

The Determinants of Global Bank Rating Changes: Evidence from Banking M&A

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Abstract

This paper examines the impact of CAMEL criteria (i.e., capital adequacy, asset quality, management, earnings, and liquidity) and miscellaneous size factors on bank rating changes of global financial institutions. This study uses the ordered logit model with marginal effect to assess overall credit rating changes by comparing pre-M&A with post-M&A performance from the perspective of the acquiring banks. An effort to identify key elements that influence the success ratings of an appropriate M&A strategy for the banking sector seems advisable. Our results indicated the CAMEL criteria were referable for determining bank rating on pre-M&A performance, while capital adequacy and liquidity were suggested for considering the economy of scale of M&A performance since capital soundness accelerated M&A accomplished through the creation of synergy.

Keywords: Bank rating changes, CAMEL, M&A

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1. Introduction

The global financial collapse of the U.S. investment bank Lehman Brothers triggered a turmoil since September 2008 and sent visibly shudders around the globe. This unprecedented downfall not only weakened stock markets worldwide, but also caused a serious setback in the global economic system wherein many firms either filed for bankruptcy or requested debt settlement. Faced with the significant inflation threat and stifling globalization competition, governments worldwide is making every effort to prevent their economies from going into a recession and to stabilize financial markets. In the business sector, some of the frail firms seek to merge with potential acquirers with good financial performance to stay afloat. According to Thomson Financial, worldwide mergers and acquisitions (henceforth M&As) reached a record \$4.5 trillion in announcing deals in 2007, an increase of 24% over the previous record established in

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2006; merger activity in the financial sector accounted for 16% of the total merger activities in 2007.

Under the wave of globalization, factors involved in the M&A arena were extremely differentiated and complicated (Borah, Karabag and Berggren, 2015; Golbe and White, 1988; Madrick 1987; Larsson and Finkelstein, 1999; Larsson and Lubatkin, 2001). Lazaridis (2003) found more possible deregulation for interstate bank mergers in the U.S. than that during the merger mania of the 1980s. Changes in the financial services industry may be partially responsible for the rapid pace of consolidation, technological progress, enhanced financial condition, excess capacity and geographic deregulation (Berger et al., 1998 and 1999; Akhigbe and Martin, 2000). Many researches focusing on the topic of M&As indicate that banks not only penetrate new markets and realize the potential of economies, but also acquire financial power and prestige associated with large size (Benston et al., 1995), increase performance efficiency (Cornett and De, 1991; Berger and Humphrey, 1993; Holder, 1993), maximize shareholders wealth (Berger et al., 1999), and significantly defend established situation (Vennet, 1996).

In order for nations to be able to maintain their economic system properly, the supervision of the banking and financial industries have become especially crucial. Most researches on bank supervision have emphasized the new Basel Capital Accord (Basell II) and the external ratings currently dominated by the three nationally recognized agencies including Moody's, Standard and Poor's and Fitch.

M&A has obviously become one of the crucial means for expansion of the financial industry. A number of theoretical and empirical studies on financial M&As have been critically important in laying the groundwork for analyzing the effects of pre-M&As and/or post-M&As from the perspectives of synergy, acquisition announcements, risk mitigation, top management turnover, and management governance (Chin et al., 2004; Demers et al., 2003; Reuer et al., 2004; Datta et al., 1992; Walsh and Ellwood, 1991, Walsh, 1988 and 1989; Gupta and Gerchak, 2002; Hrop, 1999; Larsson and Finkelstein, 1999; Larsson and Lubatkin, 2001; Zollo and Singh, 2004).

The information efficiency of rating changes has been extensively studied, however fewer studies with regards to M&As have reported on the effects of prevailing supervision rates or banking rates. This paper is motivated by the fact that factors considered in this study may be also potent catalysts in bank rating changes in M&As. This study also looks at the possibility that assessment of pre- and post-M&A on rating actions may be a useful sensitivity check that may offer possible insights for financial markets authorities in the evaluation of the utilization of rating changes as a future regulatory tool. Accordingly, many parties are interested in the achievement and growth of financial industries M&A, regardless of the fact that the supervision rates play a significant role in carrying out the M&As. With the large numbers of bank and

thrift failures in the 1980s, on-site examinations emerged as the central component of government supervision on the safety and soundness of commercial banks. The U.S. Congress promptly enacted the Federal Deposit Insurance Corporation Improvement Act of 1991, in which nearly all U.S. banks were required to be subject to a comprehensive on-site examination at least annually (Wheelock and Wilson, 2005). On-site examinations can expose comprehensive information about the object's condition, but the performance cost is high.

