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## NONPERFORMING LOANS AND PURCHASE OF LOANS BY PUBLIC ASSET MANAGEMENT COMPANIES IN MALAYSIA AND THAILAND

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*Abstract.* This paper explores the factors which eliminated the nonperforming loan (NPL) problem in Malaysia and Thailand following the 1997 Asian financial crisis. The number of NPL, which expanded in the aftermath of the crisis, has since declined in most South-East Asian countries. Although previous studies have explored the causes of the increase in NPL numbers, few have analysed the factors that contributed to the reduction in their number in Asia. In Malaysia and Thailand, authorities put in place several measures to manage NPL. As a vehicle to acquire NPL from banks, Malaysia established the Pengurusan Danaharta Nasional Berhad (Danaharta) in 1998, while Thailand established the Thai Asset Management Corporation (TAMC) in 2001. We analyse whether the characteristic features of banks, improvements in macroeconomic conditions, and facilities for purchasing loans caused a reduction in the number of NPL in Malaysia and Thailand. The results suggest that selling loans to a public asset management company was effective in reducing the number of NPL in Thailand. While macroeconomic conditions influenced the decline in NPL ratios in Thailand, in Malaysia, well performing commercial banks and large commercial and investment banks generally had smaller NPL ratios throughout and following the crisis.

### 1. INTRODUCTION

Since the 1997 Asian financial crisis, governmental authorities throughout South-East Asia have continued to pursue reform of their banking systems. In South-East Asia, a sound banking system is particularly important, because a significant number of companies rely heavily on bank loans for financing. Nonperforming loans (NPL), in particular, can become a major problem for a banking system, as evidenced by recent experiences around the world. One example is the substantial losses throughout the US banking sector which resulted from the decline in housing prices in the USA, itself fuelled by the large number of subprime mortgages and NPL. The collapse of land prices in Japan in the 1990s, which escalated the number of NPL via real estate collateral loans and provoked a banking system crisis, is another. Some South-East Asian countries have experienced similar problems, notably after the 1997 Asian financial crisis, when the massive increase in NPL wreaked havoc on the region's banking system.<sup>1</sup> Consequently, some banks faced bankruptcy, and the number of bank loans declined, causing macroeconomic conditions to worsen significantly.

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<sup>1</sup> Ito (1999) notes that real estate prices increased when the economy expanded in the 1990s before the 1997 Asian crisis.

The governments of the Asian countries affected by the 1997 crisis have sought to rebuild their banking systems by restructuring and consolidating domestic banks. In addition, government authorities attempted to eliminate NPL by purchasing them from banks.<sup>2</sup> These measures may have had contributed to the reduction in number of NPL.<sup>3</sup> Since 1999, macroeconomic conditions have improved, and NPL have gradually declined in most South-East Asian countries. This paper explores whether the characteristic features of banks, the purchase of loans by NPL management facilities and improvements in macroeconomic conditions caused the reduction in NPL in both Malaysia and Thailand.

It is important to discuss the policies that eliminated NPL in South-East Asia because this problem may also arise in other emerging economies. Although many studies have highlighted how NPL increased in the first instance and have discussed solutions to the problem, few have analysed why NPL declined in Asia and, in particular, the factors that contributed to the reduction of NPL in South-East Asian countries. In Japan, Hosono (2010) has investigated factors which caused NPL to decrease. Hosono looked at factors that increased the number of NPL as explanatory variables in the regression, and showed that land prices were an important contributing factor in the decline of NPL. In other work, Boudriga *et al.* (2009) used aggregate banking, financial, economic and legal environment data from a panel of 59 countries over the period 2002–2006 and empirically analysed the cross-country determinants of nonperforming loans. This study suggested that higher capital adequacy ratios and prudent provisioning policies appeared to reduce the level of problem loans.<sup>4</sup>

Previous studies have discussed the incidence of and solutions for NPL and some studies have described the processes of and factors influencing the NPL problem in Asia. For example, Ueda (2000) analyse the causes of NPL in Japanese banks in the 1990s, including the role of real estate-related loans, the influence of financial liberalisation, inefficient bank management, and moral hazards relating to certain safety nets. Hu *et al.* (2004) examine the influence of deregulation on the NPL of a panel of Taiwanese commercial banks during the period 1996–1999, identifying a relationship between the number of NPL and the total loan amount (hereafter, the NPL ratio) and government shareholdings. This study concluded that as the percentage of government shareholdings in a bank increased, the NPL rate initially fell and then increased thereafter. Moreover, they found a negative correlation between bank size and the NPL ratio.<sup>5</sup>

<sup>2</sup> Fung *et al.* (2004) compare government-established and government-owned asset management companies in East Asia from the late 1990s. They argue that these asset management companies have many common characteristics. Bonin and Huang (2001) discuss the importance of the establishment of asset management companies in China.

<sup>3</sup> Although selling NPL should reduce the amount of NPL in each bank, NPL could increase when banks subsequently increase loans to less creditworthy companies.

<sup>4</sup> Hasan and Wall (2004) analyse the determining factors in loan loss reserves in the USA, Canada and Japan. Also in the USA, Berger and DeYoung (1997) analytically explored the relationships between loan quality, cost efficiency and bank capital. They suggested that cost efficiency was an important indicator of future problem loans and banks.

<sup>5</sup> Sinkey and Greenawalt (1991) analyse the loan-loss factor and suggest that banks with adequate capital tend to have lower loss rates.

The governments of Malaysia and Thailand undertook a number of measures to manage NPL in their respective jurisdictions, although the periods of establishment differ. To acquire NPL, Malaysia established the Pengurusan Danaharta Nasional Berhad (or Danaharta) as an asset management company in 1998, while Thailand founded the Thai Asset Management Corporation (TAMC) in 2001.<sup>6</sup> The International Monetary Fund (2004) suggests that one reason Thailand instituted the restructuring of its banks' NPL much later than many other Asian countries was that the relatively late establishment of an agency to acquire nonperforming assets.<sup>7</sup> However, no studies have considered whether the establishment of these agencies was a more efficient solution to the problem of NPL than simply waiting for an improvement in macroeconomic and/or bank conditions.<sup>8</sup> Given that the Malaysian and Thai economies had recovered by 1999, the present paper focuses on three factors relating to the decline of NPL in these countries: (i) the purchase of loans by facilities for managing nonperforming assets; (ii) the influence of bank characteristics; and (iii) macroeconomic indicators on the decline in NPL ratios in both countries. Following Ueda (2000) and Hosono (2010), we employ a panel regression analysis of domestic bank data to examine the factors affecting the decline in NPL ratios.<sup>9</sup>

The results suggest that the purchase of loans by the public asset management company was effective in stimulating a decline in the number of NPL in Thailand. This implies that Thai banks could have reduced their NPL sooner if the government had established TAMC earlier (i.e. before 2001). While the improvement in macroeconomic conditions reduced NPL ratios in Thailand, this effect was especially clear in the period when TAMC did not buy NPL from Thai commercial banks. In Malaysia, although it is difficult to deny the influence of the selling of loans because the NPL ratio rose after the period in which the asset management company ceased purchasing loans, the effect of selling loans is unclear. By contrast, large commercial and investment banks and well performing commercial banks had smaller NPL ratios in Malaysia.

The remainder of the paper proceeds as follows. Section 2 reviews developments in the restructuring of NPL in the Malaysian and Thai banking sectors after the 1997 Asian financial crisis and explains the roles of Danaharta and TAMC. This section also describes the trends in the NPL ratio, land prices

<sup>6</sup> In addition, after the Asian crisis, some banks in Malaysia and Thailand received capital injections.

<sup>7</sup> The IMF suggests that it is difficult to evaluate the progress of TAMC because of insufficient information disclosure, although they do concede that the notional statistics illustrate that TAMC played a progressive role in the restructuring process for nonperforming loans.

<sup>8</sup> Although Terada-Hagiwara and Pasadilla (2004) support the effectiveness of asset management companies in relation to the Thai NPL problem, they also examined whether asset management companies increased moral hazard in banks.

<sup>9</sup> Relocating NPL to asset management facilities may potentially and efficiently reduce the stock of NPL. However, the current paper analyses only the effects of selling loans on the decline in the number of NPL in each bank and does not consider the efficiency effects of the decline in the number of NPL nationwide. Therefore, we do not include the impact of relocating NPL to public facilities on the burden of the government sector and macroeconomic conditions.

Table 1. Value of loan transfers

	Malaysia Loans acquired by Danaharta (million ringgit)	Thailand Loans sold to Thai Asset Management Corporation (million baht)
1998	19 727.7	
1999	25 793	
2000	1967.2	
2001	231	684 572
2002	43	759 360
2003		780 824
2004		776 959
2005		777 179
2006		775 778

and GDP growth in both countries. Section 3 discusses the hypotheses to be examined using panel data for domestic banks. Section 4 provides some concluding remarks.

## 2. NONPERFORMING LOANS, ASSET MANAGEMENT COMPANIES AND THE MACROECONOMY

### 2.1. Banking sector reform and the role of Danaharta and Thai Asset Management Corporation

In the aftermath of the Asian crisis, authorities in crisis-affected countries attempted to address the problems of bank capitalization, governance, risk management and operational inefficiencies. Another important problem they faced was the proliferation of NPL. Many authorities temporarily nationalized banks. Their efforts also included bank closure and consolidation. In addition, Malaysia and Thailand established Danaharta and TAMC, respectively, as vehicles to restructure NPL.<sup>10</sup>

In 1998, the Malaysian authorities established Danaharta as a public asset management company. The government-funded Khazanah Nasional, the national investment arm for Malaysian Government loans, granted loans to the agency. These loans were guaranteed through the issuance of Malaysian Government zero-coupon bonds. Danaharta bought NPL at market value, as appraised by independent auditors.<sup>11</sup> Table 1 shows that the value of NPL purchased by Danaharta from banks and financial companies was most significant in 1999 and 2000. The level of NPL also declined from 1999 to 2000, and the NPL ratio has since declined every year from 1998, with the exception of 2001.

The consolidation of financial institutions is another measure that aims to improve the performance of the banking system. While there were some consolidations of commercial and merchant banks and finance companies, Bank

<sup>10</sup> The basic structures of Danaharta and TAMC are similar.

