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AN ANALYSIS OF MACROECONOMIC DETERMINANTS OF COMMERCIAL BANKS PROFITABILITY IN MALAYSIA FOR THE PERIOD 1995-2011

Mirza Vejzagic

Finance lecturer, Limkokwing University of Creative Technology Malaysia and Ph.D. candidate, International Centre for Education in Islamic Finance, Malaysia

Hashem Zarafat

Finance lecturer, Limkokwing University of Creative Technology Malaysia and holds Master of Business Administration with concentration in Finance, Multimedia University, Malaysia

ABSTRACT

This paper investigates the macroeconomics factors that stimulate banks' profitability. A standard regression model is used to identify macroeconomics determinants that significantly contribute to profitability, expressed through return on assets (ROA), of commercial banks in Malaysia. The determinant factors under consideration are real gross domestic product growth, inflation (expressed through consumer price index), and real interest rates. The paper incorporates seven banks, namely, CIMB, Public Bank, Maybank, Affin Bank, RHB Bank, Alliance Bank and Hong Leong Bank for the period 1995 to 2011. In order to present research in most accurate way, the paper looked into the relationship between profitability of all banks (expressed through mean of ROAs), as well as every single individual bank, with mentioned macroeconomic determinants. Model demonstrated overall significance for mean of all banks, and three individual banks, namely, Maybank, Public Bank and Hong Leong Bank. Findings show that for mean of all banks, as well as Maybank, Public Bank and Hong Leong Bank, real GDP is significant and have positive relationship with confidence level of 1% and 5%. This paper illustrated that in Malaysian case, inflation (CPI) is not significant for mean of all banks and Maybank. On the contrary, for Public Bank and Hong Leong Bank inflation (CPI) is significant, with negative relationship. Lastly, the outcomes of this paper exemplified that in Malaysia real interest rate has no relation with banks' profitability. From the empirical estimation, it is suggested that for the banks' profitability the growth of gross domestic product must be in place in order to stimulate lending and borrowing activities. In addition, it is proposed that for the banking sector in order to preserve on profitability, the anticipation of inflation must be in place to shelter revenue and reduce cost of the banks.

Keywords: Banking, Profitability (ROA), Gross domestic product, Inflation rate, Interest rate

1. INTRODUCTION

Profit is the foremost motive for everyone to put an immense effort and make the business successful, since profit is a central source of (re) investment funds. When it comes to banking sector, the importance of banks' profitability can be appraised at the micro and macro levels of the economy (see for instance, (Bourke, 1989; Chaudhry *et al.*, 1995; Kosmidou *et al.*, 2007; Kosmidou, 2008). Accordingly, numerous studies have investigated determinants of bank profitability and banks performance in domestic and foreign markets in various countries around the world (Saunders and Schumacher, 2000; Williams, 2003; Staikouras and Geoffrey, 2004; Chantapong, 2005; Kosmidou *et al.*, 2007; Kosmidou *et al.*, 2008; Kosmidou and Zopounidis, 2008). In Malaysia, the banking sector had experienced immense and impressive structural changes in order to remain more competitive in the Asian financial industry and to be more resilient to various external shocks. In recent times, research has focused on the impact of external macroeconomic factors on bank performance and profitability determinants (e.g., (Guru *et al.*, 1999; Rasiah, 2010; Mohd and Tumin, 2011). Bank profitability is expected to be receptive to macroeconomic control variables. At the macro level, a sound and profitable banking sector is better able to withstand negative shocks and contribute to the stability of the financial system (Saunders and Schumacher, 2000; Yu and Gan, 2010).

This paper attempts to investigate the impact of macroeconomic determinants on banks' profitability in Malaysia. In other word, this study aims to explore the nature of relationship between the profitability of banks in Malaysia expressed through Return on Assets (ROA) and the three major macroeconomic variables, i.e. Real GDP growth rate, Inflation which is expressed through Consumer Price Index, and Real Interest Rates. The paper incorporates seven banks, namely, CIMB, Public Bank, Maybank, Affin Bank, RHB Bank, Alliance Bank and Hong Leong Bank during the period 1995 to 2011. In order to present research in most accurate way, the paper will look into the relationship between profitability of all banks (expressed through mean of ROAs for these seven banks), as well as three single individual banks, with mentioned macroeconomic determinants.

2. OBJECTIVES OF RESEARCH

The objective of this paper is to clearly identify significant macroeconomic determinants of commercial banks profitability in Malaysia for the period 1995-2011. Furthermore, it will examine how the macroeconomic factors contribute to the variation in commercial bank profitability over specific time in Malaysia. Lastly, this study will try to show which particular banks' profitability is mostly affected by the variations in macroeconomic factors that are not under the control of bank management.