By using the ordered logit model, this study investigates the assessment of pre- and post-M&A performance, which relies on the data of supervision rates collected monthly for the period of June 1989 to 2009 and comprised of acquiring banks and financial institutions worldwide. This paper evaluates whether supervision rates contain referable information for M&A achievement, through the CAMEL criteria presented by The Federal Deposit Insurance Corporation and used by regulators of financial institutions. CAMEL is an acronym for capital adequacy, asset quality, management, earnings and liquidity. The effectiveness of criteria has been theoretically and empirically proven by some studies like Person (1999) and Curry et al. (2008a), which utilized CAMEL criteria in assessing the financial and managerial performance of banks and financial institutions. CAMEL is an efficient way of measuring its financial and accounting integrity. Therefore, this study directly measured the five CAMEL dimensions of capital adequacy (C), asset quality (A), management (M), earnings (E) and liquidity (L).

The results of the ordered logit model broadly supported our proposed hypotheses, and some warning signs to financial institutions reviewing M&A decisions were shown. Research results revealed that CAMEL criteria were referable on pre-M&A for bank rating determination, while capital adequacy and liquidity were suggested for considering the M&A performance's economies of scale since capital soundness accelerated M&A accomplishment through the creation of synergy. Results of marginal effects show significant improvement in asset quality and management on M&As, especially for outperforming banks that illustrate stable growth on a ratings upgrade. Our study contributes to a better understanding of the relatively abundant financial institution M&As in the integration of CAMEL criteria factors.

2. Literature Review

M&A activities have a significant influence not just on the progress of both pre- and post-M&A procedures, but also on the success or failure of augmentation. Jemison and Sitkin (1986) indicated that the acquisition process recognized itself as a potentially important determinant of M&A activities. And according to the merger theory proposed by Uhlenbruck and Castro (2000), the integration and transformation process was the fundamental construct of a merger (Jemison and Sitkin, 1986; Lubatkin, 1983). Haspeslagh and Jemison (1991), D'Mello et al. (1999) and Chin et al. (2004) also asserted that the key differences between acquisition success and failure lied in understanding the acquisition process, ownership of the target firms, the types of transactions and governance structures that have profound influence on the organization.

Björkman and Söderberg (2006) and Margolis (2006) concentrated on large-scale M&As, and focused on the general causes of human resource and management issues.

Alternatively, researches on financial institutions had a similar focus on other motivations for financial institutions to undergo M&A. Cornett and Sankar (1991) and Benston et al., (1995) examined the media of payment and found that the price bid played important roles in acquiring the target bank in the early to mid-1980s. They found M&As to have the incentives of increasing the value of deposit insurance as an important consideration. Berger and Humphrey (1993), on the other hand, tested U.S. bank cost and profit functions and found that mergers have little effect on profitability and no significant predictable effect on efficiency. This is in contrast to the analysis of the European Community (EC) credit institutions, Vennet (1996) proved that M&A improves the performance of the institutions involved, and found significant operation efficiency and upward profit levels.

It is important to note, however, that M&A literatures were particularly focused on the characteristics of organizations, especially banks and financial institutions, and there are doubts whether it is advisable to utilize the CAMEL criteria in the M&A decision-making process. Data on bank ratings' issues were subjected to bank supervision due to the perceived soundness and accuracy of these agencies' ratings, in order to have a reliable projection of the outcome (Pasiouras et al., 2006; Mambrino, 2008; Gilbert et al., 2006; Wheelock and Wilson, 2005) and to minimize the chances of failure (Kupiec, 2007; Godlewski, 2007; Poon and Firth, 2005). By employing composite and component criteria CAMEL, Curry et al., (2008a) financial institutions were able to quantify the short-term and long-term impacts of bank supervision on different loan growths, and found that a systematic effect may not be avoided.

Whether or not CAMEL criteria are advisable for financial institution M&As is not provided by past literature. This study aims to add to our knowledge of the efficacy of utilizing CAMEL criteria on financial institution M&As. This paper also extends the empirical work on bank rating changes because it is the first to investigate M&A, a topic that has not been covered by previous literature.

3. The ordered logit model of bank ratings in M&As

This paper employed the ordered logit model to extend the empirical work on issues such as bond ratings and credit ratings to evaluate whether credit ratings contained referable information in terms of M&A achievement in the global banking sector (McCullagh (1980), Badu and Daniels, 1997; Chen, 2003). We compared coefficient estimates and marginal effects across different specifications and applied the ordered logit model with cross-sectional effects expressed as follows:

$$\begin{aligned}
Y_i^* &= x_i' \beta + \varepsilon, \\
Y_i &= 0, \text{ if } Y_i^* \leq z_1, \\
Y_i &= 1, \text{ if } z_1 < Y_i^* \leq z_2, \\
Y_i &= 2, \text{ if } z_2 < Y_i^* \leq z_3, \\
&\dots \\
Y_i &= M, \text{ if } Y_i^* > z_M,
\end{aligned} \tag{1}$$