<sup>11</sup> This was for secured loans; Danaharta priced unsecured loans at 10% of the principal.

Negara also provided liquidity to weakened financial institutions.<sup>12</sup> In addition to this, some banks and their finance company subsidiaries were merged. As a result, the number of commercial banks in Malaysia declined from 36 in 1997 to 22 at the beginning of 2007.<sup>13</sup> Bank ownership also changed. As the average level of foreign ownership increased, that of state ownership among the top 10 banks declined from 11% in 1997 to approximately 3.5% in 2004.

The Thai authorities established TAMC in 2001 with funding from the Financial Institutions Development Fund (FIDF), which guaranteed the issued bonds.<sup>14</sup> As appraised by the FIDF, the pricing of private bank NPL was derived from their collateral value. Table 1 demonstrates that the value of NPL purchased did not fluctuate significantly. Even though its establishment took place after that of Danaharta in Malaysia, from 2001 to 2006, TAMC consistently bought between 680 and 780 billion baht of NPL each year. Unlike the experience of several other countries, in Thailand, some restructured loans returned to their nonperforming status because of the limitations on debt reduction during the restructuring process. Consolidation also took place among financial companies in Thailand (falling from 92 before the crisis to 18 in 2003), while bank mergers reduced the number of commercial banks.<sup>15</sup> In total, 8 commercial banks were merged with other banks between December 1997 and November 1999. The Thai authorities also attempted to support private bank recapitalization directly, and had taken over 6 commercial banks by the summer of 1999. Although foreign ownership of banks in Thailand remains limited, average foreign ownership of the leading commercial banks has increased since 1999 because the Thai authorities have relaxed ownership limits.

## 2.2. *An overview of nonperforming loans, real estate prices and GDP growth*

This section graphically illustrates the fluctuations in NPL, real estate prices, real GDP growth and the value of purchased NPL in Malaysia and Thailand. Figures 1 and 4 depict the ratio of NPL to total loans and the real GDP growth rates, respectively. Figures 2 and 3 portray the housing price indexes in Malaysia and Thailand, respectively. Figure 5 shows the value of NPL and loans purchased by the asset management facility in Malaysia. Figure 6 depicts these same values for Thailand. Tables 2 and 3 provide further details on the loans purchased by the respective asset management companies and the NPL ratios of the Malaysian and Thai banks, respectively.<sup>16</sup>

<sup>12</sup> The 'merchant bank' in Malaysia changed to an 'investment bank' in 2006.

<sup>13</sup> These include locally-owned and foreign-owned banks.

<sup>14</sup> Before the establishment of TAMC, each bank set up its own asset management company. However, these private asset management companies could not significantly clear the amount of NPL.

<sup>15</sup> The number of commercial banks declined in the aftermath of the crisis. However, they subsequently increased in number after this period, with 18 commercial banks operating by the beginning of 2007.

<sup>16</sup> Tables 2 and 3 provide details only on the sample of banks included in the regression analysis.

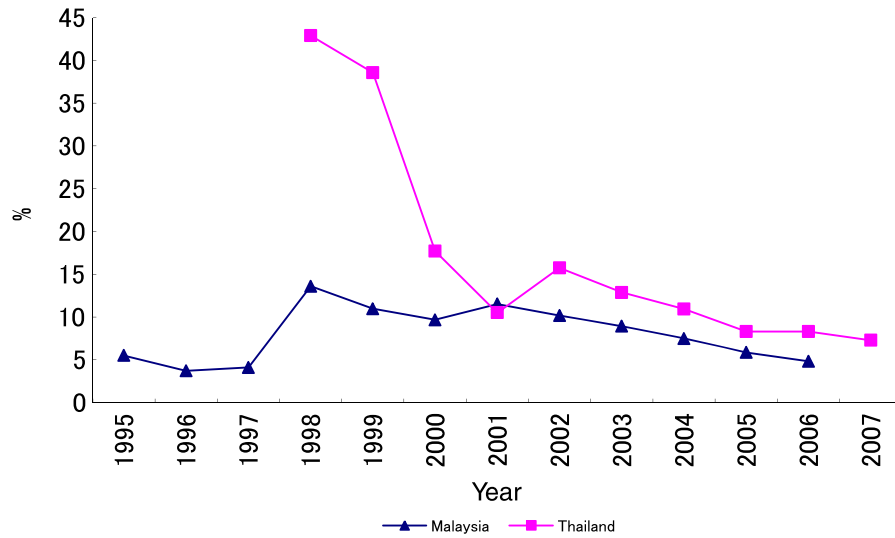


Figure 1. Ratio of nonperforming loans to total loans.

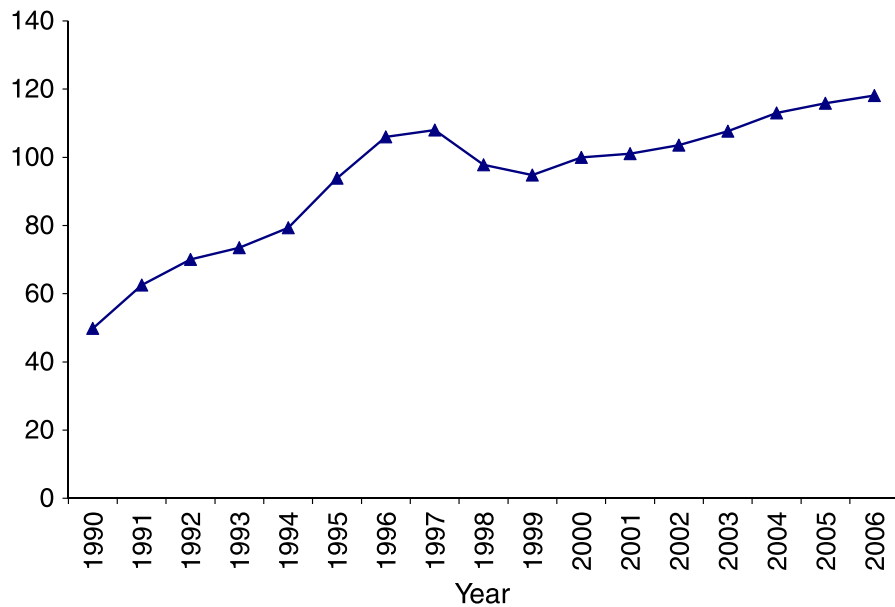


Figure 2. Real estate price index in Malaysia (housing price index).

As shown in Figure 1, Malaysia's NPL ratio increased to approximately 13.6% in 1998. Since the crisis, Malaysian banks have improved their overall asset quality, and the NPL ratio has declined accordingly. Although the NPL ratio

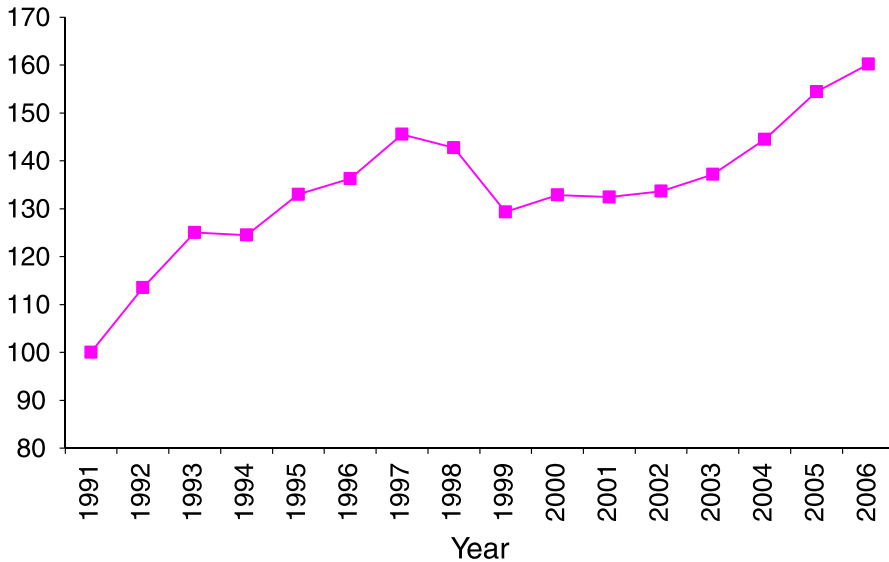


Figure 3. Real estate price index in Thailand (housing price index).

increased again in 2001, it decreased in the other years as a result of other forms of bank restructuring (e.g. through write-offs and asset sale programs). Figure 2 plots the fluctuation in the Malaysian house price index. As shown, house prices in Malaysia increased until 1997, rising approximately 18.3% in 1995 alone. The rate of change in house prices declined in 1998 and 1999 and increased thereafter. Figure 4 suggests that the Malaysian real GDP growth rate was negative in 1998 and lower in 2001 than in the other years. Together, these figures indicate that the decline in the NPL ratio and the increase in both house prices and the growth of real GDP were similar following the 1997 crisis. After the 1997 crisis, with the possible exception of 2001, economic growth and real estate prices increased, and NPL declined in Malaysia. Conversely, in 2001, the GDP growth rate and real estate prices decreased, and the NPL ratio increased.