3. LITERATURE REVIEW

Extensive literatures have previously investigated the link between bank profitability which is commonly expressed by either Return on Assets (ROA) or Return on Equity (ROE) and macroeconomics variables which generally comprise real GDP growth, inflation (i.e., price level

changes), and interest rates (Demirgüç-Kunt and Huizinga, 1999; Aburime, 2008; Athanasoglou *et al.*, 2008; Sufian and Chong, 2008; Alexiou and Sofoklis, 2009; Sufian, 2009; Sufian and Habibullah, 2009; Sufian and Habibullah, 2010; Ramadan *et al.*, 2011). These studies are frequently carried by monetary authorities and they are usually observing to what extend and how important are influence of external determinants on banks' performance and profitability. Examination of potential macroeconomics determinants as factors of bank profitability generally involves the application of different types of regression analysis, time series analysis, composite character and range of data applied by researcher (see, for instance, (Goddard *et al.*, 2004; Sufian and Habibullah, 2009; Sufian and Habibullah, 2010).

One of the earliest studies that examined relationship between bank profitability and macroeconomic variables were conducted by Molyneux and Thornton (1992). They looked into economic growth as *"primary"* indicator of bank profitability, while taking into account the importance of interest rates and inflation. Economic growth should increase bank profits through enhanced demand for household and business loans. These loans generate good returns to commercial banks, ensuing higher profits. An additional similarly significant reason why profits increase with economic growth is that smaller numbers of loans defaults occur during stage of strong growth (Molyneux and Thornton, 1992). In addition, they elaborated that interest rate movements are assumed to correlate with banks' profits. In most cases, banks rely profoundly on short-term deposits as a source of funds. The interest paid on the deposits varies in accordance with the interest rates set by the European Central Bank (ECB), which in turn are closely linked to inflationary expectations. The findings of their study also indicate that there is a significant, positive relationship between interest rates and bank's profitability. While Molyneux and Thornton (1992) study was mainly elaborating impact of economic growth and interest rates on bank profitability, empirical evidence from cross-country studies by Demirgüç-Kunt and Huizinga (1999) suggest that inflation improves bank profitability. They confer that the positive relationship between inflation and the bank profitability implies that bank income during inflation increases more than bank costs. High inflation rates are also commonly related to high loan interest rates, and consequently, high incomes. Banks also attain higher earnings from floats or delays in crediting customer accounts in an inflationary environment. However, if inflation is unanticipated and banks are sluggish in adjusting their interest rates, then there is a possibility that bank costs may increase faster than bank revenues and hence adversely affect bank profitability (Demirgüç-Kunt and Huizinga, 1999; Tan and Floros, 2012).

Even though majority of prior studies carried on correlation between bank profitability and macroeconomic determinants have propensity to be positively related, the study carried by Naceur (2003) indicated otherwise. He investigated the effect of bank's characteristics, financial structure and macroeconomic indicators on bank's net interest margins and profitability in the Tunisian banking industry for the 1980-2000 period. The measurements of bank's profitability were ROA and ROE as dependent variables. The study used inflation and GDP per capita growth as macroeconomic measures which represented explanatory variables. What was exceptionally interesting in his findings is that the macroeconomic indicators i.e. inflation and growth were

insignificant in both spread and profit regressions. According to him, this may suggest that banks tend to not profit in inflationary environment. In addition, growth does not reflect any aspects of banking regulations, while technology advances in the banking sector were omitted from the regressions. Pasiouras and Kosmidou (2007) conducted a research to study and to compare the performance of domestic and foreign banks operating in the 15 European Union countries over the period 1995–2001. They used return on average assets (ROAA) to evaluate bank's performance and bank's total assets, the cost to income ratio, the ratio of equity to assets and the ratio of bank's loans divided by customers and short term funding as the internal factors. For the external factors, they used gross domestic product growth and inflation to evaluate the macroeconomic conditions. According to their findings, GDP growth is a measure of economic activity of a country. Higher economic growth encourages banks not only to lend more and permits them to charge higher margins, but also to improve the quality of their assets. They found a positive relationship between real GDP and the bank profitability, as well as between inflation and bank profitability Pasiouras and Kosmidou (2007). In a nutshell, an evaluation of previous research on the correlation between bank profitability and macroeconomics variables normally provide support to the theoretical framework which advocates a high relationship between them, and therefore making macroeconomic variables important for determining bank profitability. However, taking into account latest findings of the impacts related to anticipation of inflation, as well as suggestions that interest rate spread or margin should be used as explanatory variable in place of just market interest rates (Guru *et al.*, 1999), it is of the essence that forthcoming research have to address several others related issues such as expectation of price differential on the global level, interest rate spread, the role of central bank in exchange rate and money supply as well as to take in consideration latest economics and financial crises.

4. EMPIRICAL APPROACH AND DATA

4.1. Specification of Empirical Model

Research has previously used linear regression and correlation analysis by Ordinary Least Squares (OLS) to pinpoint the relationship between bank profitability (ROA) and independent variables namely, real GDP growth (RGDP), inflation, i.e. consumer price index (CPI), and real interest rate (RINT). In a linear regression setting, dependent variable Y (endogenous) is denoted as ROA, while the independent variables X1, X2 and X3 are denoted as RGDP, CPI and RINT.

$$ROA_t = \alpha + \beta 1 RGDP_t + \beta 2 CPI_t + \beta 3 RINT_t + \varepsilon_t$$

where α represents intercept, β represents slope coefficient, while ε represents error term.

