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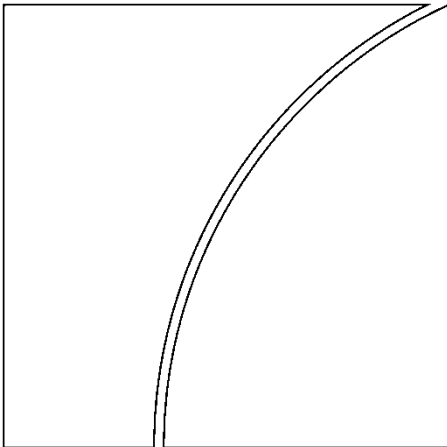No 375

Loan loss provisioning practices of Asian banks

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Loan loss provisioning practices of Asian banks

Frank Packer and Haibin Zhu[1]

Abstract

In the wake of the Asian financial crisis, many regimes in Asia adopted stricter provisioning requirements, as well as discretionary measures, with the objective of increasing provisioning in good times in response to rising levels of risk. Based on a final sample of 240 banks in 12 Asian economies, the evidence is that countercyclical loan loss provisioning has dominated throughout emerging Asia, most strikingly so in the case of India. Thus, loan loss provisioning did not simply become more conservative at all points in time subsequent to the Asian financial crisis, but actively leaned in a fashion that ameliorated swings in earnings and the macroeconomy.

Loan loss provisioning practices of Asian banks

1.   Introduction

Banks in Asia and the Pacific were strikingly resilient in the aftermath of the global financial crisis that began in 2007. While many banks in Europe and the Americas needed an infusion of public capital, assistance to Asian banks was limited to temporary liquidity support and guarantees of debt issuance to deal with market dysfunctions. Banks in Asia and the Pacific were far less likely to get downgraded than those in Europe and the United States. The profitable and well capitalised banks evident in much of Asia were a far cry from those that had characterised the region just a decade earlier (Mohanty and Turner (2010)).

It has been argued that one factor contributing to the resilience of Asian banks was changes in the regulatory environment from the late 1990s. In particular, most jurisdictions in Asia, spurred by the severe losses of the Asian financial crisis, adopted stronger risk management and more conservative loan loss provisioning standards (Angklomkliew et al (2009)). As a result, loan loss reserves and provisioning expense levels were generally higher in the run-up to the current financial crisis than they were before the Asian crisis. From a global perspective, they were also higher than those of many countries outside Asia that were significantly affected by the crisis.

However, the degree to which provisioning practices have reduced financial system procyclicality in Asia has not yet been fully tested. In this paper, loan loss provisioning is considered to be procyclical if it tends to fall during periods of high GDP growth and rise during periods of low GDP growth (after adjusting for the credit quality of bank loans and other control variables). We also focus in the empirical analysis on the relationship between provisioning and bank earnings. If banks put aside more provisions when their income is high – "earnings smoothing" is a common finding in the accounting literature – that would act to dampen financial system procyclicality.

Based on a final sample of 240 banks in 12 Asian economies spanning more than a decade, we examine whether banks in Asian jurisdictions have in fact been provisioning in a fashion that reduces financial system procyclicality. The analysis of Asia's post-financial crisis experience should be of interest to the many national and international authorities that are now considering measures to promote more forward-looking provisioning practices, so that banks enter periods of worsening credit quality with higher levels of reserves, providing a buffer to reduce the downward pressure on earnings and capital that would otherwise occur.

The main findings of the paper are as follows. First, when banks in Asia and the Pacific are looked at in aggregate, there is mixed evidence for countercyclicality in provisioning over the sample period: provisioning tends to be negatively related to economic growth, but income smoothing via provisions is also evident. For the sample as a whole, the two opposite effects are countervailing. However, when the banks are divided into different groups based on nationality, striking differences across banking systems are evident. In particular, there is evidence of countercyclical loan loss provisioning by banks throughout emerging Asia, most strikingly so in India. On the other hand, Japanese banks show procyclical provisioning. The evidence suggests that most of the result for Japan was driven by strikingly higher provisions during the financial crisis of 2007–09, which contrasts with earlier periods of economic downturn, when forbearance was more common.

2.   Literature review

Research on loan loss provisioning used to focus narrowly from an accounting perspective on whether provisions were used by banks to smooth earnings (Greenawalt and Sinkey (1988)). More recently, work has focused on how provisions contribute to the procyclicality of financial systems by being lower when output and credit are expanding and higher in periods of contraction. In early work from this perspective, Borio et al (2001) document a strong negative correlation of bank provisions with the business cycle for 10 OECD countries. Subsequent empirical studies have used bank-level information to investigate the procyclicality of loan loss provisions in more detail (Cavallo and Majnoni (2002), Laeven and Majnoni (2003), Davis and Zhu (2009), Bikker and Metzemakers (2005), Bouvatier and Lepetit (2008), Craig et al (2006); see Table 1). Researchers use regression analysis to explain annual provisioning expenses, usually scaled by the total stock of loans or assets of the bank. Some of the explanatory variables used in these studies are discussed below.

Credit quality. Given that provisions are set aside as a buffer against credit losses, credit quality variables should be expected to be important determinants of loan loss provisions. Two variables are widely used in the literature to proxy (inversely) for credit quality: the non-performing loan (NPL) ratio and the loan/asset ratio. The latter is used as loans are generally considered to be riskier than other types of bank assets (eg cash, reserves, bonds) and therefore a high loan/asset ratio is associated with lower credit quality. Both the NPL and loan/asset ratios are found to be positively associated with loan loss provisions in the literature.

Another proxy for bank-specific loan portfolio credit quality is loan growth, which at higher levels may reflect higher levels of risk being taken on. However, in most of the studies examined in Table 1, provisioning expenses vary negatively with loan growth, consistent with provisions declining even as surges in new loans might indicate increased riskiness. One exception is Bikker and Metzemakers (2005), who found a significantly positive impact of loan growth on provisions.

GDP growth. The most important variable in this study for examining whether provisioning practices might exacerbate the business cycle is (real) GDP growth. In four out of the five prior studies reviewed in which real GDP growth is an explanatory variable, provisioning expenses are found to vary negatively with the business cycle (see Table 1). The latter result is consistent with the traditional view that loan loss provisions tend to be procyclical.

Earnings. If banks use provisions to smooth earnings, there should be a positive relationship between provisions and earnings. Evidence of the existence of earnings smoothing through provisions remains fairly strong, at least for industrialised countries (eg, see Pérez et al (2008)) for the case of provisioning in Spain). In a few papers, provisions are found to vary inversely with earnings when they are negative, which would contribute to procyclicality. Meanwhile, studies on emerging markets have not found evidence for earnings smoothing; in fact, earnings have been found to negatively affect provisioning in emerging Asia (Laeven and Majnoni (2003), Craig et al (2006)). It is worth noting that income smoothing is considered as a violation of the internationally accepted accounting standards (eg IFRS or IAS 39), which determined provisioning *solely* based on evidence of incurred losses or impairment.

Capital ratio. Higher provisioning when capital is low is consistent with capital depletion being correlated with efforts to build up a greater reserve cushion. However, studies do not document a strong association with capital constraints and provisioning. In two of the above-mentioned studies (Davis and Zhu (2009), Craig et al (2006)) in which capital is included as an explanatory variable, there is no significant impact of capital on provisioning; in the other two studies the impact is of opposite signs.

Asset prices. Provisioning may be lower when asset prices are rising, if the latter are reflected in collateral valuations (changed expectations about future fundamentals are

another channel). Davis and Zhu (2009) find that provisions are lower when commercial property prices are rising. This suggests that provisioning may amplify credit cycles through the collateral channel.

The most ambitious study focusing on Asia to date is that of Craig et al (2006), who investigate the provisioning decisions of 242 Asian banks between 1996 and 2003. Their findings are consistent with the view that provisioning practices in Asia exacerbated financial system procyclicality more than in other regions. Higher real GDP, loan growth, asset prices and earnings led to lower provisions. To be sure, these results were probably driven by the collapse in many variables during the Asian financial crisis, when provisions needed to be increased.

