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Bank Loan Loss Provisioning: An Examination of Capital Management, Income Smoothing and Cyclicality Hypotheses

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Abstract. The changes in capital adequacy regulations may change the way bank managers manage their capital and earnings. In 1991, loan loss reserves account was removed from Tier 1 capital and placed in the current category of Tier 2 capital. The new ruling limits the use of loan loss reserves in meeting total capital requirement. In addition, the loan loss reserves must not exceed 1.25 per cent of risk weighted assets. Under the new rules, banks with a regulatory capital ratio of less than the minimum requirement are subjected to regulatory pressure. Several studies indicate that the regulatory pressure motivates managers to engage in capital and earnings management. With these regulations, the Basle minimum regulatory capital requirement is also said to behave pro-cyclical. When the economy is on a down-cycle, the capital level shrinks due to an increase in the amount of loan defaults. This loan loss provisioning behaviour, however, has yet to be proven, thus creating the motivation to examine provisioning behaviour of Malaysian banks. In addition, this study is also motivated by the adaptation by Malaysia of the Basle 1988 capital regulation which does not put a cap on the level of loan loss reserves.

Keywords: Bank capital, loan loss provision, non-performing loans, capital management, earning management, economic cycle

1. Introduction

Changes in the capital adequacy regulations by the Basle Accord 1988[1] have altered the way bank managers manage their capital and earnings. The new guidelines which took effect in early 1991 removed the loan loss reserves account from what was then known as "primary capital[2] or Tier 1[3] capital" and placed it in the current category of Tier 2[4] capital. The new ruling limits the use of loan loss reserves in meeting total capital requirement.[5] Under the new rules, the loan loss reserves must not exceed 1.25 per cent of the risk weighted

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1 The 1988 Basle Accord became effective beginning of 1991.

2 Primary capital includes book value of equity, loan loss reserves, perpetual preferred stock and mandatory convertible debt.

3 Tier 1 capital includes sum of book value of equity, qualifying non-cumulative perpetual preferred stock and minority interest in equity accounts of subsidiaries less goodwill and other intangible assets.

4 Tier 2 capital is the sum of loan loss reserves (up to a maximum of 1.25 per cent of risk weighted assets, perpetual preferred stock, hybrid capital instruments, perpetual debt, mandatory convertible debt securities, and term subordinated debt and intermediated preferred stock.

5 Total capital requirement equals Tier 1 capital plus Tier 2 capital.

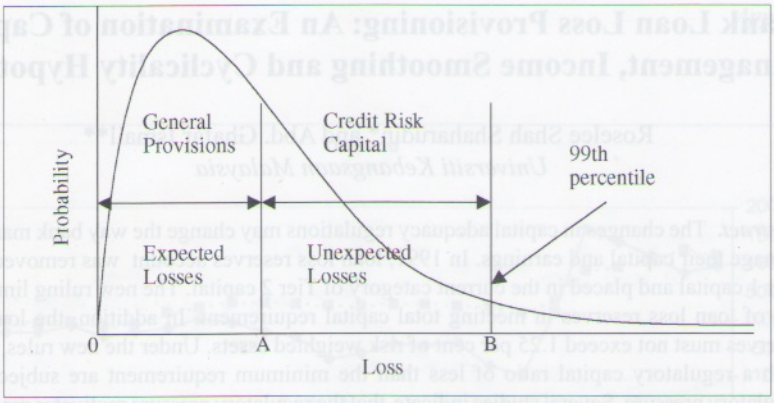

Figure 1. PDF of losses, unexpected and expected losses, and economic capital

assets. Any excess will be added to the denominator of Tier 1 capital formulation thus reducing the capital ratio itself. Tier 1 capital must exceed 4 per cent of risk weighted assets and total capital must exceed 8 per cent of risk weighted assets. In addition, Tier 1 capital must exceed 3 per cent of total assets.[6] Furthermore, the amount of Tier 2 capital must not exceed Tier 1 capital or at least 50 per cent of total capital must consist of Tier 1 capital. Banks with a regulatory capital ratio of less than the minimum requirement are subjected to regulatory pressure such as being merged with stronger banks or not being allowed to declare dividends to their shareholders. Hence, regulatory pressure motivates managers to engage in capital and earnings management.

With these regulations, the Basle minimum regulatory capital requirement is also said to behave in a pro-cyclical manner. When the economy is on a down-cycle, the capital level shrinks due to an increase in the amount of loan defaults. However, banks in most G-10 countries such as Spain and France have adopted a forward looking provisioning behaviour in an attempt to reduce the effect of growing default risk during a cyclical downturn (Cavelo and Majnoni 2002). This anti-cyclical provisioning behaviour provides additional provisions during a boom period in anticipation of poor credit quality during a downfall. As a result, capital depletion during an economic slowdown can be reduced thus avoiding the possibility of a credit crunch in the economy.

According to Laeven and Majnoni (2003), the occurrence of losses equal to OB in Figure 1 should be buffered for the amount OA by loan loss reserves and for the amount AB by depleting regulatory capital. Figure 1 shows that the effectiveness of regulatory capital as a buffer of unexpected shocks rests on the existence of the subsidiary buffer represented by the reserves that is created through loan loss provision.

When the economy is on a downswing, unexpected losses occur as a result of unexpected failures in loan repayment especially in the high risk weighted assets category. As a result, loan loss reserves fail to act as a sufficient buffer against the expected losses thus eroding

[6] See Greenbaum and Thakor (1995) for a more detailed explanation of the computation of risk weighted assets.

capital and requiring extra provisions. Hence, the anti-cyclical behaviour of provisioning will result in capital and earnings being pro-cyclical. Given this close relation between provisions and capital, one could argue that a sound provisioning policy should be part of any regulations pertaining to capital requirements (Cavello and Majnoni 2001). In summary, inadequate provisioning is one of the main reasons fo pro-cyclical behaviour of regulatory capital.

This provisioning behaviour, however, has yet to be proven in most developing countries thus creating the motivation to examine provisioning behaviour of Malaysian banks. In addition, this study is also motivated by the adaptation of the Basle 1988 capital regulation by Malaysia which does not put a cap on the level of loan loss reserves. This relaxed version of the 1988 Basle Capital Regulations may create room for bank managers to use loan loss provisioning almost freely to manage capital and earnings. Therefore, the aim of this study is to examine if the non limitation of loan loss reserves ratio reduces the pro-cyclical characteristics of regulatory capital and earnings.

