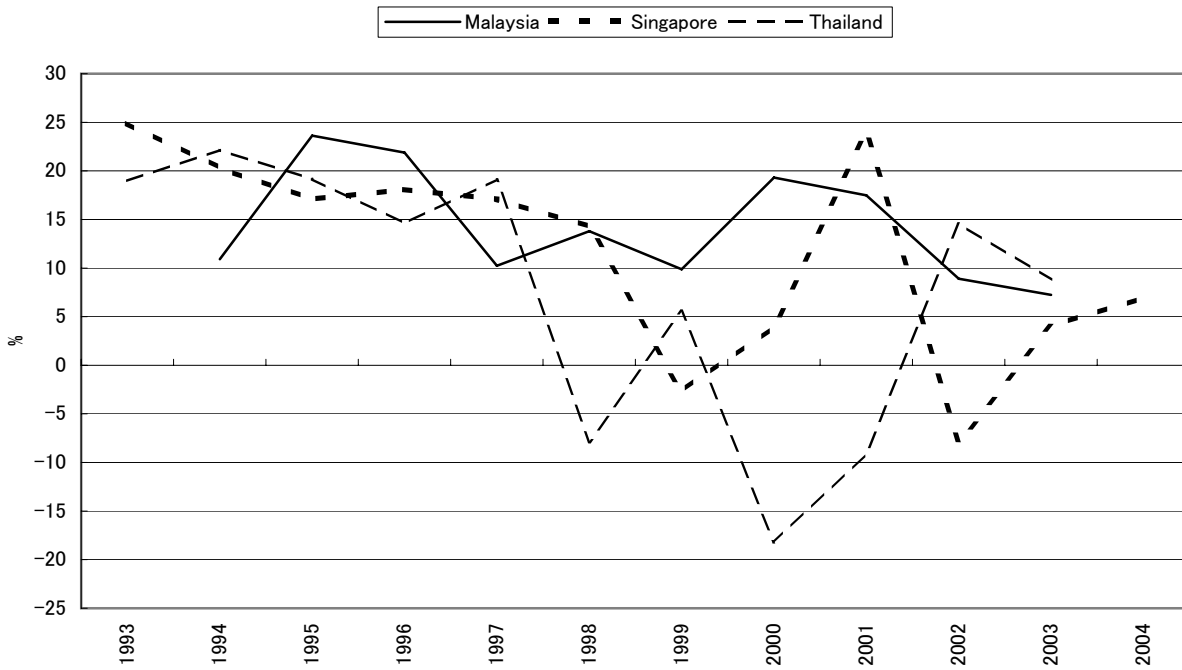


Figure 1-2

Malaysia: Claims on private sector

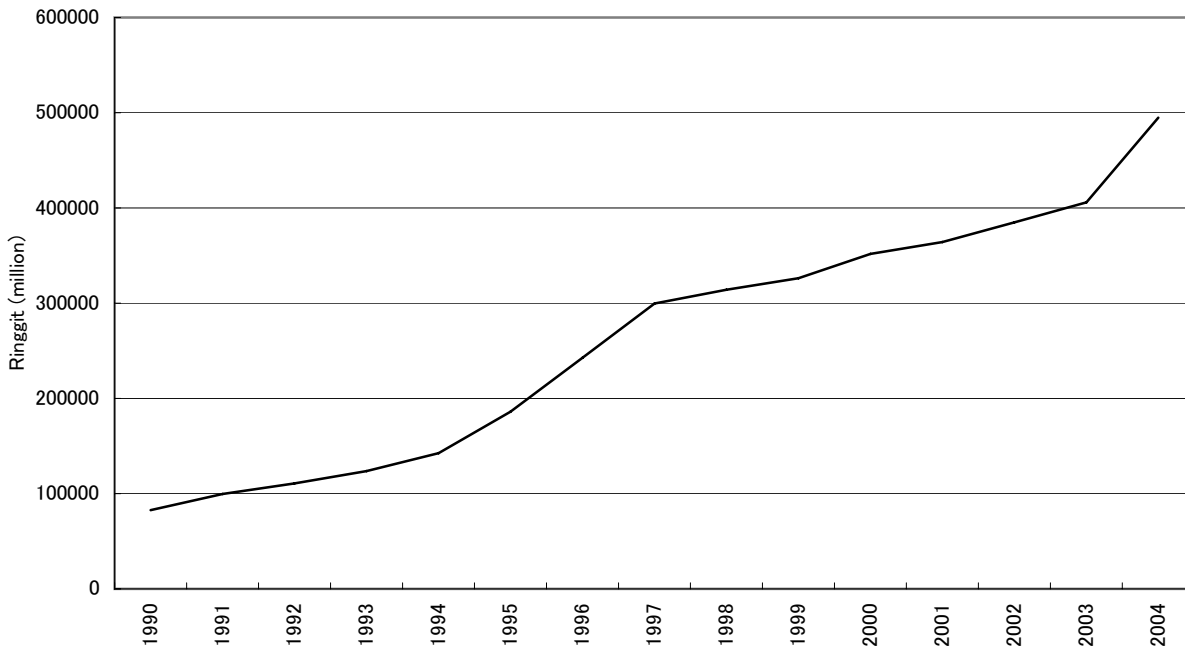




Figure 1-3

Singapore: Claims on private sector