where Y_i^* is a discrete-valued dependent variable of the unobservable measure of bank rating, and Y_i is the observed variable. x_i is a continuous-valued independent variable for a matrix of the bank i , while ε is a normal or standard logistic distribution that is normalized to a mean of zero and variance of one. The unknown “threshold” parameter, defined as the range of the observed dependent variable, is denoted by z , while the M category is ordered from the lowest to the highest are represented as $0 < z_1 < z_2 < \dots < z_M$. The probability function of Y_i can be expressed as follows:

$$Prob(Y_i = 1) = \Phi(z_1 - x_i' \beta) - \Phi(-x_i' \beta), \tag{2}$$

$$Prob(Y_i = 2) = \Phi(z_2 - x_i' \beta) - \Phi(z_1 - x_i' \beta), \tag{3}$$

$$Prob(Y_i = J) = 1 - \Phi(z_{j-1} - x_i' \beta), \tag{4}$$

where Φ denotes the standard normal density.

The ordered logit model with cross-sectional effects is estimated by expressing the cross-section and time series of credit ratings as follows:

$$\begin{aligned}
RATING_i^* &= \alpha_1 + \alpha_2 ETA_i + \alpha_3 ENL_i + \alpha_4 ETTA_i + \alpha_5 OETA_i + \alpha_6 ROAE_i + \alpha_7 EDSF_i + \\
&\alpha_8 NIM_i + \alpha_9 LATDB_i + \alpha_{10} CRN_i + \alpha_{11} SIZE_i + \alpha_{12} SIZESQ_i + \varepsilon_i,
\end{aligned} \tag{5}$$

where $RATING_i^*$ represents some unobserved measure of credit ratings associated with M&A activity and ε_i measures the white-noise residual and group specific term. Three observed values of discrete-valued dependent variables of ALL_i , OP_i and INV_i denote a linear cardinal measure of bank ratings. The ALL_i is defined as having a threshold value rating from zero to four and composed of ascendant ratings that consist of ratings of B or below, A , AA and AAA . Meanwhile, OP_i particularly deleted the lower value of net income. INV_i , based on the

investment level above *BB*, has a threshold value rating from zero to three, composed of ratings represented as *BB*, *BBB*, *A*, and *AA*.

$$ALL_i = \begin{cases} 0 & \text{if } RATING_i^* \leq B \\ 1 & \text{if } B < RATING_i^* \leq BB \\ 2 & \text{if } BB < RATING_i^* \leq BBB, \\ 3 & \text{if } BBB < RATING_i^* \leq A \\ 4 & \text{if } A < RATING_i^* \leq AA \end{cases}$$

$$OP_i = \begin{cases} 0 & \text{if } RATING_i^* \leq B \\ 1 & \text{if } B < RATING_i^* \leq BB \\ 2 & \text{if } BB < RATING_i^* \leq BBB, \\ 3 & \text{if } BBB < RATING_i^* \leq A \\ 4 & \text{if } A < RATING_i^* \leq AA \end{cases}$$

$$INV_i = \begin{cases} 0 & \text{if } B < RATING_i^* \leq BB \\ 1 & \text{if } BB < RATING_i^* \leq BBB \\ 2 & \text{if } BBB < RATING_i^* \leq A \\ 3 & \text{if } A < RATING_i^* \leq AA \end{cases}$$

For this study, the independent variables consist of a variety of financial indicators used to define the CAMEL criteria. These indicators include capital adequacy, asset quality, management, earnings, and liquidity. Miscellaneous factors of size and size square are illustrated in Table 1.

Table 1. Definitions of CAMEL criteria (dependent variables)

Criteria	Variable	Definition
C	ETA	Equity to total asset ratio.
	ENL	Equity to new loan ratio.
A	ETTA	Earnings to total assets.
M	OETA	Overhead expense to total assets.
	ROAE	Return on average equity.
E	EDSF	Equity to deposits and short term funding.
	NIM	Net interest margin.
L	LATDB	Liquid assets to total deposit and borrow.
	CRN	Current ratio.
Size factors	SIZE	Natural log of total assets.
	SIZESQ	Size * size.

This paper seeks to maximize a log likelihood function with respect to the threshold values formed below:

$$\ell(\beta, z) = \sum_{i=1}^N \sum_{j=0}^M \log(\text{Pr } ob(Y_i = |x_i, \beta, z)) \cdot \ell(Y_i = j), \tag{6}$$

where $\ell(\cdot)$ represents an indicator function that takes the value 1 if the argument is true, or 0 otherwise. In order to acquire the effect of change in the covariates of each independent variable on the cell M probabilities, the ordered logit model with marginal effects can be written as:

$$\frac{\partial \text{rob}(\text{cell}M)}{\partial x_i} = [f(z_{M-1} - \beta'x_i) - f(z_M - \beta'x_i)] \cdot \beta, \tag{7}$$

where $f(\cdot)$ represents the appropriate logistic density function, $A(z)/[1-A(z)]$ (Greene, 2002).