4.2. Expected Relation

Real gross domestic product (GDP) growth is among the most commonly used macroeconomic indicators, as it is a measure of total economic activity within an economy. The real GDP growth used in this study is expected to have a positive impact on bank profitability in the line with the literature (e.g., (Pasiouras and Kosmidou, 2007). Inflation, expressed here through consumer price index (CPI), is another important macroeconomic indicator. Even though there were studies

supporting the significant positive or negative relationship between inflation and bank profitability (e.g., (Demirgüç-Kunt and Huizinga, 1999), Naceur (2003) research showed that inflation is insignificant for bank profitability. Therefore, in this study, relation is expected to be uncertain and dependable on the analyzed results. As for the interest rate, according to previous studies, the relation between the interest rate and bank profits is expected to be positive. Molyneux and Thornton (1992), for example, indicated that bank profits increases as interest rate rises. Accordingly, Demirgüç-Kunt and Huizinga (1999) demonstrated the link between real interest rates and profitability. This study will further explore the relationship between bank profitability and the real interest rate.

4.3. Estimation Method

The estimation method used for this research is the least square estimation, i.e. the estimation of β1, β2 and β3 by minimizing the sum of the error square.

4.4. Data Time Period, Number of Observation, Source

This study covers time period between 1995 and 2011. The frequency of data is annual, which is in total 17 observations. All data used in this study are derived from World Data Bank (World Development Indicators & Global Development Finance), Bank Negara Malaysia (web site of Central Bank of Malaysia) and BankScope (world banking information source).

4.5. Definition of Each Variable

Return on Asset (ROA) is a ratio computed by dividing the net income over total assets. ROA has been used in most banks' performance studies. ROA measures the profit earned per dollar of assets and reflect how well bank management use the bank's real investments resources to generate profits. Real GDP growth is annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.[1] Economic growth (RGDP), which is measured by the real GDP growth rate, is assumed to affect banking profitability positively. This is because the default risk is lower in upturns than in downturns. Besides, higher economic growth may lead to a greater demand for both interest and non-interest activities, thereby improving the profitability of banks.

Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.[2] Inflation is associated with higher costs as well as higher income. If a bank's income rises more rapidly than its

[1] World Data Bank (World Development Indicators & Global Development Finance)

[2] World Data Bank (World Development Indicators & Global Development Finance)

costs, inflation is expected to exert a positive effect on profitability. On the other hand, a negative coefficient is expected when its costs increase faster than its income. Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.[3] In the essence of lend-long and borrow-short argument, banks, in general, may increase lending rates sooner by more percentage points than their deposit rates. In addition, the rise in real interest rates will increase the real debt burden on borrowers. This, in turn, may lower asset quality, thereby inducing banks to charge a higher interest margin in order to compensate for the inherent risk.

5. RESULTS

5.1. Descriptive Statistic

	ROA								Independent Variables		
Statistic	All Banks (mean)	Affin Bank	Alliance Bank	CIMB	Hong Leong	Maybank	Public Bank	RHB Bank	RGDP	RINT	CPI
Mean	0.944	0.529	0.844	0.83	1.026	1.082	1.467	0.833	5.088	3.7015	2.618
Median	0.978	0.78	0.94	0.85	1.1	1.23	1.49	0.75	5.848	3.296	2.662
Maximum	1.457	1.94	1.8	1.23	1.5	1.45	2.1	1.27	10.002	12.871	5.44
Minimum	0.095	-4.16	-0.86	0.28	0.19	0.1	0.21	0.1	-7.359	-3.857	0.583
Std. Dev.	0.331	1.339	0.574	0.332	0.308	0.402	0.408	0.336	4.319	4.14	1.38

The table above shows that the average ROA for the selected Malaysian commercial banks during the study period is 0.944 with the minimum of 0.095 and the maximum of almost 1.45. The standard deviation statistics is 0.331 which indicates that there is variation of the profitability between the selected banks. When it comes to individual bank profitability the highest mean has Public Bank, 1.46, while the lowest Affin Bank with 0.529. Maximum is recorded by Public Bank 2.1, while minimum by Affin Bank, -4.16. Standard deviation is highest for Affin Bank, 1.339, and lowest for Hong Leong Bank, 0.308. Considering independent variables, the mean for real GDP growth is 5.84%, with max growth reaching 10% and contraction of negative 7.35%. Standard deviation is 4.32. In other hand, for real interest rate mean is 3.7%, with max of 12.8% and minimum negative 3.8%. Standard deviation is 4.14. Lastly, inflation mean is 2.618%, with maximum rise in price recorded 5.44% and minimum 0.583%. Standard deviation is 1.38.