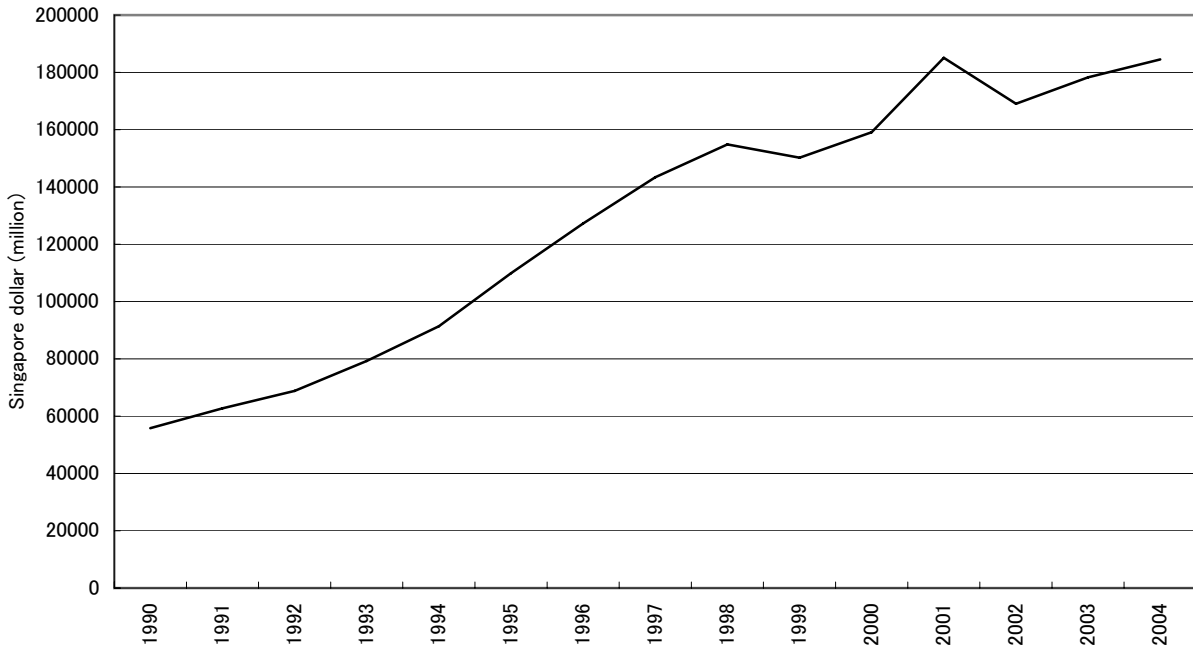


Figure 1-4

Thailand: Claims on private sector

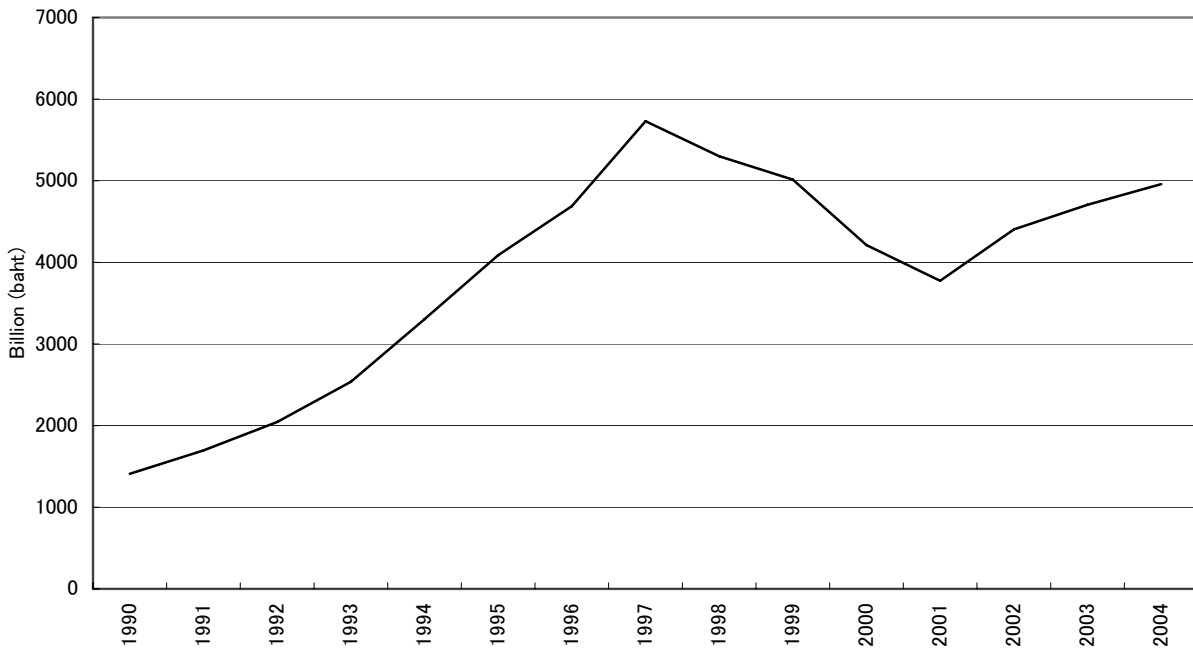


Figure2-1

Malaysia: House price index

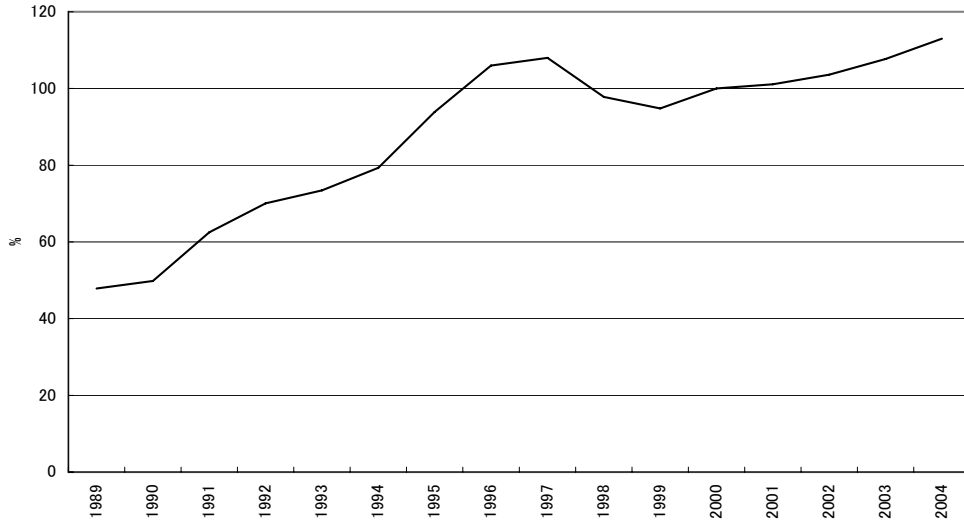