2. Prior Studies

In late 1980s and early 1990s, studying loan loss provisions became a major attraction in the field of accounting, finance and banking. The reason being banks in the United States incurred huge losses and serious capital depletion as a result of defaults in large loans given earlier to less developed countries especially those in Central and South America. Almost at the same time, the 1988 Basle Minimum Regulatory Capital was introduced forseeing the need to standardise the computation of regulatory capital across banks and to establish more resilient banking.

Banks which experienced a regulatory capital ratio of below the minimum requirement were subjected to regulatory pressure, such as being forced to merge with stronger banks or not being allowed to declare dividends to shareholders. Banks attempting to avoid regulatory pressure and to gain public confidence have to find ways to improve their regulatory capital and financial results. One way of achieving this objective is by managing discretionary accruals.

Evidence that banks manage discretionary accruals to achieve specific regulatory capital and earnings target is presented in several empirical studies. Moyer (1990) presents evidence that the capital adequacy ratio is significantly negatively related to loan loss provisions, implying that bank managers adjust loan loss provisions to reduce regulatory costs. She argued that the elimination of loan loss reserve from Tier 1 capital and the limitation placed on the use of loan loss reserve in meeting total capital requirement implies that a dollar increase in loan loss provision will result in a decrease in Tier 1 capital by the after tax amount of the provision. However, since loan loss reserves still count as Tier 2 capital up to 1.25 per cent of risk weighted assets, a dollar increase in loan loss provision increases total capital by the tax rate times a dollar. Hence, increasing loan loss provisions has the opposite effect on Tier 1 and Tier 2 capital.

By the same token, Bernard *et al. (*1996) proposed that banks resort to earning manipulation to maintain a desirable regulatory capital requirements ratio thus avoiding unnecessary regulatory costs. The author argued that banks do not wait until they are below the regulatory standard before they begin managing capital as suggested by the regulatory

capital management hypothesis, but rather when they think that they are likely to fall short in the near future.

Beatty *et al.* (1995), however, did not support the use of loan loss provisions alone in managing capital. They showed that the primary or the Tier 1 capital ratio is negatively related to loan loss provision but positively related to loan charge-offs. In addition, they found that banks use more primary capital securities when provisions and miscellaneous gains and losses are low. This suggests that bank also consider other factors such as loan charge-offs, miscellaneous gains and losses and decisions to issue securities when managing regulatory capital.

Contrary to earlier findings by Moyer (1990), Collins *et al.* (1995) found evidence that banks with low regulatory capital ratios had treated loan loss provisions conservatively. Banks with lower regulatory capital ratios tend to decrease rather than increase loan loss provisions to avoid regulatory costs. According to their study, bank regulators are possibly not swayed by the increase in capital ratios by increasing loan loss provision or managers are not willing to scarify a USD1 decrease in pre-tax earnings to obtain a USD1 time tax rate increase in capital. Their findings are consistent with managers exercising discretion in reducing reported charge-offs to avoid regulatory constraints.

In an attempt to re-investigate the effects of the 1988 Basle regulatory capital requirement on management behaviour relative to the old regulatory regime prior to the implementation of the accord, Kim and Kross (1998) documented that banks with low capital ratios reduced their loan loss provision and increased write-offs during the 1990-1992 period relative to the 1985-1988 period. Banks with high capital ratios exhibited no difference in loss provisions, but increased loan write-offs significantly during the 1990-92 periodo. Banks under the new regulatory regime have less incentive to manage regulatory capital via loan loss provisions. Ahmed *et al,* (1999) re-examined earlier findings by Kim and Kross (1998) and found support for the hypothesis that prior to the introduction of the 1988 Basle regulatory capital requirement, loan loss provision was being used extensively for managing capital. Low capitalised banks have a strong negative relationship with provisioning of loan losses to increase regulatory capital. In other words, bank managers used loan loss provision in a meaningful way to manage regulatory capital. However, after 1990, the incentives were reduced (less negative) due to the fact that over providing loan loss provision affected negatively total capital. These findings are consistent with that of Kim and Kross (1998).[7] The study also documented that the lack of support for the capital management hypothesis in Collin *et al.* (1995)[8] is driven by the assumption that the target for capital management is

[7] Studies by Kim and Kross (1998) and Ahmed *et al.* (1999) provide complementary evidence on the reduced capital management incentives in the new regulatory capital requirement.

[8] Collins *et al.* (1995) suggest five possible reasons for their observed unexpected positive relation between regulatory capital level and LLP: (1) the discrepancy in results with prior research (e.g., Moyer 1990; Beatty *et al.* 1995) may be attributable to differences in model specification; (2) bank regulators are not possibly swayed by the mechanical increase in the primary capital ratio by increasing LLP; (3) bank managers are not willing to sacrifice a USD1 decrease in pre tax earnings to obtain a (USD1 x income tax rate) increase in capital; (4) their model specification, which allows parameters to vary across firms and assumes capital management occurs relative to a time series rather than a cross-sectional mean, is important in documenting this relation; and (5) it could be attributed to relaxing other restrictions in their specification, particularly simultaneity.

the bank-specific mean capital ratio rather than the minimum capital required by regulators.

The biggest accrual in a bank's expense account is the loan loss provision. Furthermore, the reason for managing earnings is to avoid regulatory costs or regulatory pressure. Then, how do banks manage their earnings? Robb (1998) tested the hypothesis that bank managers have the incentive to manage earnings through discretionary accruals to achieve market expectation. He suggests that managers make greater use of the loan loss provision to manipulate earnings when analysts have reached a consensus in their earnings forecast. This findings is against the definition of earnings management, i.e. as "a process of taking deliberate steps within the constraints of generally accepted accounting principles to bring about a desired level of reported earnings" and called "disclosure management" (Davidson *et al.* 1987 cited in Schipper (1989)).[9]

As suggested by McNichols and Wilson (1988), there are also other reasons to manage earnings, i.e. to eliminate extreme values of profit. They find evidence that the profit decreases when reaching too high values. To a degree, they tested for income smoothing using the provision of bad debts. More precisely, the smoothing behaviour is defined as an effort to "reduce fluctuations in reported earnings", rather than to maximise or minimise reported earnings (Moses 1987; Ronen and Sadan 1981). Moreover, to smooth income, a manager takes actions that increases reported income when income is low and takes actions that decrease reported income when income is relatively high. This latter aspect is what differentiates income smoothing from the related process of trying to exaggerate earnings in all states.

Therefore, banks choose accruals to minimise the variance of reported earnings. When income is unusually high (low), managers choose income reducing (increasing) accruals. Banks can smooth earnings by drawing from loan loss reserves if actual losses exceed expected losses and by contributing additional loan loss provision to loan loss reserves if actual losses are lower than expected losses. The advantage of income smoothing is that it reduces the volatility of reported bank profits and reduces the possibility that the bank may deplete its capital. With income smoothing, earnings are less affected by the fluctuation of credit losses over the business cycle. This is achieved when loan loss provision compensates for the difference between realised credit losses and average credit losses by taking positive values during cyclical expansion and negative values during downturns. As a result, loan loss reserves increase in good times and decrease in bad times.