[3] World Data Bank (World Development Indicators & Global Development Finance)

5.2. Regression Results[4]

		Individual Bank						
Independent Variable	**All Banks (Mean)**	**Affin**	**Alliance**	**CIMB**	**Maybank**	**Public Bank**	**RHB Bank**	**Hong Leong B.**
C	0.4935**	-1.3959	0.2603	0.423	0.8581***	1.5219***	0.6065*	1.1864***
	(0.0454)	(0.2279)	(0.5952)	(0.1642)	(0.0002)	(0.000)	(0.0758)	(0.0001)
RGDP	0.0583***	0.1330	0.0665*	0.0359	0.0711***	0.055**	0.0145	0.0316*
	(0.0033)	(0.1211)	(0.0780)	(0.1090)	(0.0001)	(0.0101)	(0.5344)	(0.0562)
CPI	0.0468	0.4281	0.0214	0.066	-0.011	-0.1239*	0.0540	-0.1074**
	(0.3748)	(0.1133)	(0.8472)	(0.3322)	(0.776)	(0.0506)	(0.4655)	(0.0413)
RINT	0.0085	0.034	0.051	0.0139	-0.0293**	-0.0027	0.0030	0.0107
	(0.6356)	(0.6998)	(0.1988)	(0.5476)	(0.0436)	(0.8912)	(0.9045)	(0.5235)
R-squared	0.5159**	0.2723	0.2568	0.2025	0.8165***	0.5938***	0.0628	0.5131**
	(0.0207)	(0.2325)	(0.2616)	(0.3840)	(0.0000)	(0.0069)	(0.8312)	(0.0214)
No. of Observation	17	17	17	17	17	17	17	17

*Significance at 0.10 level

**Significance at 0.05 level

***Significance at 0.01 level

5.3. Diagnostics Statistics

Given the regression table which showed that overall significance (R-squared) was evident only for the mean of all banks, as well as three individual banks, namely Maybank, Public Bank and Hong Leong Bank, study will run the diagnostic test for mentioned significant four models.

	All Banks	**Maybank**	**Public Bank**	**Hong Leong B.**	**Conclusion**
Skewness	-0.531	-0.46	0.02	-1.008	Close to 0
Kurtosis	3.739	2.515	2.927	3.25	Approx 3
JB test	1.187* (0.552)	0.768* (0.681)	0.005* (0.997)	2.92* (0.231)	*Normally Distributed
LM test	LM (2) 3.357123* (0.1866)	LM (2) 5.814478 (0.0546)	LM (2) 1.696194* (0.4282)	LM (2) 0.454322* (0.7968)	*Non Autocorrelation
White test	10.18159 (0.0171)	2.735585* (0.4342)	1.139695* (0.7675)	0.616192* (0.8927)	*Homoskedasticity
RESET	RESET [2] 0.366519* (0.7013)	RESET [2] 9.321107 (0.0043)	RESET [2] 2.832744* (0.1018)	RESET [2] 1.659217* (0.2345)	*Correctly Specified
ARCH	ARCH (1) 0.178953* (0.6723)	ARCH (1) 0.057116* (0.8111)	ARCH (1) 0.102829* (0.7485)	ARCH (1) 0.163272* (0.6862)	*Error variance is not auto corrected
CUSUM CUSUMSQ	5% significance* (no breaks)	5% significance* (no breaks)	5% significance* (no breaks)	5% significance* (no breaks)	*Parameters are structurally stable

*p-value>0.1, therefore Ho cannot be rejected.

[4] As presented in regression table above, it can be concluded that model is statistically significant (R-Square) for mean of all banks at 5% confidence level, as well as for three individual banks, namely, Maybank (1%), Public Bank (1%) and Hong Leong Bank (5%). However, the model is insignificant for other four banks. Therefore, from here on in, the paper will consider only banks for which model is significant, i.e. mean of all banks, Maybank, Public Bank and Hong Leong Bank.

In testing normality, Jarque-Bera test shows that the error terms for all banks as well as the three individual banks are normally distributed (For detailed information please refer to appendix A). For testing Autocorrelation Breusch-Godfrey Serial Correlation LM tests is used. As the presented table indicates that the probabilities of F statistics for the mean of all banks as well Public Bank and Hong Leong Bank are above 0.10 with 2 lags, which mean we cannot reject the null hypothesis and accept that the error terms are not auto correlated. (For detailed information please refer to appendix B)[5].

As can be observed in presented table the White test for Heteroskedasticity for the mean of all banks is Heteroskadastic, i.e. the P-value of the chi square is 0.0065, what is less than 0.10. Therefore Ho is rejected[6]. In contrast, for all individually observed banks the null hypothesis are in the error term Homoskadastic and cannot be rejected as the P-values of chi-square statistic are higher than 0.10. (For detailed information please refer to appendix C). For Ramsey's Mis-specification test, RESET, the table shows that the P-value for the mean of all banks, as well as Public Bank and Hong Leong Bank is greater than 0.10, hence the Ho cannot be rejected and we can conclude that models have been specified correctly. In contrast, for the Maybank the P-Value is less than 0.10, hence Ho can be rejected, and model has not been specified correctly. (For detailed information please refer to appendix D). In the case of ARCH test, Chi-square values for the mean of all banks as well as every individual bank is higher than 0.10, hence we cannot reject the null hypothesis that states the error variance is not auto corrected. (For detailed information please refer to appendix E). The charts presented in appendix F, for CUSUM and CUSUMSQ test[7], have provided us the results which shows that there is small break for mean of all banks in the structure in 2008 but is soon back within the significance level as the alpha and beta have been restored to normal. Other than the one outlier that shows slight crossing of the 5% significance line we assume the structure to be stable with 95% confidence.

