Loan Loss Provisions and Macroeconomic Factors:
The Case of Malaysian Commercial Banks

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Abstract: The global financial system is vulnerable due to the weak growth prospects in many advanced economies. Hence, the stability of the banking system remained as an important issue to be resolved. Therefore, it is vital for the banks to properly manage the Loan Loss Provisions (LLPs) to ensure the sufficient amounts are allocated to counterbalance the non-performing loans, especially during financial turmoil. The issue of LLPs has captivated the interest of many researchers as to what extent the LLP has been affected by macroeconomic factors. Thus, the main purpose of the study is to investigate the influence of macroeconomic factors in affecting the provision decision of Malaysian commercial banks. The investigation aims at detecting whether the provisions have been influenced by the macroeconomic factors such as the interest rate, gross domestic products and exchange rate. At the same time, the effect of macroeconomic factors can be examined in order to identify the pro-cyclical or counter-cyclical behavior in relation to the LLP. The Generalized Method of Moments (GMM) is devised in assessing the significant macro factors that influencing the LLP.

Key words: Loan loss provision, interest rate, exchange rate, gross domestic product, commercial banks

INTRODUCTION

The banking system is prone to the credit risk associated with the problem loans and difficulties in loan recoveries particularly during turbulence. Nevertheless, the instability of the financial institutions is cushioned by the loan loss provisions and stronger capital adequacy ratio. Regulatory capital is required to act as a buffer against unexpected losses while loan loss provisions are meant to cover the expected losses from the loans. Hence, it is important for the banks to properly manage the LLP to ensure the sufficient amounts are allocated to counterbalance the Non-Performing Loans (NPL) mainly throughout financial turmoil. As stressed by the previous research, the most important element relating to the non-performing loans is assessing the loan loss provisions (Craigwell and Elliott, 2011). In addition, Boudriga et al. (2009) discover that prudent provisioning policy and higher capital adequacy ratio can decrease the level of NPL. Furthermore, the readiness of the bank to allocate some amounts as provisions for loan losses contributes to the confidence in the bank's future performance because it acts as a controlling mechanism over anticipated loan losses. Thus, the loan loss provision is a mechanism created in the banking system to get out of the financial instability resulted from high NPL ratio.

Motivated by the exacerbating debate on loan loss provisions on three main areas such as tool for income smoothing, capital management and signaling activities whether they are positively or negatively related to LLPs (Ma, 1988; Wetmore and Brick, 1994; Kim and Kross, 1998; Ahmed et al., 1999; Laeven and Majnoni, 2003; Ismail and Lay, 2002; Anandarajan et al., 2007). Based on the foregoing research, there are different factors influencing LLP decision by bank managers depends on the regulation and policy of particular countries, periods covered as well as the methodology of the research. However, most of the research conducted are relevant to United States and European countries. The studies on LLPs are relatively limited and have produced mixed findings on the practice of earnings and capital management as well as macroeconomic factors. Therefore, the first question addressed is whether LLPs of Malaysian commercial banks are affected by macroeconomic factors during the period of 2004-2012. In addition, the effect of macroeconomic factors can be examined in order to identify the pro-cyclical or counter-cyclical behavior in relation to the LLP.

This study is comparable to the other studies by focusing on the influence of macroeconomic factors in affecting the provision decision of Malaysian commercial banks with the presence of earnings management and capital management variables. The motivation to extend the understanding of how external factors such as gross domestic products, interest rate and inflation rate behavior of these banks influences the loan loss

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provisions during that particular period. Furthermore, the scope of the research sheds some light on the cyclical pattern of banking institutions during the recent global financial crisis of 2007-2009. Among the previous studies on the Gross Domestic Product (GDP) variable to capture the procyclicality of LLP are discussed by Floro (2010) and Beatty and Liao (2011). However, the concentration on the macroeconomic factors and LLP are only elaborated from the European countries and United States viewpoint. There is a paucity of discussion on the influence of external factors in Malaysian setting. Thus, this study contributes to the body of literature on the effect of macroeconomic factors on provisioning practice of the Malaysian commercial banks.