As shown in Figure 1, the NPL ratio in Thailand, which in 1998 had been approximately 43%, decreased to approximately 7.3% in 2007. Although the high NPL ratio of 1998 and 1999 had declined in 2000, recovery was slower in Thailand than in Malaysia. In 2006, the NPL ratio for private banks in Thailand remained higher than in Malaysia. The return to NPL status slowed after 2000, and the banking sector has generally become more profitable since 2003. However, we should note that the definition of NPL changed in 2002, and this definition encompassed more NPL as a result. Figure 3 demonstrates that house prices in Thailand increased until 1997, except in 1994. The rate of increase declined in 1998 and 1999 and increased again in 2002. As Figure 4 shows, the real GDP growth rate was negative in both 1997 and 1998. Since 1999, GDP growth in Thailand has remained positive. These observations indicate that the gradual decline in the NPL ratio, the increase in house prices, and



Table 2. *Nonperforming loan ratios and loans sold to Danaharta: Malaysian banks*

	1998	1999	2000	2001	2002	2003	2004	2005
<b>Affin Bank</b>								
Loans acquired by Danaharta (million ringgit)	4.2	194.8	30.5	0	0	0	0	0
Nonperforming loan ratio (%)	18.06	17.10	14.37	35.48	37.74	35.83	26.69	17.40
<b>Alliance Bank Malaysia Berhad</b>								
Loans acquired by Danaharta (million ringgit)	27.1	259	12.5	0	0	0	0	0
Nonperforming loan ratio (%)	16.32	15.77	16.76	18.70	20.61	18.03	15.51	13.37
<b>EON Bank Berhad</b>								
Loans acquired by Danaharta (million ringgit)	79.3	47.6	0	0	0	0	0	0
Nonperforming loan ratio (%)	7.75	8.18	8.33	15.56	11.80	8.75	6.41	7.95
<b>Hong Leong Bank Berhad</b>								
Loans acquired by Danaharta (million ringgit)	0	133.5	14.3	0	0	0	0	0
Nonperforming loan ratio (%)	10.57	13.43	10.98	12.61	12.81	11.90	8.88	6.26
<b>Malayan Banking Berhad – Maybank</b>								
Loans acquired by Danaharta (million ringgit)	937.3	519	23.4	0	0	0	0	0
Nonperforming loan ratio (%)	8.44	10.75	11.17	15.57	13.09	11.80	10.55	8.83
<b>Public Bank Berhad</b>								
Loans acquired by Danaharta (million ringgit)	27.3	134.8	0	0	0	0	0	0
Nonperforming loan ratio (%)	6.95	6.47	5.55	6.63	4.29	4.21	2.65	2.07
<b>RHB Bank Berhad</b>								
Loans acquired by Danaharta (million ringgit)	0	2185.1	13.2	0	0	0	0	0
Nonperforming loan ratio (%)	10.05	7.82	8.28	11.66	16.11	16.20	13.17	8.25
<b>Southern Bank Berhad</b>								
Loans acquired by Danaharta (million ringgit)	0	153	115.5	0	0	0	0	0
Nonperforming loan ratio (%)	14.00	10.02	16.13	19.08	18.39	15.79	11.60	9.94
<b>CIMB Bank Berhad</b>								
Loans acquired by Danaharta (million ringgit)	2345	365.2	0	0	0	0	0	0
Nonperforming loan ratio (%)	8.01	11.81	7.98	10.18	10.72	10.00	10.68	9.46
<b>AmInvestment Bank Berhad</b>								
Loans acquired by Danaharta (million Ringgit)	415.7	199.5	42	0	0	0	0	0
Nonperforming loan ratio (%)	7.88	18.89	16.76	20.80	24.09	18.52	22.23	17.65
<b>MIDF Amanah Investment Bank Berhad</b>								
Loans acquired by Danaharta (million ringgit)	0	270.7	6.2	0	0	0	0	0
Nonperforming loan ratio (%)	59.89	54.52	47.99	54.92	64.05	90.97	93.98	68.70
<b>RHB Investment Bank Bhd</b>								
Loans acquired by Danaharta (million ringgit)	54.8	244.6	0	0	0	0	0	0
Nonperforming loan ratio (%)	9.19	11.70	14.07	30.86	49.22	45.27	31.30	25.86
<b>CIMB Investment Bank Berhad</b>								
Loans acquired by Danaharta (million ringgit)	28.9	7.9	0	0	0	0	0	0
Nonperforming loan ratio (%)	9.10	22.17	8.82	20.00	14.18	8.50	5.57	3.92
<b>Affin Investment Bank Berhad</b>								
Loans acquired by Danaharta (million ringgit)	75.3	30.2	755.1	0	0	0	0	0
Nonperforming loan ratio (%)	16.56	46.61	40.05	62.84	79.55	93.15	74.27	41.33

Notes: This table details only banks that are covered in the regression analysis.

Table 3. Nonperforming loan ratios and loans sold to TAMC: Thai banks

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Bangkok Bank Public Company Limited									
Loans sold to TAMC (million baht)	0	0	0	22 457.1	24 829.7	25 396.2	25 423.9	25 550.1	25 515.7
Nonperforming loan ratio (%)	49.20	48.55	23.63	21.91	26.00	24.83	17.01	11.03	9.30
Krung Thai Bank Public Company Limited									
Loans sold to TAMC (million baht)	0	0	0	14 046.5	1959.69	2997.24	2415.61	2726.56	2725.75
Nonperforming loan ratio (%)	68.34	63.20	17.11	15.44	18.99	10.73	14.00	10.91	9.68
Siam Commercial Bank Public Company Limited									
Loans sold to TAMC (million baht)	0	0	0	7477.3	4518	22.5	904	904	714
Nonperforming loan ratio (%)	43.16	29.59	19.40	18.61	24.38	17.73	13.31	9.46	7.58
Kasikornbank Public Company Limited									
Loans sold to TAMC (million baht)	0	0	0	12 160	2199	141	61	19	0
Nonperforming loan ratio (%)	51.60	25.53	18.47	13.46	18.63	12.89	9.84	7.15	5.68
TMB Bank Public Company Limited									
Loans sold to TAMC (million baht)	0	0	0	89	278	79	177	9	730
Nonperforming loan ratio (%)	48.60	39.41	23.19	14.74	14.30	9.90	11.95	12.13	10.33
Bank of Ayudhya Public Company Ltd.									
Loans sold to TAMC (million baht)	0	0	0	5775	1409	249	46	108	0
Nonperforming loan ratio (%)	37.12	31.82	22.71	16.63	19.87	15.10	10.13	9.43	9.52
Bankthai Public Company Limited									
Loans sold to TAMC (million baht)	0	0	0	18 421	20 372	22 140	22 282	22 393	25 397
Nonperforming loan ratio (%)	70.23	54.81	41.56	3.56	6.33	6.45	5.30	5.10	3.81
United Overseas Bank (Thai) PCL									
Loans sold to TAMC (million baht)	0	0	0	6199	73	138	0	0	0
Nonperforming loan ratio (%)	39.33	44.96	28.55	18.48	17.50	19.08	15.52	10.56	11.67
Tisco Bank Public Company Limited									
Loans sold to TAMC (million baht)	0	0	0	0	0	0	0	0	0
Nonperforming loan ratio (%)	43.12	18.32	9.98	5.27	7.95	5.28	4.61	3.82	4.58
Kiatnakin Bank Public Company Limited									
Loans sold to TAMC (million baht)	0	0	0	0	0	0	0	0	0
Nonperforming loan ratio (%)	54.49	35.31	22.80	10.94	8.56	11.82	11.20	17.69	14.78

Notes: This table details only banks that are covered in the regression analysis. TAMC, Thai Asset Management Corporation.

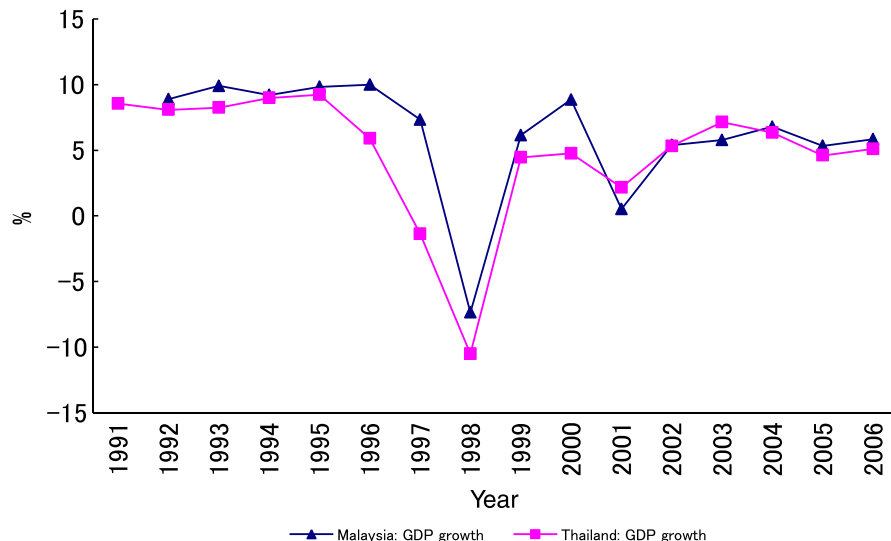


Figure 4. Real GDP growth rate.

the increase in the GDP growth rate were similar during the period after the 1997 financial crisis. Since 2003, economic growth and real estate prices in Thailand have increased further, and NPL have once again declined.

Figures 5 and 6 do not suggest a clear correlation between the changes in NPL and loan transfers to the Malaysian and Thai asset management companies. Figure 5 indicates a reduction in NPL and large loan transfers in 1999 in Malaysia. Figure 6 illustrates that in Thailand NPL declined from 2002 to 2006 and that the values of loan transfers were similar from 2001 to 2006. However, it is clear that the loans purchased by asset management companies must

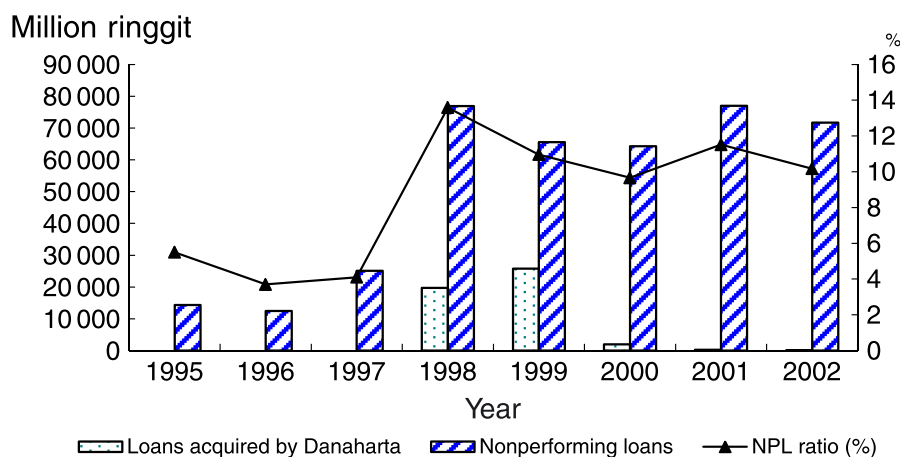


Figure 5. Nonperforming loans and loan transfers in Malaysia.