6. DISCUSSION OF THE RESULTS

As it was mentioned earlier, the results obtained from regression table showed that model as whole is significant for mean of all banks at 5% confidence level, as well as for three individual banks, namely, Maybank (1%), Public Bank (1%) and Hong Leong Bank (5%). For other four banks the model is insignificant. Therefore, the paper will discuss the results only for banks for which model is significant, i.e. mean of all banks, Maybank, Public Bank and Hong Leong Bank.

[5] Table shows that there is autocorrelation in case of Maybank. The remedy for autocorrelation issue is application of Newey-West methods.

[6] The remedy for heteroskedasticity is application of White correction method.

[7] For detailed information please refer to appendix F.

Overall Performance and Overall Significance

	Observation 17 R-squared	Adjusted R-squared	F-Statistic	Prob. of F-statistic
All Banks (Mean)	0.5159**	0.4042	4.6183	0.0207
Maybank	0.8165***	0.7742	19.2874	0.0000
Public Bank	0.5938 ***	0.5000	6.3353	0.0069
Hong Leong B.	0.5131 **	0.4007	4.5668	0.0214

*Significance at 0.10 level

**Significance at 0.05 level

***Significance at 0.01 level

R-Squared suggests goodness of the fit which means how much of the dependant variables movements can be explained by the independent variables in the study. Taking into consideration table above we can see that R-Squares for the mean of all banks and Hong Leong Bank is quiet similar, 0.515 and 0.513 or approximately 51.5% which means that 51.5% of the bank's profitability (ROAs) can be attributed or explained by the variables specifically real GDP growth rate, inflation (consumer price index), and interest rate. When it comes to Public Bank, nearly 60% of ROA can be explained by the explanatory variable. Lastly, the highest R-Square has Maybank, 0.8165, which indicates, that in the case of this bank, 81.65% of bank profitability can be explained by the model, which includes real GDP growth rate, interest rate, and consumer price index or inflation as the independent (explanatory) variables.

Adjusted R-Square just gives us the corrected R-Square when there are many equations but in this paper there is only one equation hence the use of adjusted R-Square is irrelevant. In presented regression there are F-statistics of 4.6183 and 4.566 for the mean of all banks and Hong Leong Bank respectively, and P-values of 0.0207 and 0.0214 correspondingly, which means that with 95% confidence level can be assumed the above statement to hold true for the mean of all banks and Hong Leong Bank. In other hand, the F-statistics for the Public Bank and Maybank are 6.335 and 19.287 respectively, with P-values of 0.0069 and 0.0000 correspondingly, which means with 99% confidence level we can believe that for Public Bank and Maybank the above statement to hold true.

Individual Coefficients/Interpretations

	Coefficients (Probabilities) C	RGDP	CPI	RINT
All Banks (Mean)	0.4935** (0.0454)	0.0583*** (0.0033)	0.0468 (0.3748)	0.0085 (0.6356)
Maybank	0.8581*** (0.0002)	0.0711*** (0.0001)	-0.011 (0.776)	-0.0293** (0.0436)
Public Bank	1.5219*** (0.0000)	0.055** (0.0101)	-0.1239* (0.0506)	-0.0027 (0.8912)
Hong Leong	1.1864*** (0.0001)	0.03165* (0.0562)	-0.1074** (0.0413)	-0.0107 (0.5235)

Significance at 0.10 level
**Significance at 0.05 level
***Significance at 0.01 level

Based on table presented above for mean of all banks the equation will be:

ROAt = 0.4935 + 0.0583RGDPt + 0.0468CPIt + 0.0085RINTt + εt; where RGDP is significant at 1% ($p<\alpha$; 0.0033<0.01), while CPI and RINT are not significant. Real GDP growth rate "RGDP" has the expected positive relationship with the bank profitability (ROA). More precisely, as the real GDP rises by 1% there will be an increase in the all bank profitability (ROA) by 0.05%, and the study assumes this relationship with 99% confidence level as the p value is 0.0033. Even though economic theory suggests that there should be relationship between ROA and inflation (CPI) as well real interest rates, like for instance in the case of individual banks which will be apparent later in paper, for model comprising mean of all banks study found that they are statistically insignificant although they have expected signs.

Alternatively, For the Maybnak the equation states that :

ROAt = 0.8581 + 0.0783RGDPt - 0.011CPIt - 0.0293RINTt + εt; where RGDP is significant at 1% ($p<\alpha$; 0.0001<0.01), RINT is significant at 5% ($p<\alpha$; 0.0436<0.05), while CPI is not significant. Similar to the case of all banks, as the real GDP rises by 1% there will be an increase in the Maybank profitability (ROA) by 0.07%, and we can assume this relationship with 99% confidence level as the p value is 0.0000. However, in case of Maybank, real interest rate is also significant, with negative relationship. More precisely the model forecasts that any increase in real interest rates will contribute to a decrease in Maybank profitability, as the coefficient has a negative sign on it -0.0293 and is significant at the 0.05 level. For Maybank too, inflation is not significant.
As for the Public Bank the equation shows that:

ROAt = 1.5219 + 0.055RGDPt – 0.1239CPIt - 0.0027RINTt + εt; where RGDP is significant at 5% ($p<\alpha$; 0.0101<0.05), CIP is significant as well at 5% ($p<\alpha$; 0.0436<0.05), while RINT is not significant. Likewise in previous two modules, as the real GDP rises by 1% there will be an increase in the Public Bank profitability (ROA) by 0.05%, and study can assume this relationship with 95% confidence level as the p value is 0.0101. However, in case of Public Bank, inflation is significant, with negative relationship to profitability. More expressly the model forecasts that an increase in CPI by 1% will contribute to a decrease in Public Bank profitability by 0.1239, as the coefficient has a negative sign on it -0.1239 and is significant at the 0.05 level. Interestingly, real interest rate is not significant variable for Public Bank. Lastly, for Hong Leong Bank, the individual coefficient interpretation is similar like in case of Public Bank. The equation ROAt = 1.1864 + 0.03165RGDPt – 0.1074CPIt – 0.0107RINTt + εt shows that RGDP is significant at 10% ($p<\alpha$; 0.0562<0.01), significance of CPI is 5% ($p<\alpha$; 0.0413<0.05), while RINT is not significant. Likewise in previous modules, as the real GDP rises by 1% there will be an increase in the Public Bank profitability (ROA) by 0.03%, and we can assume this relationship with 90% confidence level as the p value is 0.0562. As in the case of Public Bank, inflation is significant, with negative

relationship to profitability. More specifically the model forecasts that an increase in CPI by 1% will contribute to a decrease in Hong Leong Bank profitability by 0.1074, as the coefficient has a negative sign on it -0.1239 and is significant at the 0.05 level. Real interest rate, as in the case of the mean of all banks and Public Bank, is not significant variable for Hong Leong Bank.

7. CONCLUSION

This paper examines the relationship and dynamic linkage between profitability of Malaysian commercial banks, expressed through return on assets (ROA) and macroeconomic variables which comprise real GDP growth, inflation (expressed through CPI) and real interest rates. The analysis relies on standard and well accepted techniques of linear regression and correlation utilizing the data that span of 17 years or 17 annual observations.

7.1. Main Findings

The profitability of all banks together as well as three individual banks, Maybank, Public Bank and Hong Leong Bank in Malaysia is investigated in this paper. The paper shows that the mean for all banks, as well as three individual banks, real GDP is significant and have positive relationship with banks' profitability. This is consistent with majority of previous finding including Molyneux and Thornton (1992) as well as Pasiouras and Kosmidou (2007). The paper, in accordance with economic theory, explains that economic growth increases bank profits through enhanced demand for business loans. These loans generate good returns to commercial banks, resulting in higher profits.

Even though economic theory suggests that there should be relationship between ROA and inflation (CPI), this paper presents that in Malaysian case for the mean of all banks and Maybank inflation (CPI) is not significant. This result is consistent with findings of Naceur (2003) who suggested that banks tend not to earn profit in inflationary environment. On the contrary, for Public Bank and Hong Leong Bank inflation (CPI) is significant, showing a negative relationship. This result is consistent with findings of Demirgüç-Kunt and Huizinga (1999) who advocated that in case of unanticipated inflation banks may be slow in adjusting their interest rates, which will have for outcome that bank costs increase faster than bank revenues, therefore negatively impact bank profitability. Lastly, paper illustrated that in Malaysia real interest rate has no relation with banks' profitability. For mean of all banks, Public Bank and Hong Leong Bank real interest rate (RINT) is not significant. This result can be associated with study done by Guru *et al.* (1999) which suggested that interest rate spread or margin should be used as explanatory variable in place of just real market interest rates.

7.2. Implications

The findings of this paper indicate some implications pertaining to Malaysian banks' profitability. Firstly, growth in GDP increases the banks' profitability in Malaysia. The higher the growth of GDP, the better is the Malaysian banks' profitability. When there is a consistent growth

in GDP for a particular period of time, the business units would respond to the demand of goods and services in the economy. The more efficient the funds or capitals would be matched by the banking sector, the more it would spur economic activities and in turn further increase the demand of funds and capitals to cater for the business activities in the economy. These increase business activities would contribute to the GDP growth and hence the rapid economic development would have positive impact on the banks' profitability via advanced financial intermediation. Thus, it is suggested that for the banks' profitability, the growth of gross domestic product must be in place in order to stimulate lending and borrowing activities. Secondly, inflation, if it is significant, seems to have negative impact on some Malaysia's banks. For instance, Public Bank and Hong Leong Bank appear to be slow in adjusting their interest rates, therefore experiencing that bank costs increase faster than bank revenues. Consequently this has a negative impact on banks' profitability. Accordingly, it is suggested that for the banking sector to preserve on profitability, the anticipation of inflation must be in place in order to increase revenue and reduce cost.