In a more recent study, Angklomkliew et al (2009) also explored the degree to which provisioning has been countercyclical in eight Asian countries, but using national data only, over 1998–2008. Regressions using annual data incorporating fixed country effects are reported. Like Craig et al (2006), they also found over the full period that GDP and credit growth, earnings and capital are related to provisioning in a way that may exacerbate financial system procyclicality. However, when estimated over the more recent period only (2003–08), while GDP growth is statistically significant, the other variables lose their significance. This suggests that many of the earlier results may have been driven by the behaviour of the variables around the Asian financial crisis of the late 1990s, and may not represent current provisioning practice. However, the paucity of observations, the limitations to system-wide data and the lack of a full cycle in either subperiod of the paper limit the strength of any inferences to be drawn from the comparison.

The empirical exercise of this paper represents the first attempt using bank-level data since Craig et al (2006) to assess the determinants of provisioning in Asia. In contrast to the earlier work, it includes a significant period of observations since the Asian financial crisis, and thus addresses the question of whether or not changes in the regulatory environment since the crisis contributed to ameliorating the procyclicality of provisioning practices.

3.   Loan loss provisioning regimes in Asia

In the aftermath of the Asian financial crisis of the late 1990s, many Asian central banks and supervisory authorities tightened their prudential supervision to ensure that banks established reserves at a level commensurate with the level of risk in the loan portfolio in a timely manner (Figure 1). Many of these moves involved convergence with internationally accepted accounting regimes (such as IFRS) or improvements to loan grading and provisioning schemes. Importantly, the general principles of the IFRS, including IAS 39, required reserves to be established for specific loans only if there is objective evidence of impairment. Such requirements can give provisioning a backward-looking focus.

At the same time, significant heterogeneity remains. Not all jurisdictions are converging with IAS 39. The treatment of collateral differs, as does the tax deductibility of provisions or the inclusion of reserves in capital. Even among those jurisdictions that have adopted IAS 39, most impose additional provisioning and reserve requirements. Indeed, some authorities in the Asian region have adopted measures on a discretionary basis to encourage the build-up of loan loss reserves in good times, for instance by increasing the level of reserves required in cyclical sectors. Such departures from the incurred loss approach to provisioning can be

viewed as consistent with the more forward-looking perspectives recently proposed as one of the guiding principles for provisioning by the Basel Committee on Banking Supervision.[2].

What follow are country-specific descriptions of the salient features of loan loss provisioning regimes in 10 Asian jurisdictions.

China. Banks in China have been required to set aside general reserves of at least 1% of loans outstanding since 2005. Effective 2002, as part of a broader convergence with international practices, loan classification rules were revised such that specific reserves were mandated for the four lowest grades. Prudential guidelines allow banks to establish specific reserves for loans graded either substandard or doubtful that are 20% greater or less than the prudential norm. Factors considered when determining the appropriate level of reserves include specific risk scenarios (which may vary by region or industry), probability of losses and historical experience. Further steps by the China Banking Regulatory Commission (CBRC) to ensure adequate reserve levels included statements encouraging banks to raise their ratios of total reserves to NPLs to 150% by the end of 2009. This recommendation was intended to provide sufficient coverage not only for currently identified problem loans but also for a potential increase in NPLs owing to the significant loan growth experiences in the first half of 2009.

Hong Kong SAR. Hong Kong SAR (hereinafter Hong Kong) implemented IAS 39 in 2005. As a result, loan provisions are made when objective evidence of impairment occurs. As an additional measure, to ensure that the level of protection for expected credit losses does not decline, financial institutions are expected to maintain a "regulatory reserve" of approximately 0.5–1% of total loans to cover losses which may occur in the future. The regulatory reserve is an "earmarked" amount in retained earnings and is therefore distinct from loan loss reserves. The Hong Kong Monetary Authority expects that the regulatory reserve should approximate the difference between the sum of general and specific reserves that would have been established prior to the implementation of IAS 39 and the level of reserves required after its implementation.

India. Over the past decade, loan classification standards in India have become more conservative and have moved closer to international norms. To this end, India has raised its benchmark general provision level for standard loans (from 0.25% to 0.40% in 2005), noting the need "to build up provisioning to cushion banks' balance sheets in the event of a downturn in the economy". Required reserve levels also consider collateral. The Reserve Bank of India (RBI) applies a sector-specific approach to general provisions based on the riskiness of the sector and public policy objectives. For instance, required reserve levels for performing personal loans, residential housing loans above INR 20 million, and credit card, capital market-related and commercial real estate loans were increased from 0.4% to 1% in 2006. In 2007, the RBI further raised general provisions for personal loans, capital market exposures and commercial real estate loans from 1% to 2%, and increased provisioning requirements for banks' exposure to systemically important non-deposit-taking non-banking finance companies from 0.4% to 2%. The RBI stated that higher requirements were a response to continued high credit growth and higher default rates. Conversely, provisioning requirements for performing loans to the agricultural and SME sectors are exempted from the additional provisioning requirements enacted in 2005.

Indonesia. Bank Indonesia adopted a prudential loan classification scheme with five grades in December 1998, and later tightened the definition for each grade in 2005. Provisions are allowed to be made net of collateral, with the appraised value of collateral reduced according to the age of the appraisal (ie older appraisals result in a greater discount to the appraised

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2   Namely, that provisions should be based on methodologies that "reflect expected losses … over the life of the loans …". See BCBS (2009).

value of the collateral). General provisions of no less than 1% of loans are required, though the requirement can be waived if the loan is secured by high-quality collateral such as cash or gold.

Japan. The accounting standards board in Japan aimed to achieve convergence between Japanese GAP and IFRS by 2011. Japan has long had general provisions in addition to specific provisions. Required provisions have been a function of the past three-year loss experience in each category. General and specific provisions are tax-deductible and, as in many other countries, have been allowed to be included in Tier 2 capital up to a certain fixed percentage (Table 2). In contrast to many other countries in Southeast Asia, however, there have not been discretionary changes to provisional requirements in response to macrofinancial conditions or sectoral considerations. The main regulatory changes which affected provisioning were changes in loan classification standards, which were particularly intense in the late 1990s and early 2000s, when Japan tightened its guidelines on loan classification, which had come under attack for its overly slow recognition of problem loans (Packer (2000), Ueda (2000)).

Korea. Korea has tightened provisioning norms on numerous occasions over the past decade. The general reserve requirement for corporate loans was increased to 0.5%, 0.7% and 0.85% in 1999, 2005 and 2007, respectively. The minimum reserve levels for other categories of loans were also raised. Sectoral differences in provisioning requirements are also enforced, with higher provisioning requirements for residential housing and credit card loans relative to corporate loans in place since December 2006. In addition to the sectoral differences, Korean prudential authorities explicitly incorporate "expected loss" considerations into their guidance on provisions: local banks, when assessing the loan classification, are required to apply "forward-looking criteria", including future cash flow projections, when determining an appropriate level of reserves. Korea planned to complete the adoption of IAS 39 in 2011.

Malaysia. In the wake of the Asian crisis, the Central Bank of Malaysia increased its reserve requirements for various prudential loan grades. For example, until March 1998, no specific reserve level was required for loans graded substandard, while 50% and 100% were required for doubtful and loss loans, respectively. From March 1998, a 20% requirement for substandard loans (net of collateral) was introduced and general reserve levels were increased to 1.5% of total loans. Malaysia had planned to implement IAS 39 by 2010.

Philippines. The Philippines adopted new accounting standards in 2005 in line with IFRS and the loan impairment criteria contained in IAS 39. For financial institutions, however, the Bangko Sentral ng Pilipinas (BSP) requires that reserve levels be maintained in accordance with IAS 39 or BSP guidelines, whichever results in a higher reserve. The BSP requirements include a general provision for loans without heightened credit risk characteristics of 1% and 5% for those that were previously restructured. Specific reserves are determined based upon the particular loan grade assigned.

Singapore. As in Hong Kong and the Philippines, IAS 39 became effective in Singapore in 2005. Banks that are not yet compliant with IAS 39 must maintain a minimum specific reserve level based upon the supervisory loan grade. Though there is no specific guidance on general provisions, the Monetary Authority of Singapore states that as a "transitional arrangement" the level should be maintained at not less than 1% of loans net of collateral values. All minimum provision levels are net of collateral.