To evaluate each independent variable on the probability of bank rating changes, the marginal effect is estimated by holding both β and z constant. The probability of the normal logistic distribution of bank ratings will shift to the right with an additional unit increase in the independent variable x . Hence, the sign of highest ordered level remains unchanged after examining the marginal effects of the probability of bank ratings compared to the β signs. In contrast, the lowest ordered level of the probability of bank rating changes will have opposite β signs.

4. Data

The objective of this study is to evaluate the impact of M&A on bank rating changes. The paper provides some insights on the five categories of CAMEL criteria using available data of existing financial institutions while eliminating irrelevant data. Specifically, this work evaluates credit rating changes by comparing the cross-sectional data of a 1-year pre-M&A with the post-M&A performance. Appendix shows the extracted samples from 36,463 financial service institutions in the Bankscope’s database over the period of June, 1989-June, 2009.

In analyzing capital adequacy, Tirapat and Nittayagasetwat (1999) and Wheelock and Wilson (2005) showed that equity to total asset ratio was negatively related to the probability of financial distress and failure hazard for banks. According to the capital adequacy requirements imposed by the new capital framework (BASEL II) based on the total capital ratio (Tier 1 and Tier 2), the banks must maintain their regulatory capital and risk-weighted assets at a minimum of eight percent to defend against losses and risks of insolvency (Pasiouras et al., 2006). Ozkan-Gunay and Ozkan (2007) revealed that successful banks experienced a better performance with a lower ratio of non-performing loans to total loans. Likewise, González-

Hermosillo et al., (1997) found that a high ratio of non-performing loans to total loan was positively related to the likelihood of bank failure and negatively related to the expected survival time. We hypothesize that well-capitalized banks with higher ratio of equity to total asset and ratio of equity to new loans will probably help raise the credit ratings of banks with more diversification through M&A.

Gleason et al., (2006) claimed that efficient banks with higher total asset turnover ratio incurred lower assimilation costs and may thus increase the likelihood of an acquisition. However, Tirapat and Nittayagasetwat (1999) revealed that the ratio of retained earnings to total assets may have a negligible effect on the probability of financial distress. This study used the ratio of earnings to total assets to be a proxy variable for asset quality. We hypothesize that a decrease in the total asset turnover ratio will probably lead to a rating downgrade mainly due to weak performance caused by poor M&A activity.

Referring to the CAMEL quality of management, Lacewell et al., (2002) indicated that the overhead expense divided by average assets was negatively related to profit efficiency. In this article, the ratio of overhead to total assets is used as the proxy variable to measure the quality of management. We hypothesize that significant operational efficiency can enhance ratings and the reason for it may be related to cost-saving strategies for the M&A project.

For earnings, Pasiouras et al. (2006) explained that the earnings power was considered to be one of the main determinants of the long-term success or failure of banks. By analyzing the different impacts of bank size structure, Lacewell et al. (2002) found that the relationship between return on equity (ROE) and profitability ratio was positive especially for small and large banks. In addition, Ozkan-Gunay and Ozkan (2007) concluded that net income to equity ratio affected bank failure. We hypothesize that the coefficient of return on average equity, equity to deposit and short term funding, and net interest margin will probably have positive effects on credit ratings due to profit efficiency of M&A activities.

With regards to liquidity, Ozkan-Gunay and Ozkan (2007) used a non-linear Artificial Neural Network (ANN) to examine the financial indicators that could have predicted bank failure. They opined that lower ratio of liquid assets to total assets and ratio of liquid assets to deposit plus non-deposit funds for successful banks implied inefficiency. However, Lacewell et al., (2002) showed that banks may lower investment for the purpose of making favorable loans and increase their liquid assets as a result. However, this did not necessarily lead to weaker profit efficiency. Measuring the liquidity of a firm, Wang (2002) found that the current ratio enriched corporate market value. This study chooses the ratio of liquid assets to total deposit and borrowing, and current ratio to evaluate the liquidity effect. We hypothesize that a higher ratio of liquid assets to total deposit and borrowing, and the higher current ratio will probably lead to a lower possibility of hazard and higher profit efficiency, and thus result in an upgrade in the ratings.

Previous literature focused on the effects of non-financial variables, including size variable (SIZE) (natural log of total assets) on the bank failure probability (Abrams and Huang, 1987; Persons, 1999; Khorassani, 2000; Wheelock and Wilson, 2005). They proposed that an increase in size reduced the failure probability resulting from altering away credit risks through diversification of financial products, extra funds available, and cross-border expansions. To analyze any linear or non-linear effect, we expect that banks with larger asset size would experience lower probability of bank rating downgrades from M&A transactions.