7.3. Caveats

There is some gap in studying the profitability determinants of commercial banks in Malaysia for the period 1995-2011. This paper tries to shed light on this gap. To begin with, there is a need for more comprehensive study which covers all banks in Malaysia and for longer period. Study should also include other factors which are not covered in this paper such as market concentration, money supply and exchange rates. In addition, pre and after 1997 Financial Crisis comparison research in the profitability determinants for Malaysian banks would be appropriate. Lastly, this paper basically focused on the domestic commercial banks. Future researches may extend analysis to include subsidiaries of foreign banks operating in Malaysia in their samples. To this extent, a comparative analysis of the profitability performance of foreign and domestic banks could be carried out.

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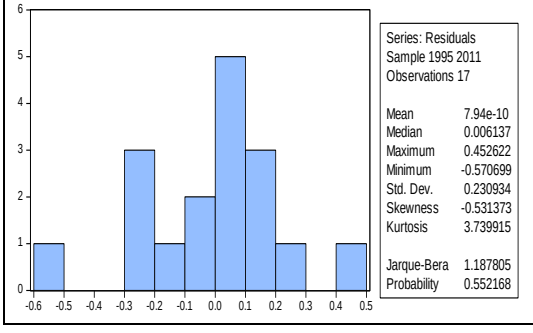
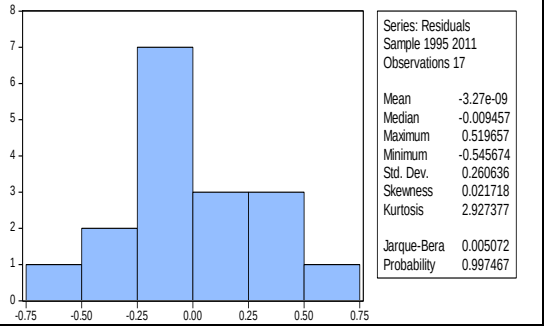
APPENDICES

Appendix-A. Jarque-Bera test

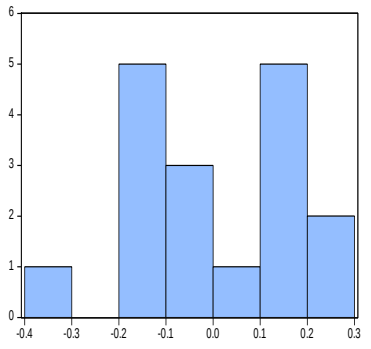
A1- All banks



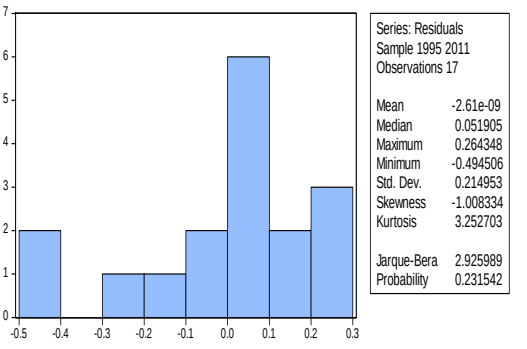
A3 – Public Bank



A2- Maybank



A4- Hong Leon Bank



Appendix-B. Breusch – Godfrey Serial Correlation LM Test

B1 – All Banks

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.353393	Prob. F(2,11)	0.2982
Obs*R-squared	3.357123	Prob. Chi-Square(2)	0.1866

B3 – Public Bank

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.609592	Prob. F(2,11)	0.5610
Obs*R-squared	1.696194	Prob. Chi-Square(2)	0.4282

B2 – Maybank

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.859020	Prob. F(2,11)	0.1000
Obs*R-squared	5.814478	Prob. Chi-Square(2)	0.0546

B4 – Hong Leong Bank

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.151022	Prob. F(2,11)	0.8616
Obs*R-squared	0.454322	Prob. Chi-Square(2)	0.7968

Appendix C: Heteroskedasticity Test: White

C1 – All Banks

Heteroskedasticity Test: White

F-statistic	6.470747	Prob. F(3,13)
Obs*R-squared	10.18159	Prob. Chi-Square(3)
Scaled explained SS	8.156643	Prob. Chi-Square(3)

C3- Public Bank

Heteroskedasticity Test: White

F-statistic	0.311386	Prob. F(3,13)
Obs*R-squared	1.139695	Prob. Chi-Square(
Scaled explained SS	0.642265	Prob. Chi-Square(

C2- Maybank

Heteroskedasticity Test: White

F-statistic	0.831033	Prob. F(3,13)
Obs*R-squared	2.735585	Prob. Chi-Square(3)
Scaled explained SS	1.212349	Prob. Chi-Square(3)

C4- Hong Leong Bank

Heteroskedasticity Test: White

F-statistic	0.162976	Prob. F(3,13)
Obs*R-squared	0.616192	Prob. Chi-Square(
Scaled explained SS	0.405862	Prob. Chi-Square(

Appendix D: Ramsey's Mis-specification test – RESET

D1 – All Banks

Ramsey RESET Test
Equation: EQ01
Specification: ROA C RGDP CPI RINT
Omitted Variables: Powers of fitted values from 2 to 3

	Value	df	Probability
F-statistic	0.366519	(2, 11)	0.7013
Likelihood ratio	1.096726	2	0.5779