Thailand. In 1998, Thailand significantly increased the minimum loan loss reserves required for the various supervisory loan grades, with the requirements applied net of collateral value. In 2006 and 2007, in order to mitigate the impact of convergence with IAS 39, which is expected to take place over the next few years, the Bank of Thailand (BoT) further tightened provisioning standards for all loans graded substandard or below such that they are consistent with IAS 39. As a result, for these loans, a reserve equalling 100% of the difference between the balance sheet amount of the loan and the present value of expected

cash flows from the debtor or the sale of collateral must be established. It is worth noting that the BoT has not yet fully applied IAS 39 to performing and so-called special mention loans, where provisions of 1% and 2% are required against loans net of collateral, respectively. All banks are expected to be fully compliant with IAS 39 by 2013.

In summary, a number of measures taken by supervisors in Asia over the past 10 years have resulted in banks maintaining higher levels of loan loss reserves in relation to total loans during a period when many jurisdictions have been experiencing economic growth and declining levels of NPLs.

In three of the countries discussed above, authorities adopted measures on a discretionary basis to respond to increasing levels of risk (Table 2). Authorities in India and Korea, for example, increased their loan loss reserve requirements on several occasions in sectors experiencing rapid credit growth. China's recommendation that banks maintain a loan loss reserve-to-NPL ratio of 150% is another measure that has resulted in the establishment of reserves in advance of an identifiable deterioration in credit quality.

The process of convergence with international accounting standards has been managed so as to ensure increased provisioning standards ahead of the full implementation of IAS 39. But when the process has threatened to reduce loan loss reserve levels, a number of authorities have instituted additional provisioning requirements, maintained existing measures on a provisional basis (Philippines) or created a special regulatory reserve account (Hong Kong).

The shifting regulatory environment described could have affected Asian banks' provisioning practices in at least two ways. For one, it may have led to banks' provisioning practices being more conservative across the board, and thus invariably higher than they would have been once the values of all other determinants were accounted for. The evidence reported in Angklomkliew et al (2009) suggests that provisioning did tend to be higher subsequent to regulatory changes. For another, the new environment may have made Asian banks' provisioning practices more countercyclical, and thus higher mainly in good times, and lower than they otherwise would have been in bad times. The empirical analysis that follows tests this second proposition. Since many of the new measures in Asia were adopted on a discretionary basis to build up loan loss reserves in good times, to be drawn upon in the event of an economic or earnings downturn, even without the emergence of rule-based countercyclicality measures indicated by regimes such as those in Spain, they could have encouraged banks to behave in a manner consistent with countercyclical provisioning.

4.   Methodology

The baseline model specification adopted in this study follows the existing literature:

$$LLP_{i,t} = \beta_1 LLP_{i,t-1} + \beta_2 NPL_{i,t} + \beta_3 LOANASSET_{i,t} + \beta_4 CAR_{i,t} + \beta_5 DLOAN_{i,t} + \beta_6 EBTPTA_{i,t}$$
$$+ \beta_7 DGDP_{i,t} + \delta \ COUNTRY_i + \gamma \ YEAR_t + \varepsilon_{i,t} \qquad (1)$$

The key objective is to investigate the determinants of loan loss provisions. Explanatory variables include the (inverse) proxy variables for credit quality (NPL ratios, loan/asset ratios, bank loan growth), as well as capital adequacy ratios, GDP growth and earnings before tax and provisions (as a percentage of total assets). In addition, country and year dummies are also included.

The key results of interest in our analysis are the two coefficients on GDP growth and earnings, ie β_6 and β_7 in equation (1). We interpret both coefficients as indicative of the important question whether bank provisioning is countercyclical or not. In particular, the two coefficients could reflect two different forms of countercyclical (or procyclical) provisioning practices. One form of countercyclical provisioning is contingent on bank-specific accounting

results, in particular bank earnings. A positive coefficient (β_6) implies that banks put aside extra provisions when profits are high. The other form of countercyclical provisioning is related to the state of macroeconomic conditions. A positive coefficient (β_7) implies that banks accumulate provisions during economic upturns, which will be used in economic downturns. In practice, the statistical provisioning method adopted in Spain is such an example of countercyclical provisioning, although it is imposed by the regulatory authority rather than self-motivated by banks.[3] Throughout this paper, we will distinguish between these two possible sources of countercyclical (or procyclical) provisioning behaviour, one micro-oriented and the other macro-oriented.

Two points are worth noting here. First, the correlation of two key explanatory variables, GDP growth and bank earnings, might cause a multicollinearity problem in the econometric analysis. Investigation into the data suggests that this is not a huge issue. While these two variables are generally positively correlated (except for Indian banks), their correlation is not overly high. Importantly, earnings also exhibit substantial differences across banks even within the same country, thus including both variables in the regression can yield evidence of whether countercyclical (or procyclical) provisioning is linked to the macroeconomic cycle, which is typically due to additional requirements imposed by supervisors/regulators, and/or linked to bank-specific performance cycles, which is typically driven by individual banks' incentives.

Second, we chose the list of explanatory variables to be consistent with previous studies, so that readers can compare the provisioning practices in Asia after the Asian financial crisis with the results found in studies of other experiences. Separately, we also analysed the impact of numerous other explanatory variables. Some of the results are reported in this paper (see Section 6.4) but others are omitted for space reasons. For instance, we included asset prices (house prices and equity prices) in unreported specifications, but as they turned out to be insignificant, they were excluded from our final reported specifications.

5.   Data

Our empirical analysis covers 12 economies in Asia and the Pacific, namely Australia, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand. Data come from two sources: bank-level balance sheet and income statement information, taken from the Bankscope database; and macrofinancial variables in each jurisdiction, taken from the national data maintained by the BIS.

We retrieve balance sheet and income statement information on individual banks in the 12 economies during the period 2000–09. The data are available on an annual basis. Following the practices in earlier studies, such as Cavallo and Majnoni (2002) and Davis and Zhu (2009), we clean up the data in the following steps.

First, our analysis covers only commercial banks and excludes other types of financial institution (such as government-sponsored financial institutions, investment banks, investment and trust corporations, finance companies, savings banks and cooperative banks). We choose to use unconsolidated bank balance sheet data, to distinguish between parent and subsidiary banks which are located in different jurisdictions and thus may follow different provisioning practices. There are in total 797 banks from the 12 economies with reported data at some point during our sample period.

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[3]   On the flip side, negative coefficients (β_6 and β_7) are evidence of procyclical loan loss provisions.

Second, we eliminate those banks with outlier observations to minimise the bias related to measurement errors. In particular, we calculate the 1st and 99th percentile values of the following five variables: returns on assets, growth rates of bank assets, growth rates of bank loans, loan-to-asset ratios and NPL ratios. For any of the five variables, if a bank has an outlier observation that is smaller than the 1st percentile or larger than the 99th percentile value, the whole record of the bank will be removed from our sample. This outlier filtering procedure leaves 524 banks with reported data from the 12 economies.[4]

Third, and lastly, we eliminate those banks that have fewer than four consecutive years of financial statements, in order to control for the quality of bank reports. Imposing such a requirement is also motivated by our desire to explore the determinants of loan loss provisioning not only from a cross-sectional but also from a dynamic perspective.

The final sample that satisfies the above criteria includes 240 banks from the 12 economies. Table 3 summarises the distribution of sample banks. By jurisdiction, Japanese banks represent move than half of the sample, followed by Indian (18%) and Chinese (9%) banks. Southeast Asia, which includes Indonesia, Malaysia, the Philippines and Thailand, has 37 banks (15% of the total). Surprisingly, Hong Kong and Singapore, the two leading global financial centres in the region, each have only one bank that survives the filtering process. By rating, only about 30% of sample banks are rated by one of the three major agencies (Standard & Poor's, Moody's and Fitch); the vast majority of these are investment grade.