However, we can conclude that building up loan loss reserves during good times and using part of these increases to absorb losses during economic downturn is not necessarily aimed at manipulating income from a regulatory perspective. Cavello and Majnoni (2001) suggest that the cyclical shortage of banks' capital is prominently due to lack of risk-based regulation of banks' loan loss provisioning practices. Capital shortage may often be due to inadequate provisioning. In other words, even though it has been recognised that bank capital should act as a buffer to unexpected losses, it is assumed that expected losses have already been absorbed by loan loss provisioning when, instead, provisions are inadequate, and

[9] Several authors believe that income smoothing is one part of earnings management: A specific example of earnings management … is income smoothing: (Beattie *et al.* 1994: 793); "A significant portion of this work (earnings management) examined income smoothing, a special of disclosure management" (Bitner and Dolan 1996); one motivation for earnings management is to smooth earnings (Ronen and Sadan 1981).

therefore expected losses eat up bank capital. The study also suggests that the pro-cyclical effect on banks capital regulation can be reduced by enhancing bank provisions. Therefore, banks should increase provisions during cyclical upswing to cover expected losses during years of cyclical downswing.

The argument by Cavello and Majnoni (2001) was later supported by Laeven and Majnoni (2003), Apra *et al.* (2001), and Borio *et al.* (2001). These studies hypothesised that credit quality of loans is expected to move up and down with the economic cycle. During cyclical downturns, the bank is expected to take a larger amount of provisions from already low profits while during the favorable cyclical upswing, provisions for the expected credit losses are expected to go down.

This provisioning technique which is known as statistical provisioning provide provisions based on expected losses beyond the current financial year and based on expectation of future losses in years to come. This strategy is expected to correct the decline in bank profit volatility and improving bank managers' awareness of credit risk. However, it is not aligned with the international standard accounting practice which requires provisioning based on the expected losses horizon that should not be for more than one financial year.

3. The Model

To examine whether the choice of loan loss provision reflects bank manager's capital management and income smoothing behaviour, it is necessary to estimate discretionary or unexpected components of loan loss provision by using a model of investors' expectation of loan loss provision. Prior research (McNicholas and Wilson 1988; Beaver and Engel, 1996) had used a two-stage model, which estimated discretionary loan loss provision in the first stage and capital management coefficient and income smoothing in the second stage. This two-stage approach potentially underestimates the absolute value of the coefficient of interest. Unlike post prior studies, this study avoids such potential underestimation by employing a single-stage model to test the capital management and income smoothing hypothesis.

The model developed is an extension of earlier research by Kim and Kross (1988), Ahmed *et al.* (1999), Arpa *et al.* (2001), Cavello and Majnoni (2001), Bikker and Hu (2002), Laven and Majoni (2002) as well as Shrives and Dahl (2003).

These studies were extended by incorporating other variables such as those measuring loan portfolios risk, regulatory capital management, income smoothing and macroeconomic variables simultaneously to examine banks provisioning behaviour based on the non limitation of loan loss reserves. Finally the cyclicality of capital and earnings of commercial banks was identified as well as the timing and the adequacy of loan loss provisioning.

The following model will be used to verify the nature of the relationship between bank provisioning and capital, earnings and economic cycle. The general form of the model is as follows:

$$LLPit = \alpha + \beta_1 NPLt + \beta_2 \Delta LOANS_t + \beta_3 LLR_{t-1} + \beta_4 TCABP_t + \beta_5 EBTP_t + \beta_6 NII_t + \beta_7 \Delta GDP + \mu_t \quad (1)$$

The definitions of each variable is presented Table 1.

Three variables as proxies for the bank specific non-discretionary component of loan

Table 1. Definition of variables

Variables	Definition	Expected Sign
LLP	Loan loss provision/total assets. Where provisions equal the difference between the present discounted value of the expected losses and the present discounted value of the expected default premium*	-
NPL	Principal and or interest that is more than six months overdue/ total assets	Positive (+)
ΔLOANS	(Gross loans at t – gross loans at t-1)/total assets	Positive (+)
LLR_{t-1}	Beginning balance of loan loss reserves/ Beginning total risk weighted assets	Negative (–)
TCBP	Total capital before provisions/total risk weighted assets	Negative (–)
TCBP*LLR	Unity for loan loss reserves above 1.25% of total risk weighted assets and zero otherwise	Positive (–)
EBTP	Earnings before tax plus loan loss provisions/total assets	Positive (+)
EBTP*NEG	Unity if earnings are negative, zero otherwise	Positive (+)
NII	Net interest income/total risk weighted assets	Positive (+)
REALGDP	Real GDP growth	Negative (–)

* Equation 3.5 theoretically explains the computation of loan loss provision.

loss provisions are included in the model. First, the non-performing loans (NPL) for the year scaled by total assets. Non performing loans are likely to be the main source of losses and consist of non accrual loans plus loans that are 180 days or more past due on interest and principal repayment. It reflects the recent improvements, or deterioration of loan quality during a particular year. The specification of this variable presumes that a portion of loan losses is preceded by changes in non performing loans. This control variable has been used by several researchers (Wahlen 1994; Collins *et al.* 1995; Beatty *et al.* 1995; Ahmed *et al.* 1999; Kim and Kross 1998). Ahmed *et al.* 1999 and Kim and Kross 1998 found a positive relationship with the loan loss provision.

To measure the credit risk inherent in the loan portfolio, the loan growth (ΔLOANS) scaled by total asset is included. Given the fact that the loan loss provision is an expense for specific accounting period rather than a stock at a point in time, it is appropriate to include changes in the total outstanding loans. The effect of changes in the total outstanding loans is largely unpredictable due to uncertainty in the quality of incremental loans. Intuitively, a change in the total outstanding loans should have an overall positive impact on management choice of loan loss provisions. It was hypothesised that the amount of provisions is directly

influenced by the size of loan portfolios. It seems logical due to the fact that every dollar of loan carries a certain percentage of credit risk. Beaver and Engel (1996) found a positive relationship with loan loss provisions suggesting that loan loss provisions increase as the size of loan portfolio increases. Among the studies that include loans in estimating provisioning behaviour are those of Wahlen (1994), Kim and Kross (1998), Beatty *et al.* (2002) and Shrives and Dahl (2003). Changes in the amount of loans will also affect the general provisions made for that particular year as banks may need to make extra provisions based on their risk exposure and also economic conditions. If the amount of provisions made previously is insufficient, based on the changes in gross loans, then additional provisions are needed.