D3 – Public Bank

Ramsey RESET Test
Equation: EQ011
Specification: ROA C RGDP CPI RINT
Omitted Variables: Powers of fitted values from 2 to 3

	Value	df	Probability
F-statistic	2.832744	(2, 11)	0.1018
Likelihood ratio	7.062561	2	0.0293

D2 – Maybank

Ramsey RESET Test
Equation: EQ01
Specification: ROA C RGDP CPI RINT
Omitted Variables: Powers of fitted values from 2 to 3

	Value	df	Probability
F-statistic	9.321107	(2, 11)	0.0043
Likelihood ratio	16.85217	2	0.0002

D4 – Hong Leong Bank

Ramsey RESET Test
Equation: EQ01
Specification: ROA C RGDP CPI RINT
Omitted Variables: Powers of fitted values from 2 to 3

	Value	df	Probability
F-statistic	1.659217	(2, 11)	0.2345
Likelihood ratio	4.482094	2	0.1063

Appendix E: ARCH Test

E1 – All banks

Heteroskedasticity Test: ARCH

F-statistic	0.158355	Prob. F(1,14)	0.6967
Obs*R-squared	0.178953	Prob. Chi-Square(1)	0.6723

E3- Public Bank

Heteroskedasticity Test: ARCH

F-statistic	0.090557	Prob. F(1,14)	0.7679
Obs*R-squared	0.102829	Prob. Chi-Square(1)	0.7485

E2 – Maybank

Heteroskedasticity Test: ARCH

F-statistic	0.050156	Prob. F(1,14)	0.8260
Obs*R-squared	0.057116	Prob. Chi-Square(1)	0.8111

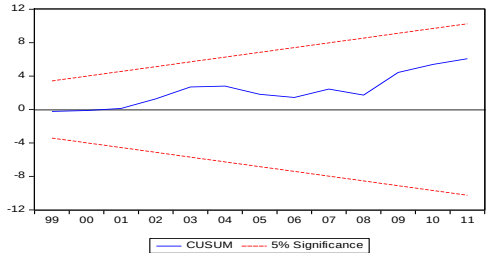
E4-Hong Leong Bank

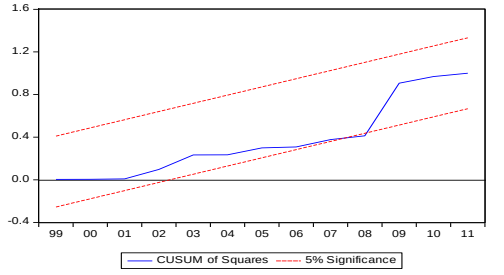
Heteroskedasticity Test: ARCH

F-statistic	0.144336	Prob. F(1,14)	0.7097
Obs*R-squared	0.163272	Prob. Chi-Square(1)	0.6862

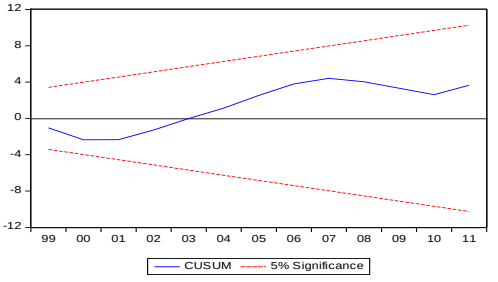
Appendix-F. CUSUM and CUSUMSQ Test

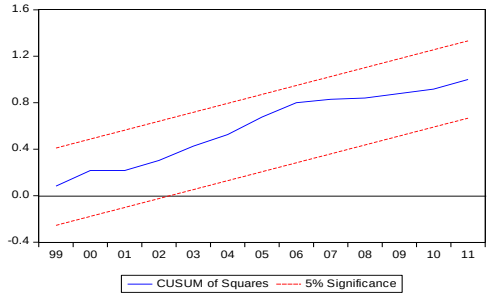
F1 – All banks



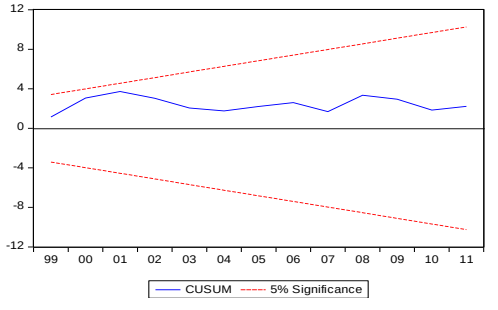


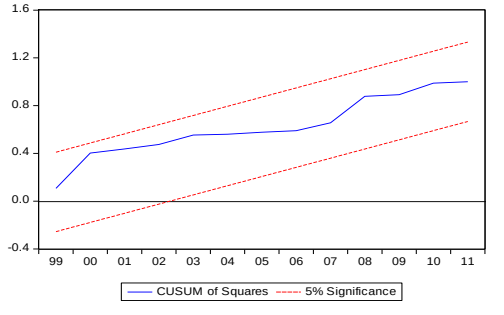
F 2- Maybank





F3- Public Bank





F4- Hong Leong Bank