5. Empirical Results

To examine effects of rating change among financial institution M&As, this paper used a qualified record of M&A dates with at least 1-year Fitch ratings on both pre-M&As and post-M&As. Data were then categorized into three different levels: the all levels (ALL), out performance level (OP), and investment level (INV). Table 2 shows the descriptive statistics of the dispersion between pre-M&A and post-M&A in the units based on the percentage of variables except for size. There are significant differences between pre-M&A and post-M&A for equity to net loan, return on average equity, and liquid asset to total deposits and borrowing. These results indicate that the profitability of M&A activities may lead to financial soundness and performance efficiency.

Table 2. Descriptive statistic of the main determinants of performance

Classification			Pre-M&A		Post-M&A	
	CAMEL Variable		Mean	S.D.	Mean	S.D.
C	ETA	Equity to total asset ratio.	9.51	8.56	8.91	4.93
	ENL	Equity to new loan ratio.	11.56	48.86	23.33	22.69
A	ETTA	Earnings to total asset.	0.01	0.03	0.01	0.02
M	OETA	Overhead expense to total asset.	0.03	0.02	0.04	0.03
	ROAE	Return on average equity.	14.46	9.07	18.60	36.29
E	EDSF	Equity to deposit and short term funding.	13.30	10.80	11.80	7.93
	NIM	Net interest margin.	5.20	5.04	5.22	4.75
L	LATDB	Liquid assets to total deposit and borrow.	17.32	15.63	21.41	18.60
	CRN	Current Ratio.	0.89	0.17	0.90	0.16
	SIZE	Natural log of total asset.	9.32	2.87	9.95	3.10

Table 3 lists the result of the estimated coefficients. The table contains six measured columns for the three-group samples of ALL in columns I and IV, OP in columns II and V, and INV in columns III and VI. To examine the group specific heterogeneity, the likelihood test rejects the null hypothesis with respective statistics values of 25.08, 36.30, 33.40 on pre-M&A and 24.31,

50.01, 43.73 on post-M&A which are greater than the critical value of $\chi^2(0.1,1)=24.72$. The best fit model indicates that all explanatory variables are jointly significant at given levels,

implying the acceptance of cross-sectional effect. The predictions of rating classifications are correctly predicted on pre-M&A, which are superior to those of post-M&A, and also compare favorably with previous researches of the ordered probit or the ordered logistic analyses (i.e. Peel et al., 1998; Chen and Chen, 2011). These bank ratings are all significant, clearly definable, and appropriate for uneven spacing intervals.

Table 3: The ordered logit with cross-sectional effect of pre-M&A and post-M&A

M&A Activities		Pre-M&A			Post-M&A		
		<i>ALL</i> (I)	<i>OP</i> (II)	<i>INV</i> (III)	<i>ALL</i> (IV)	<i>OP</i> (V)	<i>INV</i> (VI)
C	ETA	1.79*** (0.01)	1.63** (0.02)	1.78*** (0.01)	0.38 (0.38)	0.37 (0.47)	0.42 (0.46)
	ENL	-0.16** (0.02)	-0.29*** (0.01)	-0.14* (0.09)	-0.04** (0.03)	-0.04** (0.04)	-0.04 (0.19)
A	ETTA	178.61** (0.04)	52.19 (0.63)	186.16* (0.06)	-15.60 (0.64)	2.11 (0.96)	-71.85 (0.30)
M	OETA	134.43*** (0.01)	106.43** (0.05)	167.78*** (0.01)	-3.39 (0.88)	1.52 (0.95)	-27.45 (0.45)
	ROAE	-0.22*** (0.01)	-0.10 (0.37)	-0.19** (0.05)	-0.01 (0.94)	-0.01 (0.66)	0.04 (0.36)
E	EDSF	-1.11*** (0.01)	-0.81** (0.09)	-1.16*** (0.01)	-0.22 (0.51)	-0.26 (0.52)	-0.29 (0.52)
	NIM	-0.79*** (0.01)	-0.54* (0.07)	-0.86*** (0.01)	-0.17 (0.21)	-0.18 (0.18)	0.19 (0.42)
L	LATDB	0.01* (0.07)	0.01 (0.13)	0.01 (0.30)	0.01** (0.04)	0.01* (0.06)	0.01 (0.61)
	CRN	-11.99** (0.04)	-8.14 (0.21)	-9.68 (0.12)	-0.48 (0.88)	-1.31 (0.78)	0.14 (0.97)
Size	SIZE	-0.47 (0.18)	1.11 (0.40)	-0.03 (0.95)	2.13*** (0.01)	2.00** (0.02)	1.88** (0.05)
	SIZESQ	0.02 (0.18)	-0.04 (0.42)	-0.01 (0.96)	-0.09*** (0.01)	-0.08** (0.02)	-0.08** (0.03)
Major of fit:							
Likelihood Ratio Test		36.3*	33.4*	25.08*	50.01*	43.73*	24.31*
Percent correctly predicted		64.44%	65.00%	63.16%	50.00%	43.33%	56.86%