Literature review and hypotheses development
Loan loss provisions and capital management: There are several factors that have been identified by the previous literature as determinants of loan loss provisions in the banking sector as LLPs play an important role in determining the adequacy of banks capital to absorb future losses. Among the factors are past loan risk, loan quality deterioration, increase in bank loan and non-performing loans, loan write-offs, unemployment, prior period earnings and growth domestic product (Wetmore and Brick, 1994; Kim and Kross, 1998; Ahmed *et al.*, 1999; Ismail and Lay, 2002; Anandarajan *et al.*, 2003; Ghafar *et al.*, 2005; Zoubi and Al-Khazali, 2007). However, the most important issues in determining the LLPs by banks are the motivation to manage the volatility of reported earnings, manage the capital adequacy ratios required by the regulators as well to signal the future performance of the banks in order to attract the public attention (Greenawalt and Sinkey, 1998; Moyer, 1990; Wahlen, 1994; Ahmed *et al.*, 1999; Ismail and Lay, 2002; Anandarajan *et al.*, 2003, 2005; Ghafar *et al.*, 2005; Kanagaretnam *et al.*, 2005). Hence, the bank managers have incentives to increase or decrease the LLPs in order to manage the report to be presented to others.

The implementation of the Basel Accord in 1989 regarding the new capital regulation have encouraged the intense research on the capital management and the behavior of the LLPs. It starts with the investigation of Kim and Kross (1998) on the effect of capital regulation on loan loss provisions. Later, the investigation is extended by Ahmed *et al.* (1999) in reexamining the earlier findings on the capital management and LLP to more recent sample and some improvements on the models. Subsequently, the LLPs have become the major research attraction and have been explored by Ismail and Lay (2002), Anandarajan *et al.* (2003), Floro (2010) and Misman and

Ahmad (2011). They discover the banks engage in capital management. It is also supported by Curcio and Hasan in the study of capital management determinant for European banks. However, the contradictory opinion enumerated by the study of Collins *et al.* (1995) which shows the LLP is not influenced by the capital management incentive.

The issue of LLP and the computation of capital adequacy regulation have also grabbed the attention of Laeven and Majnoni (2003) to explore the importance of LLP in the capital regulatory framework. Based on the research conducted on banks in 45 countries, it provides new findings that entail specific attention from regulators about the importance of LLP to be included in capital adequacy regulation. In addition, the empirical results indicate that a distinct treatment of loan loss reserve in the country may affect the procyclical features of capital regulation. The report of the Basel Committee on Banking Supervision in 2001 as stated in their research clearly indicated that the banking institutions are prone to credit risk during economic downturns, therefore, the banks indirectly need more capital to alleviate the risk of financial distress. It shows that risk based capital requirement totally procyclical as proven by the investigations done on 1419 banks by Laeven and Majnoni (2003).

The same investigations have been done in Malaysia by Ismail and Lay (2002) pertinent to this capital management behavior. Adopted the models from previous studies, they examined how capital management influences the LLPs by testing the hypothesis that stating the negative relation between LLPs and Total Capital excluding loan loss reserve (TCAPB). The study supports the result of Kim and Kross (1998) and Moyer (1990), saying that banks engage in capital ratio management when LLP and the TCAPB coefficient is negative. Thus, it is hypothesized as follows:

- H_1: Capital ratio will be negatively associated with loan loss provisions

Loan loss provisions and macroeconomic factors: Economic growth is normally associated with the positive development in production of goods and services or when there is an increase in the capacity of the country's production. It is measured by the Gross Domestic Product (GDP). While, procyclical is a term used to explain how an economic quantity is related to economic growth. Procyclicality refers to the inclination of banks to increase (decrease) the amount of lending in the period of economic growth (recession). There are several studies have used the Gross Domestic Product (GDP) variable to