Figure 2-2

Singapore: Private residential price index

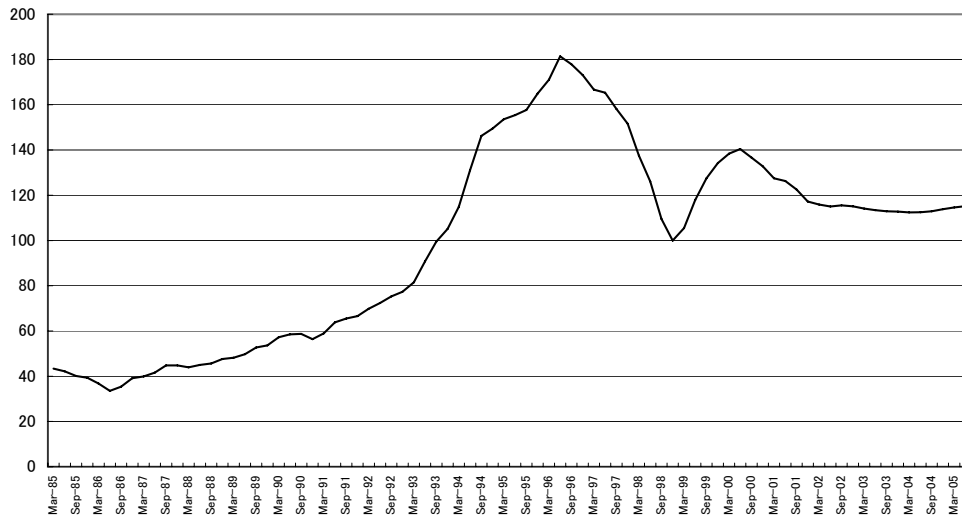


Figure2-3

Thailand: Housing price index



Figure3-1

Makaysia: Lending rate