Notes: Variables: ETA, equity to total asset ratio; ENL, equity to new loan ratio; ETTA, earnings to total asset; OETA, overhead expense to total asset; ROAE, return on average equity; EDSF, equity to deposit and short Term funding; NIM, net interest margin; LATDB, liquid assets to total deposit and borrow; CRN, current ratio; SIZE, natural log of total asset; SIZESQ, size * size. Significance levels: * 0.05 < p < 0.10, **0.01 < p < 0.05, *** p < 0.01. Pseudo R=x²(0.01,1) =24.72.

The result of pre-M&A equity to total asset ratio (ETA), as expected, illustrate that sound capital adequacy contributes to the probability of bank ratings upgrade, but the result also implies that it is difficult to integrate different capital structures on post-M&A due to the burden of the target's finance (Akhavain et al., 1997; and Altubas et al., 2008). Results show the equity to new loan ratios on both pre-M&A and post-M&A are negative and statistically significant except for the insignificant estimation in column (VI). These suggest that overhead expense to total assets and the earnings of total asset have a significantly positive impact on the probability of pre-M&A credit ratings. The economic significance of these findings is that most banks may experience lower management quality since the prioritized cost reduction and lower asset efficiency could cause a downgrade in bank ratings (e.g. from A to BBB).

In other words, this may not be the main strategic advantage of M&A (Altunbas et al., 2008). The negative impact of return on average of equity (ROAE), equity to deposit and short funding (EDSF) and net interest margin (NIM) on pre-M&A is possibly attributed to the shifted resources toward improvement in profit efficiency associated with the scale of M&A after a disappointing earnings performance (Akhavain et al., 1997). However, a negligible impact is shown on the post - M&A activity (Chen, 2003; Altunbas et al., 2008). To capture the liquidity effect, the estimated results of the ratio of liquid assets to total deposit and borrowing (LATDB) show a significantly positive effect on M&A performance, illustrating that an increase of LATDB reduces the possibility of hazard and promotes higher profit efficiency, leading to a better credit rating. However, current ratio (CRN) only presents a significant effect on normal grade pre-M&A, reflecting risk diversification (Altunbas et al., 2008). As expected, the significant impact of quadratic size effect on post-M&A implies that economy of scale creates a higher probability of M&A synergy (Francis et al., 2008).

Table 4 shows the marginal effects for the explanatory variables of primary interest on the CAMEL criteria for the three groups of samples in both pre- and post-M&A activities. An increase in the ratio of equity to total asset (ETA) is associated with a decrease of 0.28 in the lower rating at the BB level. The estimated results indicate that equity to new loan ratio (ENL), return on average equity (ROAE) and liquid assets to total deposits and borrowing (LATDB) exhibit mixed signs, but negligible values for pre-M&A, while the positive effects of upgrade rating levels support our expectation that well-capitalized M&As probably accelerate diversification achievement. The higher value of earnings to total assets (ETTA) and overhead (OETA) also indicate that operational efficiency and quality management improve ratings at higher rating levels, and are associated with the cost-saving strategy.

The improvement of earnings to total assets may generate a rating increase and enhance M&A performance over pre-M&A. The equity of total asset reflects the negative effect on lower level ratings, but a reversal on the upgrade ratings for both pre-M&A and post-M&A. The lower ratio of equity to deposit and short term funding (EDSF), net interest margin (NIM)

and the current ratio (CRN) among the highest rating of A level appears to indicate that inefficient management results from poor pre-M&A leverage control and asset quality, but M&A could help improve this phenomenon, because resources could be shifted toward improving the profit efficiency associated with scale M&A.

Table 4: Marginal effects of variables on pre-M&A and post-M&A

Classification		Pre-M&A										
		ALL				OP				INV		
		(I)				(II)				(III)		
Criteria / Variables / Rating Levels	Y= BB	Y= BBB	Y= A	Y= AA	Y= BB	Y= BBB	Y= A	Y= AA	Y= BBB	Y= A	Y= AA	
C	ETA	-0.28	0.00	0.28	0.04	-0.27	0.04	0.23	0.04	-0.36	0.35	0.09
	ENL	0.03	0.00	-0.03	0.00	0.05	-0.01	-0.04	-0.01	0.03	-0.03	-0.01
A	ETTA	-28.09	0.40	27.54	4.37	-8.54	1.25	7.47	1.15	-37.39	36.64	9.61
M	OETA	-21.14	0.30	20.73	3.29	-17.41	2.55	15.24	2.35	-33.70	33.02	8.66
	ROAE	0.04	0.00	-0.03	-0.01	0.02	0.00	-0.01	0.00	0.04	-0.04	-0.01
E	EDSF	0.17	0.00	-0.17	-0.03	0.13	-0.02	-0.12	-0.02	0.23	-0.23	-0.06
	NIM	0.12	0.00	-0.12	-0.02	0.09	-0.01	-0.08	-0.01	0.17	-0.17	-0.04
L	LATDB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CRN	1.89	-0.03	-1.85	-0.29	1.33	-0.19	-1.17	-0.18	1.95	-1.91	-0.50
Size	SIZE	0.07	0.00	-0.07	-0.01	-0.18	0.03	0.16	0.02	0.01	-0.01	0.00
	SIZESQ	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00