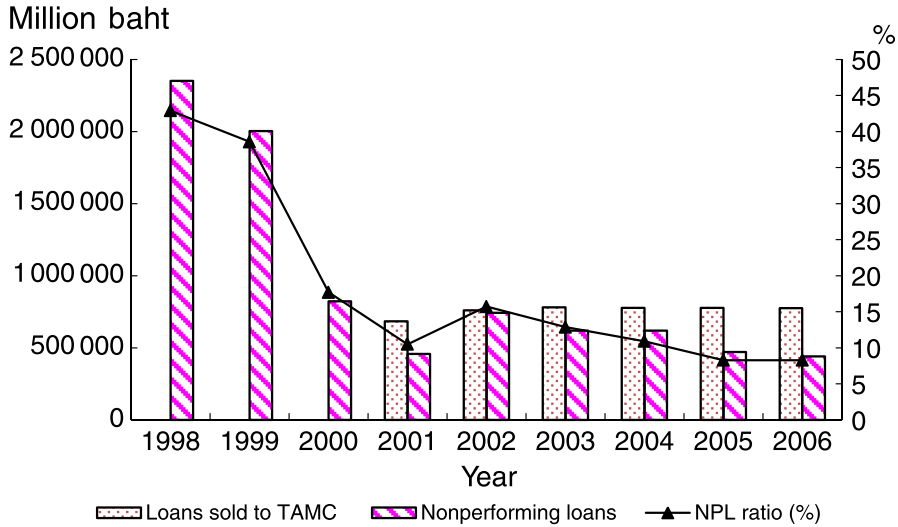


Figure 6. Nonperforming loans and loan transfers in Thailand.

have reduced the number of NPL because the banks had sold them. Therefore, it is logical to conclude that the number of NPL would have been larger in Malaysia and Thailand if their respective asset management companies had not purchased them.

Tables 2 and 3 also do not show a clear correlation between the loans purchased by the asset management companies and the NPL for each bank in Malaysia and Thailand. In Thailand, the NPL ratios of banks that sold loans and those of banks that did not both fell after 2000, even though TAMC did not exist and did not commence the purchase of loans until 2001.<sup>17</sup> However, the NPL ratios of most banks in Malaysia were lower in 2000 than the period from 2001 to 2003 when Danaharta ceased buying loans.

### 3. EMPIRICAL ANALYSIS

#### 3.1. Methodology

In this analysis, we examine the influence of bank characteristics, the purchases of nonperforming loans by asset management facilities, and macroeconomic indicators on the decline in NPL in both Malaysia and Thailand. The analysis employs panel regression techniques, following previous studies that have focused on the relationship between the NPL ratio and other variables, such as the number of loans acquired, macroeconomic conditions and bank performance.<sup>18</sup> We focus on the influence of these same variables on the NPL ratio

<sup>17</sup> The BankThai Public Company merged with the CIMB Thai Bank Public Company in 2009.

<sup>18</sup> As our analysis uses a reduced-form equation, we are unable to use the results to distinguish between demand and supply factors.

for domestic commercial and investment banks in Malaysia and domestic commercial banks in Thailand.

Following Ueda (2000), Hu *et al.* (2004) and Hosono (2010), the reduced-form regression equation for the NPL ratios is as follows:

$$NPL_{i,t} = \alpha_1 + \beta_1 X_{i,t-1} + \beta_2 Size_{i,t-1} + \beta_3 AMC_{i,t-1} + \beta_4 M_{t-1} + \mu_i + \varepsilon_{i,t}, \quad (1)$$

where  $NPL_{i,t}$  is the ratio of NPL to total loans (for bank  $i$  in period  $t$ ),  $X_{i,t-1}$  is a bank characteristic variable representing bank performance,  $Size_{i,t-1}$  is a bank characteristic variable denoting bank size,  $AMC_{i,t-1}$  is the value of loans sold to the public asset management company by each bank divided by total assets,  $M_{t-1}$  is a macroeconomic variable denoting either the GDP growth rate or the real estate price index,  $\mu_i$  denotes the fixed effects or random effects, and  $\varepsilon_{i,t}$  is the residual error.<sup>19, 20</sup>

The bank characteristic variables include the logarithm of total bank assets ( $Size_{i,t-1}$ ) and bank performance. Bank performance ( $X_{i,t-1}$ ) is measured as equity divided by total assets ( $Equity_{i,t-1}$ ) or the return on assets ( $ROA_{i,t-1}$ ). The variables for macroeconomic conditions ( $M_{t-1}$ ) are the real GDP growth rates ( $Growth_{t-1}$ ) or the rate of change in the real estate price index ( $Land_{t-1}$ ).<sup>21</sup> We lag all explanatory variables by one period. Table 4 provides the sample means and standard deviations of the variables.

If low-risk and large banks could eliminate NPL and increase the number of new loans, the NPL ratio of these banks would be smaller than those of high-risk and small banks and the expected sign of the coefficients for the bank characteristic variables would be negative.<sup>22</sup> Therefore, we expect the sign of the estimated coefficients for *Size* and *Equity* or *ROA* to be negative when the disposal of NPL depends on bank characteristics. In other words, if the banking sector reforms undertaken by the Malaysian and Thai authorities resulted in banks becoming sounder and larger after the Asian crisis and extensively eliminated NPL, the signs of the estimated coefficients for the bank characteristic variables would be negative.

Because loans sold to the public asset management company can contribute to clearing off NPL, the NPL ratios of banks can decline through the purchase of these loans by asset management companies. As a result, we expect the

<sup>19</sup> We employed either a fixed or a random effects least squares regression technique according to the results of a Hausman test. The equation therefore includes either fixed or random effects.

<sup>20</sup> In our regression, the selection bias problem would occur when there is a unique characteristic of banks that induces an increase in the sale of loans to decrease the NPL. If this unknown characteristic exists, it could be an important factor in solving the problem of NPL loans. Our regression method can alleviate this problem by using fixed effects. In addition, the effect of the purchase of NPL by asset management facilities would still be an important factor if the effect of an uncontrolled bank characteristic on the decline in the NPL ratios is conveyed by selling NPL.

<sup>21</sup> Because we omit inflation from the rate of change in the real estate price index, *Land* is in real values.

<sup>22</sup> Some theories assert that well-capitalized banks face lower insolvency risk and lower expected bankruptcy costs, and that a higher bank equity ratio implies lower risk. A high level of ROA also implies a lower default risk.

Table 4. Basic statistics

	Malaysia				Thailand			
	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum
<i>NPL ratio</i>	0.20027	0.18784	0.02065	0.93983	0.20628	0.15714	0.03558	0.70232
<i>ROA</i>	0.47174	2.10575	-12.0800	5.11000	-0.66711	4.43441	-23.9500	8.28000
<i>Equity</i>	0.10097	0.03810	0.03891	0.23062	0.08603	0.05769	-0.01206	0.31197
<i>Size</i>	23.5701	1.39932	19.4833	25.9802	26.5248	1.17560	23.7640	28.0267
<i>Land</i>	-0.01301	0.05826	-0.14722	0.04282	-0.01347	0.03893	-0.10075	0.02368
<i>Growth</i>	0.04752	0.05819	-0.04800	0.11999	0.03047	0.03978	-0.06535	0.06425
<i>AMC</i>	0.01011	0.04561	0	0.40224	0.00846	0.02265	0	0.11702

Notes: The regression periods for Malaysia and Thailand are 1998–2005 and 1998–2006, respectively. The variables are as follows: *NPL ratio* is the ratio of NPL to total loans, *ROA* is return on assets, *Equity* is equity divided by total assets, *Size* is the logarithm of total bank assets, *Land* is the rate of change in the real estate price index, *Growth* is real GDP growth rates, and *AMC* is the value of loans sold to the public asset management company by each bank divided by total assets.

estimated coefficient for *AMC* to be negative.<sup>23</sup> Similarly, an increase in real estate prices can reduce NPL through increases in collateral values, and high real GDP growth rates can transform some NPL to normal loans by improving corporate performance. Therefore, favourable macroeconomic variables can reduce the number of NPL. Accordingly, we anticipate that the estimated coefficients for *Growth* and *Land* will also be negative.

Along with these variables, we include dummy variables as constants and as slope coefficients. To better explore the influencing factors when banks did not sell loans, we specify these dummies for periods in which the asset management companies did not purchase NPL. Although the transfer of bad loans can directly reduce NPL, it is difficult to demonstrate exactly how the elimination of the NPL could have taken place without the asset management companies purchasing the loans. Therefore, to consider the NPL situation as if there were no asset management companies in Malaysia or Thailand, we also investigate the effects of macroeconomic conditions and bank characteristics on the NPL ratio during the period when loan transfers did not occur. The regression equation used in this analysis is as follows:

$$NPL_{i,t} = \alpha_2 + \alpha_2 Dum + (\beta_5 + \gamma_1 Dum)X_{i,t-1} + (\beta_6 + \gamma_2 Dum)Size_{i,t-1} + \beta_7 AMC_{i,t-1} + (\beta_8 + \gamma_3 Dum)M_{t-1} + \varpi_i + \varphi_{i,t}, \quad (2)$$

where *Dum* is a dummy variable taking a value of one in the period without the purchase of NPL by an asset management company and zero otherwise. Consequently, the dummy period in the regression for Malaysia is the period

<sup>23</sup> The possibility exists that bad banks sell more loans than good banks. Although this means that the coefficient can be positive, the regression results do not support this, as discussed later.

2001–2005 while that for Thailand is the period 1998–2001.<sup>24</sup> In the regression analysis of equation 2, the variables are otherwise the same as in equation 1.