The third bank specific control variable included in the estimation is the beginning balance of loan loss reserves also known as loan loss reserves ratio lagged by one period. The loan loss reserves ratio has been chosen due to the fact that it represents the asset quality in a given loan portfolio. The beginning balance of loan loss reserves results from the past accumulation of loan loss provisions and serves as an inventory in setting the current level of loan loss provision. Intuitively, if bank managers experience a high level in beginning balance of loan loss reserves, then it is less likely that loan loss provisions will increase due to regulators' assessment of the adequacy of the loan loss reserves. Moyer (1990), Collins *et al.* (1995), Beatty *et al.* (1995), Robb (1998) and Beatty *et al.* (2002) have used this variable to control for loan quality or as a loan loss determinant. This reserve summarises past decisions regarding charge-offs and loan loss provisioning and is therefore exogenous to this period's decisions. If a bank adjusts provisions to achieve bank-specific target reserve-to-assets levels, a negative relationship is expected to occur.

Previous studies have found the beginning balance of loan loss reserves to be negatively related to the loan loss provisions at the end of the year, indicating that the amount of loan loss provision is decreased (increased) as the bank's previous year problem loans increase (decrease). A positive and significant coefficient for the reserve ratio indicates that banks which have higher loan loss reserves at the beginning of the year have a propensity to set higher levels of provisions. Shrives and Dahl (2003) found a positive relationship between LLR_{t-1} and loan loss provisions suggesting that Japanese banks, given a high loan loss reserve ratio at the beginning and due to high volume of problem loans in the previous year, will continue to provide a higher provision in current year in anticipation of a higher loss. Though Malaysian banks are not required to limit their loan loss reserves to a maximum of 1.25 per cent from the total risk weighted assets, they must maintain at least 40 per cent of capital in the form of Tier 1 capital. Thus, this study expects to find a negative relationship between loan loss provision and LLR_{t-1}. This means that a large beginning balance of loan loss reserves may reduce the bank's current provisioning because any increase in loan loss provision will only reduce its Tier 1 capital ratio via depletion of total earnings.

Following Ahmed *et al.* (1999), this study includes total capital ratios before loan loss provisions (TCBP) which is the bank's total capital before loan loss reserve scaled by the total risk weighted assets. The reason for the inclusion is to identify whether low capitalised banks managed their regulatory capital ratio by increasing the amount of loan loss provisions to improve their Tier 2 capital thus improving their regulatory capital ratio as suggested by the capital management hypothesis.

Several papers have tested the hypothesis of income smoothing empirically and have found conflicting results. Basically, banks can smooth earnings by drawing from loan loss reserves if actual losses exceed expected losses and by contributing additional loan loss provisions to loan loss reserves if actual losses are lower than expected losses. If bank managers expect earnings to be low, loan loss provisions are deliberately understated to mitigate the adverse effect of other factors on earnings. However, prior studies have yielded mixed results. Based on data for individual US banks, studies by Greenwalt and Sinkey (1988), Barth *et al.* (1990), Wahlen (1994), Collins *et al.* (1995), Beaver and Engel (1996), have found a positive relationship between loan loss provisions and earnings before taxes and provisions, supporting the earning management hypothesis. On the contrary, Beatty *et al.* (1995), Kim and Kross (1998), Ahmed *et al.* (1999), and Laeven and Majnoni (2003) do not found evidence of earnings smoothing.

To test whether Malaysian commercial banks practise income smoothing behaviour, earnings before taxation and provisions deflated by total assets (EBTP) are included to examine for this kind of behavioir.[10] The income smoothing hypothesis suggests that when earnings are expected to be low, banks will deliberately understate the provision of loan losses to mitigate the adverse effects of other factors on earnings. The choice of increased or decreased provisioning in the years to come, however, depends on benefit and costs the bank needs to incur. An increase in provisions reduces reported income but increases capital. Kim and Kross (1998) and Shrieves and Dahl (2003) found a positive relationship between EBTP and loan loss provisions suggesting that when earnings are low, banks will reduce provision to get better EBTP. This behaviour will then reflect better on the performance of the banks which is consistent with income smoothing activities. If discretionary components on unexpected provisions are used by bank managers to smooth earnings, the unexpected provisions are positively related to current net income before tax and provision (EBTP). If the current net income before tax and provision are high (low), the discretionary loan loss provisions will be high (low), thereby resulting in a reported income number that is less variable. Hence, the predicted sign of the income smoothing coefficient is positive. Both Ahmed *et al.* (1999) and Laeven and Majnoni (2003) have failed to find evidence of income smoothing while Cavello and Majnoni (2001) confirm previous result by Greenwalt and Sinkey (1988) for the US market, indicating an income smoothing pattern

Ediz *et al.* (1998) investigated bank behaviour with regard to financial distress by examining the net interest income over the total risk weighted assets. The inclusion of NII is also as a supporting test variable for the earnings management and can be used as a signal of inadequate provisioning for capital management. Since most of the banks in the sample have their Tier 1 and regulatory capital above the minimum requirement, banks with lower NII should reduce provisioning when earnings are low to increase reported earnings. Thus banks with lower EBTP and NII should have stronger incentives to smooth earnings. Banks in financial distress have lower NII thus suggesting a lower loan quality to generate income. If banks engage in income smoothing, those banks with a lower NII will reduce loan loss provisioning to signal a better earnings performance to the public.

[10] Mc Nichols and Wilson (1988) controlled for income by using each form's deviation of EBTP from its historical mean as a portioning variable rather than an independent variable in their model.

The credit quality of loans is expected to move up and down with the business cycle. During a cyclical downturn, banks normally provide more provisions from the already low earnings while in times of favorable cyclical development, the credit loss provisioning amount of non quality assets is expected to decrease thus increasing the profit. This counter cyclical behaviour of credit loss provisioning would thereby reinforce the cyclical nature of capital and earnings. Cavello and Majnoni (2001) have observed such behaviour for non G-10 countries while that for G-10 countries has been proven to be anti-cyclical implying that more provisions are made during boom period to cover expected losses during economic downturns.