Table 4 reports the summary statistics of key variables. For each bank-specific variable, our sample has between 1,814 and 2,054 bank-year observations, that is, on average 7 to 8 annual observations for each bank during 2000–09. Loan loss provisioning averages 0.49% of total assets, despite the occurrence of negative values for numerous bank-years when loan loss provisions were run down rather than accumulated. In terms of stock, loan loss reserves average 1.72% of total assets, and the ratio ranges between 0.047% and 20.16%. Across countries, the levels of loan loss provisions and reserves are at comparable levels in China, India and Japan, although they are higher on average in Southeast Asian economies (Indonesia, Malaysia, the Philippines and Thailand).

The NPL ratio averages 3.92%, though it is as high as 60% for certain bank-year observations. The occurrence of the Asian financial crisis, as well as the large-scale disposal of NPLs in China and Japan in the early 2000s, contribute to the high levels and large variation of NPL observations in our sample.

Asset growth and loan growth average about 7–8%, but exhibit substantial cross-country differences. The growth rates are much lower in Japan, which was consistently troubled by banking system distress, sluggish economic performance and weak bank lending over the sample period. This is also reflected by the much lower earnings for Japanese banks. By contrast, emerging Asian economies, especially China and India, were experiencing waves of financial liberalisation and financial deepening over the sample period. Accordingly, banks in these economies reported on average double-digit growth rates in total assets and total loans, with the highest annual increase of nearly 50% in our sample.

In addition, we also retrieve a number of macroeconomic and financial variables for each jurisdiction. The list of variables includes real GDP growth, inflation and growth rates in

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[4] We use two alternative filtering criteria as robustness checks. In the first exercise, we change the percentile thresholds to the 5th and 95th percentile values of the same five variables, and the filtering results are the same. In the second exercise, we use filtering criteria defined in terms of absolute values: (i) the return on assets in absolute terms less than 10%; (ii) the growth rate of bank assets in absolute terms less than 50%; (iii) the growth rate of bank loans in absolute terms less than 50%; (iv) the loan-to-asset ratio in the range of 10% and 90%; and (v) the NPL ratio smaller than 100%. The filtering results are quite similar: 551 banks remain in the sample.

national house prices. The house price data, which are updated from the study by Glindro et al (2011), are collected from national sources, though definitions of house prices vary somewhat across jurisdictions. The coverage of residential properties varies from those in a single major city (eg in Thailand) to nationwide (eg China, Korea and Malaysia). The methodologies of constructing house price indices also differ. Some series are derived using a hedonic pricing method and others are based on floor area prices collected by the authorised land registration authorities or the private sector, for which no quality adjustment was done. Another important caveat is that house price data have become available in most Asian economies only since the late 1990s, and are still not available in some countries (eg Indonesia).

6. Empirical findings

Following the methodology described in Section 4, we examine the determinants of loan loss provisioning of Asian banks. Though there is only mixed evidence for countercyclicality in provisioning when banks in Asia and the Pacific are examined in aggregate, differences across banking systems are apparent. We find evidence of countercyclical loan loss provisioning throughout emerging Asia, particularly in India, but banks in Japan show procyclical provisioning. The behaviour of Japanese banks during the latest financial crisis, when provisions were increased significantly, seems to account for much of this difference.

6.1 Preliminary analysis

As a starting point, a panel OLS regression based on equation (1) is estimated and the results are reported in Table 5.[5] Country and time dummies are included in the regression, and the t-statistics are calculated based on clustered standard errors grouped by banks following the method proposed by Peterson (2009).

The coefficients for both the NPL ratio and the loan-asset ratio both have the expected positive signs, although only the coefficient for the NPL ratio is positive and significant at the 99% level. This finding suggests that Asian banks put aside higher provisions when the credit risk of bank assets is higher, which is consistent with standard accounting principles as well as the results found in previous studies. The coefficient for loan growth is negative and statistically significant, indicating that provisioning tends to be low even when rapid loan growth is suggestive of increased credit risks.

The coefficients for other standard control variables also have the expected signs. First, the coefficient for the lagged dependent variable is positive and statistically significant, suggesting a certain degree of persistency in the time series of loan loss provisions. Second, the coefficient for the capital adequacy ratio is negative and statistically significant. To the extent that provisions and bank capital are two differing forms of protection against credit losses – albeit one for expected losses and the other for unexpected losses – it is possible that banks with a strong capital base may have less incentive to provision as the two forms of protection are viewed as substitutable.

Of the two key coefficients with regard to procyclicality of provisioning, one for EBTPTA and the other for DGDP, only the former is statistically significant. The coefficient for EBTPTA is positive, supporting the income-smoothing hypothesis and suggesting that Asian banks have

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[5] In addition to the list of explanatory variables in equation (1), we also examined the impact of other possible factors, eg growth rates of property prices (suggested by Davis and Zhu (2009)) and equity market returns. Neither of them has a significant impact on loan loss provisions.

been loan loss provisioning in a countercyclical fashion by setting aside extra buffers in high-earning years. Using the sample statistics reported in Table 4, we estimate that a one-standard-deviation increase in EBTPTA (1.06%) increases loan loss provisions by around 12.0 basis points. However, the coefficient for DGDP is both of the opposite sign and statistically insignificant, demonstrating no clear relationship between the economic cycle and provisioning behaviour. Thus, the pooled regression results are not conclusive, given our interest in both the earnings and the macroeconomic cycle.

As a check on the econometric specification, we also estimate equation (1) with the dynamic panel data GMM approach developed by Arellano and Bond (1991).[6] Variables are in differences to control for unobserved bank-specific effects. To mitigate the endogeneity issues associated with the joint determination between loan loss provisions and the list of bank-specific explanatory variables, we use as instruments two- and three-year lags of the explanatory variables. Results are reported in Table 5; while they are in most respects similar to those using the panel OLS regression, there are some significant differences. The persistency of provisioning and the importance of capital adequacy and loan growth are even stronger than in the earlier regression, though the credit risk variable coefficients are either insignificant or have the wrong sign. Also, now both the coefficients proxying for cyclicality of bank provisioning behaviour are positive and statistically significant, including that for DGDP. Thus, the GMM results point towards countercyclical provisioning in Asia over the period with regard to both earnings and the macroeconomy.

6.2   Baseline analysis: country-specific regressions

The empirical results in Section 6.1 should be treated with caution. A major concern is that the pooled regression implicitly assumes that loan loss provisioning practices are the same for banks from different countries, which is highly debatable. As described in Section 3, accounting and regulatory regimes in Asia have differed quite a bit across countries. Reflecting this, we revisit the issue by dividing the sample into four groups: China, India, Japan and Southeast Asian economies (Indonesia, Malaysia, the Philippines and Thailand).

Table 6 reports the results of various country/region-specific regressions, each using the observations of the banks of one country/regional group. The coefficients for the conventional control variables, including lagged dependent variable, NPL ratios, capital adequacy ratios and loan growth, remain very similar to those in the pooled regression, although statistical significance varies across countries.

Nevertheless, the most remarkable finding is that the coefficients for EBTPTA and DGDP differ considerably across the four groups. In particular, the country-specific analyses provides clear evidence that bank provisioning tends to be countercyclical in emerging Asia (China, India and Southeast Asia), but procyclical in Japan.

In both China and Southeast Asia, it is the coefficient on EBTPTA that is significantly positive, consistent with countercyclical provisioning in these regions being attributable to income-smoothing behaviour on the part of banks. Banks in these economies contribute additional loan loss provisions when their profits are high. This countercyclical provisioning can be used to reduce the volatility of reported bank profits, but it can also reduce the possibility that a bank may have to eat into its capital when actual losses exceed expected losses. By contrast, there is no evidence that banks in these economies provision against the

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[6]   There are two potential caveats associated with the dynamic panel data GMM approach. One is the degree of freedom issue, in that taking first difference and using lagged variables as instruments will significantly reduce the number of observations (our sample data have a relatively short time horizon). In addition, it is not easy to choose the right instrument variables. Therefore, we choose the panel OLS regression as the benchmark approach in this study.

business cycle (the coefficients for DGDP are insignificant). Therefore, countercyclical provisioning in these economies arises from additional provisioning when the performance of individual banks is better, but not necessarily when their economies are expanding.