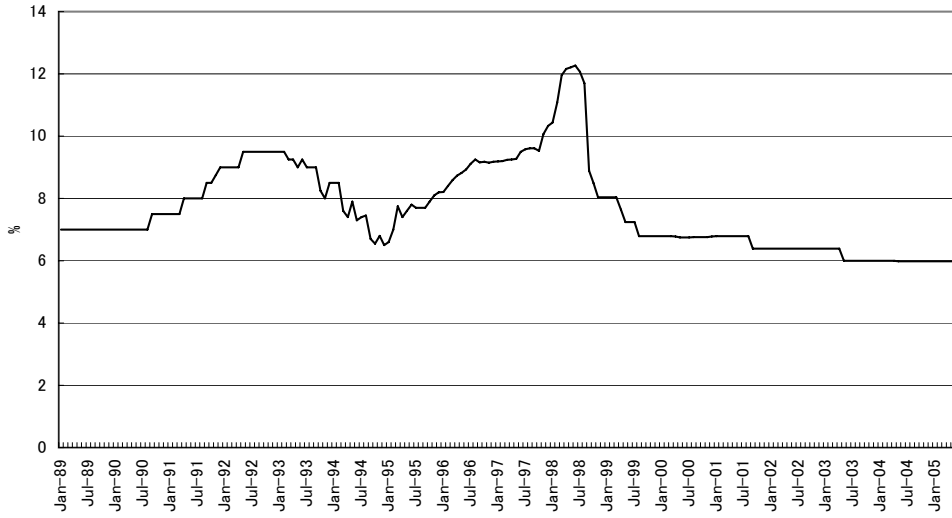


Figure 3-2

Singapore: Lending rate

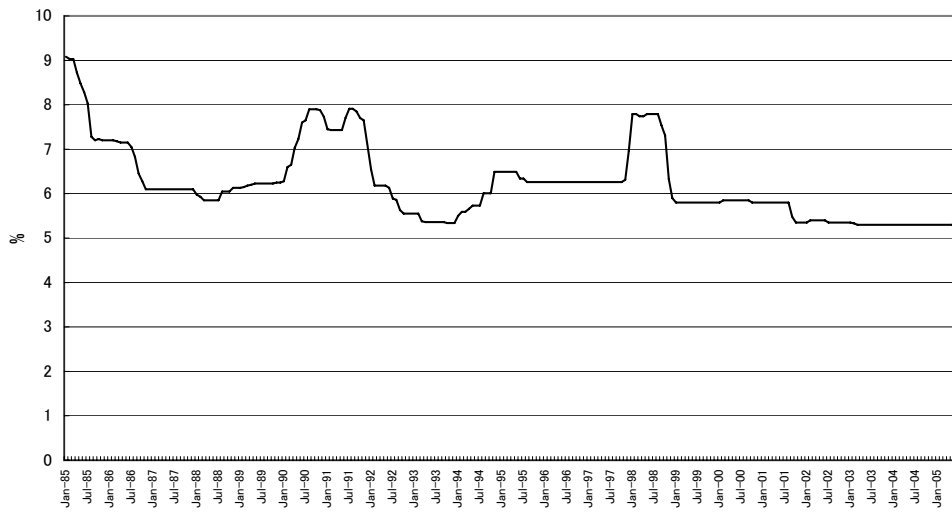


Figure3-3

Thailand: Lending rate

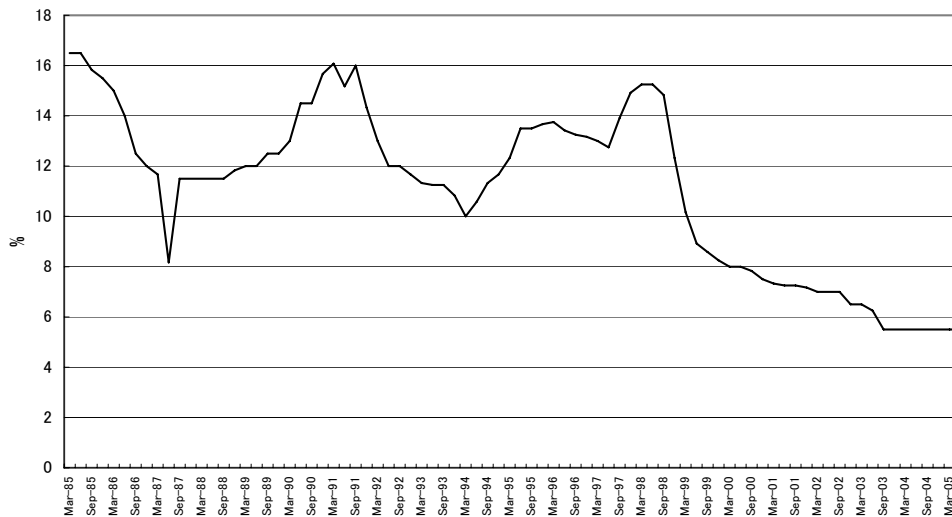


Table 1. The number of domestic banks in regressions

	Malaysia	Singapore	Thailand
all periods	4	4	8
before the crisis (1992-1997)	11	9	11
after the crisis (after 1997)	8	4	13