Although the regression equations 1 and 2 use one-period lagged variables as a means of avoiding the problems of endogeneity, we can assume that the loans purchased by asset management companies and the macroeconomic variables also influence the results in any given year. Therefore, we also estimate the models using the dynamic panel regression method proposed by Arellano and Bond (1991) in place of lagged variables.<sup>25</sup> The Arellano and Bond estimator is a generalized method of moments (GMM)-type estimation, and it specifies the equations in first differences with orthogonality conditions.<sup>26</sup> When explanatory variables, including the variable for the loans purchased by the asset management facilities, are correlated with the error term, the Arellano–Bond estimator is useful because this dynamic GMM estimator is designed for the situation in which the independent variables are correlated with the error term.<sup>27</sup> The regression equations used in this analysis are as follows:

$$NPL_{it} = \delta_1 + \theta_1 NPL_{i,t-1} + \theta_2 X_{i,t} + \theta_3 Size_{i,t} + \theta_4 AMC_{i,t} + \theta_5 M_t + \phi_{i,t}. \quad (3)$$

$$\begin{aligned} NPL_{i,t} = & \delta_2 + \delta_3 Dum + \theta_6 NPL_{i,t-1} + (\theta_7 + \mu_1 Dum) X_{i,t} \\ & + (\theta_8 + \mu_2 Dum) Size_{i,t} + \theta_9 AMC_{i,t} + (\theta_{10} + \mu_3 Dum) M_t + v_{i,t}. \end{aligned} \quad (4)$$

The specification of all variables is otherwise the same as in equations 1 and 2.<sup>28, 29</sup>

<sup>24</sup> Although Danaharta purchased loans from some banks after 2002 in Malaysia, the purchased bank loans included in the regression analysis are only from the period 1998 to 2000.

<sup>25</sup> Blundell and Bond (1998) also suggest another dynamic panel regression method (system GMM). Both the system GMM and Arellano–Bond estimations are designed for situations of dynamic panels with few time periods and many individuals (Roodman, 2009). Although the system GMM estimator is more efficient than the Arellano–Bond estimator, the latter requires fewer instrumental variables. This analysis does not employ system GMM because our sample of banks is insufficient for it.

<sup>26</sup> As Subsection 3.3 discusses the regression results, the results for the effects of selling loans on the NPL ratios in the dynamic GMM tests (eqns 3 and 4 are approximately similar to those in the fixed-effects or random-effects model tests eqns 1 and 2. Although the result for equation 3 is very different from that for equation 1 in the case of the test for all Malaysian sample banks (commercial and investment banks), the reliability of the regression results of equation 3 (the dynamic GMM test) for all Malaysian sample banks is not high because the overidentifying restriction is not satisfied for this regression.

<sup>27</sup> For example, this endogeneity problem would be serious if banks increase their loans to riskier borrowers after selling NPL and this leads to increases in the sales of new NPL.

<sup>28</sup> We employ second-period lagged variables as instruments for the explanatory variables.

<sup>29</sup> The error terms have two components in equations 3 and 4: the fixed effects and the idiosyncratic shocks.

### 3.2. Data and terms

Given the constraints on data availability, we consider the periods 1998–2005 in Malaysia and 1998–2006 in Thailand.<sup>30</sup> The periods during which loan transfers did not take place were 2001–2005 in Malaysia and 1998–2000 in Thailand. The domestic bank panel data, including those for NPL, equity, ROA, total loans and total assets, are taken from the Bankscope database. The data for each bank that sold loans to a public asset management company are taken from Danaharta's operation reports in Malaysia and the annual reports of each individual bank in Thailand. The macroeconomic variables, including the GDP growth rate and the real estate price index, are from the databases of the CEIC Data Company. In the regression, we specify the housing price indexes as the real estate price.<sup>31</sup>

The analysis specifies data for domestic commercial and investment banks in Malaysia and domestic commercial banks only in Thailand.<sup>32</sup> Consequently, to obtain consistency in the statistical tests for Malaysia, we conduct separate regressions including both commercial and investment banks and commercial banks alone.<sup>33</sup> We exclude banks from our samples that merged or ceased to operate after the crisis.<sup>34</sup> Our final sample comprises 14 Malaysian domestic commercial and investment banks, including 9 commercial banks and 10 Thai domestic commercial banks.

### 3.3. Regression results

Table 5 provides the results of the panel regressions of equation 1 for the NPL ratio of domestic banks in Malaysia and Thailand.<sup>35</sup> For Malaysian commercial and investment banks, the coefficient for loans sold to Danaharta is not significant.<sup>36</sup> While the coefficients for *Growth* are negative, the coefficients for *Land* are positive.<sup>37</sup> While the coefficients for *Equity* and *ROA* are not negative,

<sup>30</sup> The Malaysian Government introduced capital controls in 1998, and they were gradually relaxed and continued until 2001. Although the controls may heterogeneously affect how each bank disposes of NPL, the idiosyncratic influence would not be large because the capital controls mostly have an impact on the financial system or macroeconomic condition. In addition, the idiosyncratic impacts would be partly reflected in the variables for each bank's performance in our regression.

<sup>31</sup> Because the house price index for Thailand also includes housing land, the index is conceptually close to the real estate price index.

<sup>32</sup> The term 'domestic bank' covers banks listed by local authorities.

<sup>33</sup> In Malaysia, most of the commercial banks are larger than the investment banks.

<sup>34</sup> We included the Bank Thai Public Company in Thailand as it merged in 2009. We excluded the Standard Chartered Bank in Thailand because we could not obtain data on its sale of loans to TAMC. A few commercial banks founded toward the middle of the 2000s are also not included.

<sup>35</sup> According to the results of a correlation test, there is no significant correlation between any of the explanatory variables. In addition, the results of the regressions that exclude some of the variables do not differ substantially from the original regression results.

<sup>36</sup> The data on NPL and the balance sheet information for each bank do not suggest that the larger banks had smaller NPL ratios before authorities began attempting to eliminate the NPL.

<sup>37</sup> The estimated coefficients for *Land* are significantly positive. We surmise that one reason for this finding is a situation in which NPL ratios and real estate prices declined in 1999 and increased in 2001.



Table 5. Determinants of the nonperforming loan ratios

	Malaysia (commercial and investment banks)			Malaysia (commercial banks)			Thailand		
$ROA_{i,t-1}$	0.29183	0.73605	-3.60378***	-3.07227***	-0.00230	0.00420	-0.00230	0.00420	
SE	0.69690	0.72042	0.63487	0.74225	0.00517	0.00274	0.00517	0.00274	
$Equity_{i,t-1}$	0.28372	0.87215*	-1.23834***	-1.14855***	-0.46961	0.20925	-0.46961	0.20925	
SE	0.51405	0.50526	0.33710	0.35543	0.52120	0.33685	0.52120	0.33685	
$Size_{i,t-1}$	-0.07063***	-0.04377*	-0.02159	-0.04027***	-0.24068***	-0.13091***	-0.24068***	-0.13091***	
SE	0.02473	0.03395	0.01414	0.01406	0.06809	0.04380	0.06809	0.04380	
$Land_{t-1}$	0.43469***	0.41193**	0.37291***	0.26559***	-0.68424	0.04930	-0.68424	0.04930	
SE	0.15368	0.16398	0.09172	0.09370	0.47942		0.47942		
$Growth_{t-1}$		-0.02619	-0.07145	0.08921	-0.02067	-2.56106***	-2.56106***	-2.46404***	
SE		0.14719	0.14932	0.08806	0.08474	0.23186	0.23186	0.22481	
$AMC_{i,t-1}$	-0.17853	-0.21988	-0.23843	0.09152	0.07725	-1.51116**	-1.51116**	-1.16157	
SE	0.22154	0.19936	0.23180	0.33961	0.36066	0.66751	0.66751	0.71571	
Constant	1.86741***	1.52809*	0.68220*	1.21312***	-0.00553**	3.73132***	3.73132***	3.52194***	
SE	0.58207	0.83578	0.56905	0.34438	0.33287	1.58833	1.58833	1.28742	
$R^2$	0.126	0.127	0.051	0.384	0.233	0.763	0.763	0.756	
Model	Fixed-effects	Fixed-effects	Fixed-effects	Random-effects	Random-effects	Fixed-effects	Fixed-effects	Fixed-effects	
Sample size	111	111	72	72	90	90	90	90	

Notes: The regression periods for Malaysia and Thailand are 1998–2005 and 1998–2006, respectively.

\*\*\*, \*\* and \* indicate that the statistics are significant at the 1, 5 and 10% levels, respectively. The dependent variable is the ratio of nonperforming loans to total loans (for bank  $i$  and period  $t$ ). The independent variables are as follows:  $ROA$  is return on assets,  $Equity$  is equity divided by total assets,  $Size$  is the logarithm of total bank assets,  $Land$  is the rate of change in the real estate price index,  $Growth$  is real GDP growth rates, and  $AMC$  is the value of loans sold to the public asset management company by each bank divided by total assets.

the coefficients for *Size* are significant and negative. For Malaysian commercial banks, the coefficients for *Equity* and *ROA* are significantly negative.

In Thailand, the estimated coefficients for loans purchased by TAMC are significant and negative.<sup>38</sup> The values of the coefficients are from approximately  $-2.525$  to  $-1.511$ . One of the coefficients for the real estate price index is significantly negative, while the coefficients for GDP growth rate are also significant and negative. The estimated coefficients for *Equity* and *ROA* are both insignificant. The coefficients for *Size* are significant and negative in all tests. This implies that faster economic growth, an increase in real estate prices and an increase in loans sold to TAMC reduced the NPL ratio in Thailand. In addition, large banks may have had lower NPL ratios.

Table 6 depicts the results for the regressions of equation 2 for the dummy period in which banks did not sell loans to either Danaharta or TAMC.<sup>39</sup> These results are similar to the regression results without the dummy variables. The estimated coefficients for *Size* are significant and negative in Malaysia. In addition, the coefficients for the *Size* dummies are significantly negative. This means that large banks had lower NPL ratios than small banks over the period 1998–2000. Remarkably, this persisted after 2001. The constant dummy variables are significantly positive in the tests for Malaysian banks. The positive constant dummy implies that NPL ratios increased in the period 2001–2005 during which the asset management company did not purchase NPL.

In Thailand, the coefficients for loans purchased by TAMC are significant and negative. Their values are from approximately  $-1.602$  to  $-1.151$ . While the estimated coefficients for *Land* are significantly negative and the corresponding coefficient dummies are positive, the coefficient dummies for *Growth* are significantly negative. This implies that the real GDP ratio was more central to the decline in NPL ratios during the period 1998–2000, the period before TAMC began buying NPL, than in the period after.