In India, countercyclical provisioning originates not only from income-smoothing behaviour but also from additional loan loss provisions during economic upswings. In particular, a one-standard-deviation increase in bank earnings is estimated to result, other things equal, in an Indian bank making an additional 0.13–0.14% of provisions (as a percentage of total assets). Similarly, a one-standard-deviation increase in India's economic growth rate (1.97%) is associated with an increase in loan loss provisions of slightly higher magnitude (0.17–0.18%). The economic significance of these impacts of earnings or economic growth shocks on provisions is thus rather large, given that Indian banks report on average 0.50% provisions/total asset ratios with a sample standard deviation of 0.37% (Table 4).

The finding that Indian banks provision against the economic cycle probably reflects, at least in part, the shifts in regulatory practice with regard to loan loss provisioning. India not only raised its benchmark general provision level for standard loans from 0.25% to 0.40% in 2005, but the RBI also increased the reserve levels for sectors deemed risky, such as residential housing and commercial real estate loans, from 0.4% to 1.0% in 2006, and again from 1.0% to 2% in 2007. Mortgages provided by banks declined considerably after these new requirements (Patnaik et al (2011)). However, in November 2008, in response to the global financial crisis, the RBI lowered its provisioning requirements for real estate lending again to 0.4%. Clearly, to the extent that individual banks provisioning decisions' were constrained by the existing regulations, the timing of the regulatory changes would appear to have guided provisioning to be countercyclical, ie higher in good times, and lower in downturns.

By contrast, Japan is the exceptional case in which bank provisioning is procyclical, in that the coefficients for EBTPTA and GDP growth are both negative, and at levels of statistical significance for the latter coefficient. The rejection of the income-smoothing hypothesis for Japanese banks is consistent with the earlier findings of Laeven and Majnoni (2003). The highly procyclical outcome for the GDP growth coefficient may reflect gradually harsher loan classification requirements over the middle of the period (Ueda (2000)), in which banks were required to provision more for newly classified problem loans even as the economy turned down. We will examine other explanations for the procyclical provisioning behaviour of Japanese banks with additional empirical specifications in the next section.

In sum, the distinct findings regarding loan loss provisioning practices in different jurisdictions help to explain the mixed results in Section 6.1. Reflecting this, we will focus on country/region-specific results in the remainder of the analysis.

6.3 Extended analysis with interactive terms

In addition to cross-country differences in the coefficients as described above, we are also interested in whether certain bank characteristics within any of the countries under investigation might affect the determinants of bank provisioning, in particular the impact of earnings and GDP growth. We address this issue by extending the above country-specific baseline analysis, by adding additional interactive terms between bank earnings or GDP growth and a number of other variables. The results are reported in Tables 7 to 10.

Bank size

We first examine whether bank size matters for the cyclicality of the provisioning decision. Here we define large banks as any bank that belongs to the list of the top 1,000 banks globally ranked by *The Banker* magazine in 2009 (the ranking is based on total equity).

The results, reported in column 1 in Tables 7 to 10, show little evidence that large and small banks have different provisioning strategies over either the earnings or economic cycles. The

coefficients for the interactive terms are all insignificant in China, India as well as Japan. As an exception, in Southeast Asia large banks tend to be more likely to provision in a procyclical way over the business cycle.

High asset growth years

We also examine whether the cyclicality of bank provisioning is affected by whether or not their assets are growing rapidly. To start with, we define a dummy variable that indicates a high asset growth year for a bank, which equals one if the year-on-year asset growth exceeds 15% (which is about the 80th percentile for asset growth within the entire sample of bank-years).

Whereas in China and India there is no difference in the provisioning pattern in banks' high-growth years, in Southeast Asia the coefficients for the interactive terms are statistically significant, with the signs suggesting that banks tend to use provisions for income-smoothing more in high asset growth years, but that provisioning of high-asset growth banks also tends to be more countercyclical in relation to the business cycle. In Japan, banks with high asset growth tend to go against the grain in terms of provisioning more with GDP growth.[7]

Bank loan quality

Banks with high NPL ratios might also adopt different provisioning strategies in relation to credit and economic cycles. We construct a dummy variable that equals one if the NPL ratio exceeds 5%, and introduce an interactive term between this dummy variable and earnings as well as GDP growth.

In China and India, there is no evidence that low-credit-quality banks have adopted different provisioning strategies. In Japan, after controlling for credit quality, banks with high NPL ratios tend to provision less from earnings, suggesting that the negative coefficient for earnings was accounted for mainly by problem banks. Perhaps these banks were forced to provision less even in periods of high earnings. In Southeast Asia, there is evidence that banks with low credit quality are more likely to adopt income smoothing, but at the same time their provisions also move in a procyclical way with the economic cycle, and the two effects seem to cancel each other out.

Bank capitalisation

Due to the close relationship between bank capital and loan loss provisions, we also examine whether capital adequacy affected the cyclicality of banks' provisioning behaviour. Two dummy variables are constructed for this purpose, one equalling one if the capital adequacy ratio is higher than 12% (well-capitalised banks) and the other equalling one if the ratio is below 8% (low-capitalised banks).

The results are reported in column 4 in Tables 7 to 10. In general, capital adequacy seems to affect banks' choice between the two possible countercyclical provisioning methods, but the overall impact is mixed. For instance, in Japan, well-capitalised banks tend to adopt income smoothing (which is countercyclical), but at the same a procyclical provisioning over the business cycle. By contrast, low-capitalised banks adopt the opposite strategy, ie procyclical earnings management and countercyclical provisioning over the business cycle. In either case, the overall implication of capital adequacy for the cyclicality of loan loss provisions is ambiguous. Similar results are also reported for banks from Southeast Asia. By contrast,

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[7] However, there were only a few cases of high asset growth of Japanese banks over the sample period (5 out of 934 bank-year observations), so perhaps not too much should be read into this result.

capital adequacy does not have a significant role for Chinese banks, and low-capitalised banks in India have a smaller degree of countercyclical provisioning over the business cycle than well-capitalised banks.

The global financial crisis

Finally, we examine whether the occurrence of the global financial crisis has contributed to the cyclicality of Asian banks' provisioning behaviour. A dummy variable indicating the period 2007–09 is introduced. The results, as reported in column 5 in Tables 7 to 10, suggest that the observation of the global financial crisis has contributed significantly to the empirical findings of the countercyclical loan loss provisions in India, as well as the procyclicality of loan loss provisioning in Japan.

6.4 Robustness checks

As a robustness check, we use another variable as an alternative to GDP growth to investigate the procyclicality of provisioning practices. The substitute variable is the output gap, another metric of the economic cycle, which is calculated as the difference between GDP and its trend (as calculated by a one-sided HP filter). Borio and Lowe (2001) document a negative relationship between the output gap and bank provisioning expenses. We use the same regression method as in Table 6, ie dividing the sample by country/region. The results, as reported in Table 11, do not differ significantly from those of Table 6. The fit of the specification is virtually identical.[8]

As another robustness check, we also perform analysis based on loan loss reserves. From the accounting perspective, loan loss provisions and loan loss reserves are two closely related concepts. Loan loss reserve is a stock concept and its change is attributable to loan loss provisions (a flow concept), as well as the write-off and write-back of NPLs.

In the revised specification, we use changes in loan loss reserves as the dependent variable. Explanatory variables include the lagged dependent variable, lagged capital adequacy ratios, NPL ratios, loan growth, loan-asset ratios, earnings and GDP growth. The regression method is again the same as in Table 6.

The results are reported in Table 12. First, the lagged dependent variable has a negative and statistically significant impact, which suggests that loan loss reserves follow a mean-reverting process. Second, the impact of the credit quality factors, NPL ratios and loan-asset ratios, as well as the impact of bank loan growth, show very similar results to those of Table 6. Lastly, and most importantly, the coefficients for earnings and GDP growth in each country (or group of countries) suggest that the results regarding the cyclicality of country/region-specific provisioning practices are quite robust. In particular, Table 11 suggests countercyclical provisioning practices are evident in China, India and Southeast Asia, but procyclical provisioning practices have dominated in Japan.