Economic downturns which are normally measured by the growth of the real gross domestic products (GDP) tend to increase financial distress, resulting in deteriorating loan quality and increasing the probability of loan default. Arpa *et al.* (2001), Cavello and Majnoni (2001) and Biker and Hu (2002) included macro economic variables such as real GDP growth, interest rates and real estate indices in their studies to determine the cyclicality of earnings and loan loss provision behaviour. Real GDP growth was also used by Cavello and Majnoni (2001) and Laeven and Majoni (2003) as a control for the economic cycle. Both papers found an identical pattern of earnings with business cycles where banks provide more provisions during cyclical downturns, thus reducing earnings. Earnings are then said to be pro-cyclical, becoming lower when the economy is depressed. Cavello and Majnoni (2001), however, found a different pattern between less developed and developed OECD countries. A high level of real GDP growth should signal a high quality institutional setting with adequate incentives for debtors to fulfill their obligations and one where banks can lower their provisions. If Malaysian commercial banks adopt a more prudent provisioning behaviour like those of G-10 countries, then a positive relationship between LLP and ΔGDP should appear. Hence, it can be proudly said that Malaysian banks provide more provisions in anticipation of a cyclical downturn of the economy and indirectly smooth earnings when real GDP growth is high.

To examine capital management incentives for banks with loan loss reserves of more than 1.25 per cent of risk weighted assets, a dummy variable (*LLR) interacting with TCBP was included in the model. Equation (1) can now be extended as below:

$$LLP_{it} = \alpha + \beta_1 NPL_t + \beta_2\ \Delta LOANS_t + \beta_3 \Delta LLR_{t-1} + \beta_4 \Delta TCABP_t + \beta_5 \Delta EBTP_t + \beta_6 \Delta NII_t + \beta_7 \Delta GDP + \beta_7 \Delta TCBP^* DLLR + \mu_t \quad (2)$$

The dummy TCBP*LLR equals to one if loan loss reserves exceed 1.25 per cent of risk weighted assets and zero otherwise. Ahmed *et al.* (1999) found a negative coefficient with banks with loan loss reserves below 1.25 per cent. However, coefficient is less negative for banks whose reserves exceed the 1.25 per cent limit. The finding concludes that under the Basle 1988 regulation, banks that already have loan loss reserves above the required percentage have less incentives to use loan loss provisions to increase capital, while banks with a lower loan loss reserves ratio have much stronger incentives to increase their loan loss reserves since a dollar increase in reserves will increase total capital by tax rate times a dollar. However, without the loan loss reserves limitation of 1.25 per cent of the risk weighted assets, the excess loan loss reserves do not add to the denominator of Tier 1 capital ratio and

the capital management behaviour has become more interesting for examination. However, four main issues arise with the non limitation of loan loss reserves. First, markets may react negatively with an additional increase in loan loss reserves since higher reserves indicate poor asset quality (Healy 1985; Lancaster, 1993). Second, up to a certain point, bank managers may be reluctant to scarify a dollar of earnings to improve regulatory capital by just the tax amount of a dollar. Third, a reduction in earnings as a result of additional provisions will reduce Tier I capital. However, Tier I capital must be at least 50 per cent of total capital thus limiting the amount of provisions that can be manipulated. Finally, regulators may penalise banks if the large amount of provisions is not adequately supported by the amount of expected losses. Therefore this study expects an ambiguous relation between loan loss provisions and banks that have their level of loan loss reserves exceeding 1.25 per cent of the ratio.

4. Methodology

4.1 Pooled Time-series Cross-sectional OLS and GLS Regressions

Pooling data cross-sectionally and intertemporally assumes that the model's parameters are equal across banks and are stable over time. In this study, the Ordinary Least Squares estimation method (OLS) will first be used to estimate the developed model followed by the Generalized Least Squares estimation method (GLS).

The OLS adopt the criterion of minimising $\Sigma \hat{u}_i^2$ (sum of residuals squares). Each residual was given equal weight though some of the residuals were much closer to the sample regression function. In other words, all residuals receive equal importance (unweight) no matter how close or how widely scattered the individual observations were from the sample regression function. The GLS on the other hand minimise the weighted sum of residual squares. In GLS, the weight assigned to each observation is inversely proportional to its σ_i, that is, observations coming from a population with a larger σ_i will get a proportionately larger weight in minimising residual sum of squares (RSS). The ideal estimation is to give more weight to observations that are closely clustered around their mean than those that are widely scattered about.

4.2 Panel Data Regression Models: The Fixed Effects and Random Effects

The OLS and GLS pooled time series cross-sectional specification assumes that all firms have the same behaviours of capital management and income smoothing. In other words, it assumed that the slope and intercept of banks are constant across individuals and time. These assumptions deny the presence of any form of heterogeneity, which in practice is unlikely to prevail. If individual differences among bank managers' discretion over loan loss provisions have any significance at all, then the results from the basic OLS and GLS specification disregard the heterogeneity of parameters of interest.

4.2.1 The Fixed Effects Approach

One way to take into account the individuality of each bank for each cross-sectional unit is to let the intercept vary but still assume that the slope coefficients are constant across banks. In the fixed effects model, the intercept in the regression model is allowed to differ among

individuals in recognition of the fact that each individual, or cross-sectional unit, may have some special characteristics of its own. This model is easy to estimate, is parsimonious and treats individual differences in a simple systematic way.

$$LLP_{it} = \alpha_{0i} + \beta_1 NPL_{it} + \beta_2 LOANS_{it} + \beta_3 LLR_{i-t-1} + \beta_4 TCBP_{it} + \beta_5 EBTP_{it} + \beta_{6v} NII_{it} + \beta_7 \Delta GDP_{it} + \beta_8 TCBP_{it}*DLLR + \mu^{it} \quad (3)$$

The subscript i on the intercept term is included to suggest that the intercept of all the 33 commercial banks in the sample may be different; the differences may be due to individual characteristics of each bank, such as managerial style or managerial philosophy. Although the intercept may differ across individual banks, each individual's intercept does not vary over time. This is the reason why it is called "fixed effects". In addition, the (slope) coefficients of the regressors are assumed to not vary across individuals or over time. To allow for the (fixed effects) intercept to vary between banks, the dummy variable technique with a different intercept is included. Therefore equation (3) can be written as

$$LLP_{it} = \alpha_0 + \alpha_1 D_{1i} + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \ldots\ldots\ldots\ldots + \alpha_n D_{ni} + \beta_1 NPL_{it} + \beta_2 \Delta LOANS_{it} + \beta_3 LLR_{it-1} + \beta_4 TCBP_{it} + \beta_5 EBTP_{it} + \beta_6 NII_{it} + \beta_7 \Delta GDP_{it} + \beta_8 TCBP_{it}*DLLR + \mu_{it} \quad (4)$$

where D_{1i}, D_{2i}, D_{3i},... dan D_{ni} are the values for each unit of the cross-sectional.