capture the procyclicality of the LLP (Floro, 2010; Beatty and Liao, 2011; Laeven and Majnoni, 2003). According to Beatty and Liao (2011), the procyclicality in bank lending can be seen clearly in banking systems when the increasing rates in the default loan if the LLP are not well managed in the good times. The evidence on the capital crunch theory have been shown by Beatty and Liao when their research indicates that bank with less timely LLP reduced the lending activities more during recession periods compared to normal economic growth. Thus, it has also convinced the view that LLP timeliness could reduce the effect of capital crunch theory in the economic downturn periods. The same result is produced by Laeven and Majnoni (2003) and Floro (2010) when there is an undesirable negative relation of the LLP to GDP growth for banks in Unites States, Japan and Asia. It indicates the less provision during the high GDP growth, the signal of procyclical behavior of those banks.

However, the mixed findings are found in Packer and Zhu. It shows the evidence of a negative relation of the LLP and GDP (procyclical) if the banks in Asia and the Pacific are viewed in the aggregate. Nonetheless, the result of the countercyclical LLP by bank throughout emerging Asia obviously in India when the banks are divided into different groups based on nationality.

The essence of inflation is generally caused by the increase of money supply in an economy which in turns contributes to the general increase in the price of goods and services. As the cost of goods and services increase, thus the value of each dollar is decreasing due to the inability of a person to buy the goods or services as much as previous transaction. Consumer Price Index (CPI) is a measurement used in inflation. Thus, the high inflation rate in a country will be part of the cause for increasing patterns of LLP due to the inability of the borrower to pay the debt. Nonetheless, Craigwell and Elliott (2011) give the evidence on the negative sign of CPI on LLP. It might show the explanation of high inflation in an economy will cause the decreasing in value for loan growth due to the expensive cost to service debts. Hence, the fewer amounts allocated for LLP. Therefore, the hypothesis is stated as below:

- H_{2a}: gross domestic product as a macroeconomic factor influences loan loss provision
- H_{2b}: interest influences loan loss provision
- H_{2c}: inflation influences loan loss provision

Loan loss provisions and other factors: The positive results between LLPs and earnings shown by Collins *et al.* (1995) have contributed to the consistency of earnings management hypothesis when most of the

banks that have been investigated shows the low LLP in the years of low bank earnings. Another study tested the earnings management is Cavallo and Majnoni which has confirmed the income smoothing behavior of G-10 countries' banks when the LLP are set high during the high net profits. Conversely, the result of Cavallo and Majnoni indicates the banks of non G-10 countries do not involve in income smoothing when they provide little provisions when economy is expanding and produce high net income. In addition, the positive relation between loan loss provisions and economic cycles in Spain shows the increasing portion of LLP when facing positive economic growth (Saurina, 2009).

As far as, the literature is concerned, the NPL is related to loan loss provisions in the bank and it should see the positive relation between NPL and LLP as found in the study of Adela and Iulia (2010). Meanwhile, the evidence of positive relationship between LLP and interest rate is enumerated in the study of Floro (2010). Meanwhile, the expected positive relationship of size and LLP is suggested by Anandarajan *et al.* (2003). They have assumed that larger banks might involve in high volume of business transactions and tends to allocate higher LLP compared to smaller banks as expected by Zoubi and Al-Khazali (2007).

MATERIALS AND METHODS

The dataset in our study is limited to the commercial banks in Malaysia for a period of 2004-2012. During the specific time frame, the banks were subject to the global financial crisis at the end of 2007, therefore, the study focused on the macroeconomic factors with the presence of capital and earnings management in the model. Data were extracted from bank scope database and any banks with incomplete data were excluded from the sample. The final sample of the banks produced 19 commercial banks with a total number of 133 observations.

The Dependent Variable (DV) in this study is Loan Loss Provisions (LLP) which is the variable of the primary interest. The Independent Variables (IV) to be examined are the combined variables from the existing literature which are suggested to have a strong association with LLP based on the previous research as well as considered to be related in other country settings. The summaries of variables are shown in Table 1. This study involves the dynamic panel data analysis and uses Arellano Bond Difference Generalized Method of Moments (Diff GMM) estimator.