7. Conclusion

In the wake of the Asian financial crisis, many jurisdictions in Asia adopted stricter provisioning practices and began the process of converging with international accounting

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[8]   Only when the adjusted R-squared is calculated at the three-digit level does there appear to be a slightly worse fit than those of the Table 6 regressions. Unreported regressions in which the credit gap is inserted in place of the GDP gap also have a slightly worse fit than those of Table 6.

standards. Under certain circumstances, convergence with international standards could increase the procyclicality of provisions. However, a number of regimes overlaid additional prudential provisioning requirements, and adopted discretionary measures to increase provisioning in good times in response to rising levels of risk. Based on a final sample of 240 banks in 12 Asian economies since the Asian financial crisis of the late 1990s, this paper examines whether banks in Asian jurisdictions have in fact been applying loan loss provisions in a countercyclical fashion.

The main findings of the paper show striking differences between Japan and the countries of emerging Asia. Japanese banks show procyclical provisioning. By contrast, countercyclical loan loss provisioning by banks dominates throughout emerging Asia, and most strikingly so in India. Thus, the evidence is consistent with the conclusion that in emerging Asia, loan loss provisioning did not simply become more conservative at all points in time subsequent to the Asian financial crisis, but actively leaned in a fashion that ameliorated swings in earnings and the macroeconomy. The degree to which policy initiatives were responsible for this, as opposed to simply more prescient behaviour on the part of banks, remains a subject for future investigation.

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Table 1

Literature review: determinants of loan loss provisions (LLP)

	Sample	Sample period	Impact of				Memo
			GDP growth	Loan / asset ratio	Loan growth	Bank earnings	
Cavallo and Majnoni (2002)	1,176 banks, 36 countries	1988–99		+ve	-ve	+ve	(1) Per capita GDP and public debt/GDP ratio also have significantly negative impact on LLP; (2) No evidence of income smoothing for non-G10 banks (the opposite); (3) Legal systems affect provisioning behaviour
Laeven and Majnoni (2003)	1,419 banks, 45 countries	1988–99	-ve		-ve	+ve	Japanese and Asian banks have less procyclical LLP behaviour than in other countries
Davis and Zhu (2009)	904 banks 15 OECD countries	1989–2002	insig	+ve	-ve	+ve	Property prices are negatively related to provisioning levels
Bikker and Metzemakers (2005)	8,000 bank-year obs, 29 OECD countries	1991–2001	-ve	+ve	+ve	+ve	Capital/asset ratios are negatively associated with provisioning; there exist significant cross-country differences
Bouvatier and Lepetit (2008)	41 banks, 8 European countries	1995–2001	-ve			+ve	NPLs are positively related to provisioning levels, while the capital/asset ratio are negatively related to LLP
Craig et al (2006)	242 Asian banks, 11 Asia-Pacific economies	1996–2003	-ve	+ve	-ve	-ve	Property prices are negatively related to provisioning levels; short-term funding/asset ratios (a proxy for liquidity risk) have a negative impact on provisioning levels

+ve = positive; -ve = negative; insig = insignificant.

Table 2

Provisioning practices in selected jurisdictions

	CN	HK	ID	IN	KR	MY	PH	SG	TH
Convergence to international standards									
General provisions†	✓	✓[1]	✓	✓[2]	✓	✓	✓	✓	✓
Adoption of IAS 39	✓[3]	✓[4]			✓[5]	✓[5]	✓[4]	✓[4]	✓[5]
Strengthening loan classifications			✓[6]	✓[6]					
National discretion									
Increase in specific provisions	✓[7]				✓				✓[8]
Increase in general provisions	✓[7]			✓	✓				
Differences by industry sector				✓	✓				
"Expected loss" considerations	✓	[9]			✓[10]				
Issues of capital and incentives††									
Tax deductibility	✓[11]	✓[12]	na	✓[12]	✓[12]	✓[12]		✓[13]	✓[12]
Capital allocation	✓	✓[14]	na	✓[15]	✓[15]	na	✓[16]	✓[14]	✓[14]

CN = China; HK = Hong Kong SAR; ID = Indonesia; IN = India; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand. ✓ = yes; blank space = no; na = not available.

Taken from Angklomkliew et al (2009).

[1] The Hong Kong Monetary Authority established a Regulatory Reserve without imposing a minimum level but stated that banks are expected to maintain a regulatory reserve of between 0.5% and 1% of total loans. [2] In addition to general provisions, prudential norms require banks to create a "floating provision" which can only be used for predefined contingencies and under extraordinary circumstances as determined by the board; moreover, it may only be used for specific provisions and with prior approval from the Reserve Bank of India. [3] IAS 39 was implemented by all listed banks on 1 January 2007, and in 2009 for all other all other banks. [4] Effective since 2005. [5] Full implementation will occur in 2011, 2012 and 2013 for Korea, Malaysia and Thailand, respectively. [6] Reducing the number of days past due to assign an adverse supervisory loan grade (ie substandard or worse). [7] Raising the NPL coverage ratio to a minimum of 150% by end-2009. [8] Tighter rules for provisioning against NPLs introduced in preparation for the implementation of IAS 39. [9] Reflected in the Regulatory Reserve for loan losses which is part of retained earnings and is in addition to the reserves established under IAS 39. [10] Based on forward-looking criteria which consider the borrower's business and operational environment, financial condition and future cash flow projection. [11] General provisions are tax-deductible. [12] Specific provisions are tax-deductible. [13] General provisions are tax-deductible up to a maximum of 3% of qualifying loans and investments. [14] Aggregate of regulatory reserves and collective impairment allowance is allowed to be included in Tier 2 capital up to a maximum of 1.25% of risk-weighted assets. [15] General provisions may be included in Tier 2 capital up to a maximum of 1.25% of risk-weighted assets. [16] General provisions are allowed to be included in Tier 2 capital up to a maximum of 1% of risk-weighted assets. † Enhancements for prudential requirements for general provisions. †† Information in this section is drawn from World Bank, *Bank loan classification and provisioning practices in selected developed and emerging countries (a survey of current practices in countries represented on the Basel Core Principal Liaison Group)*, June 2002; and J Barth, G Caprio and R Levine, *Bank regulation and supervision database*, World Bank, 2008.

Source: National data.

Table 3

Distribution of sample banks

By jurisdiction	Number of banks	By rating	Number of banks
Australia	1	Aa	4
China	21	A	41
Hong Kong SAR	1	Baa	20
India	44	Ba	9
Indonesia	11	Unrated	166
Japan	121		
Korea	11		
Malaysia	12		
New Zealand	3		
Philippines	8		
Singapore	1		
Thailand	6		
Total	*240*	*Total*	*240*

Table 4

Summary statistics of key variables

Variables	LLP	LLR	CAR	NPL	DASSET	DLOAN	LOAN ASSET	EBTPTA
Whole sample	0.49 (0.52) 2013	1.72 (1.41) 1970	11.46 (4.60) 1953	3.92 (3.32) 1989	7.48 (10.45) 1815	8.70 (12.29) 1814	60.61 (11.50) 2054	1.18 (1.06) 2013
China	0.55 (0.35) 121	1.46 (1.31) 135	9.51 (3.11) 101	4.85 (8.27) 117	20.19 (11.28) 118	20.01 (11.94) 118	52.12 (7.46) 139	1.57 (0.62) 121
India	0.50 (0.37) 396	1.39 (0.79) 334	12.76 (2.99) 400	2.86 (1.84) 400	17.84 (8.28) 363	21.98 (9.79) 362	50.73 (8.64) 406	1.83 (0.91) 396
Japan	0.45 (0.50) 1051	1.44 (0.82) 1055	9.77 (2.00) 1055	4.17 (2.31) 1055	0.80 (4.06) 934	0.83 (4.52) 934	66.63 (7.02) 1055	0.52 (0.43) 1051
Southeast Asia[1]	0.56 (0.63) 303	3.42 (2.30) 305	16.61 (8.61) 281	5.31 (4.01) 288	9.64 (10.52) 270	10.83 (13.79) 270	55.58 (13.96) 307	2.28 (1.45) 303

LLP = ratio of loan loss provisions over total assets; LLR = ratio of loan loss reserves over total assets; CAR = ratio of total capital over risk-weighted assets; NPL = ratio of non-performing loans over total assets; DLOAN = growth rate of bank loans; LOANASSET = ratio of bank loans over total assets; EBTPTA = ratio of earnings before tax and provisions over total assets. The unit of scale is in percentage points for all variables. In each cell, the first number represents sample mean and the second number (in parenthesis) its standard deviation, and the third number represents the number of bank-year observations.