Classification		Post-M&A										
		ALL				OP				INV		
		(IV)				(V)				(VI)		
Criteria / Variables / Rating Levels	Y= BB	Y= BBB	Y= A	Y= AA	Y= BB	Y= BBB	Y= A	Y= AA	Y= BBB	Y= A	Y= AA	
C	ETA	-0.05	0.00	0.06	0.02	-0.05	-0.01	0.06	0.03	-0.08	0.05	0.05
	ENL	0.01	0.00	-0.01	0.00	0.01	0.00	-0.01	0.00	0.01	0.00	0.00
A	ETTA	2.20	0.02	-2.38	-0.94	-0.31	-0.03	0.33	0.16	13.20	-8.80	-8.86
M	OETA	0.48	0.00	-0.52	-0.20	-0.22	-0.02	0.24	0.11	5.04	-3.36	-3.39
	ROAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00
E	EDSF	0.03	0.00	-0.03	-0.01	0.04	0.00	-0.04	-0.02	0.05	-0.04	-0.04
	NIM	0.02	0.00	-0.03	-0.01	0.03	0.00	-0.03	-0.01	-0.04	0.02	0.02
L	LATDB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CRN	0.07	0.00	-0.07	-0.03	0.19	0.02	-0.20	-0.10	-0.03	0.02	0.02
Size	SIZE	-0.30	0.00	0.33	0.13	-0.29	-0.03	0.31	0.15	-0.35	0.23	0.23
	SIZESQ	0.01	0.00	-0.01	-0.01	0.01	0.00	-0.01	-0.01	0.02	-0.01	-0.01

Comparing the marginal effect of earnings to total assets (ETTA) and overhead (OETA) on all group samples at higher rating grades in pre-M&A activities with that of pre-M&As, identical results are seen in the group samples of the outperformance level (OP). However, an inverse result is demonstrated in the two group levels of all level (ALL) and investment level (INV). These results are similar to our hypothesis, which states that cost-saving strategy from M&A is derived from significant operation efficiency represented by improved ratings. Especially, the pre-M&A and post-M&A OP results demonstrate that efficient overhead management is crucial for maintaining higher ratings. The results clearly show that financial institutions with A or above ratings in post-M&A possess economies of scale.

The results of this paper demonstrate that most factors have a negligible effect on post-M&A bank rating changes except for the mixed results in asset and management quality. This implies that there may be difficult for financial institutions to achieve M&A synergy even with better managerial performance and capital adequacy. Also, financial institutions with higher rating levels manage to improve operational efficiency and management quality due to a cost-saving strategy.

6. Conclusion

This study employed the ordered logit model to evaluate whether credit ratings offer referable information for M&A achievement in the global banking sector. We compared CAMEL criteria and the marginal effects of various factors and estimated the different standards for both pre-M&A and post-M&A.

The results from the descriptive analysis indicate that capital adequacy contributes to the probability of bank ratings upgrade and accelerates M&A performance, but also points to the difficulties of integrating pre-M&A capital structures due to the burden of the target's finance. ETTA, as a proxy variable of asset quality, demonstrates a positive impact on the probability of the credit ratings upgrade and acceleration of M&A performance. The positive impact of OETA, a proxy variable of management quality, indicates that favorable pre-M&A credit ratings is associated with cost saving strategy, but a lower post-M&A OETA implies that most banks experience a lower quality of management due to a priority in cost reduction prior to the M&A. As expected, the positive effect of quadratic size significantly relates to the ratings upgrade of M&A accomplishment and creating an economy of scale. Results of marginal effects explain the intuitively expected direction. Also, because significant changes are observed post-M&A, the CAMEL criteria proposed by this study is supported. One reasonable interpretation is that the diversification of M&As accelerates the improvement of capital soundness and superior leverage management. A finding that is consistent with financial M&A studies, especially that the outperforming M&A activity is considerably related to the scale of M&A.