4.2.2 The Random Effects Approach

In the random efffect, instead of treating α_{0i} in equation (3) as fixed, it is assumed that it is a random variable with a mean value of α_0 and the intercept value for an indivudual bank can be expressed as

$$\alpha_{0i} + \alpha_0 \varepsilon_i \qquad i=1,2,\ldots..,N \quad (5)$$

where ε_i is the random error term with mean equal to zero and variance σ_ε^2. In other words, the 33 commercial banks in our sample have a common mean value for the intercept (α_0) and the individual differences in the intercept values of each commercial banks are reflected in the error term ε_i.

Substituting equation (5) into (3) we get:

$$LLP_{it} = \alpha_0 + \beta_1 NPL_{it} + \beta_2 \Delta LOANS_{it} + \beta_3 LLR_{it-1} + \beta_4 TCBP_{it} + \beta_5 EBTP_{it} + \beta_6 NII_{it} + \beta_7 \Delta GDP_{it} + + \beta_8 TCBP_{it}*DLLR + \varepsilon_i + \mu_{it}$$

$$= \alpha_0 + \beta_1 NPL_{it} + \beta_2 \Delta LOANS_{it} + \beta_3 LLR_{it-1} + \beta_4 TCBP_{it} + \beta_5 EBTP_{it} + \beta_6 NII_{it} + \beta_7 \Delta GDP_{it} + + \beta_8 TCBP_{it}*DLLR + w_{it} \quad (6)$$

where

$$w_{it} = \varepsilon_i + \mu_{it} \quad (7)$$

where the error term w_{it} consist of two components: the error term for cross-sectional or specific individual (ε_i) and error term for the combination of time series and cross-sectional (μ_{it}). If the components for the two different periods are correlated, the coefficient of the correlation, corr (w_{it}, w_{is}) can be figured out as follows:

$$Corr\ (w_{it}, w_{is}) = \frac{\sigma^2\mu_2}{\sigma^2\mu_2 + \sigma^2\mu_1} \quad (8)$$

From equation (8), two characteristics for the coefficient of correlation are identified. First, the value of the correlation between the components of error term for two different periods are the same for any unit of the cross-section. Secondly, the structure of the correlation in equation (8) is the same for every unit of the cross section. Therefore, the application of the OLS will produce inferior results. Hence, the GLS technique will be much more appropriate. At this point the error term in the equation is relevant.

Thus far, the difference between the fixed effects and the random effects is that in the fixed effects model, each cross-sectional unit has its own (fixed) intercept value. In random effects model, however, the intercept α_0 represents the mean value of all the (cross-sectional) intercepts and the error component ε_i doeos not directly intercept from the mean.

5. The Results

The sample period used in this study covers 1994 to 2002 where it captures the economic upswings and downturns. For purposes of this study, a sample of 299 commercial banks-years with annual data available over the period 1994 to 2002 has been collected. However, since some of the data were missing from the financial statements, only 210 bank-years have been used for unbalanced panel data. Except for macroeconomic variables, all data collected are from the annual reports of banks. Yearly data was used due to the difficulty of obtaining quarterly bank data. Macroeconomic data were obtained from the central bank's web site at www.bnm.gov.my

Since panel data relate to individual banks, there is bound to be heterogeneity in these units. The GLS pooled time-series cross sectional specification assumes that all banks have the same behaviours of capital management and income smoothing. In other words, it assumed that the slope and intercept of banks are constant across individuals and time. These assumptions deny the presence of any form of heterogeneity, which in practice is unlikely to prevail. If individual differences among bank managers' discretion over loan loss provisions have any significance at all, then the results from the basic GLS specification disregard the heterogeneity of parameters of interest.

Table 2 reports the OLS and GLS regression results as well as the results of GLS with fixed effects and the random effects.

Table 2. Results of pooled cross-sectional and time-series estimation and the panel data regression

Variable	Ordinary Least Squares (OLS)	Generalized Least Squares (GLS)	GLS with Fixed Effects	GLS with Random Effects
Constant	0.0191	0.0142	-	0.0209
	(0.0059)***	(0.0011)***	-	(0.0042)***
NPL	0.0664	0.0604	0.0289	0.0618
	(0.0447)	(0.0094)***	(0.0143)**	(0.0129)***
ΔLOANS	–0.0190	–0.0011	–0.0175	–0.0196
	(0.0153)	(0.0022)	(0.0015)***	(0.0094)**
LLR_{t-1}	–0.0325	–0.0203	–0.4000	–0.0374
	(0.0140)**	(0.0026)***	(0.0015)***	(0.0396)
TCBP	–0.0370	–0.0285	–0.0483	–0.0377
	(0.0215)*	(0.0054)***	(0.0095)***	(0.0225)*
TCBP*LLR	–0.0011	–0.0006	–0.0027	–0.0019
	(0.0019)	(0.0006)	(0.0005)***	(0.0028)
EBTP	–0.1288	–0.0767	–0.1533	–0.1519
	(0.1250)	(0.0235)***	(0.0194)***	(0.0760)*
EBTP*NEG	-	-	-	-
	-	-	-	-
NII	–0.0058	–0.0034	–0.0090	–0.0063
	(0.0054)	(0.0009)***	(0.0010)***	(0.0137)
ΔGDP	–0.0798	–0.0637	–0.0760	–ß0.0818
	(0.0215)***	(0.0029)***	(0.0024)***	(0.0175)***
R^2	0.3167	0.7789	0.9569	0.3581
Adj R^2	0.2842	0.7684	0.9442	0.3276
F	9.7328	73.9859	431.5161	-
P	0.0000	0.0000	0.0000	-
DW	1.4936	1.5771	2.0192	1.5751
Durbin *h*	2.7709	3.8289	0.1490	1.1530

Numbers in parenthesis is the standard error
***Significant at 1 per cent level
**Significant at 5 per cent level
*Significant at 10 per cent level

LLP	Loan loss provision/total assets
NPL	Non performing loans at time *t*/total assets
ΔLOANS	(Gross loans balance at time *t* - Gross loans balance at time *t*-1)/total assets
LLR_{t-1}	Closing balance of loan loss reserves at time *t*-1 or beginning balance of loan loss reserves at time *t*/total risk weighted assets
TCBP	Total capital before loan loss reserves/total risk weighted assets
TCBP*LLR	Unitary if loan loss reserve exceed 1.25 per cent of total risk weighted assets and zero otherwise
EBTP	Income before taxes and provisions/total assets
NII	(Interest income minus interest expense)/ total risk weighted asset
ΔGDP	Real GDP growth

Table 3. Hausman test using Wald Coefficient

F-Statistics	Chi-Square
24.8919 (0.000002)	24.8919 (0.000001)

The parameter estimator of the GLS with random effects is to be tested with Hausman test to determine its suitability in explaining the variables' effects. In the random effects, individual effects are not correlated with the explanatoty variable. The explanatory variable is assymptotically efficient. Hausman (1978) argued that the random effects should move randomly as explained by the characteristics of random variables in the random effect model. However, in the fixed effect model, the random variable is treated as fixed though the specification for the parameter estimator with fixed effect is consistent and unbiased but not efficient.