Meanwhile, the panel unit root test is performed to investigate whether each variable has unit root or not.

Table 1: Variables dscription

Variables	Descriptions	Proxies
Loan loss provision	Loan Loss Provision (LLP)	Total LLP_{it}/total assets$_{it}$
Earnings management	Earnings Before Tax and loan loss Provisions (EBTP)	$EBTP_{it}$/total assets$_{it}$
Capital management	Capital ratio (CAP)	Total capital$_{it}$/risk weighted assets$_{it}$
Macroeconomic factors	Growth Domestic Product (GDP), Inflation (IR), Interest Rate	GDP real growth rate$_{it}$, consumer price index$_{it}$, real interest rate $_{it}$
Bank specific factors	Non-Performing Loan (NPL)	NPL_{it}/total asset$_{it}$
	Size of banks (SZ)	Total assets$_{it}$
	Total loan	Total Loan $_{it}$/total assets$_{it}$
	Loan growth	Gross loan balance$_{it}$-gross loan, balance$_{it-1}$/total assets$_{it}$
	Write off (WO)	Loan WO$_{it}$/total asset$_{it}$
	Return on Assets (ROA)	Net profit$_{it}$/total assets$_{it}$
	Debt to Equity (DE)	Total debt$_{it}$/total equity$_{it}$

Where: t = Current year; i = Bank

The null hypothesis declare the variable has a unit root (not stationary). Rejecting the null hypothesis shows that the variable has no unit root (stationary). This study examines the stationary of the data using three types of panel unit root test which are called Levin, Lin and Chu (LLC) test, Im, Pesaran and Chin (IPS) test and Breitung test. The LLC test is developed to test the unit root for a moderate size of panel data analysis (Levin *et al.*, 2002). The unit root test by Im *et al.* (2003) has extended the framework of LLC test formulated by Levin *et al.* (2002). While the Breitung test was created by Breitung (2001) to perform the same test for panel unit root. The result illustrates the stationary of data indicated by two out of the three tests for each of the variable reject the null hypothesis when the probability is <0.01.

GMM is an alternative estimator for panel data analysis and it is more efficient than other common estimators in the presence of heteroscedasticity. Furthermore, GMM also can overcome the problem of serial correlation of unknown form. As discussed in the previous studies by Faustino and Leitao (2007), the application of GMM estimator in panel data has been recommended to be more efficient than the fixed effects and random effects estimators if the strict exogeneity assumption of the regressors fails.

The Arellano and Bond (1991) and Arellano-Bover/Blundell-Bond dynamic panel estimators are created for the panel data with situations of:

- Small T and large N panels
- Linear functional relationship
- Single left-hand-side variable that is dynamic
- Independent variables that are not strictly exogenous
- Fixed individual effects
- Heteroscedasticity and autocorrelation within individuals not across them (Roodman, 2006)

The Arellano Bond difference GMM is an estimator starts by transforming all regressors by differencing it and uses the Generalized Method of Moments which is proposed by Hansen in 1982.

Empirical model: The baseline model specification adapted in this study follows the existing literature of Packer and Zhu:

$$LLP_{it} = \beta_0 + \beta_1 LLP_{it-1} + \beta_2 EBTP_{it} + \beta_3 CAP_{it} + \beta_4 GDP_{it} + \\ \beta_5 IR_{it} + \beta_6 IF_{it} + \beta_7 NPL_{it} + \beta_8 SZ_{it} + \beta_9 TL_{it} + \\ \beta_{10} LG_{it} + \beta_{11} WO_{it} + \beta_{12} ROA_{it} + \beta_{13} DE_{it} + \varepsilon_{it} \quad (1)$$

The models are used to examine the factors influencing the LLPs with the main interest is macroeconomic factors (β_4-β_6). The other variables are earnings management, capital management and bank specific factors which are represented by the parameter β_2, β_3 and β_7 to β_{13}, respectively. The model is used to test the overall result of loan loss provision determinants for the period of 2004-2012.