[1] Indonesia, Malaysia, the Philippines and Thailand.

Table 5

Determination of loan loss provisions: panel-data regression

Explanatory variables	OLS regression		Dynamic GMM (in first differences)	
	Coefficient	t-statistics	Coefficient	t-statistics
LLP(-1)	0.18	5.20	-0.15	-4.99
NPL (%)	5.46	5.79	3.80	4.49
LOANASSETT (%)	0.10	0.60	0.04	0.14
CAR (%)	-1.85	-5.10	-1.54	-4.66
DLOAN (%)	-0.90	-4.90	-0.69	-4.92
EBTPTA (%)	11.35	4.38	9.96	4.43
DGDP (%)	-1.07	-1.00	-0.30	-0.38
Adjusted-R^2	0.33			
Number of observations	1697		1457	

The dependent variable (LLP) is defined as the ratio of loan loss provisions over total assets. Explanatory variables include lagged dependent variable, the ratio of non-performing loans over total assets (NPL), the ratio of bank loans over total assets (LOANASSET), capital adequacy ratio (CAR, the ratio of total capital over risk-weighted assets), the growth rate of bank loans (DLOAN), the ratio of earnings before tax and provisions over total assets (EBTPTA) and the growth rate of real GDP (DGDP). All variables are scaled in per cent except for LLP (in basis points). Two estimation methods are used. The first method is to use panel OLS regression, with country dummies and time dummies (by year) as additional variables. The t-statistics are calculated based on clustered standard errors grouped by banks (Peterson (2009)). The second method is to use the dynamic GMM approach proposed by Arellano and Bond (1991), using first differences. Period fixed effects are included and instruments for the endogenous variables use lags 2 to 3 for explanatory variables. The t-statistics are calculated based on a White period weighted covariance matrix.

Table 6

Determination of loan loss provisions (baseline analysis): by country/region

Explanatory variables	China	India	Japan	Southeast Asia
LLP(-1)	0.30 **	0.33 ***	0.001	0.35 ***
NPL	2.17	4.74 **	8.30 ***	3.38 **
LOANASSETT	-0.19	-0.16	-0.05	0.12
CAR	-3.51 **	-1.56 **	-3.20 ***	-1.15 ***
DLOAN	-0.09	-0.79 ***	-2.81 ***	-0.48
EBTPTA	28.32 ***	15.10 ***	-4.90	9.60 **
DGDP	1.07	9.36 *	-51.85 ***	-5.43
Adjusted-R^2	*0.32*	*0.60*	*0.40*	*0.33*
Number of observations	*85*	*343*	*930*	*239*

The dependent variable (LLP) is the ratio of loan loss provisions over total assets. Explanatory variables are defined in Table 5. Estimation method: panel OLS regression with time dummies. The t-statistics are calculated based on clustered standard errors grouped by banks (Peterson (2009)). The subgroup "Southeast Asia" in the last column includes all banks from Indonesia, Malaysia, the Philippines and Thailand.

*, ** and *** represent statistical significance at 90%, 95% and 99%, respectively.

Table 7

Determination of loan loss provisions in China

Explanatory variables	Model 1	Model 2	Model 3	Model 4	Model 5
LLP(-1)	0.30 **	0.33 ***	0.31 **	0.27 **	0.30 **
NPL	2.15	1.70	1.09	2.22	1.93
LOANASSET	-0.07	-0.19	-0.25	-0.41	-0.16
CAR	-3.79 *	-3.59 *	-3.52 *	-0.34	-3.45 *
DLOAN	-0.15	0.28	-0.10	-0.12	-0.08
EBTPTA	30.76 ***	34.40 ***	29.83 ***	33.23 ***	21.69 *
DGDP	-0.15	-0.03	1.19	-1.67	3.81
EBTPTA*LARGE	-1.11				
EBTPTA*HIGH_GROWTH		-13.83			
EBTPTA*HIGH_NPL			-23.59		
EBTPTA*HIGH_CAP				-12.24	
EBTPTA*LOW_CAP				-10.43	
EBTPTA*2007-09 CRISIS					9.05
DGDP*LARGE	0.89				
DGDP*HIGH_GROWTH		0.87			
DGDP*HIGH_NPL			3.73		
DGDP*HIGH_CAP				0.69	
DGDP*LOW_CAP				3.17	
DGDP*2007-09 CRISIS					-3.43
Adjusted-R^2	*0.31*	*0.33*	*0.31*	*0.30*	*0.31*
Number of observations	*85*	*85*	*85*	*85*	*85*

The dependent variable (LLP) is the ratio of loan loss provisions over total assets. Explanatory variables are defined in Table 5 with additional interactive terms with earnings (EBTPTA) and GDP growth (DGDP). The additional variables included in the interactive terms are: a dummy for large banks (ranked as one of the top 1,000 in *The Banker*'s global ranking in 2009) in model 1, a dummy for high asset growth (year-on-year asset growth exceeding 15%) in model 2, a dummy for high NPL ratios (exceeding 5%) in model 3, two dummies representing well-capitalised (capital adequacy ratios exceeding 12%) and low-capitalised banks (below 8%) in model 4, and a dummy variable indicating the period of the global financial crisis (2007–09) in model 5. Estimation method: panel OLS regression with time dummies; the t-statistics are calculated based on clustered standard errors grouped by banks (Peterson (2009)).

*, ** and *** represent statistical significance at 90%, 95% and 99%, respectively.

Table 8

Determination of loan loss provisions in India

Explanatory variables	Model 1	Model 2	Model 3	Model 4	Model 5
LLP(-1)	0.33 ***	0.33 ***	0.32 ***	0.33 ***	0.33 ***
NPL	4.72 ***	4.68 **	7.16 ***	4.64 **	4.36 **
LOANASSET	-0.22	-0.11	-0.15	-0.17	0.00
CAR	-1.64 **	-1.47 **	-1.55 **	-1.69 *	-1.55 **
DLOAN	-0.80 ***	-0.77 ***	-0.73 ***	-0.80 ***	-0.78 ***
EBTPTA	14.30 ***	13.02 ***	16.00 ***	10.84 ***	12.36 ***
DGDP	10.07 **	9.18 *	8.34 *	10.66 **	3.61
EBTPTA*LARGE	3.28				
EBTPTA*HIGH_GROWTH		3.42			
EBTPTA*HIGH_NPL			-2.38		
EBTPTA*HIGH_CAP				7.85 **	
EBTPTA*LOW_CAP				-18.32 ***	
EBTPTA*2007-09 CRISIS					8.50 ***
DGDP*LARGE	-0.50				
DGDP*HIGH_GROWTH		-0.94			
DGDP*HIGH_NPL			-1.61		
DGDP*HIGH_CAP				-2.02 **	
DGDP*LOW_CAP				-2.41	
DGDP*2007-09 CRISIS					2.38
Adjusted-R^2	*0.60*	*0.60*	*0.60*	*0.61*	*0.61*
Number of observations	*343*	*343*	*343*	*343*	*343*

For an explanatory note, see Table 7.

*, ** and *** represent statistical significance at 90%, 95% and 99%, respectively.