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APPENDIX:**Financial service institutions in 1 year pre- and post-M&A performance**

Name of financial institution	year	Rating	Name of financial institution	year	Rating
Aareal Bank AG	2006	BBB+	Banco Popular North America	2005	A
Abanka Vipac dd	2002	BBB-	Banco Provincial	2000	B-
Ahli United Bank BSC	2005	BBB+	Banco Santander SA	1999	BBB-
Amegy Bank National Association	2007	BBB	Banesto Banco Universal CA	2002	B-
Associated Bank NA	2007	A-	Banistmo-Primer Banco del Istmo SA	2003	BBB+
Banco Agricola	2001	BB	Bank Audi SAL - Audi Saradar Group	1998	B+
Banco BHD	2001	D	Bank CenterCredit	1998	B+
Banco Bradesco SA	2004	B+	Bank Danamon Indonesia Tbk	1999	BB
Banco de Credito del Peru	2003	BB-	Bank Dhofar SAOG	2003	BBB
Banco de la Produccion S.A.	2000	A	Bank Hapoalim BM	2003	A-
Banco de Venezuela, S.A.C.A.	2002	B	Bank Mandiri (Persero) Tbk	1999	AA
Banco Dominicano del Progreso SA	2000	AAA	Bank Muscat SAOG	1999	BBB+
Banco Espanol de Credito SA	2004	AA-	Bank of Hawaii	1998	BBB+
Banco Industrial S.A.	2006	BB-	Bank of the West	2005	A+
Banco Macro SA	2003	B+	Bank of Valletta Plc	2001	A
Banco Mercantil del Norte S.A.	2002	BBB-	BankAtlantic, FSB	2002	BB+
Banco Nacional de Mexico, SA	2001	BBB	Banque Espirito Santo et de la Venetie	2002	A-
Banco Occidental de Descuento	2002	B+	Banque Populaire Centre-Atlantique	2003	AA-
Banque Populaire d'Alsace	2003	AA	EFG Bank	2003	BBB+
Banque Populaire des Alpes	2001	AA-	Fifth Third Bank	2000	AA+
Banque Populaire Lorraine	2002	AA-	HSBC Mexico, SA	2003	A+
Champagne					
Banque Populaire Occitane	2006	AA	Huntington National Bank	2007	A
BBVA Bancomer S.A.	2000	BB+	ICICI Bank Limited	2003	BB+
Branch Banking and Trust Company	2001	A+	Intercontinental Bank Plc	2005	A
BRE Bank SA	2003	BBB+	JP Morgan Chase Bank, NA	2001	A+
BTA Bank JSC	1997	BB+	Kaspi Bank	1997	B
Byblos Bank S.A.L.	1997	BB-	Kazkommertsbank	1994	B+
Cajasol-Monte de Piedad y Caja de Ahorros San Fernando de Huelva	2007	A-	Korea Exchange Bank	2004	BBB-
California Bank & Trust	1998	AA	Malayan Banking Berhad - Maybank	2001	A-

(continue)

Name of financial institution	year	Rating	Name of financial institution	year	Rating
Cathay Bank	2008	BBB-	Manufacturers and Traders Trust Company	2003	A
Central Pacific Bank	2005	BBB+	Marfin Egnatia Bank SA	2007	BBB
Ceskoslovenska Obchodni Banka - CSOB	2000	A+	Mercantil C.A. Banco Universal	2001	BB-
Chase Bank USA, NA	2007	A+	Mizuho Bank	2002	A
DBS Bank (Hong Kong) Limited	2003	A+	Mizuho Trust & Banking Co., Ltd	2003	BBB+
Deutsche Genossenschafts-Hypothekenbank DG	2002	A	Nishi-Nippon City Bank Ltd (The)	2004	BBB-
Deutsche Postbank AG	2000	A+	Nova Ljubljanska Banka d.d.-NLB dd	2001	BBB+
DZ BANK International S.A.	2001	A-	Ocean Bank	2007	A-
OTP Bank OJSC	2006	A+	UBS AG	1998	AAA
Punjab National Bank	2003	BBB-	Uniao de Bancos Brasileiros UNIBANCO	2002	BBB
Republic Bank Limited	1997	BBB-	United Bank for Africa Plc	2005	AA-
Samba Financial Group	1999	A	United Bulgarian Bank - UBB	1993	BBB
Scotiabank El Salvador SA	2005	BB+	URSA Bank	2006	B
Slovak Savings Bank-Slovenska sporitel'na as	1999	A-	Venezolano de Credito SA, Banco Universal	2002	B-
State Bank of India	2008	BB+	Wells Fargo Bank Northwest, NA	1996	A
T.C. Ziraat Bankasi A.S.	2001	B+	Wüstenrot Bausparkasse AG	2001	A-
Taiwan Cooperative Bank	2006	BBB	Zagrebacka Banka dd	2003	BBB-
The Bank	2007	A			

Note: The list of financial service institutions used in this study is extracted from Bankscope's original database of 36,463 institutions for which the information on both M&A and long-term Fitch rating is available.