RESULTS AND DISCUSSION

Descriptive statistics and correlations: The descriptive statistics for all variables in Malaysia for the period of 2004-2012 are presented in Table 2 to show the characteristics of the data. The descriptive statistic measures used are mean, median, maximum, minimum and standard deviation. The other tests that are conducted to verify the normality of the data are skewness, kurtosis and Jacque Bera. The mean ratios of LLP to total assets = 0.24% with a maximum ratio of 2.60%. This implies that banks in Malaysia make a very low provision for loan losses. The minimum ratio of LLP to total assets for the sample banks is equal to -0.80%.

Table 3 provides the Pearson correlation coefficient of the sample variables. It is employed to examine the multicollinearity problem among the variables. LLP is positively and significantly correlated to NPL (0.535), SZ (0.308), TL (0.425), LG (0.214) and DE (0.296). This indicates that the higher the non-performing, total loan and loan growth, it will contribute to the higher provision. While the CAP (-0.367) and ROA (-0.458) are significantly and negatively correlated with LLP. However, LLP is not significantly correlated with EBTP, GDP, IR, IF and WO.

Difference generalized method of moments (Diff GMM) estimation: First and foremost, the instruments for all models are valid as the null hypotheses of the AR (2) and sargan Over-Identifying Restrictions (OIR) test are not rejected. Where the lagged endogenous estimated

Table 2: Descriptive statistic

Variables	Mean	Median	SD	Min.	Max.
LLP	0.0024	0.0022	0.0034	-0.0084	0.0260
EBTP	0.0175	0.0179	0.0054	-0.0037	0.0325
CAP	22.2040	15.2700	20.7520	9.180	128.9500
GDP	4.9790	5.5850	2.4260	-1.513	7.1540
IR	1.4888	0.8464	4.3110	-3.902	11.7820
IF	2.5212	2.0270	1.3740	0.597	5.4290
NPL	0.0208	0.0143	0.0236	5.51E-05	0.1680
SZ	8.8520	9.2370	1.5960	5.524	11.9940
TL	0.4713	0.5620	0.2197	0.0042	0.7500
LG	0.0560	0.0560	0.0650	-0.109	0.3310
WO	0.0009	0.0010	0.0050	-0.0344	0.0248
ROA	0.0111	0.0115	0.0046	-0.0085	0.0240
DE	10.7890	11.1830	4.8860	1.975	27.0090

The sample includes 19 commercial banks from Malaysia over the period of 2004-2012

Table 3: Pearson correlation

Variables	LLP	EBTP	CAP	GDP	IR	IF	NPL	SZ	TL	LG	WO	ROA	DE
LLP	1.000												
EBTP	0.1035	1.000											
CAP	-0.367***	-0.034	1.000										
GDP	-0.0519	0.0156	0.0015	1.000									
IR	-0.014	-0.102	0.013	-0.72***	1.000								
IF	0.031	0.195**	-0.036	-0.268***	-0.716***	1.000							
NPL	0.535***	0.0013	-0.222***	0.123	-0.13*	-0.023	1.000						
SZ	0.308***	0.150**	-0.584***	-0.018	0.047	-0.006	0.363***	1.000					
TL	0.425***	0.303***	-0.457***	-6.71E-05	0.0009	-0.012	0.398***	0.559***	1.000				
LG	0.214***	0.101	-0.0261***	0.208***	-0.0181**	0.166**	0.094	0.345***	0.550***	1.000			
WO	-.066	-0.053	-0.004	-0.105	0.094	0.115	-0.0331***	0.097	0.049	0.161**	1.000		
ROA	-0.458***	0.825***	0.174**	0.023	-0.075	0.154**	-0.258***	-0.016	0.035	-0.033	-0.029	1.000	
DE	0.296***	0.094	-0.582***	0.038	-0.074	0.073	0.212***	0.690***	0.380***	0.200***	0.035	-0.079	1.000