Table 7 details the results of the dynamic panel regressions of equation 3. For Malaysian commercial and investment banks, the coefficients for loans sold to Danaharta and two of the coefficients for *Size* are significantly negative. However, the overidentifying restriction is not satisfied for this regression.<sup>40</sup> In Malaysian commercial banks, two of the coefficients for loans sold to Danaharta are significant and negative. The estimated coefficients for *Equity*, *ROA*, *Size* and *Growth* are also significantly negative. This implies that low-risk commercial banks had lower NPL ratios and that higher economic growth was important for the decline in NPL for Malaysian commercial banks.

<sup>38</sup> Because the definition of NPL changed in 2002 and the number of NPL increased, we also estimate an equation that includes a dummy variable for the year 2002 in the analyses for Thailand. The estimated coefficients for this dummy variable are never significant.

<sup>39</sup> It is possible that the dummy variables capture the influence of factors that we do not control for in this period. Therefore, we need to interpret the results with caution.

<sup>40</sup> As footnote 26 indicates, this regression result of the coefficient for NPL sold to Danaharta is different from other regressions. The results of the tests for equations 1, 2 and 4 show that these coefficients are not significant. Although the real reason is not clear, the regression results for equation 3 have low reliability because the overidentifying restrictions are not satisfied.

Table 6. Determinants of the nonperforming loan ratios : the regression with dummies

	Malaysia (commercial and investment banks)	Malaysia (commercial banks)	Thailand
<i>ROA</i> $i,t-1$	0.15303	-0.18648	-0.00427
SE	0.74562	1.65608	0.00428
<i>D*ROA</i> $i,t-1$	0.98239	-2.96254*	-0.00375
SE	0.90145	1.73389	0.00507
<i>Equity</i> $i,t-1$	-0.78639*	-0.80488*	-0.79139*
SE	0.42184	0.42601	0.42202
<i>D*Equity</i> $i,t-1$	-0.04735	-0.03884	-0.57713
SE	0.48025	0.46934	0.54237
<i>Size</i> $i,t-1$	-0.08672***	-0.09508***	-0.04958***
SE	0.02690	0.01693	0.00987
<i>D*Size</i> $i,t-1$	-0.03977***	-0.04056***	0.01254
SE	0.01213	0.01393	0.00045
<i>Land</i> $t-1$	-0.23633	0.01414	0.01629
SE	0.19751	0.0281	-1.77665**
<i>D*Land</i> $t-1$	-1.25988**	-1.26219**	0.73390
SE	0.56385	0.62955	5.19888***
<i>Growth</i> $t-1$	-0.26023	0.31710	0.83607
SE	0.22147	0.23429	-0.61977
<i>D*Growth</i> $t-1$	-0.07623	-0.11245	0.77856
SE	0.26531	0.28721	-2.45060**
<i>AMC</i> $i,t-1$	0.01762	-0.00776	0.96951
SE	0.17948	0.18093	-1.15799**
<i>Constant</i>	2.15870***	2.45179***	0.48210
		1.50097***	0.52335
		1.39594**	0.67636
		1.36437***	0.60611
		1.36437***	0.06169
		1.36437***	0.06169

(Continues)

Table 6. (Continued)

	Malaysia (commercial and investment banks)			Malaysia (commercial banks)						Thailand		
	111	111	111	111	72	72	72	72	72	90	90	90
SE	0.62622	0.41636	0.63342	0.41839	0.38195	0.34189	0.38252	0.33919	0.33342	0.44899	1.26771	0.48587
<i>Dum</i>	1.08173***	1.11026***	1.04951***	1.07284***	0.77765**	0.65633**	0.77090***	0.63930**	0.37502	0.59994	-0.15899	0.19757
SE	0.28085	0.35173	0.28587	0.35614	0.25417	0.31482	0.25171	0.31148	0.33229	0.44992	0.41766	0.53003
$R^2$	0.467	0.690	0.451	0.686	0.572	0.463	0.573	0.469	0.798	0.781	0.788	0.714
Model	Fixed-effects	Random-effects	Fixed-effects	Random-effects	Fixed-effects	Random-effects	Fixed-effects	Random-effects	Random-effects	Random-effects	Fixed-effects	Random-effects
Sample size	111	111	111	111	72	72	72	72	90	90	90	90

Notes: The regression periods for Malaysia and Thailand are 1998–2005 and 1998–2006, respectively.

\*\*\*, \*\* and \* indicate that the statistics are significant at the 1, 5 and 10% levels, respectively. The dependent variable is the ratio of NPL to total loans (for bank  $i$  and period  $t$ ). The independent variables are as follows:  $ROA$  is return on assets,  $Equity$  is equity divided by total assets,  $Size$  is the logarithm of total bank assets,  $Land$  is the rate of change in the real estate price index,  $Growth$  is real GDP growth rates,  $AMC$  is the value of loans sold to the public asset management company by each bank divided by total assets,  $Dum$  and  $D$  is a 0–1 dummy variable taking a value of one in the period without the purchase of nonperforming loans by asset management companies and 0 otherwise. The dummy periods in the regressions for Malaysia and Thailand are 2001–05 and 1998–2000, respectively.

Table 7. Determinants of the nonperforming loan ratios: the dynamic panel regression

	Malaysia (commercial and investment banks)		Malaysia (commercial banks)		Thailand						
<i>NPL lagged ratio</i>	0.433940***	0.400717***	0.525678***	0.477371***	0.948675***	0.933667***	0.522261***	0.314864***	0.282082***	0.334827***	0.361035***
<i>SE</i>	0.092774	0.082272	0.090656	0.079030	0.124872	0.112531	0.117483	0.102605	0.073410	0.0669793	0.081092
<i>ROA</i>	0.00273	0.00510	0.00553	0.00773	-0.05199***	0.00773	-0.04653***	0.00758	-0.01006**	-0.01354***	0.00329
<i>Equity</i>		0.51232		0.71935*		-1.33340***		-1.14843***		-0.36944	-0.30521
<i>SE</i>		0.42485		0.40602		0.36534		0.33294		0.33093	0.37734
<i>Size</i>	-0.04494*	-0.01700	-0.04105*	-0.00352	-0.04791***	-0.07103***	-0.04088**	-0.05687***	-0.02176	-0.02814	-0.02515
<i>SE</i>	0.02411	0.02718	0.02257	0.02503	0.01767	0.02212	0.01657	0.02012	0.03873	0.03939	0.04478
<i>Land</i>	0.06205	0.03316		-0.11298	-0.17639	0.18239	-0.54926*	-1.13751***	0.31929	0.22126	
<i>SE</i>	0.21808	0.21585		0.16594							
<i>Growth</i>		-0.31318**		-0.32282***		-0.18113**		-0.28790***		-0.38952	-1.27990***
<i>SE</i>		0.12825		0.12523		0.07147		0.07709		0.44141	0.41847
<i>AMC</i>	-0.46118*	-0.54303***	-0.36103**	-0.48373***	-1.48301	-2.85951**	-1.13556	-2.12639***	-1.36702**	-2.16503**	-1.87667***
<i>SE</i>	0.18507	0.16235	0.18172	0.15593	1.25354	1.23802	0.86560	0.87915	0.56325	0.62661	0.57339
<i>Constant</i>	1.18283**	0.48007	1.08937**	0.14447	1.22360***	1.92442***	1.05887***	1.56978***	0.81507	0.72965	0.85639
<i>SE</i>	0.56846	0.67002	0.53097	0.61657	0.43398	0.55392	0.40606	0.50407	1.03693	1.04892	1.19237
Sargan test ( <i>P</i> -value)	0.0016	0.0015	0.0008	0.0006	0.4548	0.1166	0.4665	0.1101	0.8123	0.6706	0.8737
AR(2) test ( <i>P</i> -value)	0.1079	0.0793	0.1330	0.1006	0.2230	0.4557	0.2855	0.4823	0.6081	0.5993	0.9453
Number of 84 observation	84	84	84	84	54	54	54	54	70	70	70

Notes: The regression periods for Malaysia and Thailand are 1998–2005 and 1998–2006, respectively. \*\*\*, \*\* and \* indicate that the statistics are significant at the 1, 5 and 10% levels, respectively. The Sargan test is the test for null hypothesis that the overidentifying restriction is satisfied. The AR(2) test indicates the result of the Arellano–Bond serial correlation test. The dependent variable is the ratio of nonperforming loan to total loans. The independent variables are as follows: *ROA* is return on assets, *Equity* is equity divided by total assets, *Size* is the logarithm of total bank assets, *Land* is the rate of change in the real estate price index, *Growth* is real GDP growth rates, and *AMC* is the value of loans sold to the public asset management company by each bank divided by total assets.

The coefficients for loans purchased by TAMC are significant and negative in Thailand. These results are similar to those for equation 1 and the coefficient values are from approximately  $-2.165$  to  $-1.166$ . One of the coefficients for the GDP growth rate is significantly negative, as are the coefficients for the real estate price index. While the coefficients for *ROA* are significantly negative, the estimated coefficients for *Size* are statistically insignificant. This implies that high economic growth, an increase in real estate prices and an increase in loans sold to TAMC reduced the NPL ratio of the banks in Thailand.

Table 8 details the results of the dynamic regressions of equation 4 for the dummy period in which banks did not sell loans to the asset management companies. For Malaysian commercial and investment banks, the estimated slope coefficients for *Size* and the dummies of *Size* are significantly negative, and the constant dummy variables are significantly positive. However, the overidentifying restriction is also not satisfied for this regression.<sup>41</sup> In Malaysian commercial banks, the coefficients for *ROA*, *Equity* and *Size* are significant and negative. The constant dummy variables are significantly positive and two of the *Size* dummies are significantly negative.

In Thailand, the coefficients for loans purchased by TAMC and *ROA* are significant and negative. This result for selling loans to TAMC is similar to that in equation 2, and the values of the coefficients are  $-1.656$  to  $-1.376$ . While the estimated coefficients for *Land* are not significant, one of the coefficient dummies for *Growth* is significantly negative. This suggests that real GDP was important for the fall in NPL ratios during 1998–2000.