The Hausman test (Table 3) shows that the results of GLS with fixed effect explains better, relative to the random effects on the relationship of the related variables.

Based on the estimation results of the fixed effects, the adjusted R^2 which is the common measure of the goodness-of-fit stood at 0.9442. That is, 94.42 per cent variation in LLP is explained by the independent variables. The result of the *F*-test which is the test of overall fitness of the model suggests that at least one or more of the independent variables influence the dependent variable, LLP. Following the rejection of the null on the *F*-test, the individual coefficient of the estimated model is next to be tested. The *t*-test on each variable suggests that all variables except LOANS and EBTP are significant at least at 5 per cent significance level.

The indicator for default risk inherent in a loan portfolio is represented by the ratio of non performing loans to total assets. An increase in NPL would affect the loan loss provision by increasing the specific provisions that need to be made for that year. The positive and significant coefficient in NPL indicates that as bank's non performing loans increase so does the provision for total loan portfolio. The estimated coefficient of ΔLOANS surprisingly enters an undesirable negative sign (-0.0175) at 1 per cent significance level. On average, commercial banks in the sample appear to be less prudent during periods of rapid credit growth. Banks appear to have reduced the amount of provisions during rapid credit growth period which normally happens during an economic upswing. This may due to the anticipation of the bank that borrowers may have the capability to repay the loan due to increases in income or profit, normally associated with economic growth. The coefficient of the lagged value of loan loss reserves ratio enters a negative and significant coefficient (-0.4000) indicating that banks which have a higher beginning loan loss reserves ratio have the propensity to set lower levels of provisions in the coming financial year. This suggests that even with the non limitation of loan loss reserves ratio, banks on the average are aware of the consequence of having higher loan loss reserves in terms of a negative perception by regulators, the public and financial account users.

5.1 *Evidence of Capital Management*

The capital management hypothesis suggests that low capitalised banks have an incentive to increase loan loss provisions in their quest to improve the regulatory capital ratio. If low capital banks use loan loss provision to boost their capital, then the expected sign of the coefficient on TCBP should be negative. The regression yields a significantly negative estimated coefficient for TCBP (-0.0483) suggesting evidence of capital management by sample banks. The results support earlier studies on U.S banks by Ahmed *et al.* (1999); it implies that the level of loan loss provision chosen by commercial banks during the period of study significantly improves their total capital reported thus avoiding facing regulatory pressure.

The Malaysian version of Basle Accord 1988, however, did not limit the amount of loan loss reserves. With this relaxation, low capital banks should have even stronger incentives to engage in capital management to increase their regulatory capital. If this is true, then a strong negative relation should be seen when a dummy for the 1.25 per cent loan loss reserves is introduced. The results of the regression yield a smaller negative coefficient (-0.0027) at one percent level. This seems to suggest that the relation between loan loss provision and TCBP is more negative for banks that have reserves exceeding the upper bound. Therefore, it can be concluded that banks with loan loss reserves higher than the 1.25 per cent have a stronger incentive to engage in capital management, taking advantage of the non limitation of loan loss reserves to increase capital and attempting to signal the ability to absorb additional losses as suggested among others by Greeenwalt and Sinkey (1988) and Wahlen (1994).

5.2 *Evidence of Earnings Management via Income Smoothing*

The earnings management hypothesis assumes that bank managers have incentives to smooth earnings. When earnings are expected to be low, bank managers will deliberately understate loan loss provision to mitigate the adverse effect of other factors on earnings. If banks were to use loan loss provision to smooth their earnings, then a positive relation between EBTP before taxes and provisions is expected. The estimation yields a significantly negative coefficient (-0.1533) with significance level at 1 per cent. The magnitude of coefficient value implies that for every 100 basis point increase in earnings before taxes and provisions as a percentage of assets, the provisions to assets reduces by 15.33 basis point. The results support earlier findings by Cavello and Majnoni (2001) for the non G-10 countries, by Arpa *et al.* (2001) for Austria, Collins *et al.* (1995), Beaver and Engel (1996) and by Ahmed *et al.* (1999) on U.S banks. It implies that banks in the sample appear to have increased the amount of provisions during periods of low earnings and reduced provisioning during periods of high earnings. They also reduced provisioning in the period of higher credit growth. This indicates that income smoothing behaviour is not occurring in this sample.

The ratio between net interest incomes over risk weighted assets can be used as a measure of financial distress and riskiness of bank operations (Ediz *et al.* 1998). Higher NII ratio reflects well on banks earnings given a level of risk on their loan portfolio. Therefore, banks with low NII will have greater incentive to reduce provisions in their attempt to increase their overall earnings for that particular financial year. Banks with higher NII on the other hands have an incentive to increase provisioning on their loan losses to smooth their overall

Table 4. Fixed effects of panel data regression with negative earnings dummy

Variable	NPL	ΔLOANS	LLR_{t-1}	TCBP	TCBP *DLLR	EBTP	EBTP* DNEG	NII	ΔGDP
Coefficient	0.0288	–0.0176	–0.0403	–0.0492	(0.0099)***	–0.1468	0.0003	–0.0089	–0.0760
	(0.0144)**	(0.0015)***	(0.0016)***	(0.0099)***	–0.0028	(0.0245)***	(0.0005)	(0.0010)***	(0.0025)***
Adjusted R^2	0.9437								
F	373.9575								
p	0.0000								
Durbin *h*	0.1815								

earnings over time. The estimated coefficient for NII is negative (-0.0090) suggesting that banks increase their provision when NII is low thus supporting earlier findings for EBTP. Banks on the average do not smooth their earnings over time.

To allow for an asymmetric pattern of loan loss provisioning behaviour during periods of positive and negative earnings, the earnings variable (EBTP) is interacted with a dummy variable that is unitary when earnings are negative and zero otherwise. The estimation yields a positive (0.0003) but is not significant. This suggests a positive relation with loan loss provision. However, the result failed to suggest that banks in the sample provide lower provisions when they incur losses than when they generate a positive level of earnings.