*, **, *** Significant at the 10, 5 and 1% level

coefficient is significant, the wald statistics is also significant. The regression findings are shown in Table 4 and it reveals the result of the impact of the variables on LLPs. This study will compare the results obtained from Diff GMM which involves the one step, two step and two step robust. The explanation is based on the one step result. The lagged dependent variable is significant at 0.1 level illustrating that previous LLP influences the present decision of LLP. The effect of GDP on LLPs shows a significant negative relationship between GDP and LLPs It illustrates that LLPs tend to be procyclical and support the H_{2a}. However, the interest rate and inflation are not significantly correlated with LLP and therefore, indicates insufficient evidence to support the H_{2b} and H_{2b}.

The coefficient for the capital adequacy ratio is positive and statistically significant. It indicates the positive association between CAP and LLP, higher provisioning when capital ratio is high is not consistent with the efforts to build up a greater reserve cushion. In the mean time, the positive association with capital constraints and provision demonstrates the inconsistent result of the capital management hypothesis as stressed by the previous studies (Kim and Kross, 1998; Ahmed *et al.*, 1999; Ismail and Lay, 2002; Anandarajan *et al.*, 2003; Floro, 2010; Misman and Ahmad, 2011).

Table 4: Arellano bond difference GMM (GMM) estimation

Variables	Coefficient		
	One step	Two step	Two step robust
LLP_{t-1}	0.038*	0.0511	0.0511
EBTP	0.849***	0.877***	0.877***
CAP	0.00002**	0.0002***	0.00002
GDP	-0.0001***	-0.00008***	-0.00008
IR	-0.00004	0.00002	0.00002
IF	-0.00003	0.00008	0.00008
NPL	0.016***	-0.003	-.003
SZ	0.0006***	0.0002	0.0002
TL	0.00001	0.001	0.0017
LG	0.0013	0.004	0.004
WO	-0.0095	-0.08	-0.081
ROA	-1.150***	-1.17***	-1.177***
DE	-0.00002	0.00003	0.00003
Wald χ^2	2129.82 (0.000)	4946.31 (0.000)	516.71 (0.000)
AR (1)	-4.11 (0.000)	-2.92 (0.004)	-2.16 (0.031)
AR (2)	-0.01 (0.991)	0.68 (0.495)	0.57 (0.570)
Sargan test	125.6 (0.179)	125.6 (0.179)	125.6 (0.179)

*, **, *** Significant at the 10, 5 and 1% level

The NPL is found to be positively associated with loan loss provisions in both periods. The coefficient for the NPL is positive and significant at the 99% level. It suggests that the higher level of NPL may reflect the higher provision for LLPs which is consistent with the previous studies. The coefficient for size is positive and statistically significant at the 90% level, showing that the smaller banks tend to allocate a small amount of loan loss provisions. There is a significant positive relationship between EBTP and LLPs.

CONCLUSION

It has been disputed that one of the factors contributing to the resilience of Asian banks was the transformation of the regulatory environment of the late 1990s. In particular, most jurisdictions in Asia, encouraged by the critical losses of the Asian financial crisis, adopted stronger risk management and more conservative loan loss provisioning standards as reported by 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.

Overall, the macroeconomic factors such as GDP has the significant negative impact on LLPs. It points out and supports the previous result of others (Floro, 2010; Beatty and Liao, 2011; Laeven and Majnoni, 2003). Moreover, according to Beatty and Liao (2011), the negative development in production of good and services contributing to higher loan loss provisions to meet the expected losses from the loan portfolios. It indicates the less provision during the high GDP growth, the signal of procyclical behavior of those banks. This negative relationship between GDP and LLP is considered to be procyclical as discussed in the study of Packer and Zhu. Meanwhile, this study also documents that LLPs are significantly affected by capital management behavior. This situation may be due to the strong intention to fulfill the regulatory minimum target. Thus, the results support the findings of El Sood in (2012) that stresses on the association between regulatory capital and LLP. It points out and supports the previous result of others (Floro, 2010; Beatty and Liao, 2011; Laeven and Majnoni, 2003).

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