### 3.4. Influence on the amount of bank loans and number of nonperforming loans

Because the number of NPL and the value of bank loans are the numerator and denominator in the NPL ratio, respectively, the regressions on these values can explain whether the influences of selling loans on the NPL ratio are due to a decrease in the number of NPL (the numerator) or from an increase in total loans (the denominator). We also test for the influence of bank characteristics, the purchase of loans by nonperforming asset management facilities, and macroeconomic conditions on the values of total loans and NPL for each bank in Malaysia and Thailand. The logarithm of the number of NPL or the logarithm of the value of bank loans serves as a dependent variable and the explanatory variables are the same as they are in the tests for the NPL ratios. If the signs of the coefficients for the explanatory variables are positive in the regressions on the value of bank loans, their effects could increase bank loans and reduce the NPL ratio. In the case of regressions on the number of NPL, the signs of the explanatory variables are expected to be negative when their effects reduce the number of NPL and the NPL ratio.

Tables 9 and 10 show the results of the panel regression on the number of NPL and the value of total bank loans, respectively. For Malaysian

<sup>41</sup> In addition, the serial correlation AR(2) tests are not satisfied in the regression.

Table 8. Determinants of the nonperforming loan ratios: The dynamic panel regression with dummies

	Malaysia (commercial and investment banks)		Malaysia (commercial banks)		Thailand							
<i>NPL lagged ratio</i>	0.225341	0.182307**	0.313125***	0.324864***	0.682647***	0.195411**	0.719079***	0.248386**	0.283640***	0.255887***	0.295551***	0.271414***
SE	0.090532	0.092294	0.101950	0.111067	0.148205	0.108452	0.144859	0.119224	0.095116	0.094541	0.093632	0.094983
<i>ROA</i>	0.00164	0.00219	0.00219	0.00164	-0.03939***	-0.03744***	-0.03744***	-0.03744***	-0.00949**	-0.00949**	-0.00993***	-0.00993***
SE	0.00534	0.00537	0.00537	0.00534	0.00801	0.00798	0.00798	0.00798	0.00376	0.00376	0.00368	0.00368
<i>D*ROA</i>	1.74431***	1.63876***	1.63876***	1.74431***	-1.82009***	-1.59904***	-1.59904***	-1.59904***	0.00081	0.00081	0.00093	0.00093
SE	0.57956	0.39884	0.58899	0.75828	0.58908	0.58773	0.58773	0.58773	0.00348	0.00348	0.00350	0.00350
<i>Equity</i>												
SE		0.45436		0.48019		0.31535		0.35130		0.34411		0.33803
<i>D*Equity</i>		0.03142		0.16001		-0.10122		-0.01878		-0.26129		-0.28880
SE		0.36429		0.36944		0.30993		0.31555		0.48167		0.48820
<i>Size</i>		-0.11429***		-0.09624***		-0.06577***		-0.14610***		-0.02429		-0.03639
SE		0.02938		0.03192		0.02115		0.03615		0.04228		0.04111
<i>D*Size</i>		-0.03109***		-0.02746**		-0.02930***		-0.02537**		0.00280		0.00449
SE		0.01065		0.01349		0.01059		0.01139		0.01215		0.01131
<i>Land</i>		0.02374		0.03371		0.10512		0.10808		-0.32772		-0.63529
SE		0.19467		0.20674		0.17179		0.15693		0.67694		0.70261
<i>D*Land</i>		1.74431**		-1.10599**		0.14703		-0.46359*		0.85852		1.54836
SE		0.57956		0.44771		0.28176		0.27105		2.00179		2.13321
<i>Growth</i>												
SE				-0.14530		-0.26058		-0.16247		-0.02594		-0.01310
<i>D*Growth</i>				0.15148		0.17266		0.11607		0.13026		0.49457
SE				-0.29285**		-0.35005***		-0.03383		-0.12491		-1.08321
<i>AMC</i>				0.12436		0.12862		0.08698		0.08423		0.70133
SE				-0.17834		-0.18899		-0.94710		-1.40540**		-1.37580**
<i>SE</i>				0.19923		0.19023		0.20248		0.63139		0.63513

(Continues)

Table 8. (Continued)

	Malaysia (commercial and investment banks)		Malaysia (commercial banks)		Thailand							
Constant	2.80876***	1.31369	2.38360***	0.20164**	1.65927***	4.18824***	1.06388	3.39888***	0.58715	0.76807	0.73670	1.09328
SE	0.68860	0.90852	0.74557	1.02312	0.51506	0.56268	0.67430	0.88849	1.12863	1.14649	1.09747	1.10903
Dum	0.81988***	0.84990**	0.71708***	0.68179**	0.45528*	0.80321***	0.26825	0.68892**	0.10963	0.11988	0.00679	-0.10279
SE	0.25408	0.33975	0.26406	0.34739	0.26248	0.25456	0.27659	0.29099	0.33413	0.35473	0.30424	0.33737
Sargan test (P-value)	0.0029	0.0065	0.0044	0.0081	0.5893	0.0499	0.5901	0.0797	0.5582	0.4274	0.5880	0.4606
AR(2) test (P-value)	0.0464	0.0452	0.0468	0.0549	0.1783	0.8226	0.7573	0.9740	0.6779	0.9522	0.7587	0.8761
Number of observation	84	84	84	84	54	54	54	54	70	70	70	70

Notes: The regression periods for Malaysia and Thailand are 1998–2005 and 1998–2006, respectively.

\*\*\*, \*\* and \* indicate that the statistics are significant at the 1, 5 and 10% levels, respectively. The Sargan test is the test for null hypothesis that the overidentifying restriction is satisfied. AR(2) test indicates the result of the Arellano–Bond serial correlation test. The dependent variable is the ratio of nonperforming loan to total loans. The independent variables are as follows: *ROA* is return on assets, *Equity* is equity divided by total assets, *Land* is the logarithm of total bank assets, *Land* is the rate of change in the real estate price index, *Growth* is real GDP growth rates, and *AMC* is the value of loans sold to the public asset management company by each bank divided by total assets. *Dum* and *D* is a 0–1 dummy variable taking a value of one in the period without the purchase of NPL by asset management companies and 0 otherwise. The dummy periods in the regressions for Malaysia and Thailand are 2001–2005 and 1998–2000, respectively.



Table 9. Determinants of the number of nonperforming loans

	Malaysia (commercial and investment banks)		Malaysia (commercial banks)		Thailand	
$ROA_{i,t-1}$	-4.03943	-2.88052	-15.57515***	-14.00514***	-0.05710**	-0.02594*
SE	3.27245	3.22535	5.73334	6.36015	0.02322	0.01535
$Equity_{i,t-1}$						
SE	2.48139	4.13494*	-6.13961**	-5.53771*	-1.13196	-2.67954*
	2.29088	2.14584	2.74060	2.85727	2.44099	1.41130
$Size_{i,t-1}$	0.61762***	0.64229***	0.62214***	0.73641***	-0.08451	0.29849
SE	0.08308	0.15130	0.12688	0.11354	0.30613	0.98059***
$Land_{t-1}$	0.39271	0.42770	2.42023***	1.84462**	-1.19360	0.24534
SE	0.70494	0.73076	0.82163	0.76096	2.15536	0.07827
$Growth_{t-1}$						
SE		-0.94202	-1.18407*	0.42215	-0.14006	-9.06707***
		0.66530	0.63417	0.75748	0.68299	1.29861
$AMC_{i,t-1}$	0.28623	0.65046	6.44821***	7.04048**	-12.55235***	-10.66128***
SE	1.05607	0.88845	2.77899	2.85119	2.90927	3.73864
Constant	6.53509***	9.14991**	7.72541**	9.29417***	5.99171**	16.63349**
SE	1.95868	3.72469	1.88675	2.84875	2.67985	6.48765
$R^2$	0.684	0.181	0.680	0.614	0.589	0.601
Model	Random-effects	Random-effects	Fixed-effects	Random-effects	Random-effects	Fixed-effects
Sample size	111	111	72	72	90	90

Notes: The regression periods for Malaysia and Thailand are 1998–2005 and 1998–2006, respectively. \*\*\*, \*\*, and \* indicate that the statistics are significant at the 1, 5 and 10% levels, respectively. The dependent variable is the logarithm of nonperforming loans (for bank  $i$  and period  $t$ ). The independent variables are as follows:  $ROA$  is return on assets,  $Equity$  is equity divided by total assets,  $Size$  is the logarithm of total bank assets,  $Land$  is the rate of change in the real estate price index,  $Growth$  is real GDP growth rates, and  $AMC$  is the value of loans sold to the public asset management company by each bank divided by total assets.

Table 10. Determinants of the value of total bank loans

	Malaysia (commercial and investment banks)			Malaysia (commercial banks)			Thailand		
$ROA_{i,t-1}$	0.03471	-0.30391	0.89428	1.09120	1.76791	-0.04099***	-0.02711***		
SE	2.06632	2.06513	2.83495	2.97519	1.76791	0.00646	0.00644		
$Equity_{i,t-1}$		2.32224	1.57511	1.78985	1.20916	1.92710**	2.11805**		
SE		1.50609	1.45423	1.20564	1.20916	0.94733	0.97406		
$Size_{i,t-1}$	0.69166***	0.79699***	0.72381***	0.90229***	0.89682***	0.97210***	0.52300***	0.97490***	0.54320***
SE	0.07331	0.09947	0.08980	0.04091	0.03831	0.03877	0.01858	0.13872	0.02060
$Land_{t-1}$	-0.65184	-0.94924*	0.23208	0.26200	0.03831	3.55917***	1.09302		
SE	0.45567	0.48042	0.38531	0.36466	0.08452	0.75564	0.69385		
$Growth_{t-1}$		-0.34337	-0.48346	0.08452	0.10698	0.10698	1.04502		0.19877
SE		0.42193	0.42977	0.36124	0.32729	0.32729	0.65167		0.65009
$AMC_{i,t-1}$	0.99385	0.98092*	1.05604*	5.30819***	5.38842***	5.08370***	-5.67304***	-5.48996***	-5.30259**
SE	0.65688	0.58409	0.66448	1.42554	1.38009	1.37568	1.16622	2.01462	2.06960
Constant	6.66700**	3.95344	7.38442***	5.78466***	1.91746*	1.70453*	0.48667	12.21346***	0.35061
SE	1.72584	2.44872	1.63124	2.20194	2.18888**	0.96787	0.49283	3.62266	0.54453
$R^2$	0.506	0.519	0.499	0.948	0.949	0.949	0.971	0.427	0.964
Model	Fixed-effects	Fixed-effects	Fixed-effects	Random-effects	Random-effects	Random-effects	Random-effects	Fixed-effects	Fixed-effects
Sample size	111	111	111	72	72	72	90	90	90

Notes: The regression periods for Malaysia and Thailand are 1998–2005 and 1998–2006, respectively.