5.3 Evidence of Economic Cycle

The estimated coefficient for ΔGDP is (-0.760) and is significant at one per cent level. The presence of a negative relationship between macroeconomic variables and loan loss provision is consistent with earlier findings, among others by Cheng (2002), Cavello and Majnoni (2001) and Laeven and Majoni (2003). The result suggests that commercial banks in Malaysia made loan loss provisioning during and not before an economic recession. This is consistent with the argument that the current standard setting of the Basle minimum regulatory capital requirement behaves pro-cyclically, that is anti-cyclical provisioning will result in a pro-cyclical capital and earnings behaviour. However, the pro-cyclical characteristic of regulatory capital for Malaysian commercial banks is expected to be much lower due to the non limitation of the loan loss reserves ratio. The reason is that, any excess of loan loss reserves above the 1.25 per cent level will not be added to the denominator of Tier I capital formulation. Thus a continuous increase in loan loss provisions increases regulatory capital ratio until the specific target of an individual bank's regulatory capital requirements is achieved.

6. Conclusion

The aim of this study is to examine if bank managers engaged in capital management and income smoothing practices. In addition, it also examined whether the non limitation of loan loss reserves ratio reduces the pro-cyclical characteristics of regulatory capital and earnings. The study produced several findings: first, bank managers do use loan loss provisions to manage regulatory capital. Low capitalised banks have strong incentives to engage in regulatory capital management via increasing the provision for loan losses. This incentive continues for banks with a reserves ratio exceeding 1.25 per cent of the risk weighted assets. Banks seem to take advantage of the non limitation of loan loss reserves to continuously increase their regulatory capital ratios until they achieve the specific regulatory capital target. Second, the study does not find evidence of income smoothing behaviour for the same sample period. Banks with low earnings did not reduce provisioning to increase reported earnings. Evidence on income smoothing is also not found when banks incurred negative earnings or losses. This may be due to the reason that banks provide provisions according to the expected losses and they do manage to isolate between expected and unexpected losses during economic downturns so that the expected losses are covered only by loan loss provisions while capital injected is required to cover heavy unexpected losses. Banks in the sample also did not reduce provisioning when their net interest incomes

generated from their assets were low. This result strengthens the finding above and rejects the evidence of income smoothing behaviour. Third, banks postpone loan loss provisioning when faced with favorable cyclical and income conditions, until negative conditions set in. As a result, during economic difficulty, they have to reduce loans or shift towards less risky assets, thus creating credit contraction in the economy. This undesirable conventional strategy is consistent with provisioning behavior of developing and less developed countries.

6.1 A Summary of Policy Recommendations

From the above findings, it can be concluded that banks in the sample do manage capital to improve regulatory capital. The non limitation of loan loss reserves has actually created additional incentives for low capitalised banks with high loan loss reserves to continuously increase their reserves to achieve higher regulatory capital. Banks increase their reserves if they feel that their regulatory capital is not sufficient to signal the capital soundness to the regulators as well as to the public. However, it should be noted that banks are required to make provisions according to their expected losses. Taking into consideration the effect of limiting the level of loan loss reserves on the economic activity and the role of loan loss provisions and their reserves that represent the true economic value of bank capital, there is a need to actually limit the level of the reserves to prevent abuse of loan loss provisioning. Perhaps, banks should use the industry historical average of loan loss reserves ratio rather than the fixed 1.25 per cent as a benchmark for their provisioning behaviour pertaining to capital management. By applying this, the incentives to engage in capital management via loan loss reserves can be reduced thus strengthening capital soundness.

The importance of income smoothing has been proven empirically in many studies. However, this study failed to find evidence of income smoothing behaviour. The pro-cyclical characteristics of regulatory capital can be reduced if banks smooth income over time. During a cyclical downturn, bank earnings are normally low due to an increase in the non repayment of loans. If banks smooth income over time, they may increase provisioning when income is high as a buffer to support expected losses during a cyclical downturn. Of course, the level of provisioning should not be abused to avoid accounting misrepresentation.

Banks are less willing to loan money during a cyclical downturn due to presumed increased credit risk. This behaviour will further aggravate the negative impact of minimum capital requirements during recession and cause a credit crunch in the economy. If banks are forced to maintain larger capital buffers in such circumstances, together with the constraint of limiting loan loss reserves, the presumed pro-cyclical nature of bank lending is liable to become even stronger. Banks should reserve more during good years, possibly as a precaution. Such a prudent and forward looking provisioning policy causes the banking sector to be less pro-cyclical than would, at first sight, seem to follow from the dependency of banks' profits on the business cycle.

The recent proposal of the new capital accord known as Basle II does not address the need for a risk based regulation of bank provisions and does not provide new incentives for a proper treatment of expected loses. It confirms explicitly what was only implicit in the 1988 Capital Accord that capital is intended to deal with both expected and unexpected losses. Therefore, general reserves of loan losses should be considered as a component of regulatory capital. The maximum level of loan loss reserves has been maintained in the

upcoming capital regulation, forbidding any desirable flexibility in the use of provisioning. This paper provides empirical evidence that stresses the importance of new developments in the area of bank regulation. Perhaps the Malaysian central bank will have to maintain the flexibility of the loan loss reserves limit to ensure that the pro-cyclical characteristic of regulatory capital will continuously be reduced along with the economic cycle and the flexibility of provisioning will be maintained to perform its main duty, i.e. to cover expected loses.

6.2 Future Research

The upcoming new Basle Accord on capital requirements, expected to become effective in late 2006, raises concerns about possible reinforcement of banks' pro-cyclical behaviour. The new Accord makes capital requirements more risk sensitive, which could exert a pro-cyclical influence on macroeconomics where banks play a major role as suppliers of credit. This argument has motivated researchers to explore the relationship between macroeconomic variables, loan loss provisions and the economic cycle. The reason being that a borrower's ability to repay the loan changes over time, particularly in response to changes in economic conditions. In other words, a good loan can turn bad during an economic downturn, as evidenced by increasing bankruptcies during such times. Another explanation is that, during an economic upswing, the borrower's ability to repay a debt tends to increase thus reducing loan default. Conversely, during a recession, loan defaults are likely to increase. One of the reasons is that the value of the collateral on a loan, which usually comprises real estate properties, tends to fall in recessions and rise during booms. However, loan losses may not be realised until an economic downturn occurs, though the risk of such losses can increase during an economic upswing, as the likelihood of future downturn grows (see Borio *et al.* 2001). Another reason is that the non-symmetrical information between bank managers and outsiders has forced the latter to depend on macroeconomic data to mitigate the information asymmetry problem between the two parties, though the impact of macroeconomic variables on the loan portfolio is partly observable through the loan portfolio data reported by the management of commercial banks. If bank managers have incorporated the impact of the macroeconomic variables into their loan portfolio data, then macroeconomic variables would have little value to the external parties for the purpose of evaluating loan quality.

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