Table 9

Determination of loan loss provisions in Japan

Explanatory variables	Model 1	Model 2	Model 3	Model 4	Model 5
LLP(-1)	0.00	-0.004	0.001	-0.007	0.004
NPL	8.25 ***	8.11 ***	7.83 ***	8.32 ***	8.34 ***
LOANASSET	-0.08	0.03	-0.05	-0.13	-0.05
CAR	-3.07 ***	-3.23 ***	-3.08 ***	-3.19 ***	-3.18 ***
DLOAN	-2.82 ***	-3.12 ***	-2.78 ***	-2.77 ***	-2.78 ***
EBTPTA	-2.88	-4.41	-2.31	3.62	-9.33
DGDP	-52.02 ***	-48.49 ***	-51.27 ***	-57.62 ***	24.96 ***
EBTPTA*LARGE	3.54				
EBTPTA*HIGH_GROWTH		5.46			
EBTPTA*HIGH_NPL			-8.35		
EBTPTA*HIGH_CAP				-10.87	
EBTPTA*LOW_CAP				-27.60 ***	
EBTPTA*2007-09 CRISIS					11.23
DGDP*LARGE	-0.46				
DGDP*HIGH_GROWTH		29.67 ***			
DGDP*HIGH_NPL			6.95 *		
DGDP*HIGH_CAP				6.53	
DGDP*LOW_CAP				14.13 **	
DGDP*2007-09 CRISIS					-75.90 ***
Adjusted-R^2	*0.40*	*0.40*	*0.40*	*0.41*	*0.40*
Number of observations	*930*	*930*	*930*	*930*	*930*

For an explanatory note, see Table 7.

*, ** and *** represent statistical significance at 90%, 95% and 99%, respectively.

Table 10

Determination of loan loss provisions in Southeast Asia

Explanatory variables	Model 1	Model 2	Model 3	Model 4	Model 5
LLP(-1)	0.34 ***	0.33 ***	0.35 ***	0.32 ***	0.35 ***
NPL	3.06 *	3.43 **	2.49	3.19 **	3.64 **
LOANASSET	0.17	0.06	0.16	0.19	0.21
CAR	-1.02 ***	-1.20 **	-1.07 **	-1.31 ***	-1.04 **
DLOAN	-0.53 *	-0.78 ***	-0.45	-0.45	-0.46
EBTPTA	8.29 **	4.94	7.83 **	15.58	9.78 **
DGDP	-4.46	-5.68 *	-4.88	-8.82 **	-12.04 **
EBTPTA*LARGE	3.94 *				
EBTPTA*HIGH_GROWTH		17.23 ***			
EBTPTA*HIGH_NPL			5.09		
EBTPTA*HIGH_CAP				-7.04	
EBTPTA*2007-09 CRISIS					-6.26
DGDP*LARGE	-0.39				
DGDP*HIGH_GROWTH		-5.37 ***			
DGDP*HIGH_NPL			-0.17		
DGDP*HIGH_CAP				5.39	
DGDP*2007-09 CRISIS					15.86 **
Adjusted-R^2	*0.33*	*0.37*	*0.33*	*0.34*	*0.34*
Number of observations	*239*	*239*	*239*	*239*	*239*

For an explanatory note, see Table 7.

*, ** and *** represent statistical significance at 90%, 95% and 99%, respectively.

Table 11

Determination of loan loss provisions: by country/region

(Replacing GDP growth with output gap)

Explanatory variables	China		India		Japan		Southeast Asia	
LLP(-1)	0.30	**	0.33	***	0.001		0.35	***
NPL	2.17		4.74	**	8.30	***	3.08	*
LOANASSETT	-0.19		-0.16		-0.05		0.18	
CAR	-3.51	**	-1.56	**	-3.20	***	-1.13	***
DLOAN	-0.09		-0.79	***	-2.81	***	-0.50	*
EBTPTA	28.32	***	15.10	***	-4.90		9.08	**
GAP	1.88		17.41	*	-120.55	***	0.55	
Adjusted-R²	*0.32*		*0.60*		*0.40*		*0.33*	
Number of observations	*85*		*343*		*930*		*239*	

The model specification is the same as in Table 6, except that GDP growth is replaced by the output gap.

*, ** and *** represent statistical significance at 90%, 95% and 99%, respectively.

Table 12

Explaining changes in loan loss reserves

Explanatory variables	China	India	Japan	Southeast Asia
LLR(-1)	-0.64 ***	-0.48 ***	-0.48 ***	-0.44 ***
CAR(-1) (%)	-2.93	1.01	2.15 **	0.40
NPL (%)	37.81 ***	24.25 ***	17.65 ***	27.92 ***
LOANASSETT (%)	-3.34	0.39	-0.82 ***	-1.33 **
DLOAN (%)	-0.55	-0.53 **	-1.38 ***	0.54
EBTPTA (%)	97.62 **	7.26 **	-3.30	18.53 ***
DGDP (%)	14.42	-5.80	-36.12 *	-5.69
Adjusted-R²	*0.46*	*0.59*	*0.46*	*0.46*
Number of observations	*80*	*280*	*932*	*232*

The dependent variable is the change in loan loss reserves (in basis points). Explanatory variables are defined in Table 5. Estimation method: panel OLS regression with time dummies. The t-statistics are calculated based on clustered standard errors grouped by banks (Peterson (2009)).

*, ** and *** represent statistical significance at 90%, 95% and 99%, respectively.

Figure 1: Banks' provisioning behaviour by country: 2000–09

In per cent

China

India

Japan

Southeast Asia
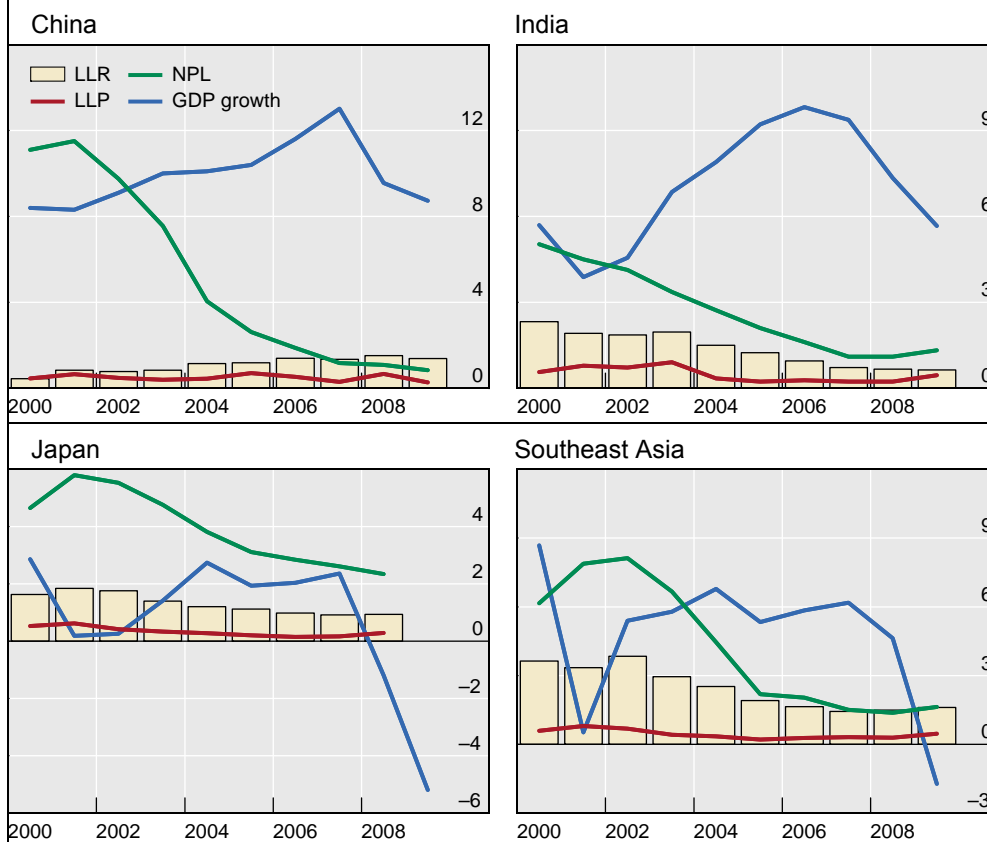
LLR = ratio of loan loss reserves over total assets; LLP = ratio of loan loss provisions over total assets; NPL = ratio of non-performing loans over total assets; GDP growth = annual growth rate of real GDP in each economy. LLR, LLP and NPL are calculated as the median of individual banks in each economy in each year. Southeast Asia includes Indonesia, Malaysia, the Philippines and Thailand, and GDP growth uses weighted-average growth rates.