\*\*\*, \*\*, and \* indicate that the statistics are significant at the 1, 5 and 10% levels, respectively. The dependent variable is the logarithm of bank loans (for bank  $i$  and period  $t$ ). The independent variables are as follows:  $ROA$  is return on assets,  $Equity$  is equity divided by total assets,  $Size$  is the logarithm of total bank assets,  $Land$  is the rate of change in the real estate price index,  $Growth$  is real GDP growth rates, and  $AMC$  is the value of loans sold to the public asset management company by each bank divided by total assets.

commercial and investment banks, the coefficients for loans sold to Danaharta are not significant in the regression on the number of NPL, although two of the coefficients are significantly positive in the test on the value of total loans. While the coefficients for *Size* are significant and positive in both regressions, the values of the coefficients in the regression for total loans are larger than those in the test of NPL. For Malaysian commercial banks, the coefficients for *AMC* and *Size* are significantly positive in both regressions on NPL and total loans. However, the values of the coefficients for *Size* in the regression on total loans are larger than those in the test for NPL. The coefficients for *ROA* and *Equity* are significantly negative in the regression on NPL, but they are not significant in the regression on total loans.

This result means that although both the NPL and loans of large banks are larger than those of small banks, the NPL ratios of large banks are lower than those of small banks during the regression period in Malaysia because the difference in the number of NPL (the numerator) between large banks and small banks is smaller than that in the amount of loans (the denominator). In addition, the purchase of loans by Danaharta may have increased both banking loans and NPL of Malaysian commercial banks during the same period. This implies that one of reasons for the unclear effect of selling NPL to Danaharta on the NPL ratios in the regression results for the NPL ratio was the increase in NPL of Malaysian commercial banks in spite of the purchase of loans by Danaharta. In addition, commercial banks with high levels of ROA and high equity ratios reduced their NPL ratios primarily through an increase in the number of NPL (the numerator).

For Thai banks, the coefficients for loans purchased by TAMC are significant and negative in both regressions on NPL and total loans. Meanwhile, the absolute value of the coefficients in the regression for NPL is larger than that in the test for total loans. The coefficients for the macroeconomic variables are significantly negative, except for one *Land* coefficient, in the regression for the number of NPL, but these coefficients are not significant or positive in the test for loans. This means that the purchase of loans by TAMC may reduce the NPL ratio of Thai commercial banks because the reduction effect on the number of NPL (the numerator) is larger than that on total loans (the denominator) despite the decline in both NPL and loans. In addition, an improvement in macroeconomic conditions led to a decline in the NPL ratio principally by decreasing the number of NPL in Thailand.

### 3.5. Implications of regression results

These findings support the argument that an improvement in macroeconomic circumstances and the purchase of NPL may have affected the NPL problem in Thailand. From the coefficient values for selling NPL, we estimate that a 1-basis-point increase in the ratio of the value of loans purchased by TAMC to the total assets leads to a drop in the NPL ratio

by approximately 1.2 to 2.5 basis points.<sup>42</sup> This implies that the number of NPL could have declined sooner in Thailand if the authority had established TAMC prior to 2001.

In Malaysia, individual bank characteristics, notably bank size, exerted an enormous influence on the NPL problem. In addition, well performing Malaysian commercial banks also reduced their NPL ratios.<sup>43</sup>

The effect of selling NPL on the decline in NPL ratios of Malaysian banks is unclear. It is possible that the increase in loans sold to Danaharta affected the NPL ratio, because some coefficients were significant and the NPL ratio rose after the period in which the asset management company ceased purchasing loans.<sup>44</sup> However, the role of the asset management company in Malaysia may have been smaller than that in Thailand in solving the NPL problem because banking loans and NPL for Malaysian commercial banks may have increased while Danaharta purchased loans.<sup>45</sup>

#### 4. CONCLUSION

This study investigated the impact of variables that describe the characteristics of banks, the purchase of nonperforming loans by asset management facilities, and macroeconomic indicators on the decline of NPL in Malaysia and Thailand. As a result of the 1997 Asian financial crisis, both countries faced similar problems with the amount of NPL. In response, the Malaysian and Thai authorities established respective public asset management companies and attempted to reform their banking systems using various measures and policies to eliminate NPL, including bank closure and consolidation. In addition, improved macroeconomic conditions in both countries after the crisis could also have affected the NPL problem. However, until now, the factors influencing the reduction in NPL in the banking sectors of South-East Asia have not been the subject of empirical attention. It is important to investigate these factors now in order to address similar problems if they were to reoccur in the future.

The panel regression results suggest that selling loans to public asset management companies was effective in reducing NPL, especially in Thailand. This

<sup>42</sup> Just for reference, we test for the influence of the value of selling loans on the number of NPL. The regression employs the number of NPL and the level of loans sold to asset management facilities in each bank as variables, instead of the NPL ratios and loans sold divided by total assets, respectively. The specifications of the other variables are the same as in equation 1. The results show that three of four coefficients for the value of purchased loans are significant in Thailand and that their values are approximately  $-2.702$  to  $-4.451$ . This implies that a 1-baht purchase of loans by TAMC can reduce NPL by more than 2 baht in the next period. In contrast, the coefficients are not significant in the regression for Malaysian banks.

<sup>43</sup> The difference in results for commercial and investment banks and commercial banks alone potentially suggests a difference in the contributing factors accounting for the decline in NPL of commercial banks compared with investment banks in Malaysia.

<sup>44</sup> This is consistent with the high NPL ratios of most Malaysian banks from 2001 to 2003, as shown in Table 2.

<sup>45</sup> While Malaysian commercial banks sold loans to Danaharta, they may have increased their loans to less creditworthy companies. This could have weakened the effects of purchasing NPL by Danaharta on the decline in the NPL ratio.

implies that Thai banks could have reduced their NPL sooner if TAMC had existed before 2001. In Malaysia, the number of NPL of commercial banks may have increased during the period in which Danaharta purchased loans, although we cannot deny the existence of the effect of Danaharta's purchasing loans.

In addition, the results reveal that some variables measuring bank risk are significant in Malaysia. Malaysian domestic banks with larger assets have smaller NPL ratios, and this trend was more significant in the period in which banks did not sell loans to Danaharta. Malaysian commercial banks which perform well generally have smaller NPL ratios. If banking reforms after the crisis contributed to creating sounder banks, this may have affected the decline in NPL for banks, as well as affecting the overall improvement in Malaysia's domestic banking sector.

While macroeconomic conditions caused a decline in the NPL ratio principally by decreasing the number of NPL in Thailand, the effect was more significant than that in Malaysia.<sup>46</sup> In addition, if the Thai authorities had not established TAMC, solving the NPL problem would have largely depended on the general improvement in macroeconomic conditions. This implies that macroeconomic recovery from the financial crisis of 1997 affected largely the reduction in NPL ratios and that macroeconomic policy may have played an important role in resolving the NPL problem in Thailand.

#### REFERENCES

- Arellano, M. and S. Bond (1991) 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations', *The Review of Economic Studies* 58, 277–97.
- Berger, A. N. and R. DeYoung (1997) 'Problem Loans and Cost Efficiency in Commercial Banks', *Journal of Banking and Finance* 21, 849–70.
- Blundell, R. and S. Bond (1998) 'Initial Conditions and Moment Restrictions in Dynamic Panel Data Models', *Journal of Econometrics* 87, 115–43.
- Bonin, J. P. and Y. Huang (2001) 'Dealing with the Bad Loans of the Chinese banks', *Journal of Asian Economics* 12, 197–214.
- Boudriga, A., N. Bouloua and S. Jellouli (2009) 'Does Bank Supervision Impact Nonperforming Loans: Cross-country Determinants using Aggregate Data?', MPRA Paper, No. 18068.
- Fung, B., J. George, S. Hohl, and G. Ma (2004) 'Public Asset Management Companies in East Asia: A Comparative Study', BIS Occasional Paper, No. 3.
- Hasan, I., and L. D. Wall, (2004) 'Determinants of the Loan Loss Allowance: Some Cross-Country Comparisons', *Financial Review* 39, 129–52.
- Hosono, K. (2010) *Microeconomic Analysis of Financial Crises [Kinyukiki no Mikurokeizai Bunseki]*. Tokyo: University of Tokyo Press (in Japanese).
- Hu, J. L., Y. Li, and Y. H. Chiu (2004) 'Ownership and Nonperforming Loans: Evidence from Taiwan's Banks', *The Developing Economies* 42, 405–20.
- International Monetary Fund (2004) 'Thailand: Selected Issues. IMF Country Report'.
- Ito, T. (1999) 'The Background of the Asian Crisis [Asia Tsukakiki no Haikai]', *Research on Development Aid [Kaihatsuenjyo Kenkyu]* 5, 102–29 (in Japanese).
- Roodman, D. (2009) 'How to do xtabond2: An introduction to difference and system GMM in Stata', *The Stata Journal* 9(1), 86–136.

<sup>46</sup> If real estate prices play an important role in the decline in NPL, this is also consistent with the influential role of collateralized real estate on bank loans in Thailand.

- Sinkey, J.F. Jr. and M. B. Greenawalt (1991) 'Loan-Loss Experience and Risk-Taking Behavior at Large Commercial Banks', *Journal of Financial Services Research* 5, 43–59.
- Terada-Hagiwara, A. and G. Pasadilla (2004) 'Experience of Asian Asset Management Companies: Do They Increase Moral Hazard?-Evidence from Thailand', ADB-ERD Working Paper, No. 55.
- Ueda, K. (2000) 'Causes of Japan's Banking Problems in the 1990s', in T. Hoshi and H. T. Patrick (eds), *Crisis and Change in the Japanese Financial System*, Massachusetts: Kluwer Academic Publishers.

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