Table2 Results of panel regression of Malaysia

	loans of domestic banks	loans of domestic banks	loans of domestic banks
	all period	before the crisis	after the crisis
Constant	-0.01065 **	0.10295	-0.02694 **
Std Error	0.00520	0.23781	0.01302
z-value	-2.05000	0.43000	-2.07000
lagged bank loan flow	-0.18532 **	-0.56960 ***	0.06195
Std Error	0.08277	0.20883	0.07536
z-value	-2.24000	-2.73000	0.82000
Lending rate	-0.00871	0.17321	0.25089
Std Error	0.01872	0.21193	0.19765
z-value	-0.47000	0.82000	1.27000
real estate price ratio	0.09720	2.72955 *	-0.75299
Std Error	0.52723	1.41550	0.76263
z-value	0.18000	1.93000	-0.99000
Sargan test statistic	33.10	8.11	4.08
Number of observations	37	27	40

*Notes:* The “all period” in regression covers from 1993 to 2004. The period of “before the crisis” covers from 1993 to 1997. The period of “after the crisis” covers from 1998 to 2003. In explanation variables, \*, \*\*, and \*\*\* indicates that the statistic is significant at the 10%, 5%, and 1% level respectively. In Sargan test, \*, \*\*, and \*\*\* indicates that the null hypothesis, overidentifying condition is satisfied, is rejected at the 10%, 5%, and 1% level respectively.

Table3 Results of panel regression of Singapore

	loans of domestic banks	loans of domestic banks	loans of domestic banks
	all period	before the crisis	after the crisis
Constant	0.00813	-0.02139	-0.11670 **
Std Error	0.01537	0.01933	0.04728
z-value	0.53000	-1.11000	-2.47000
lagged bank loan flow	-0.04622	0.00659	-0.03412
Std Error	0.15784	0.14505	0.11524
z-value	-0.29000	0.05000	-0.30000
Lending rate	-0.05581	0.04079	0.34740 **
Std Error	0.05636	0.04710	0.16359
z-value	-0.99000	0.87000	2.12000
real estate price ratio	0.21270	-0.28906 **	2.12556 ***
Std Error	0.22508	0.11570	0.60393
z-value	0.95000	-2.50000	3.52000
Sargan test statistic	36.81	13.33	12.48
Number of observations	43	31	20

*Notes:* The “all period” in regression covers from 1992 to 2004. The period of “before the crisis” covers from 1992 to 1997. The period of “after the crisis” covers from 1998 to 2004. In explanation variables, \*, \*\*, and \*\*\* indicates that the statistic is significant at the 10%, 5%, and 1% level respectively. In Sargan test, \*, \*\*, and \*\*\* indicates that the null hypothesis, overidentifying condition is satisfied, is rejected at the 10%, 5%, and 1% level respectively.

Table4 Results of panel regression of Thailand

	loans of domestic banks	loans of domestic banks	loans of domestic banks
	all period	before the crisis	after the crisis
Constant	-0.01524 **	-0.02647 **	-0.04032
Std Error	0.00721	0.01073	0.07692
z-value	-2.11000	-2.47000	-0.52000
lagged bank loan flow	-0.13487 **	0.05417	-0.22473 **
Std Error	0.06818	0.24224	0.09403
z-value	-1.98000	0.22000	-2.39000
Lending rate	-0.00146	0.00122	0.56572 *
Std Error	0.00268	0.00451	0.32805
z-value	-0.55000	0.27000	1.72000
real estate price ratio	0.89526 *	-0.27031	-0.6442135
Std Error	0.48770	0.20925	1.505492
z-value	1.84000	-1.29000	-0.43
Sargan test statistic	59.59	14.93 *	12.77
Number of observations	68	38	44

*Notes:* The “all period” in regression covers from 1992 to 2003. The period of “before the crisis” covers from 1992 to 1997. The period of “after the crisis” covers from 1998 to 2003. In explanation variables, \*, \*\*, and \*\*\* indicates that the statistic is significant at the 10%, 5%, and 1% level respectively. In Sargan test, \*, \*\*, and \*\*\* indicates that the null hypothesis, overidentifying condition is satisfied, is rejected at the 10%, 5%, and 1% level respectively.

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